Rheem Australia Pty Ltd

ABN 21 098 823 511

SERVICE INSTRUCTIONS

325 & 410 Series II Heat Pump

TM077

Issued: June 17

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Issued: April 19

Solahart	Everhot	RheemPlus	Rheem
325HAV	251325	554325	451325
	251410	554410	551325
			551410

First Issued April 2014

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 325 or 410 Series II Heat Pump Water Heater, contact your nearest Rheem Service Department where all genuine replacement parts are also available.

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 325 or 410 Series II 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

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

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

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

Isolate power before conducting the indicated test

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

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

Touch Voltage Testing

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

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

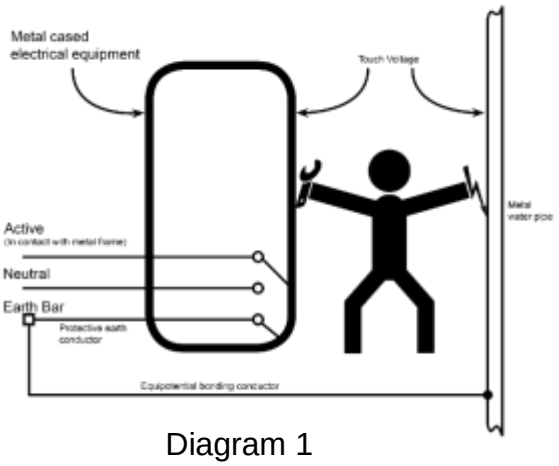


Diagram 1

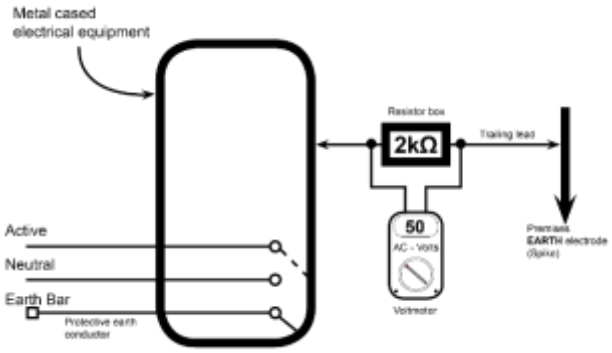


Diagram 2

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

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

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

Procedure:

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

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

POWER SUPPLY

325 & 410 Series II 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

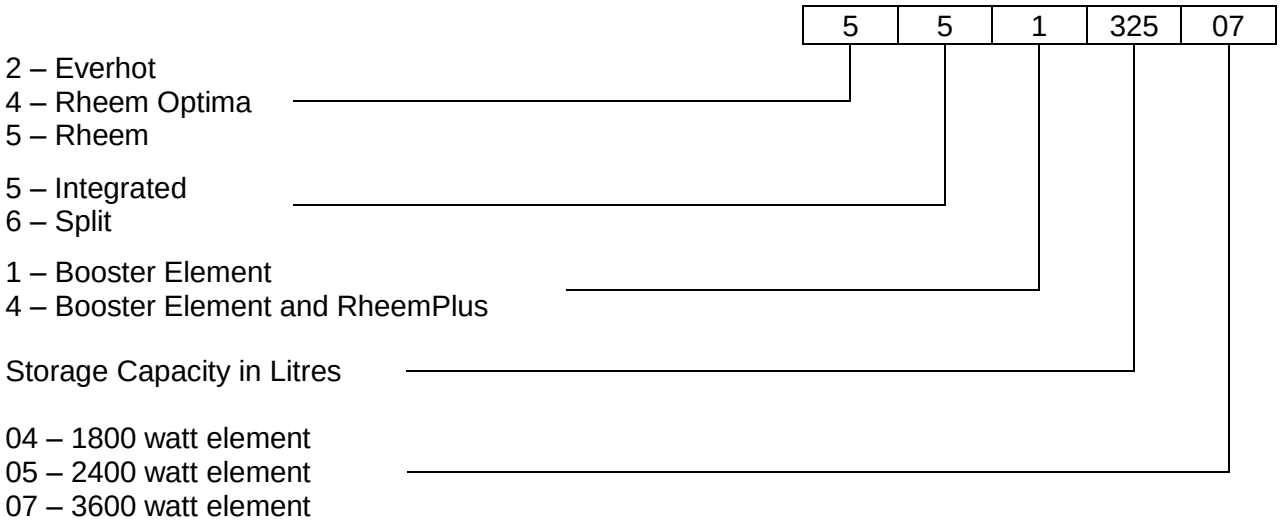
R134a refrigerant is a controlled substance under the Ozone Protection and Synthetic Greenhouse Gas Management Act. Only personnel qualified and licensed to work with refrigerants may carry out service and repair work on the sealed refrigeration system. During repair the refrigerant must always be recovered, 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.

HEAT PUMP WATER HEATER MODEL IDENTIFICATION

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

Rheem / Everhot Model Identification



Solahart Model Identification

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

HEAT PUMP WATER HEATER MODELS

The 325 & 410 Series II 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 or 18 = 1.8kW
- 05 or 24 = 2.4kW
- 07 or 36 = 3.6kW

Brand	Model		Storage Tank		Heat Pump Module
Rheem	551325xx 551410xx	=	T551325xx T551410xx	+	182550
Rheem Optima	451325xx	=	T451325xx	+	182550
RheemPlus	554325xx 554410xx	=	T554325xx T554410xx	+	182550
Everhot	251325xx 251410xx	=	T251325xx T251410xx	+	182553
Solahart	325HAVxx	=	T325HAVxx	+	182541
	325HAV36(1)	=	R325HAV36	+	183550

(1) This variant introduced from April 2019

Storage Tank

Parameter		Model		
		T551410[1] T554410[1, 3] T251410[1]	**T451325**	**T551325 T554325[3] T251325 T325HAV R325HAV[4]**
Capacity (Litres)		410	325	325
Boost Capacity (Litres)		200[2]	180[2]	100 / 180[2]
Booster Element Rating (kW)		2.4 / 3.6	1.8 / 2.4 / 3.6	1.8 / 2.4 / 3.6
T&PR Valve Rating (kPa)		1000	1000	1000
Maximum Inlet Water Pressure (kPa)	With ECV	680	680	680
	Without ECV	800	800	800
Water Connections	Inlet / Outlet	Rp¾" (20mm)	Rp¾" (20mm)	Rp¾" (20mm)
	Heat Pump	Rp½" (15mm)	Rp½" (15mm)	Rp½" (15mm)
	T&PR	Rp½" (15mm)	Rp½" (15mm)	Rp½" (15mm)
Anode	Quantity	1	1	1
	Length (mm)	1596	1340	1370
Booster Element Thermostat Setting (Fixed)		70ºC	70ºC	70ºC
Booster Element ECO Setting		85ºC	85ºC	85ºC

[1] 410L model for use in QLD only.

[2] Boost volume with droopy element fitted – droopy element available in 2.4kW and 3.6kW only.

[3] RheemPlus models have the mains terminal block and earth connection on the opposite side of the tank to the heat pump module. RheemPlus models therefore have three electrical covers on the storage tank.

[4] Atmos available in 3.6kW rating only

Heat Pump Module

Parameter	Model
	182550 / 182553 / 182541 / 183550
Superheat Setting (Factory)	6K at 10ºC saturated suction temperature
Refrigerant Type	R134a
Refrigerant Charge	375 grams
Refrigerant High Pressure Switch	Cut Out: 2930kPa (± 103kPa) Manual Reset Pressure: 2241kPa (± 207kPa)
Compressor Capacitor	25 µF +10/–5%, 370/440V AC, 50/60Hz
Compressor Current Draw	3.3A
Compressor Internal Overload Setting (Automatic Reset)	Cut Out: 150°C Cut In: 90°C
Compressor Winding Resistance	Run Winding – Red & Blue: 4.18Ω at 20ºC Start Winding – Red & Black: 5.76Ω at 20ºC
Compressor Switching Relay	Type: Omron Coil Voltage: 240V AC Coil Resistance: 30.51kΩ at 20ºC
Fan Capacitor	1.5µF ± 5%
Fan Winding Resistance	Run Winding – Blue & Black: 650Ω at 20ºC Start Winding – Blue & Brown: 375Ω at 20ºC
Circulator Winding Resistance on Speed Setting 1	602Ω at 20ºC
Circulator Capacitor	1.5µF +2/–5%
Circulator Speed Setting	1

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.
- RheemPlus models: Service the tempering valve, refer to page 62.
- 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 pages 41 and 56.
- 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.
- RheemPlus models: Service the tempering valve, refer to page 62.
- 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 pages 41 and 56.
- 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.

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.

Discharge Check Valve – A valve in the refrigerant discharge line that allows refrigerant to move in one direction only. The valve prevents refrigerant migrating back into the compressor when the refrigeration system is not operating.

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.

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

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.

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.

Process Tube – A short piece of copper pipework used for charging refrigerant into the refrigeration system during manufacture.

Refrigerant High Pressure Switch – A pressure switch in the refrigerant discharge line that opens when the refrigerant discharge pressure exceeds the switch rating.

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.

Sight Glass – A component fitted in the refrigerant liquid line. The sight glass allows the state (liquid/vapour) of the passing refrigerant to be observed, and includes a moisture indicator.

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.

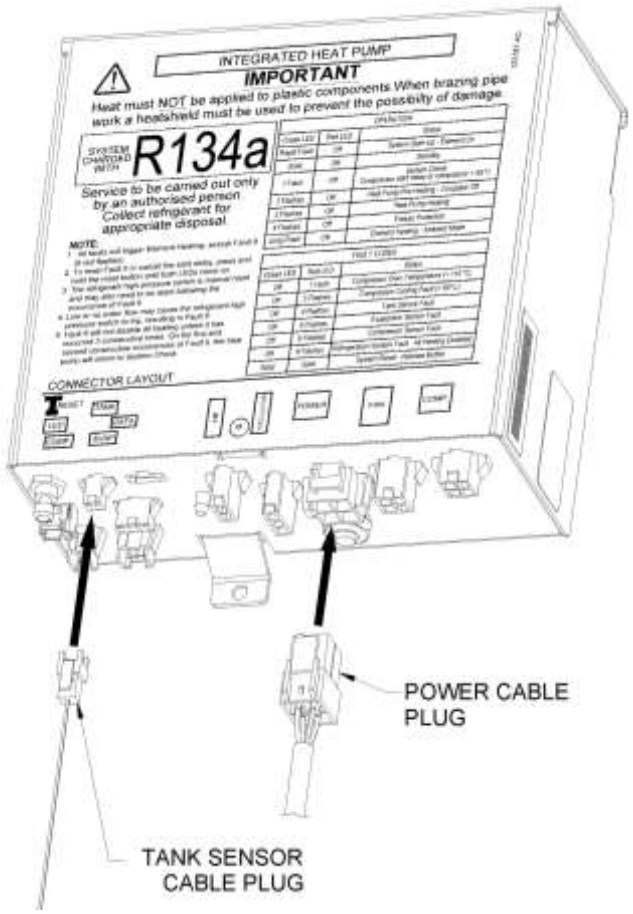
Never fit a T&PR Valve with a pressure rating greater than that indicated on the product rating label.

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.

Power and Tank Sensor Connections



Sensors

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

The sensors are identified as follows:

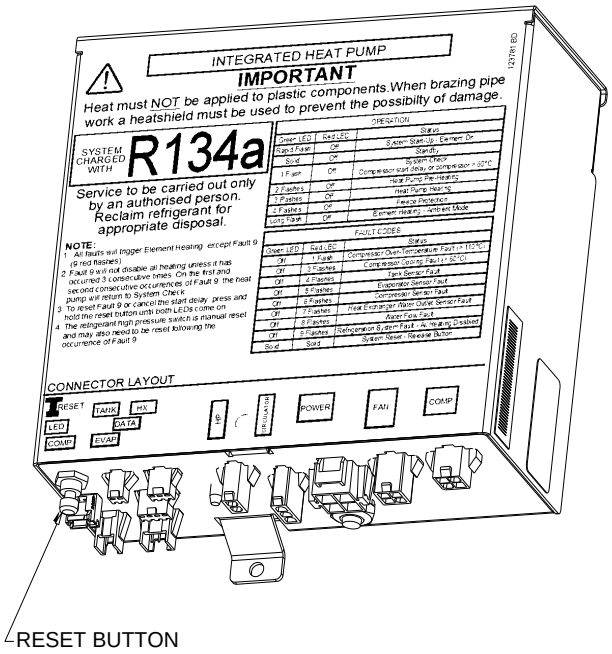
- Tank sensor
- Evaporator sensor
- Compressor sensor
- Heat exchanger water outlet sensor

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

For more information on the sensors refer to the Sensor Testing section on page 49.

Reset Button

On the underside of the controller is a reset button.



The reset button may be used to cancel the start delay, or reset Fault 9. Fault 9 will not disable all heating unless it has occurred 3 consecutive times however if Fault 9 has occurred once, or twice consecutively, the reset button will reset the consecutive occurrence count.

The reset button also clears any stored Fault Code from the controller memory.

The reset button does not function during System Start-Up or the Last Fault Code display function, however may be used at all other stages of system operation.

To reset the system, press and hold the reset button until both LEDs come on (approximately 2 seconds). After both LEDs come on, release the reset button. If the reset button is held down for longer than 10 seconds, the reset will not occur.

When reset, the system returns to System Start-Up.

NOTES:

1. The refrigerant high pressure switch is manual reset and may also need to be reset following the occurrence of Fault 9.

2. Resetting the compressor start delay prematurely after the compressor has been operating may cause the compressor to trip out on its internal overload switch, if the heat pump is operated. This is due to the compressor's inability to overcome the residual pressure differential that will remain in the refrigeration system for a period of time after the compressor has operated. The compressor's internal overload switch will reset automatically, however the controller may detect Fault 9 prior to the automatic reset occurring.

OPERATION

The heat pump controller contains a main relay that ensures only the heat pump *or* the booster element can be operated. The main relay will enable element operation in its un-powered (off) state. Whenever power is available and element heating is not being used, the controller energises the main relay to enable heat pump operation.

When heat pump operation is enabled and occurring, power for the compressor is passed through an electronic switch called a triac, which is downstream of the main relay and allows the controller to switch the compressor on and off in response to the demand for heat pump heating.

Downstream of the triac, power for the compressor also passes through the load side of a compressor switching relay. The compressor switching relay prevents compressor operation in the event of high refrigerant pressure, via a high pressure switch in the refrigeration system. The compressor switching relay will enable compressor operation in its powered (on) state.

The compressor switching relay's coil side is fed power from the main relay when the main relay is in its powered (on) state, via the refrigerant high pressure switch. This way, the compressor switching relay is energised whenever heat pump heating enabled, and it will not switch the compressor load unless it is de-energised as a result of the refrigerant high pressure switch opening.

The 325 & 410 Series II 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, condenser (heat exchanger), thermostatic expansion (TX) valve and the evaporator.

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.

SYSTEM START-UP

When power is first applied to the system, a 3 second System Start-Up process occurs. During the 3 second System Start-Up, the green LED displays a rapid flash and the element operates.

If a fault occurred during the last operation of the heat pump, a Fault Code will have been stored. If a Fault Code is stored, that Fault Code will be displayed for 27 seconds after the green LED's rapid flash, to indicate the last fault that occurred. See the LED Status Codes section on page 19.

The element is energised if the red LED is displaying a stored Fault Code.

STANDBY MODE

Standby is an idle mode where power is available, but water heating is not required. The green LED is illuminated and remains on.

The Freeze Protection function may be required whilst in Standby Mode, refer to the Freeze Protection section on page 18.

HEAT PUMP MODE

Heat pump heating is initiated when the tank sensor detects a temperature less than 50°C. Should the ambient temperature be outside the heat pump's operating limits or a fault is detected, the system may switch to Element Mode at any stage during Heat Pump Heating – see the Element Mode section on page 16.

Heat Pump Mode consists of three stages – System Check, Heat Pump Pre-Heating 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 45 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.
- Once the compressor has cooled and the start delay has elapsed, the system goes to Heat Pump Pre-Heating.

The Freeze Protection function may be required whilst in System Check, refer to the Freeze Protection section on page 18.

Heat Pump Pre-Heating

During Heat Pump Pre-Heating, the green LED will display 2 flashes.

The compressor and fan operate, and the circulator is initially off. The controller checks the heat exchanger water outlet temperature every 30 seconds and when the heat exchanger water outlet temperature is greater than 22°C, the circulator starts at its pre-set initial speed.

The circulator speed is then adjusted up or down to maintain the heat exchanger water outlet temperature at a control point of 26°C. The circulator speed is adjusted every 30 seconds, in very small increments only. This ensures the controller is only able to maintain the 26°C control point whilst the heat input from the refrigeration system is very low (as it is at start-up).

As the refrigeration system begins to generate useful heat, the temperature at the heat exchanger water outlet will rise more quickly and pull away from the control point. In this way, the system will only proceed from Heat Pump Pre-Heating when the heat exchanger water outlet temperature is rising at an acceptable rate.

The system goes to Heat Pump Heating under either of the following conditions:

- Heat exchanger water outlet temperature is greater than 35°C for more than 2 minutes
- The circulator speed reaches its maximum

  Note: This means the system will always be in Heat Pump Pre-Heating for at least 2 minutes. This is because the circulator speed can not reach its maximum within 2 minutes, as it is only adjusted every 30 seconds.

Heat Pump Heating

During Heat Pump Heating, the green LED will display 3 flashes.

The compressor and fan continue to operate, and the circulator runs at full speed. The system can not go from Heat Pump Heating back to Heat Pump Pre-Heating.

Heat Pump Heating ceases and the system returns to Standby Mode when the tank sensor detects a temperature greater than 60°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 outside the heat pump's operating limits or a fault is detected, the controller initiates Element Mode which uses the booster element to heat the water.

The booster element is controlled by the mechanical thermostat on the storage tank and remains energised until the mechanical thermostat contacts open at approximately 70ºC, at which point the element, controller and LEDS are de-energised.

Element Mode – Ambient

During Element Mode – Ambient, the green LED will display one long flash.

Element Mode – Ambient is utilised if the ambient temperature is outside the heat pump's operating limits. The conditions for Element Mode – Ambient depend on whether or not the heat pump is operating. Therefore, Element Mode – Ambient is utilised under the following conditions:

- The evaporator sensor temperature is less than 4°C or greater than 45°C when the system is in Standby Mode and heating is required, and the compressor start delay has elapsed (it has been 45 minutes since the compressor last ran)

- The evaporator sensor temperature is less than –3°C or greater than 40°C when the system is in Heat Pump Mode, any time after the first 10 minutes of compressor operation

The Freeze Protection function may be required whilst in Element Mode – Ambient, refer to the Freeze Protection section on page 18.

Element Mode – Fault

During Element Mode – Fault, the red LED will display a fault code indicating the fault that has occurred – see the LED Status Code Tables on page 20.

The Freeze Protection function may be required whilst in Element Mode – Fault, refer to the Freeze Protection section on page 18.

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

Fault	Description	Condition
Fault 1	Compressor Over-Temperature Fault	The temperature detected by the compressor sensor is greater than 110ºC.
Fault 3	Compressor Cooling Fault	During System Check, the compressor sensor detects a temperature greater than 60ºC that persists for more than 90 minutes.
Fault 4	Tank Sensor Fault	The tank sensor has failed.
Fault 5	Evaporator Sensor Fault	The evaporator sensor has failed.
Fault 6	Compressor Sensor Fault	The compressor sensor has failed.
Fault 7	Heat Exchanger Water Outlet Sensor Fault	The heat exchanger water outlet sensor has failed.
Fault 8	Water Flow Fault	The temperature detected by the heat exchanger water outlet sensor is greater than 73ºC.

FAULT 9 – HEATING DISABLED

When Fault 9 is current and heating is disabled, the red LED will display 9 flashes.

Fault 9 is a Refrigeration System Fault and is detected when the compressor sensor temperature is less than 12°C higher than the evaporator sensor temperature at any time after the first 10 minutes of compressor operation.

First and Second Consecutive Occurrences of Fault 9

On the first and second consecutive occurrences of Fault 9, the heat pump will return to System Check. Although the system attempts to re-start the first two consecutive times, each occurrence of Fault 9 is still stored in the controller's memory as per the Last Fault Code function – see page 19. After the first and second consecutive occurrences of Fault 9, the Fault 9 counter will be reset if a successful completion of a heat pump heating cycle occurs.

Refrigerant High Pressure Switch

The refrigerant high pressure switch will stop the compressor if it trips. The refrigerant high pressure switch is manual reset, therefore Fault 9 will occur when the compressor has cooled after being stopped. Without intervention, the refrigerant high pressure switch will remain open and therefore Fault 9 will re-occur after the system attempts to re-start.

Fault 9 Occurs 3 Consecutive Times

If Fault 9 occurs 3 consecutive times, the heat pump and element are disabled and no further heating will occur. Cycling of the power supply will not reset this condition. For instructions on how to reset Fault 9, refer to the Reset Button section on page 13.

The refrigerant high pressure switch is manual reset and may also need to be reset following the occurrence of Fault 9.

The Freeze Protection function may be required whilst heating is disabled, refer to the Freeze Protection section on page 18.

FREEZE PROTECTION

Whilst the Freeze Protection function is active, the green LED will display 4 flashes.

The Freeze Protection function is utilised in order to prevent the water within the heat pump module freezing during low ambient conditions. (Only Series II heat pump models are susceptible to freezing in the water circuit, due to the presence of a check valve in the storage tank fittings).

If the compressor start delay has elapsed (it has been 45 minutes since the compressor last ran) and the evaporator sensor temperature is less than 1°C for more than 15 minutes, 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 will switch off after 30 seconds.

The controller may utilise the Freeze Protection function when in any of the following modes:

- Standby Mode
- System Check
- Element Mode – Ambient
- Element Mode – Fault
- Fault 9 – Heating Disabled

Whilst the Freeze Protection function is active, the controller checks for Faults 1, 5 and 6 only.

Freeze Protection during Element Heating – Fault

Whilst the Freeze Protection function is active, the main relay is energised meaning it is possible for the compressor to receive power if a controller hardware failure exists. Therefore if Freeze Protection is required during Element Heating – Fault, it must still be possible to monitor the condition of the compressor.

Therefore the Freeze Protection function is disabled under the following conditions:

- If Fault 1 is current, as Fault 1 may indicate a compressor problem
- If Fault 6 is current, as Fault 6 indicates the compressor temperature sensor has failed and therefore the compressor condition can not be monitored

Whenever Fault 5 is current, the Freeze Protection function is also disabled as Fault 5 indicates the evaporator temperature sensor has failed and therefore it is not possible to determine the need for Freeze Protection.

LED STATUS CODES

The 325 & 410 Series II Heat Pumps utilise a green and red LED to display information about the operating status and/or fault conditions.

The green LED displays the operating mode; the red LED displays a fault condition. Refer to the LED Status Code Tables on page 20 for the LED flash sequences and a description of the condition.

In addition to displaying the current operating condition, the red LED is also able to display the last fault condition that occurred, as this Fault Code is stored in the controller's memory. If a current fault is being displayed, this is the same Fault Code that is stored in the controller's memory.

To initiate the Last Fault Code function, turn the power off, wait 30 seconds then turn the power back on again.

When power is restored to the system, the green LED will display a rapid flash during the 3 second System Start-Up process and the element operates.

If only the green LED illuminates after System Start-Up, a fault is not stored in the memory.

If a fault has occurred in the past, the red LED will display the stored Fault Code for 27 seconds, then attempt normal operation. (For example, if the red LED displays 1 flash – Fault 1 – the compressor discharge temperature has exceeded 110°C during the last heat pump operation).

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

The element is energised whilst the red LED displays the stored Fault Code.

The stored Fault Code is automatically cleared from the controller memory each time the heat pump completes a full cycle in Heat Pump Mode without detecting a fault, or when the reset button is pressed.

LED STATUS CODE TABLES

Operation

Green LED	Red LED	Condition See the Operation section from page 14 for detailed information
Off	Off	No power or mechanical thermostat contacts open.
Rapid Flash	Off	System Start-Up.
Solid	Off	Standby Mode.
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 – Heat Pump Pre-Heating. Compressor and fan on, circulator off for at least the first 30 seconds. Circulator starts when the heat exchanger water outlet temperature is greater than 22°C, and runs at variable speed.
3 Flashes	Off	Heat Pump Mode – Heat Pump Heating. Compressor, fan and circulator on – circulator at full speed.
4 Flashes	Off	Freeze Protection. Circulator operates for 30 seconds, every 15 minutes.
Long Flash	Off	Element Heating – Ambient Mode.

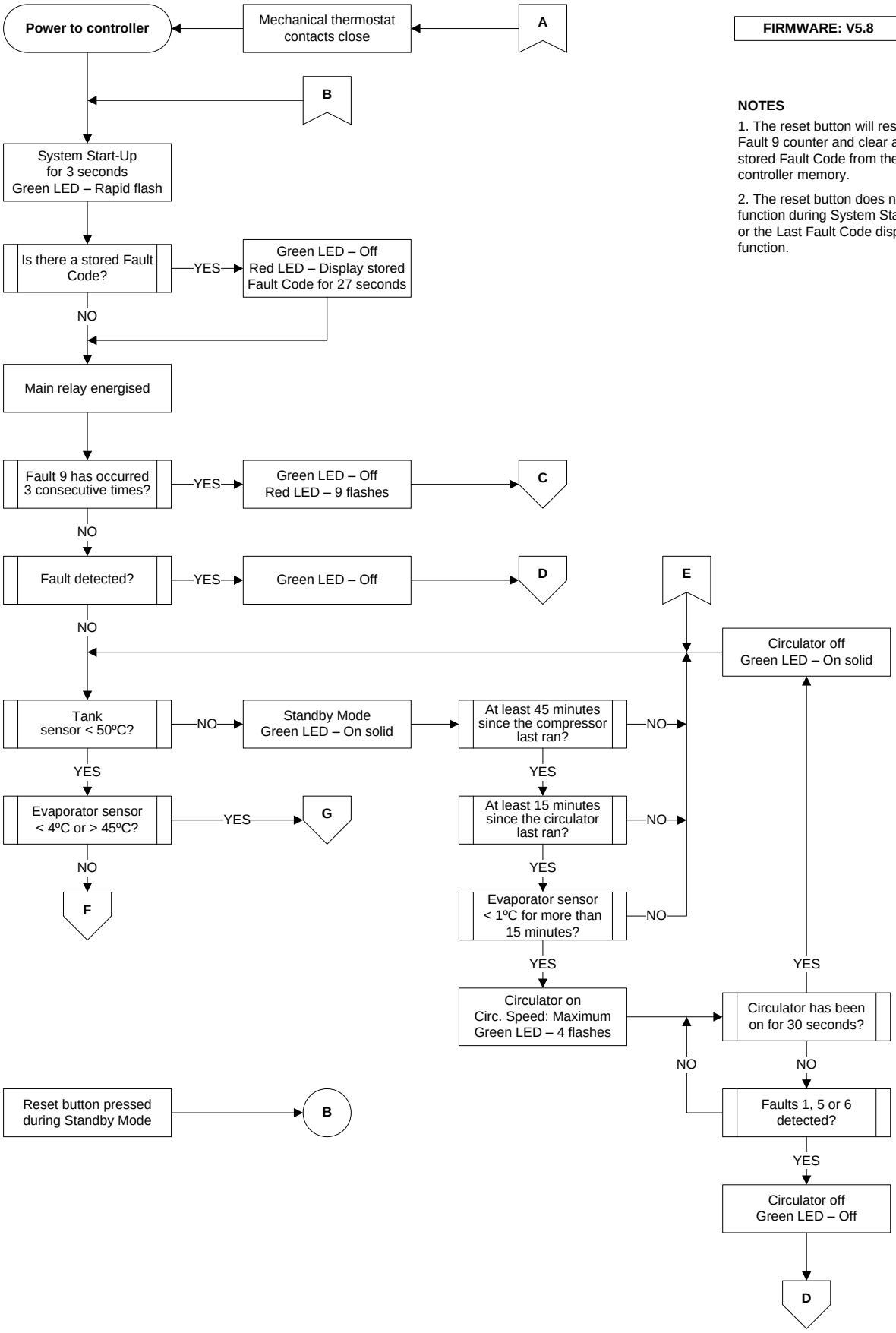
Fault Codes

Fault	Green LED	Red LED	Condition See the Operation section from page 14 for detailed information
FAULT 1	Off	1 Flash	Compressor Over-Temperature Fault, element heating enabled. Compressor temperature > 110°C.
FAULT 3	Off	3 Flashes	Compressor Cooling Fault, element heating enabled. Compressor temperature > 60°C.
FAULT 4	Off	4 Flashes	Tank Sensor Fault, element heating enabled.
FAULT 5	Off	5 Flashes	Evaporator Sensor Fault, element heating enabled.
FAULT 6	Off	6 Flashes	Compressor Sensor Fault, element heating enabled.
FAULT 7	Off	7 Flashes	Heat Exchanger Water Outlet Sensor Fault, element heating enabled.
FAULT 8	Off	8 Flashes	Water Flow Fault, element heating enabled.
FAULT 9	Off	9 Flashes	Refrigeration System Fault, heat pump and element heating disabled.
	Solid	Solid	System reset – release button.

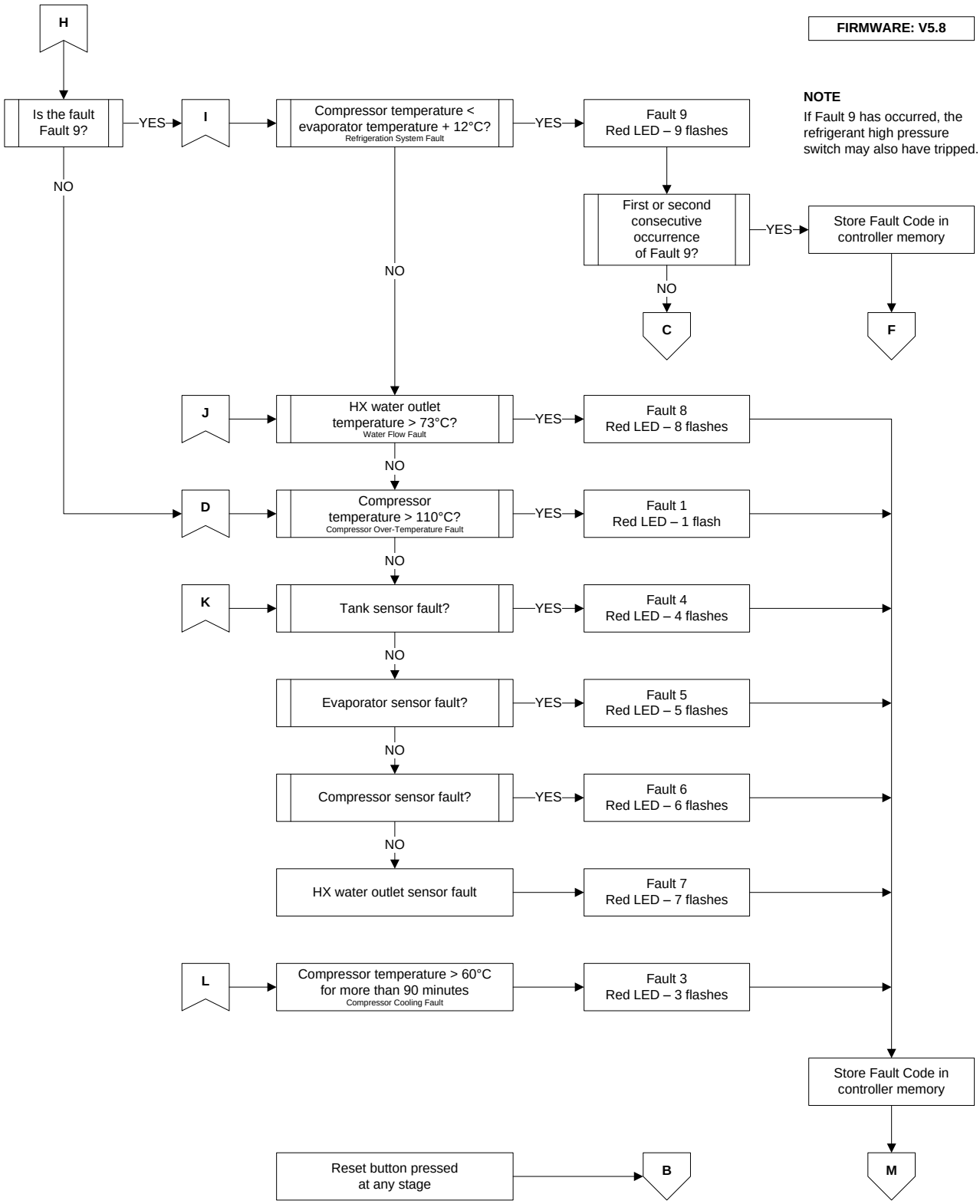
Notes

1. All faults will trigger Element Heating, except Fault 9 (9 red flashes).
2. Fault 9 will not disable all heating unless it has occurred 3 consecutive times. On the first and second consecutive occurrences of Fault 9, the heat pump will return to System Check.
3. To reset Fault 9 or cancel the start delay, press and hold the reset button until both LEDs come on.
4. The refrigerant high pressure switch is manual reset and may also need to be reset following the occurrence of Fault 9.

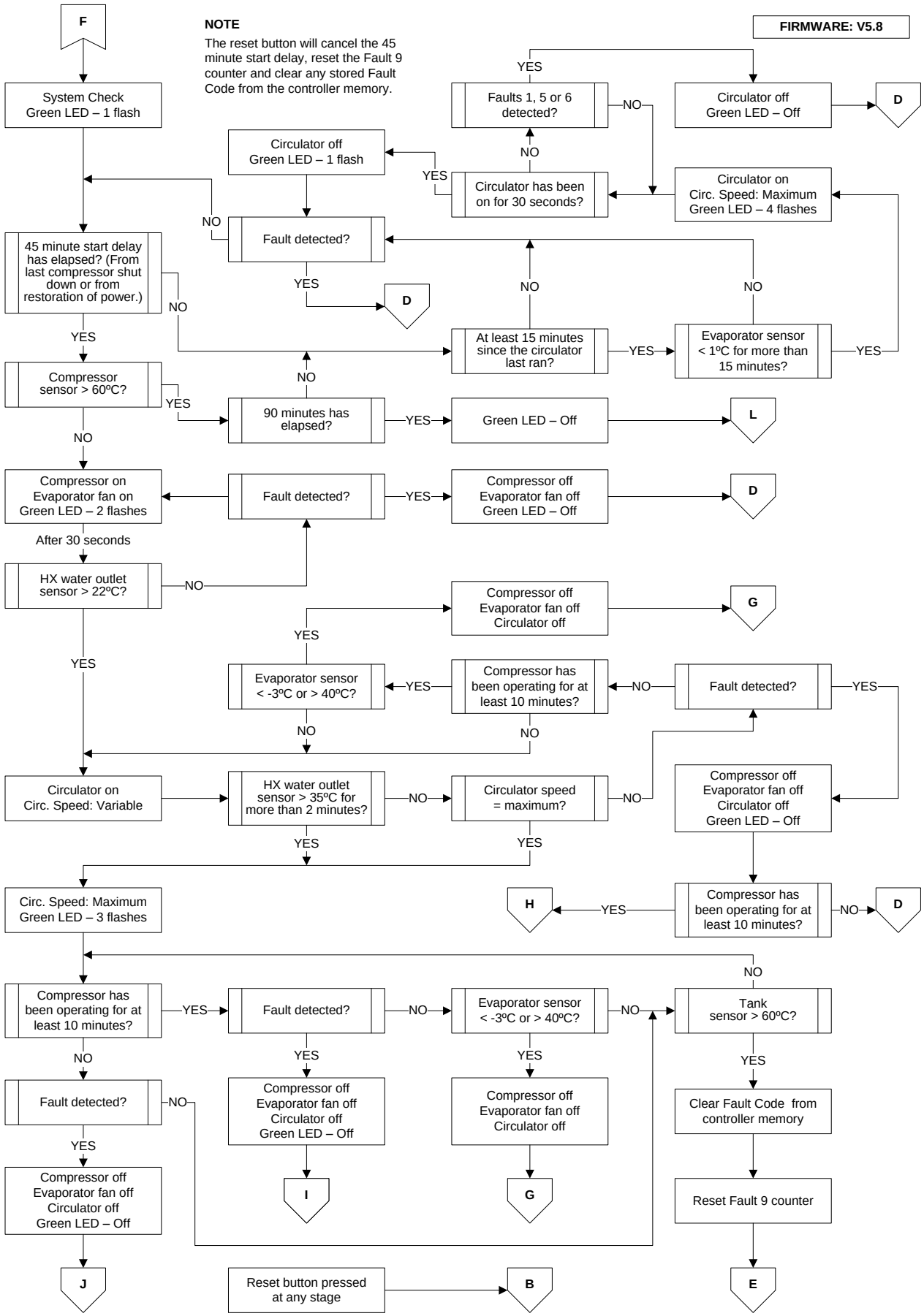
System Start-Up and Standby Mode



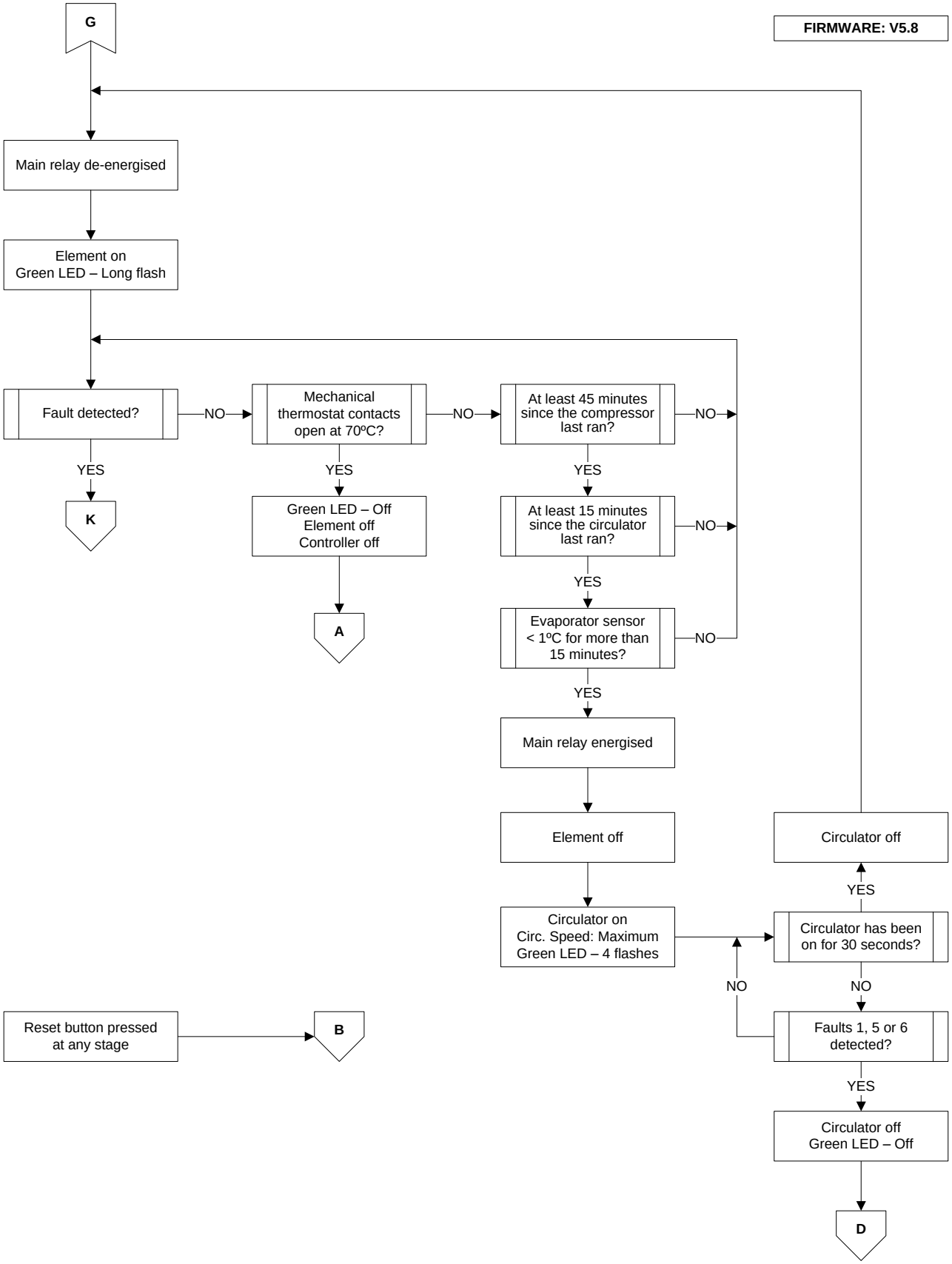
Faults



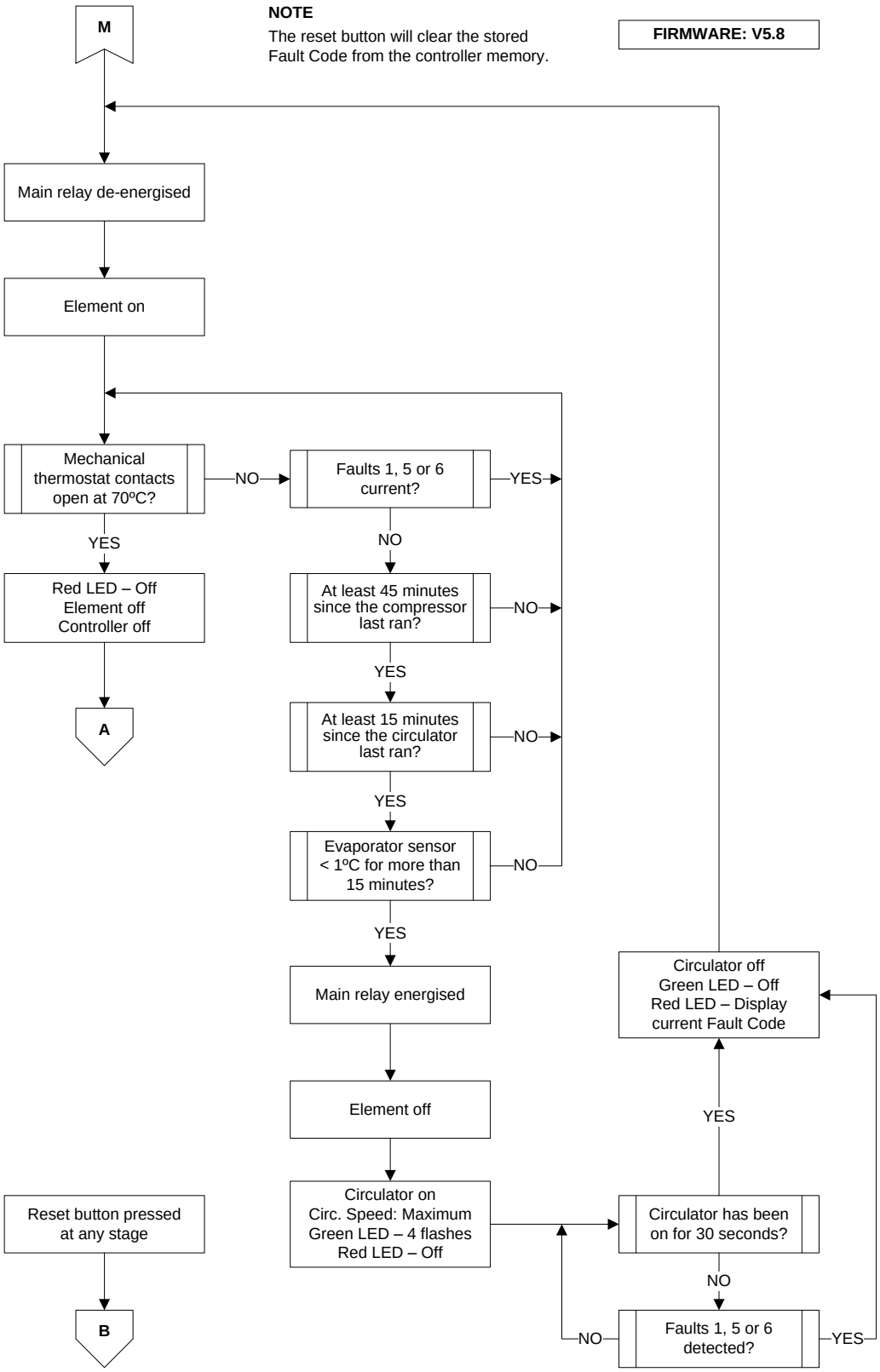
Heat Pump Mode



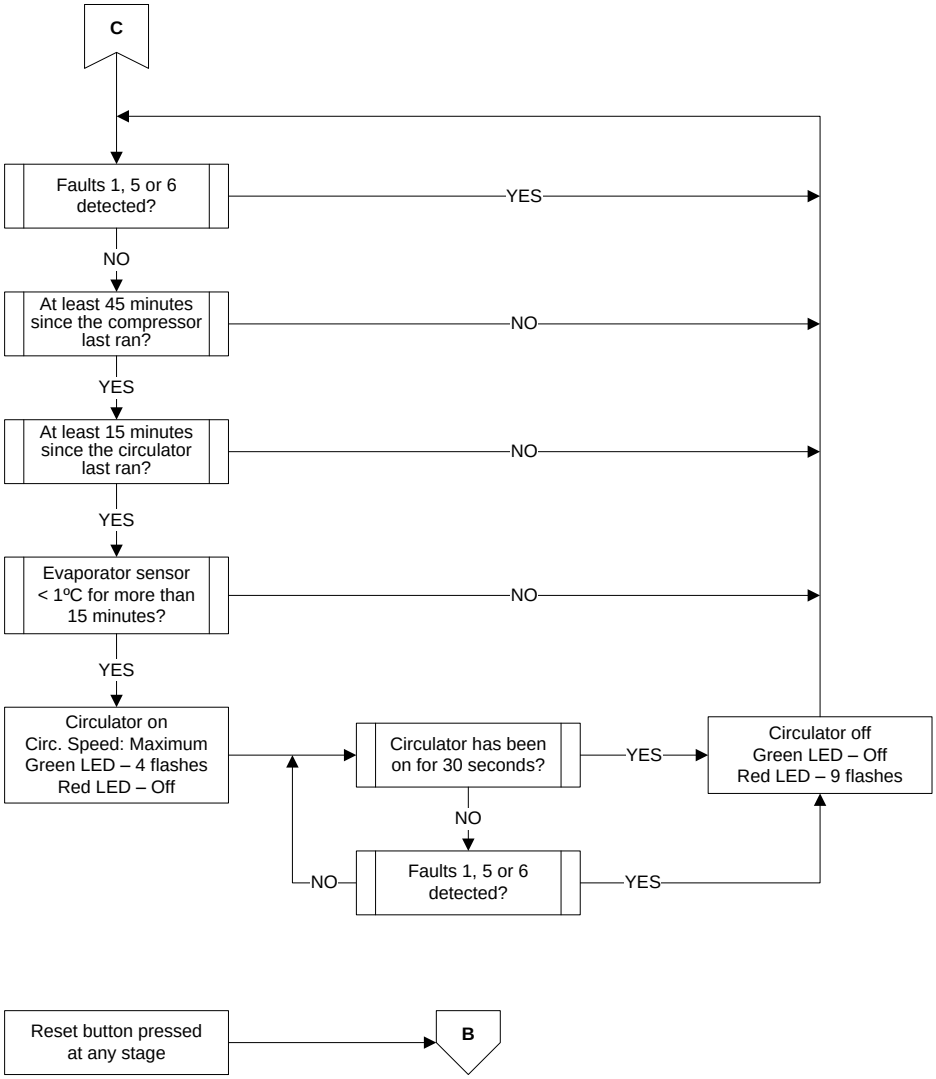
Element Mode – Ambient



Element Mode – Fault



Fault 9 – Heating Disabled



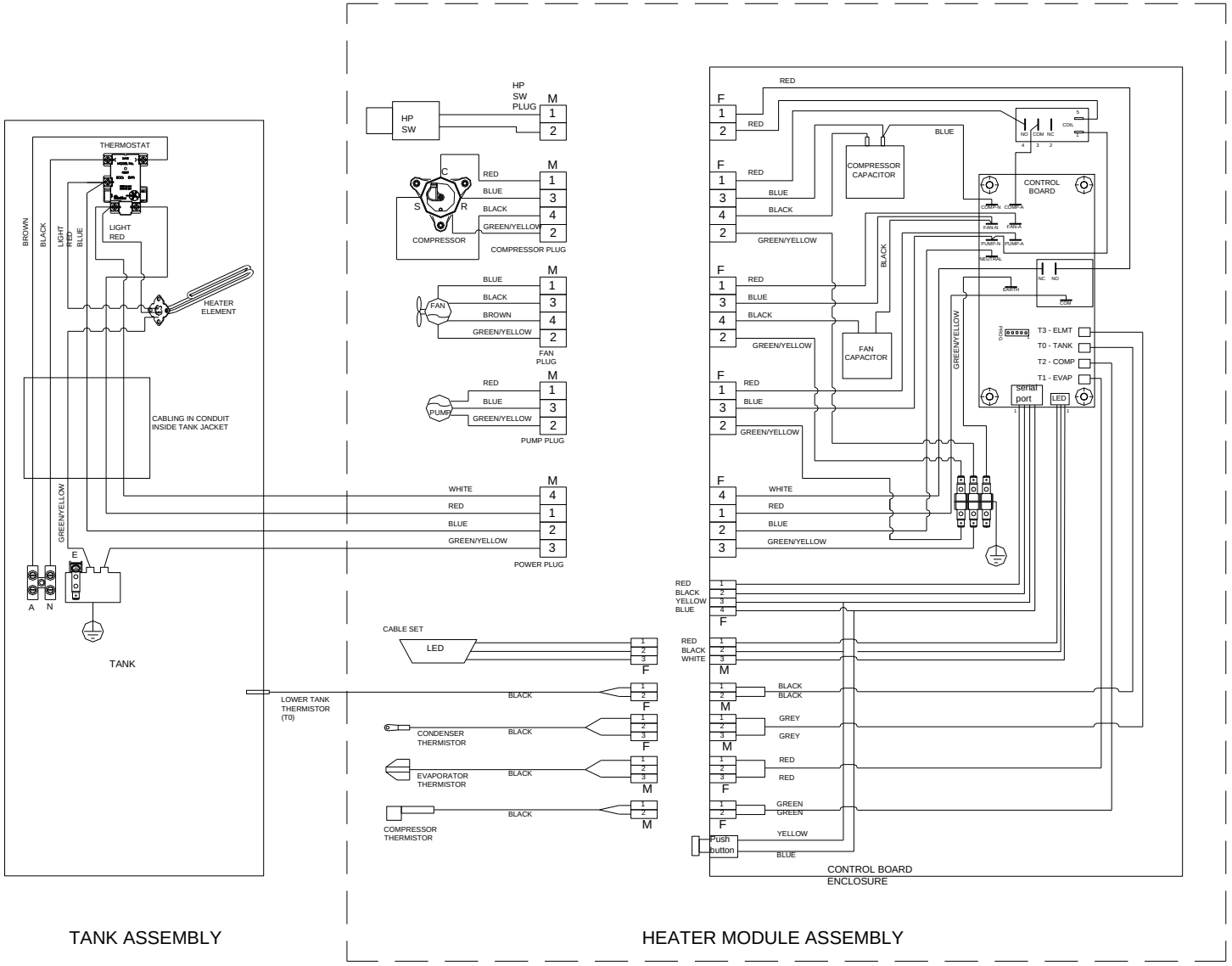
FIRMWARE: V5.8

NOTES

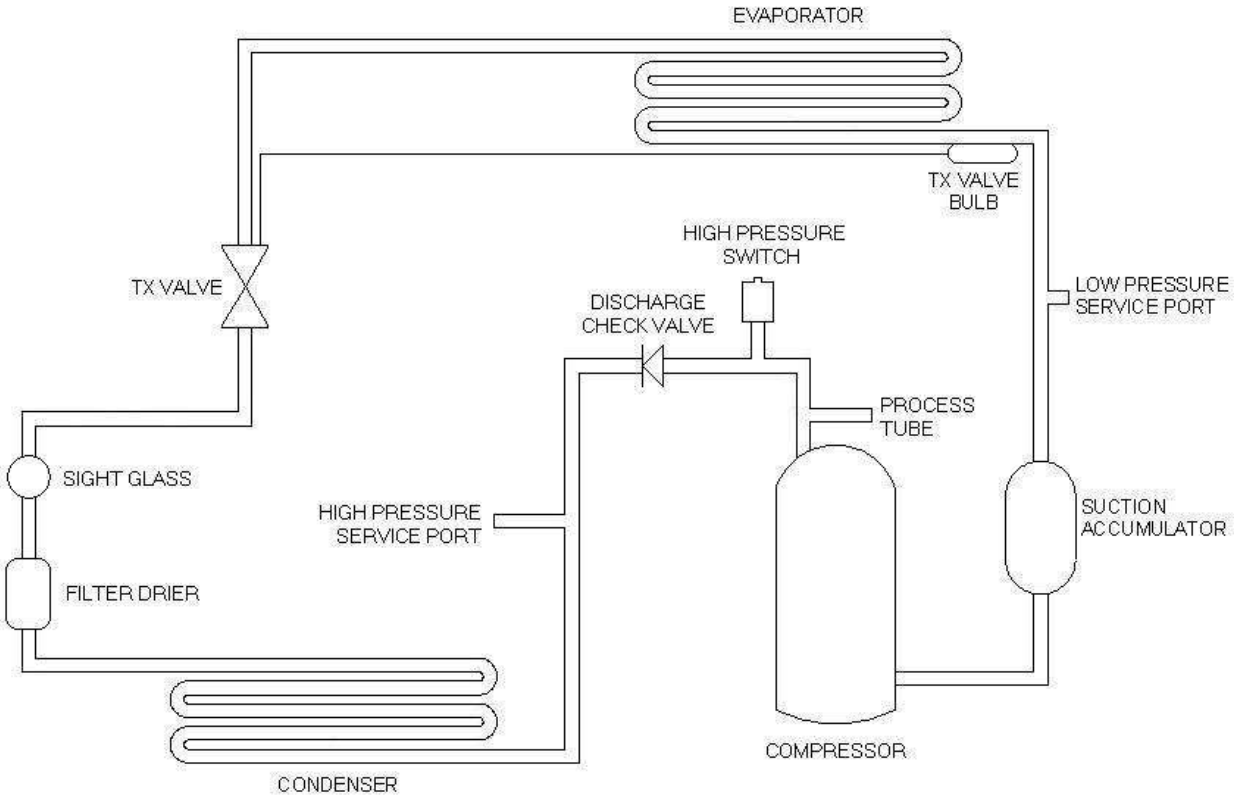
1. The reset button will reset Fault 9, reset the Fault 9 counter and clear the stored Fault Code from the controller memory.

2. If Fault 9 has occurred, the refrigerant high pressure switch may also have tripped.

WIRING DIAGRAM



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.

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

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.

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 325 or 410 Series II 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 325 & 410 Series II Heat Pumps.

Primarily, the kit provides the ability to conduct a full functional test on the appliance, which is required at the completion of any service work. The kit also facilitates the technician's ability to diagnose problems with the appliance, in circumstances where the faults present may otherwise hinder this process.

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 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 diagram on page 12.

Before using the Heat Pump Service Power Cable, isolate power to the water heater. Remove the mains power cable from the bottom of 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.

The Heat Pump Service Power Cable may need to be used in conjunction with the Proxy Tank Sensor if the water in the storage tank is fully heated.

Proxy Tank Sensor

In order to conduct a full functional test, the heat pump must be operated in heating mode. As a heating cycle may not be required due to the water in the storage tank being fully heated, the heat pump will not ordinarily operate in heating mode. Use of the Proxy Tank Sensor will allow the heat pump to be operated in heating mode irrespective of the temperature of the water in the storage tank.

The Proxy Tank Sensor is plugged into the heat pump module's controller, in place of the normal tank sensor – see the diagram on page 12.

Before using the Proxy Tank Sensor, isolate power to the water heater. Remove the tank sensor from the bottom of the heat pump module's controller, and plug in the Proxy Tank Sensor instead.

The heat pump module can now be operated.

The Proxy Tank Sensor may need to be used in conjunction with the Heat Pump Service Power Cable if timed (off peak) power is unavailable.

Note: The Proxy Tank Sensor must not be left in place after testing or as a substitute for a failed tank sensor, as the heat pump will not turn off.

Element Plug

In the event that a heat pump module needs to be decommissioned, for example if the heat pump module is found to be demonstrating the 'jack hammering' phenomenon, the Element Plug is used to bypass the heat pump module controller and effectively turn the storage tank into an electric water heater. By using the Element Plug, the service technician is able to safely ensure the home owner still has hot water available.

If the Element Plug is used, the repairer must endeavour to rectify the issue with the heat pump module as soon as possible in order to minimise the impact on the home owner's power consumption expense.

Before using the Element Plug, isolate power to the water heater. Remove the mains power cable from the bottom of the heat pump module's controller (see the diagram on page 12), and insert the 4-pin Element Plug into the 4-pin plug on the end of the mains cable.

The water heater can now be operated.

The Service Technician's Heat Pump Kit contains two Element Plugs, and Element Plugs can be ordered as a separate part through Rheem Spare Parts, Rheem part number 056041.

FAULT FINDING

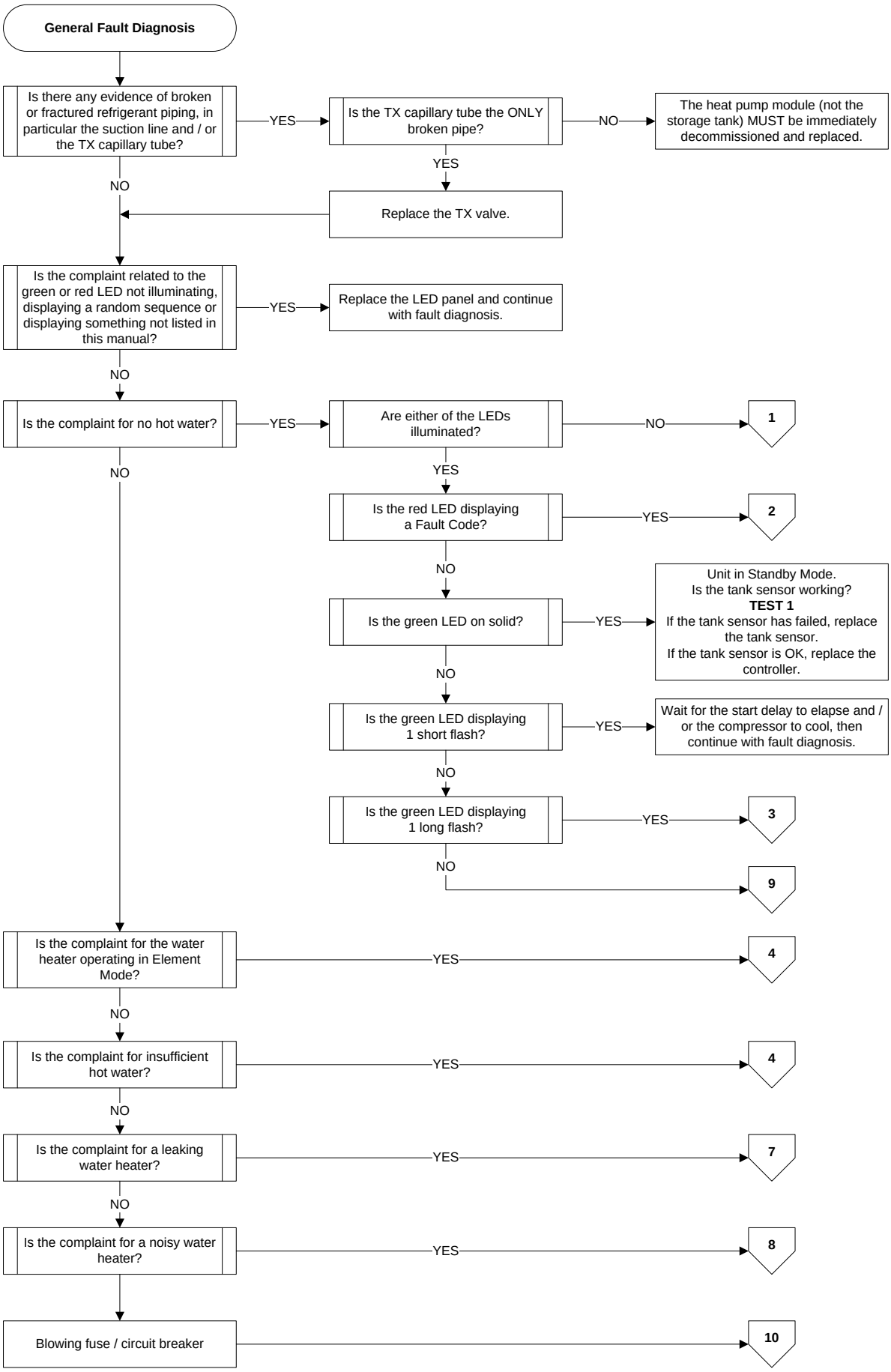
When using the fault finding flow charts, it is essential to ALWAYS start from the beginning – the General Fault Diagnosis chart. Starting fault diagnosis from any other chart is not correct usage and may result in misdiagnosis.

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.

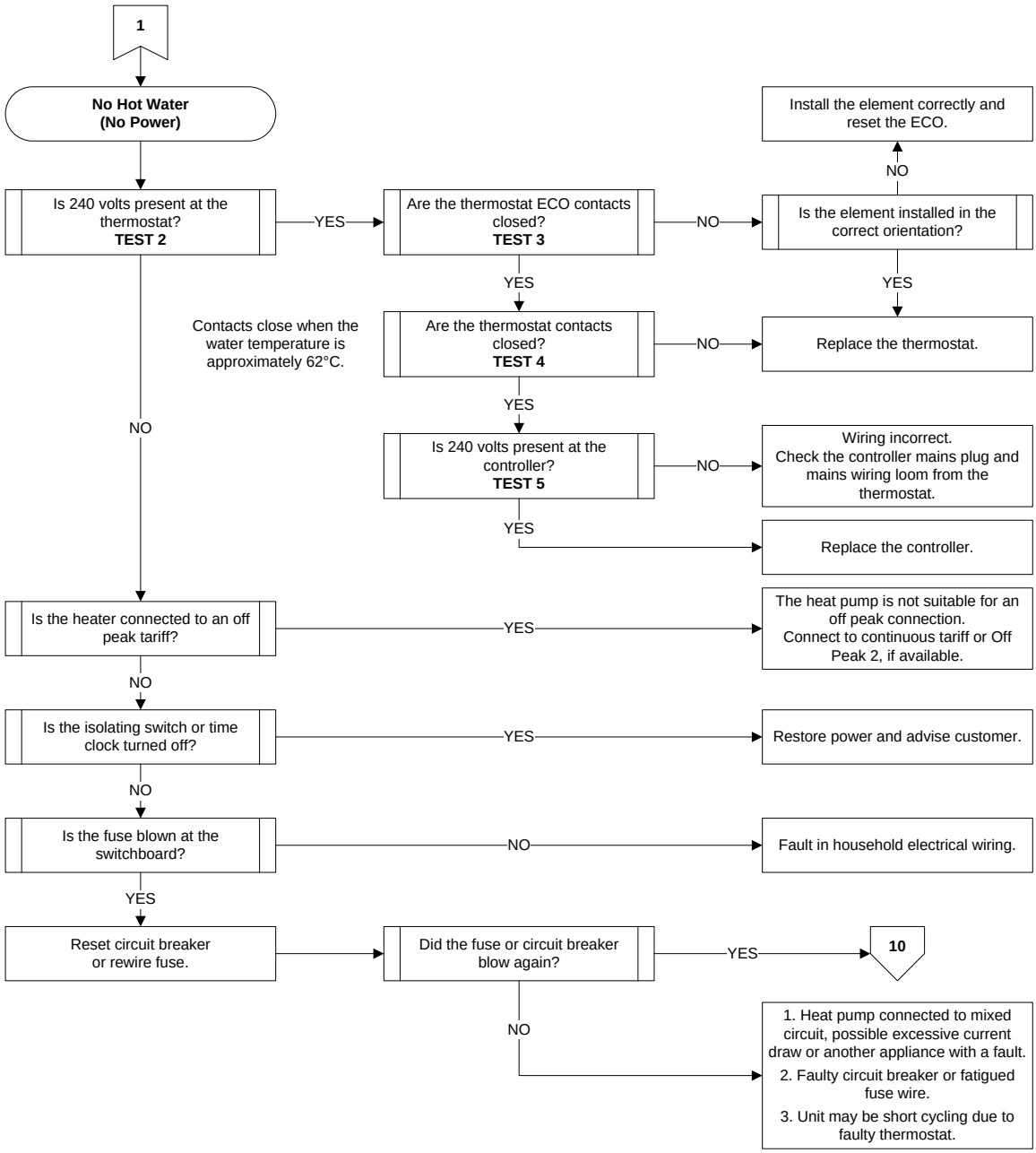
"Live" testing to be conducted. Personal Protective Clothing (PPE) shall be worn to reduce the risk of electric shock. Refer to Rheem Safety Procedure on electrical testing.

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

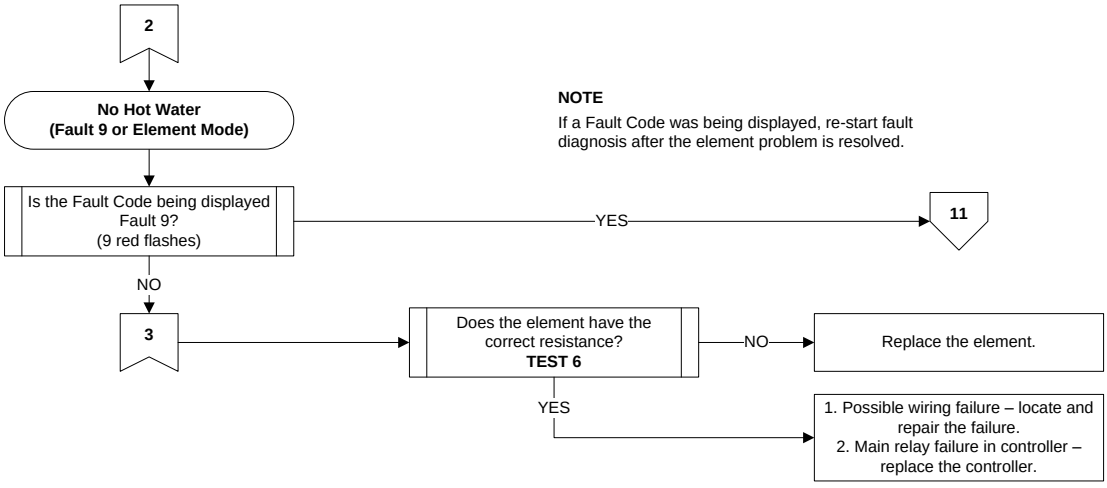
Fault Finding Flow Chart Table



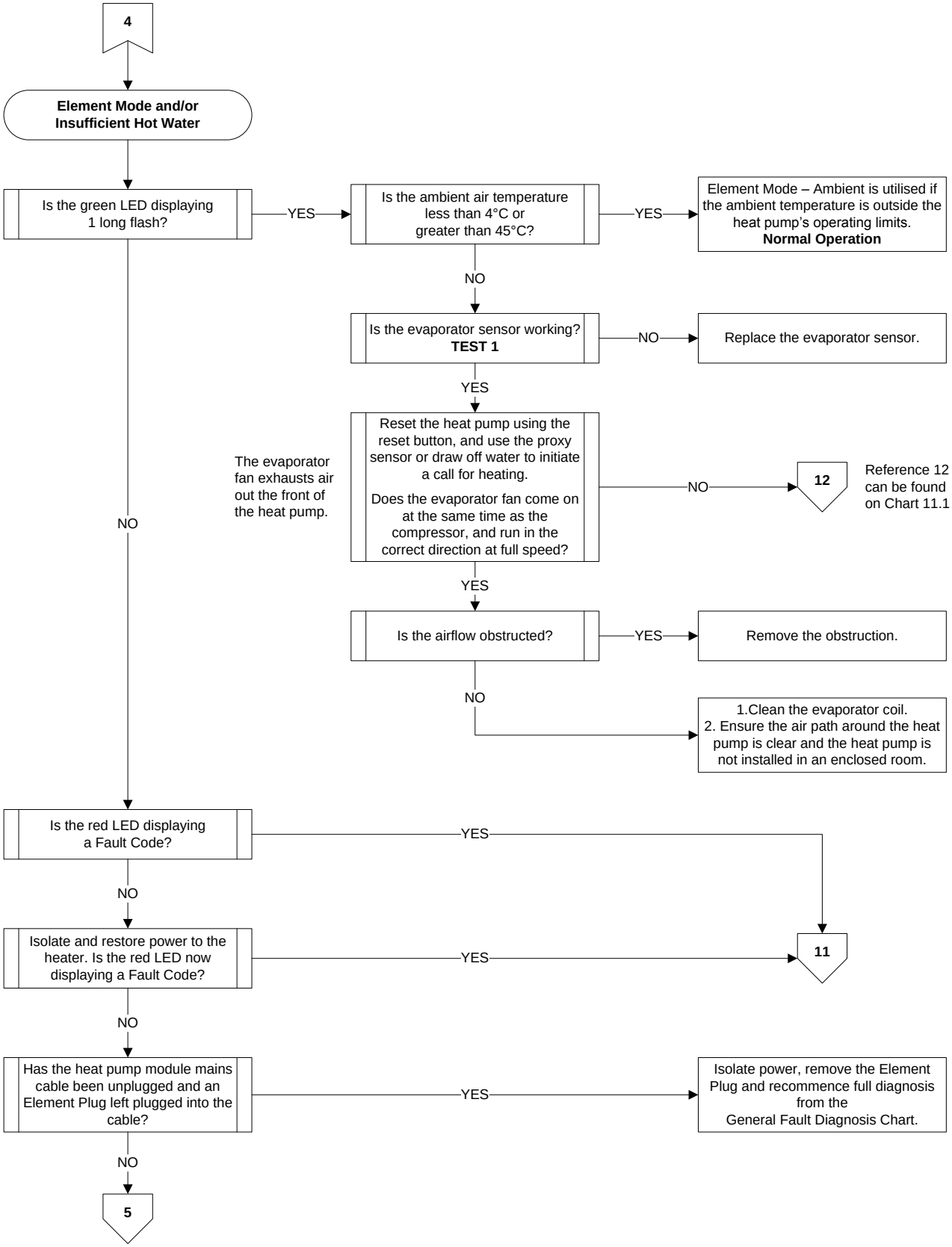
Fault Finding: Chart 1



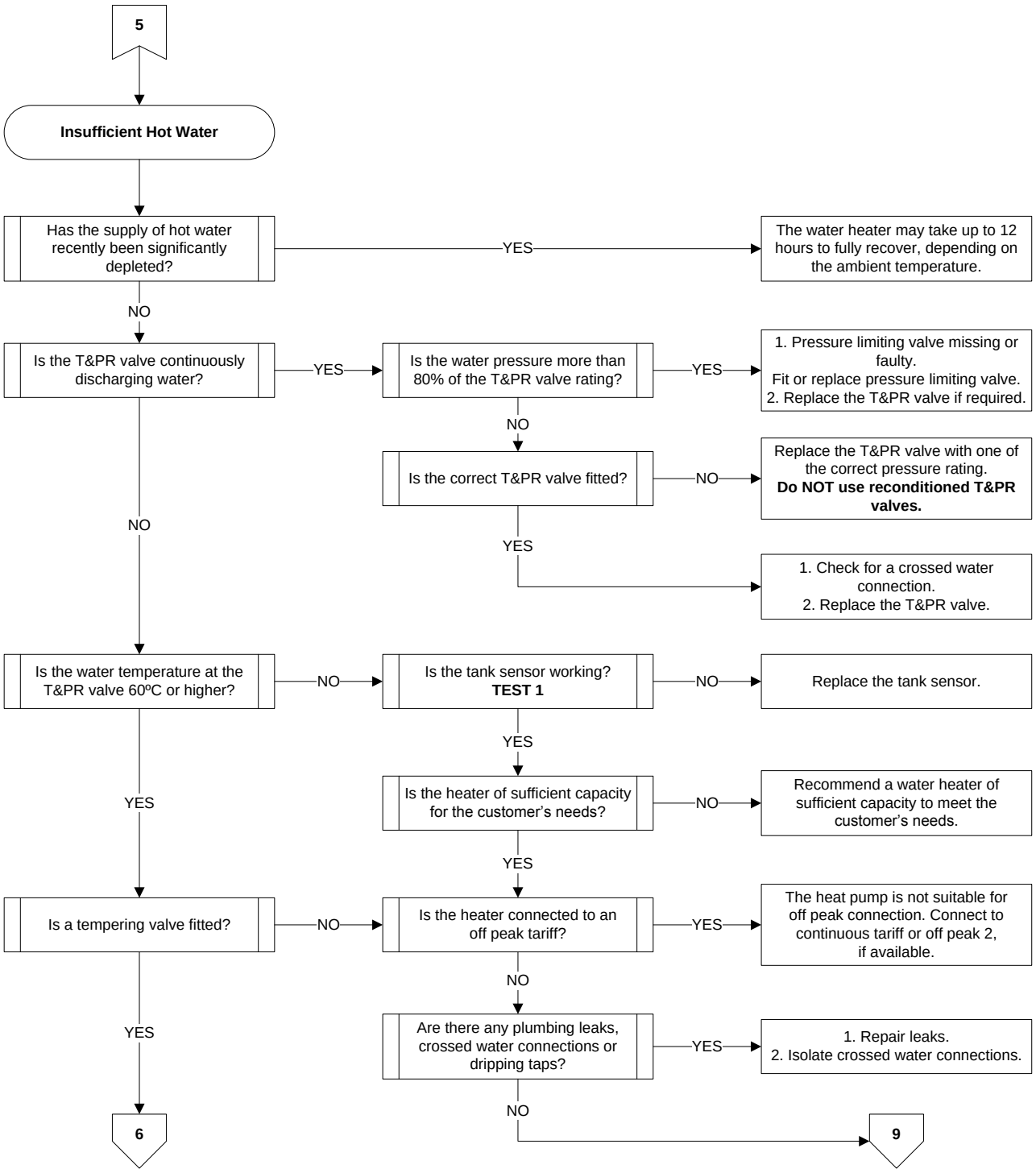
Fault Finding: Charts 2 and 3



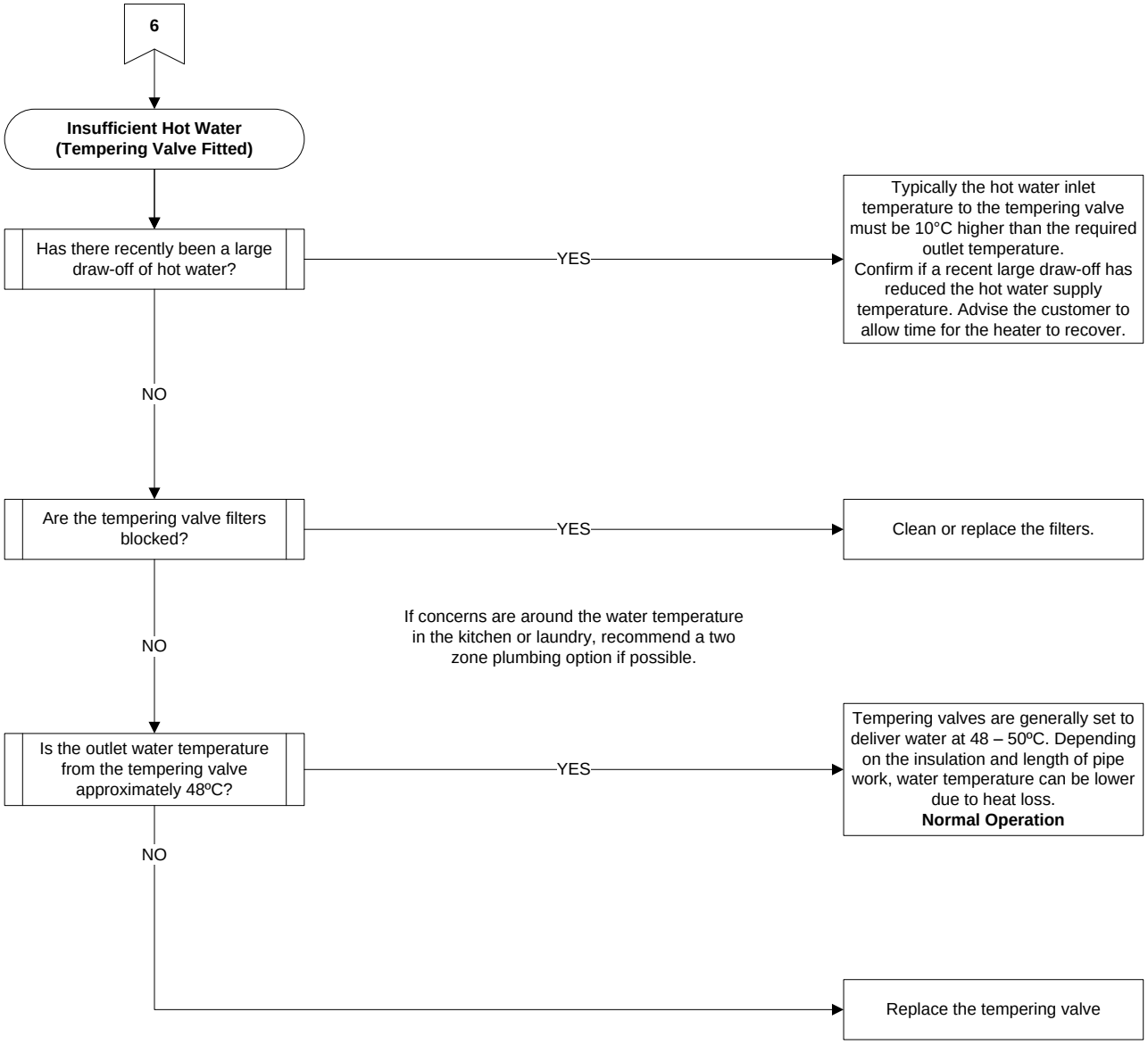
Fault Finding: Chart 4



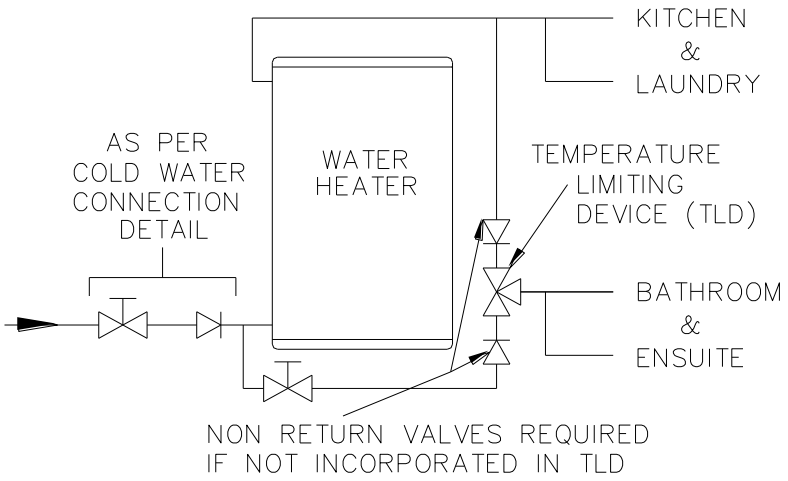
Fault Finding: Chart 5



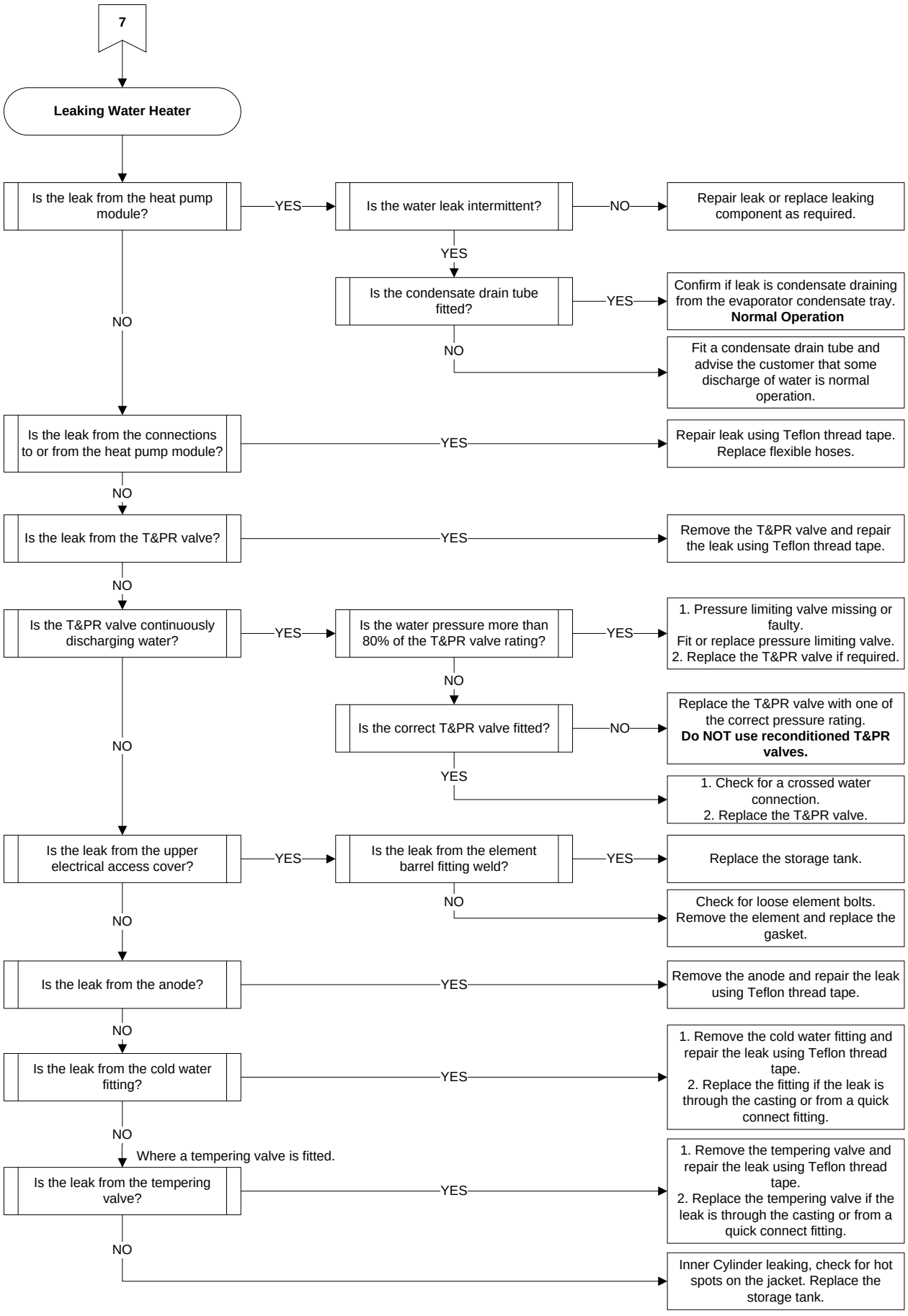
Fault Finding: Chart 6



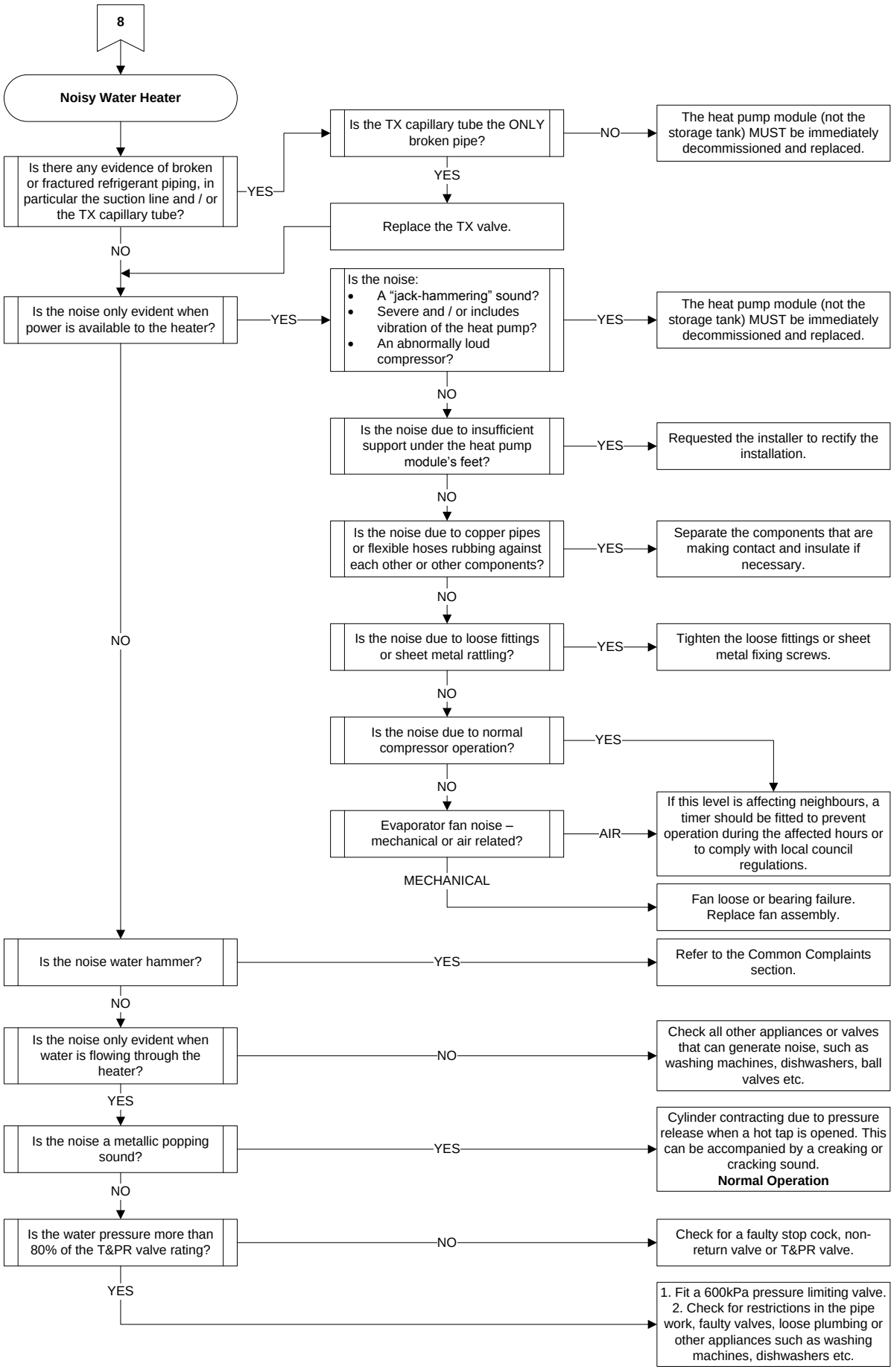
Two Zone Plumbing Option



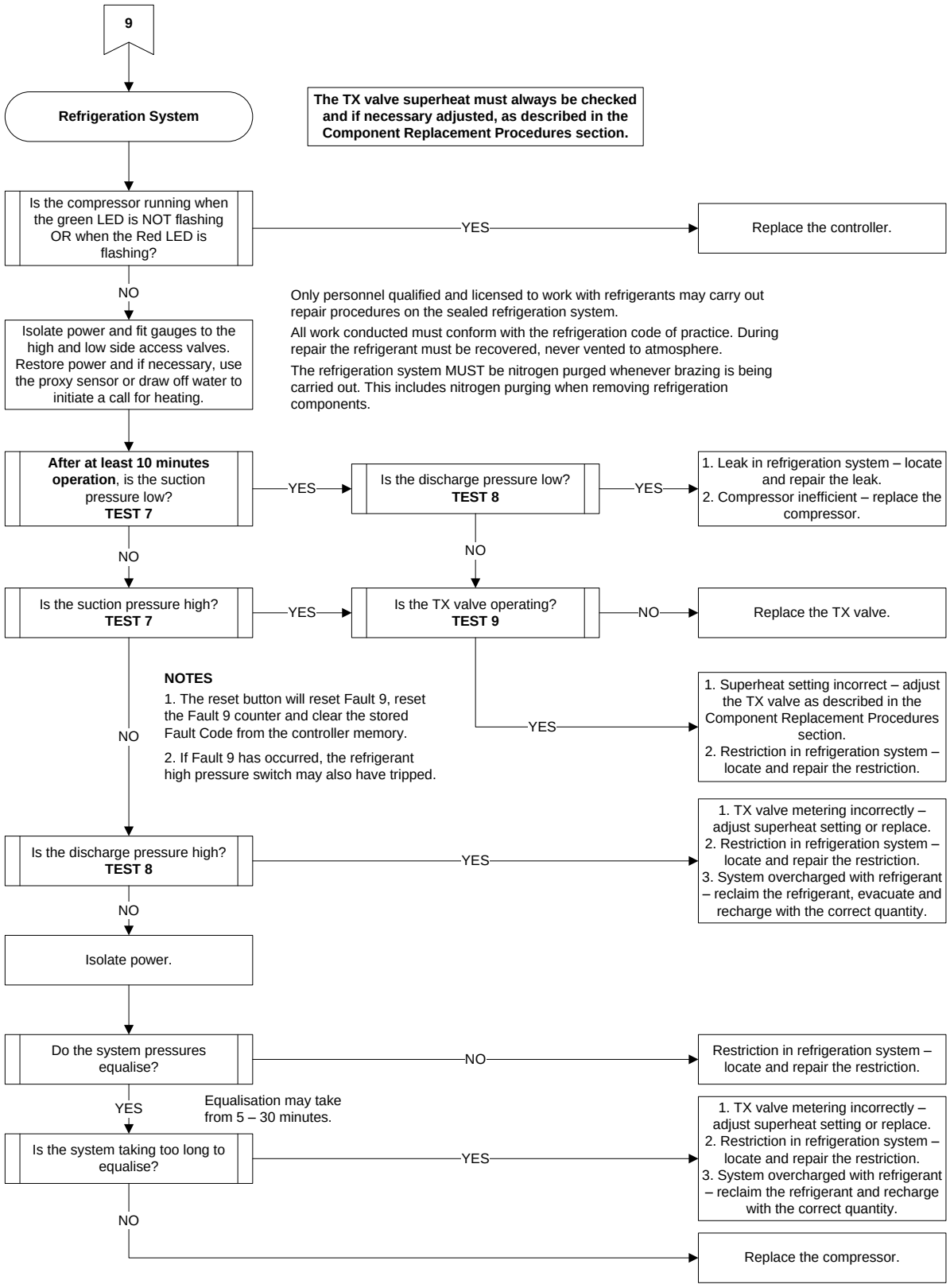
Fault Finding: Chart 7



Fault Finding: Chart 8



Fault Finding: Chart 9



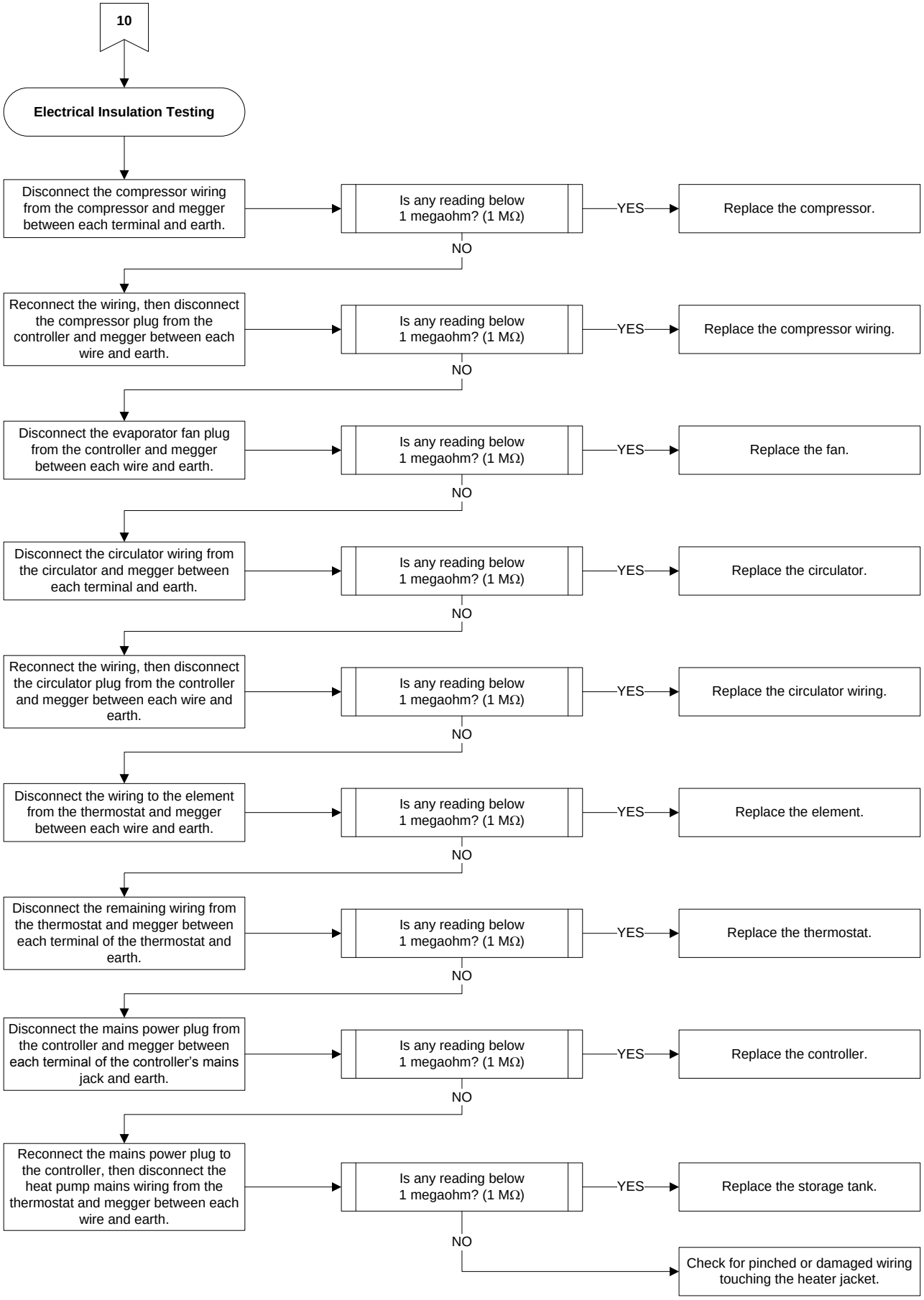
WARNING: The heat pump must NEVER be operated with the refrigeration system open to atmosphere.

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.

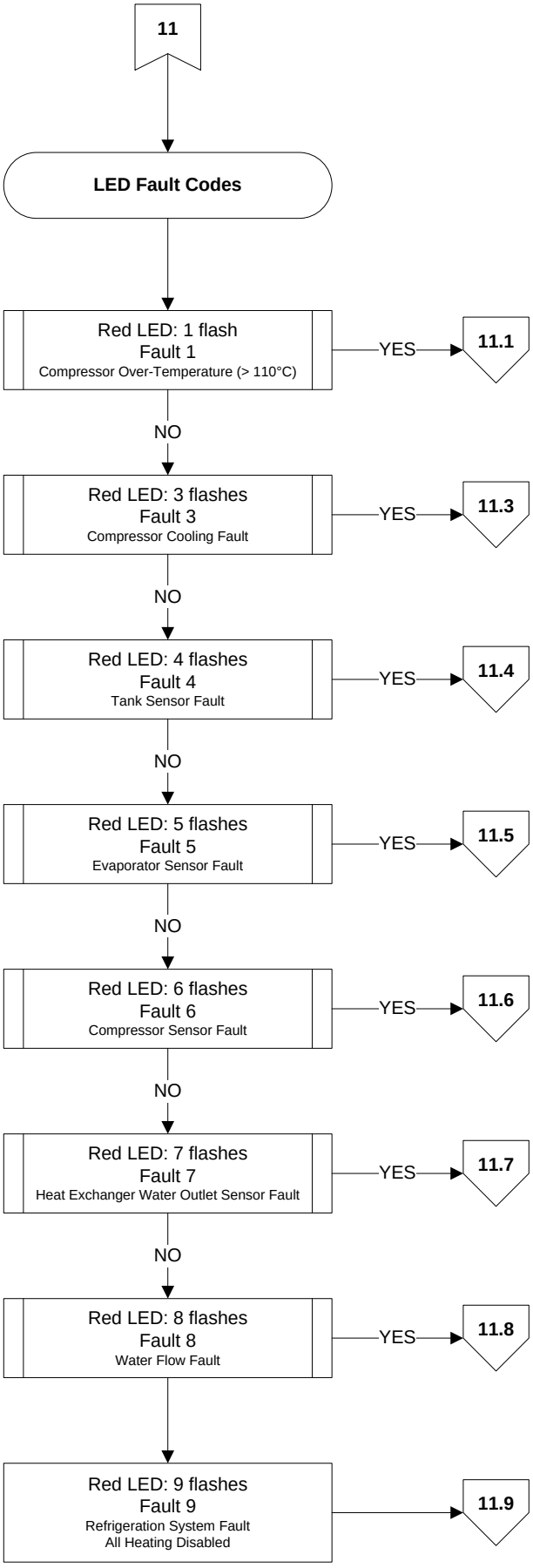
WARNING: When removing refrigeration system components, refrigeration pipes should be cut rather than un-brazed wherever possible.

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.

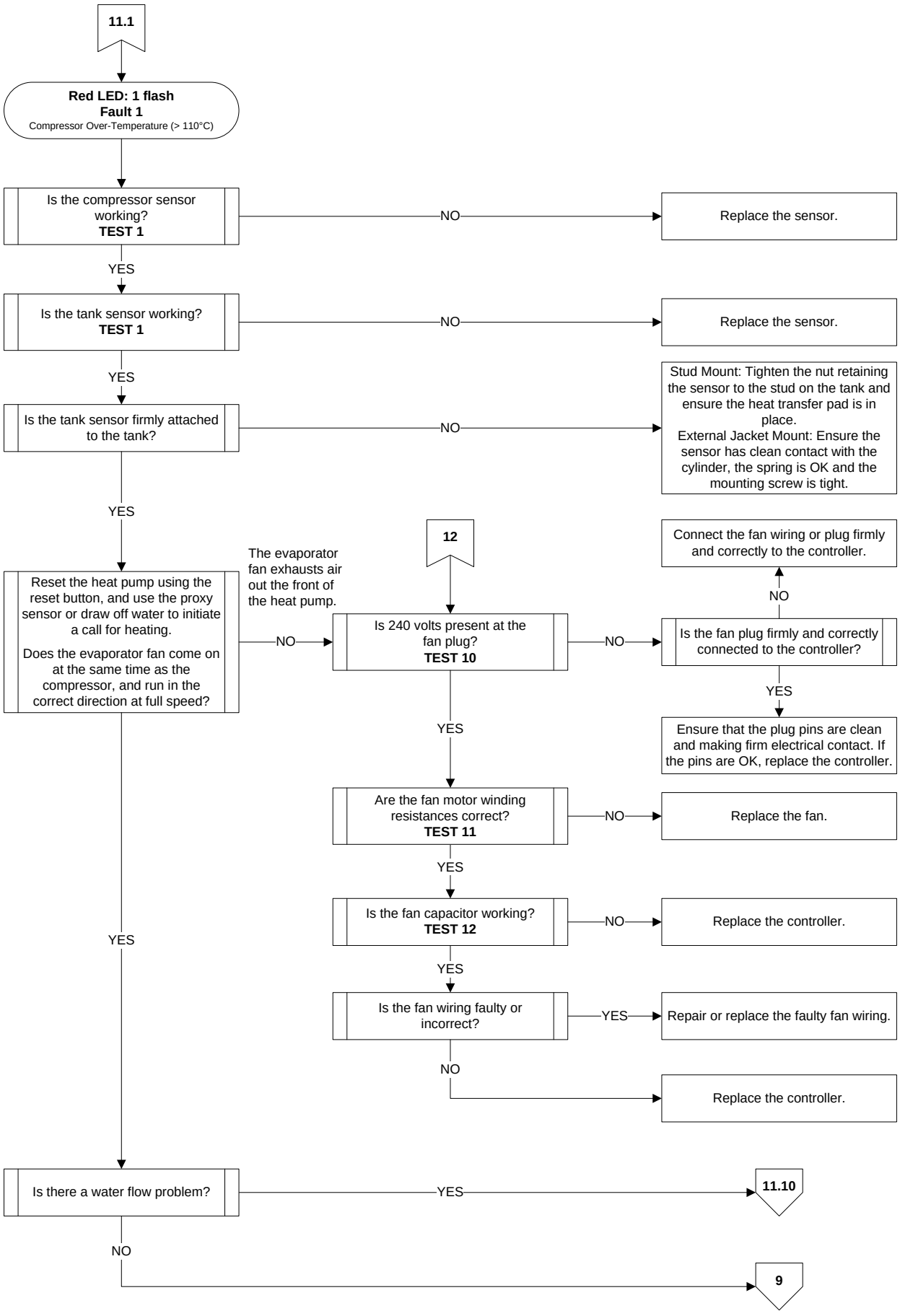
Fault Finding: Chart 10



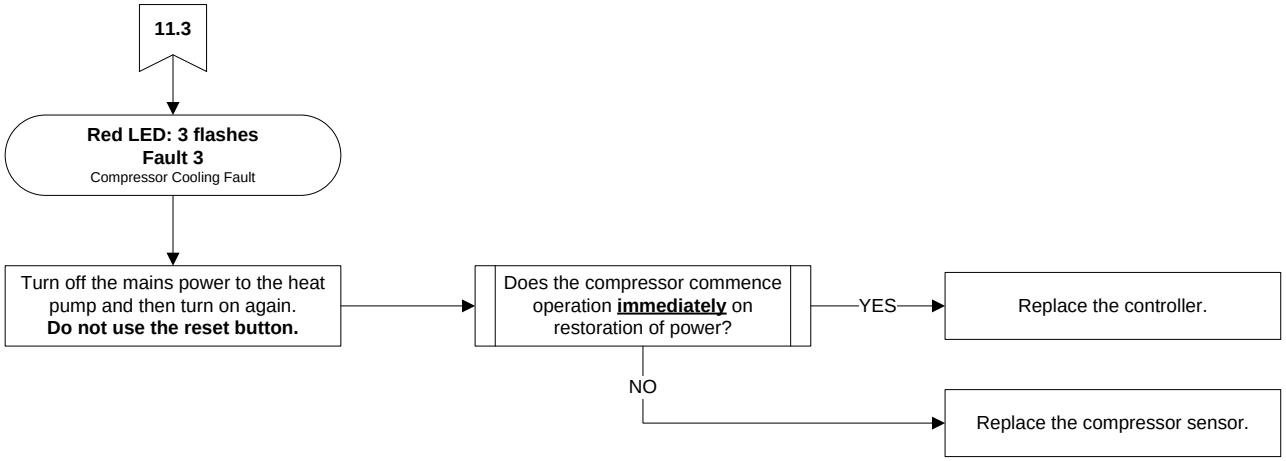
Fault Finding: Chart 11



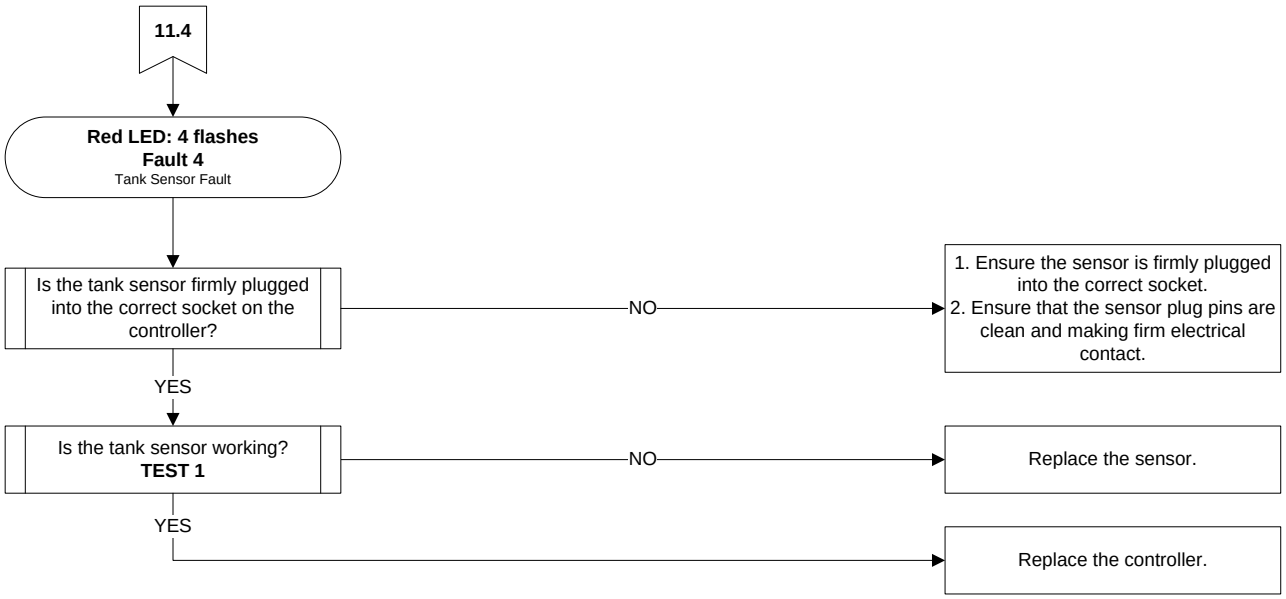
Fault Finding: Chart 11.1



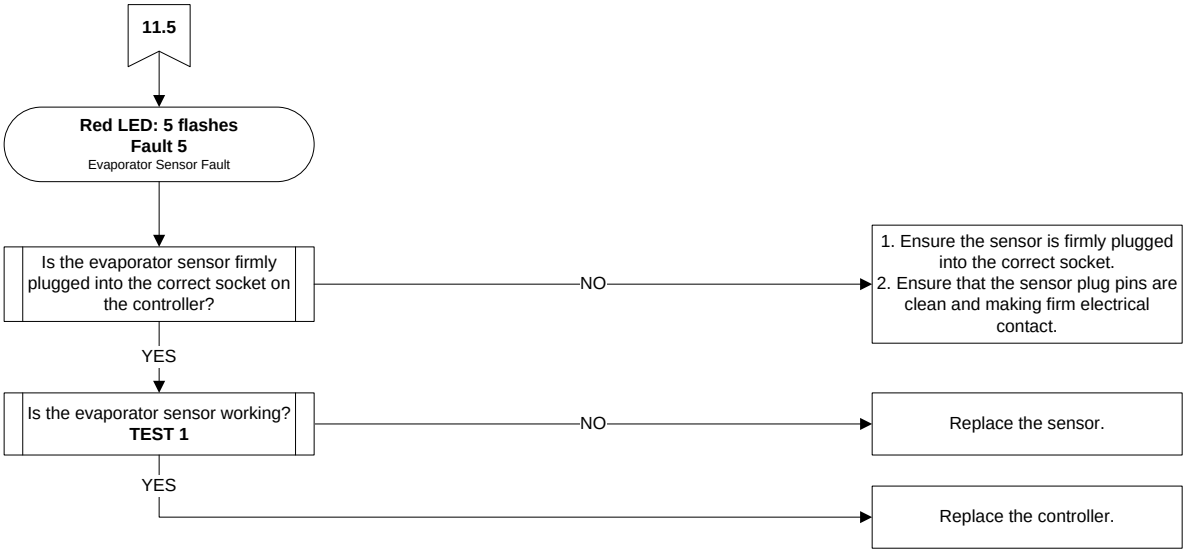
Fault Finding: Chart 11.3



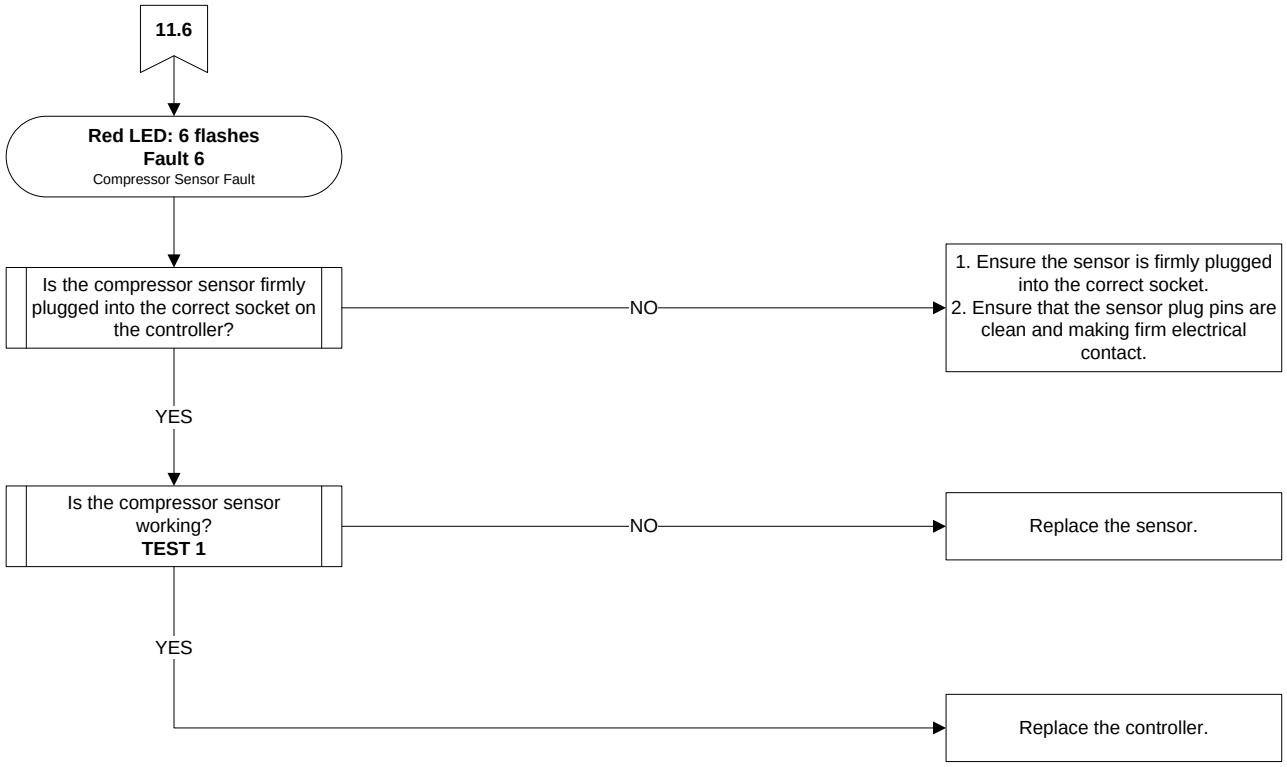
Fault Finding: Chart 11.4



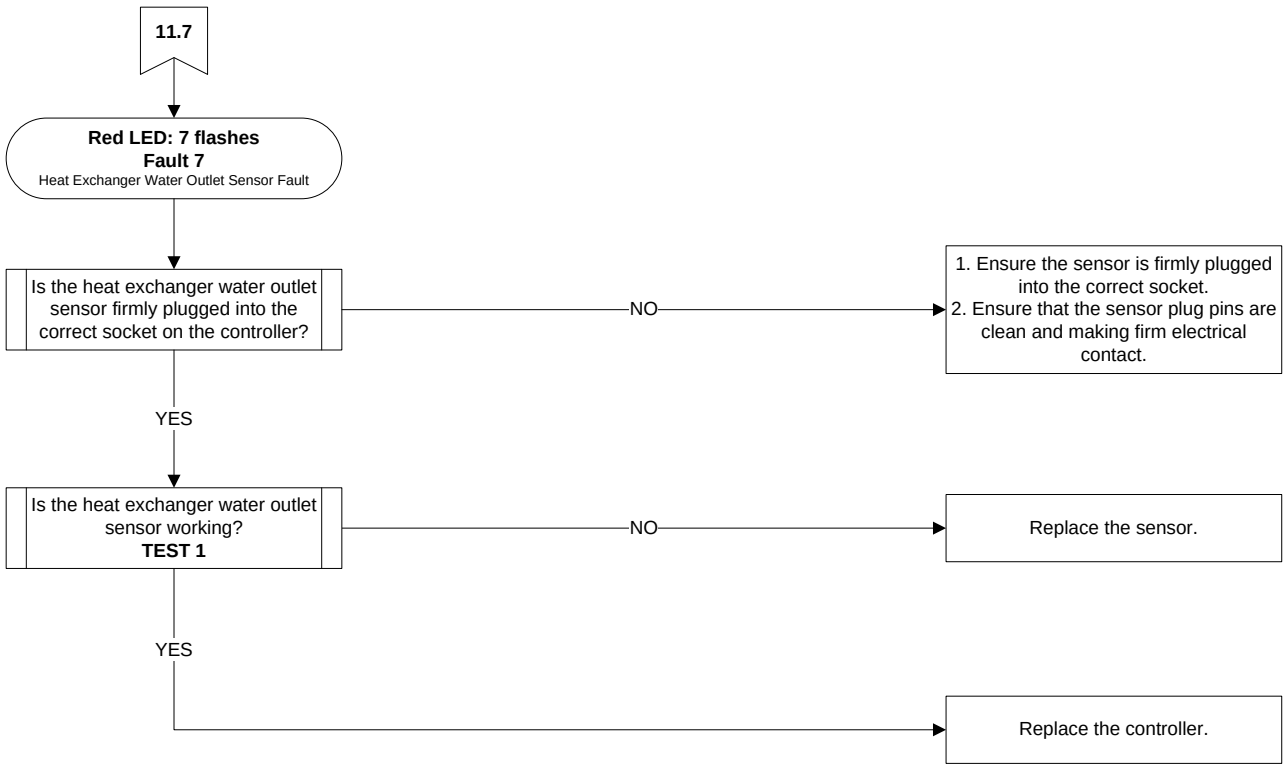
Fault Finding: Chart 11.5



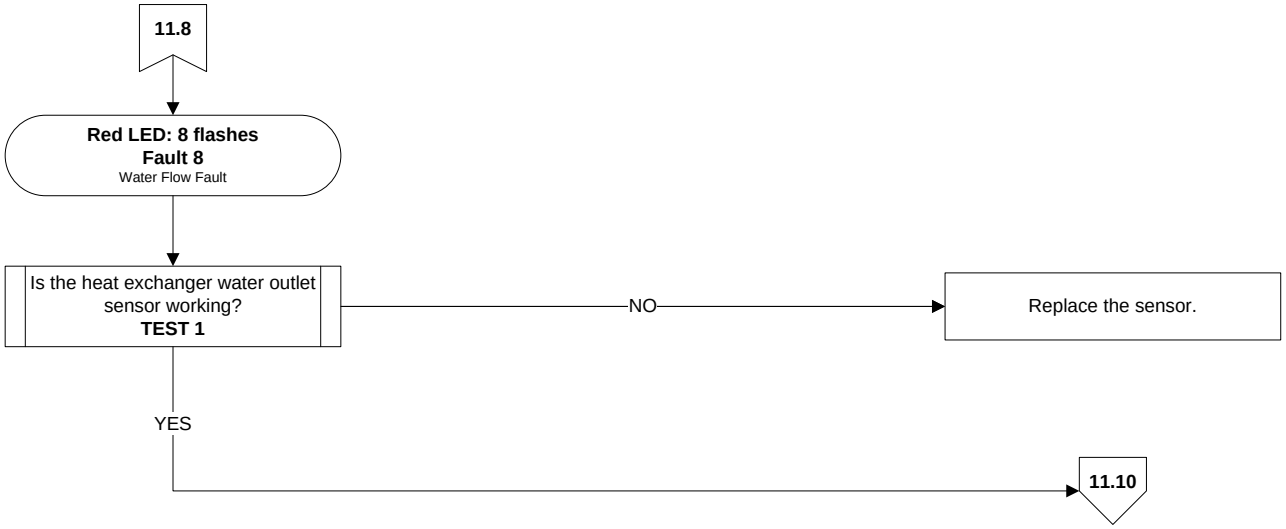
Fault Finding: Chart 11.6



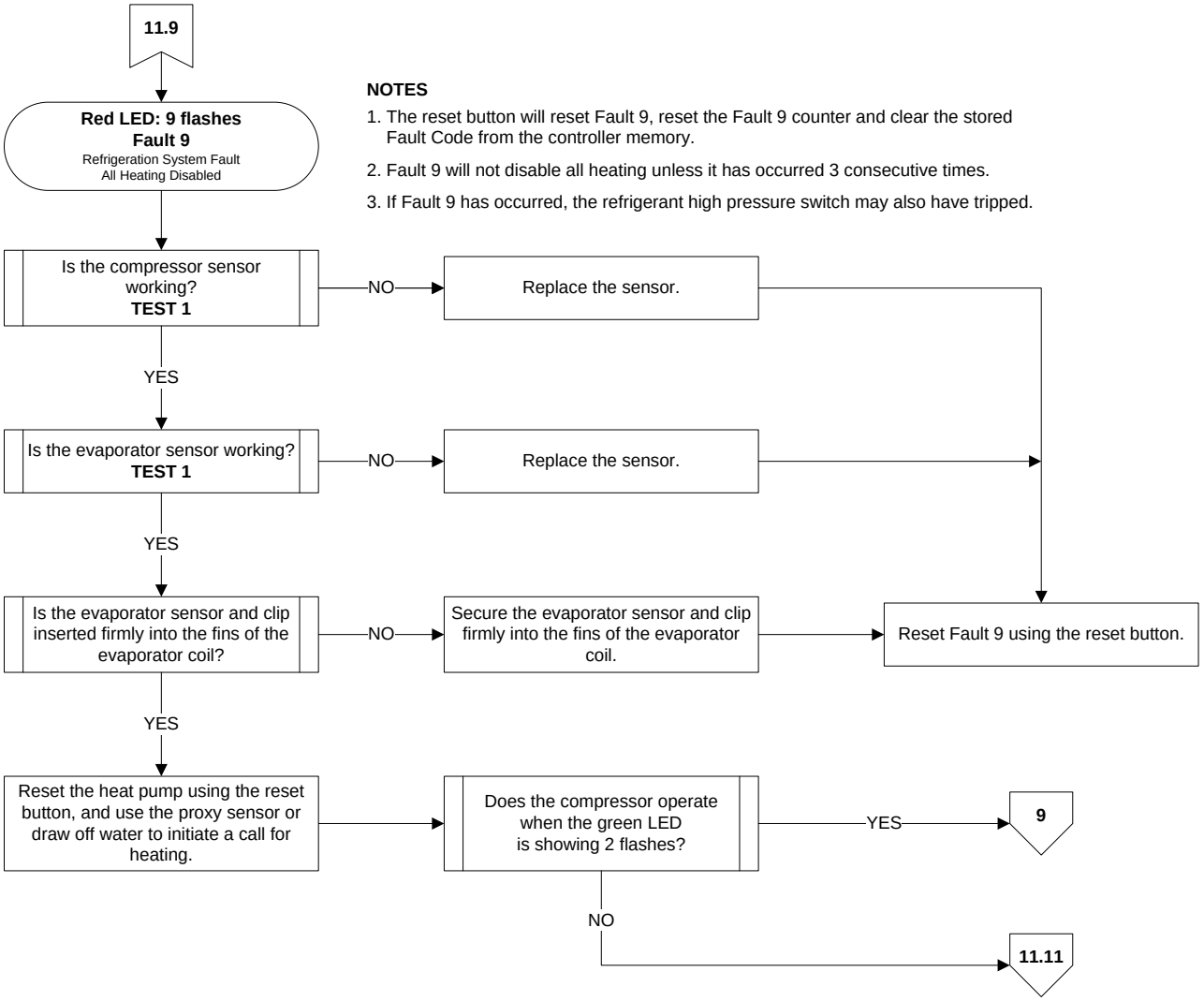
Fault Finding: Chart 11.7



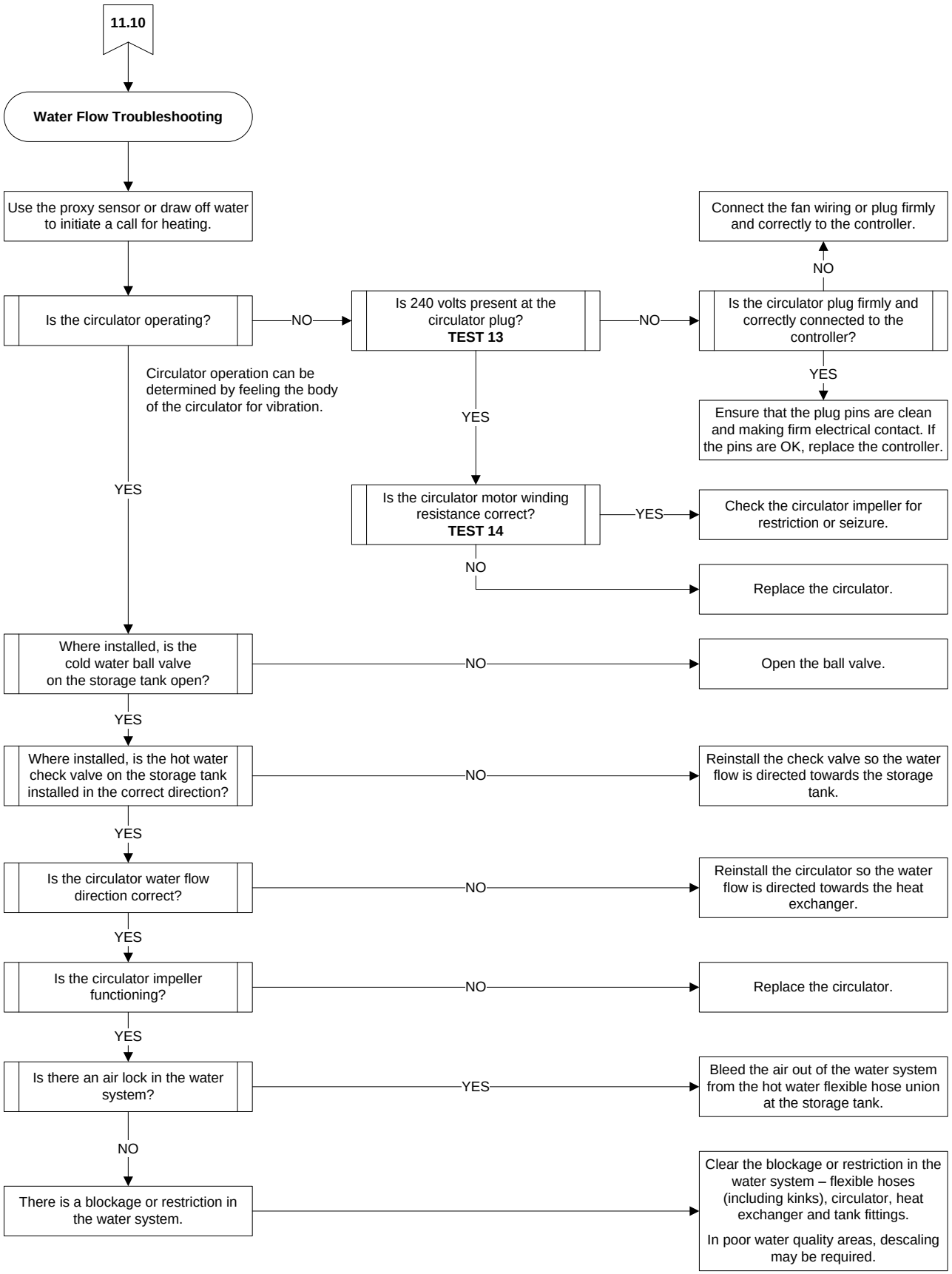
Fault Finding: Chart 11.8



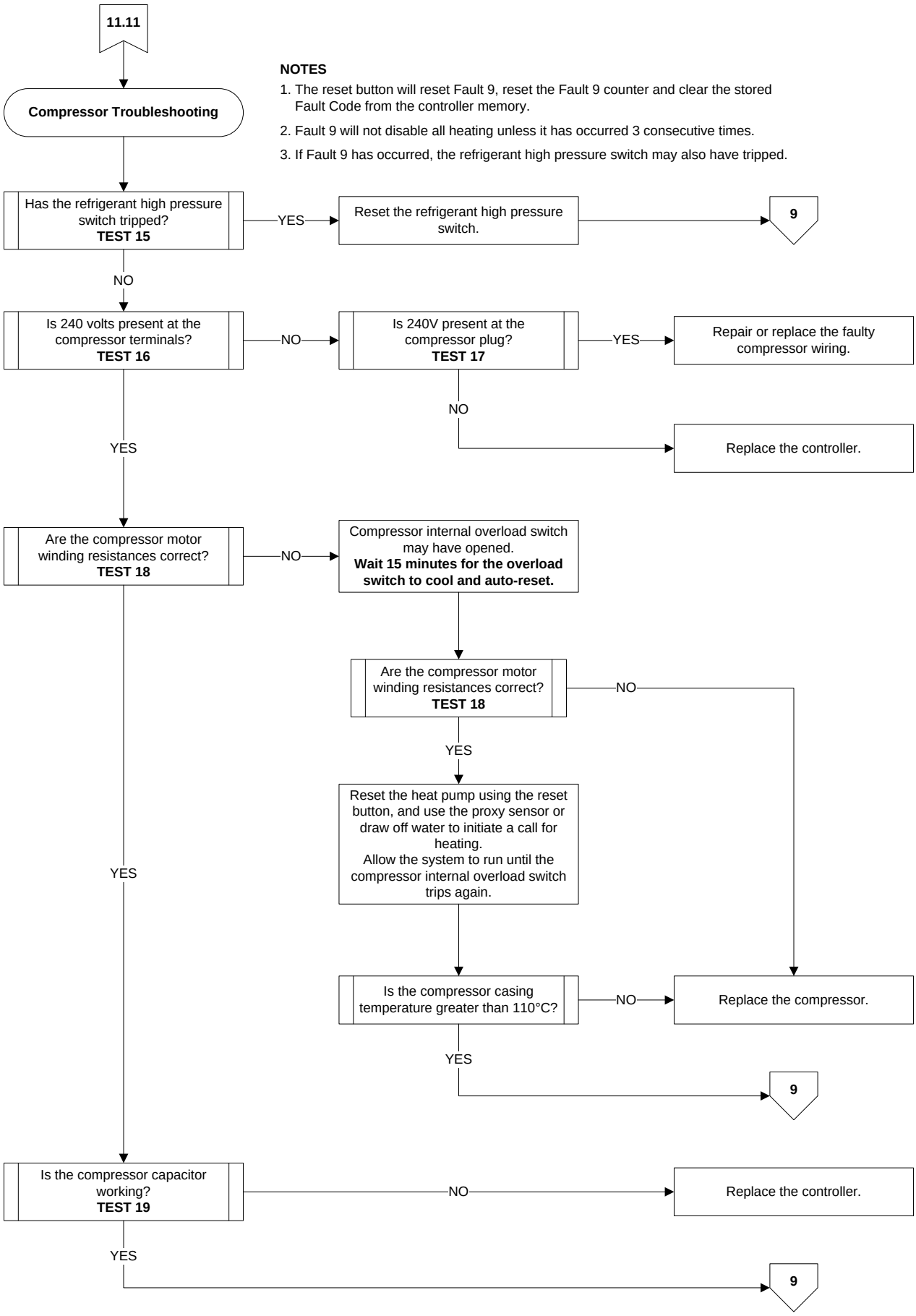
Fault Finding: Chart 11.9



Fault Finding: Chart 11.10



Fault Finding: Chart 11.11



Sensors

The sensors are identified as follows:

- Tank sensor
- Evaporator sensor
- Compressor sensor
- Heat exchanger water outlet sensor

All four 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. The sensors all have different connectors to aid with correct reinstallation.

As the evaporator sensor is difficult to remove, it may 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.

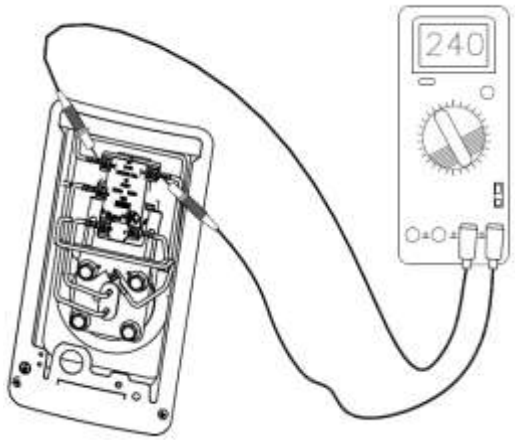
* Note: The sensor plug sockets are quite small. Fine Probe Adapters (available from Rheem Spare Parts, part number WH0020082) can be utilised as probe extensions. Alternatively small pins may be used, however ensure good contact is made when testing.

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

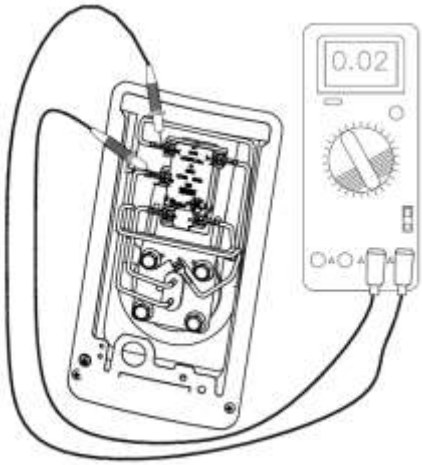
Test 2



Remove the top electrical cover from the storage tank and using a multimeter set on the AC voltage scale, measure between terminals 1 and 3 on the thermostat.

Normal voltage is 240V AC.

Test 3

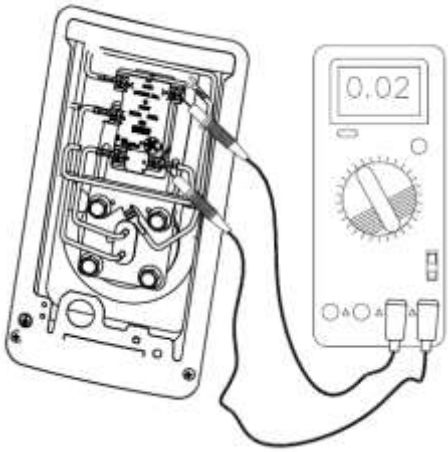


Using a multimeter set on the resistance (ohms) scale, measure between the terminals of the mechanical thermostat.

The following results should be obtained when the ECO is closed:

1 & 2: 0 – 1Ω
3 & 4: 0 – 1Ω

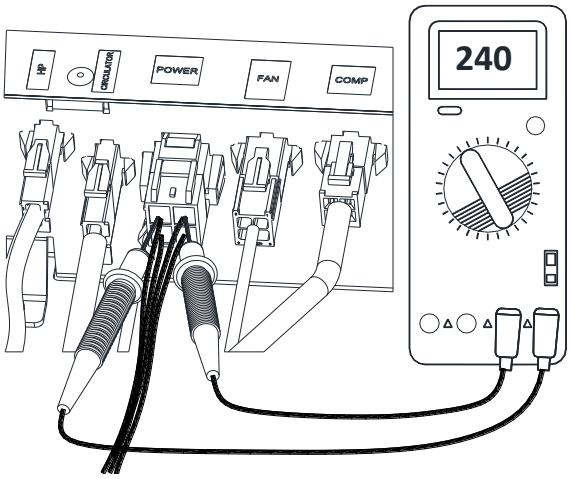
Test 4



Using a multimeter set on the resistance (ohms) scale, measure between terminals 1 and 2 on the thermostat.

Normal resistance when the thermostat is closed is 0 – 1Ω.

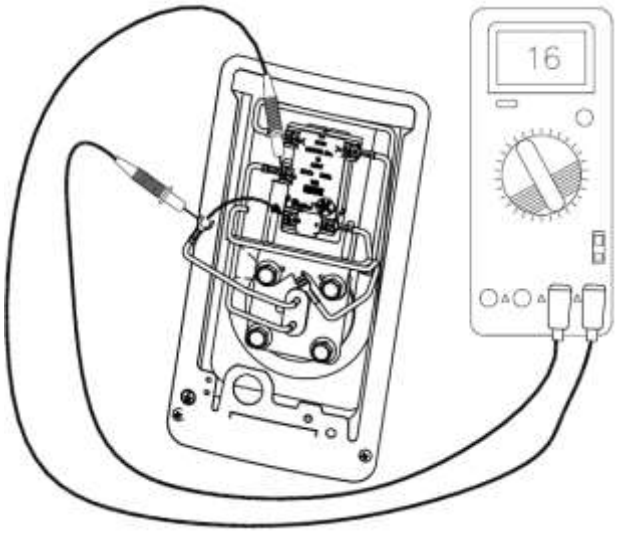
Test 5



Remove the front cover from the heat pump module and using a multimeter set on the AC voltage scale, measure between the active (red) and neutral (blue) terminals of the mains plug at the controller.

Normal voltage is 240V AC.

Test 6

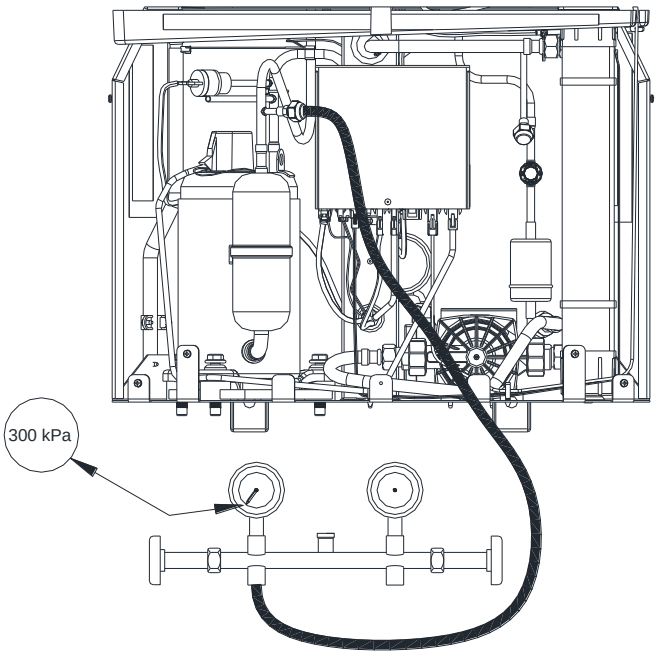


Disconnect the element wire from terminal 5 of the thermostat and using a multimeter set on the resistance (ohms) scale, measure between the two element wires.

Normal resistance for the element is:

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

Test 7



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

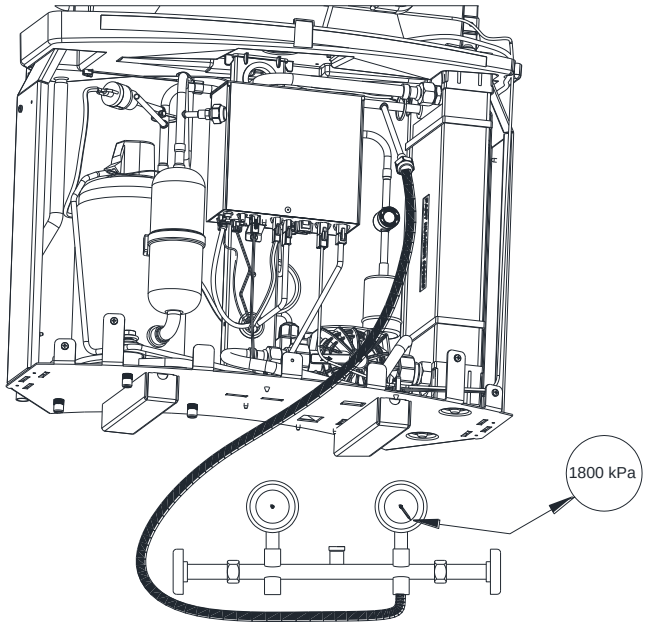
The suction pressure is dependent on ambient conditions, however the suction pressure range is typically between 200 – 600kPa:

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 55 for more information on refrigerant charge and refrigerant charge fault indications.

Test 8



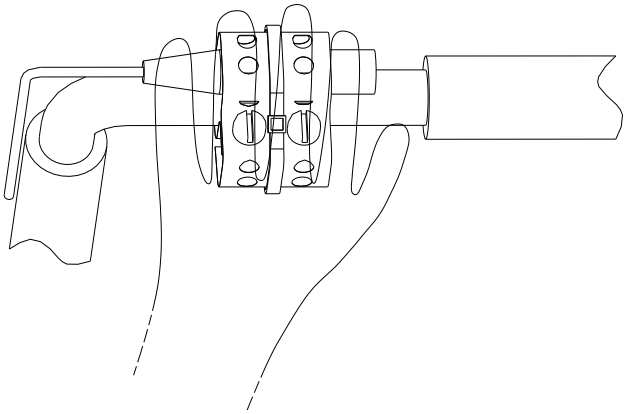
Fit gauges to the discharge (high) side access valve and observe the discharge pressure.

Typical discharge pressure range is 600 – 2100kPa depending on the storage tank water temperature.

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 55 for more information on refrigerant charge and refrigerant charge fault indications.

Test 9

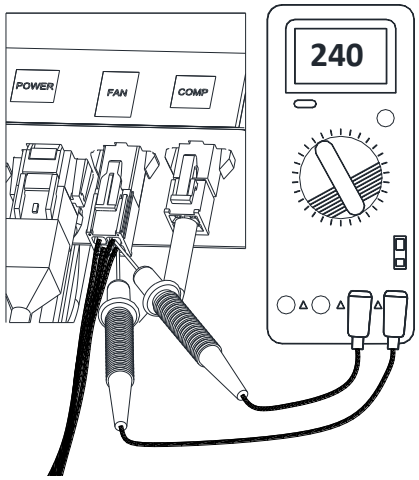


Remove the insulation and hold the TX valve bulb tightly by hand, to increase the heat detected. The TX valve should open with the following results:

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.

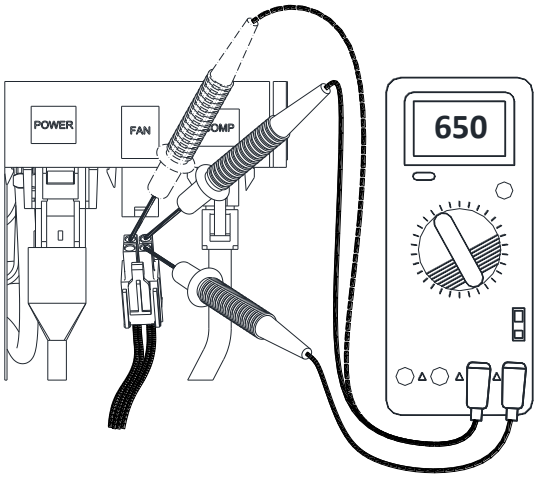
Test 10



Using a multimeter set on the AC voltage scale, measure between the active (blue) and neutral (black) terminals of the fan plug at the controller.

Normal voltage is 240V AC.

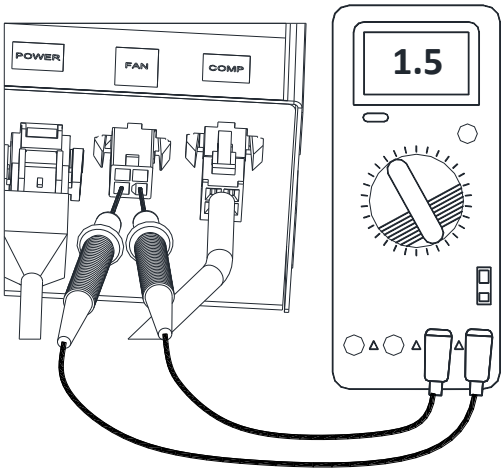
Test 11



Unplug the fan from the controller 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:

Blue & black wires (Run): 650Ω
Blue & brown wires (Start): 375Ω

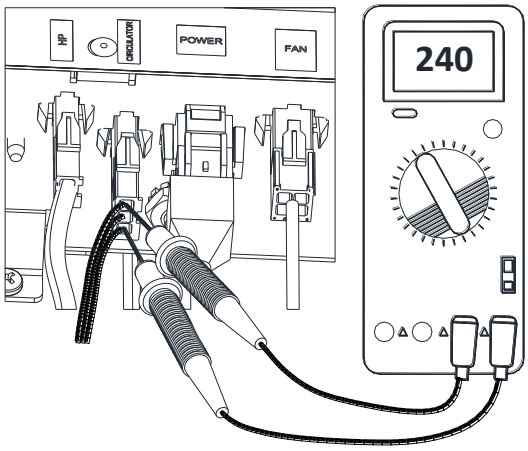
Test 12



Unplug the fan from the controller and using a multimeter set on the capacitance (µF) scale, measure between the two rear pins of the jack on the controller.

Normal capacitance is 1.5 micro Farads (1.5µF).

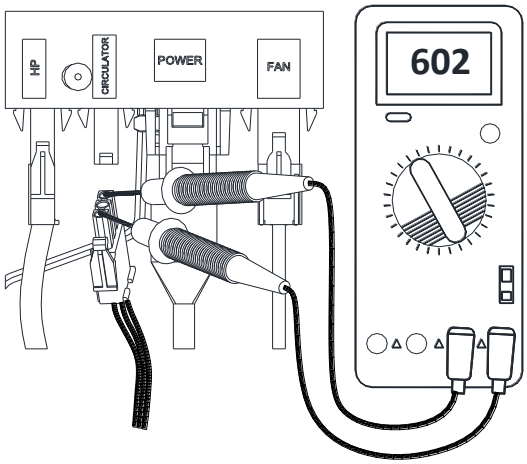
Test 13



Using a multimeter set on the AC voltage scale, measure between the active (brown) and neutral (blue) terminals of the circulator plug at the controller.

Normal voltage is 240V AC.

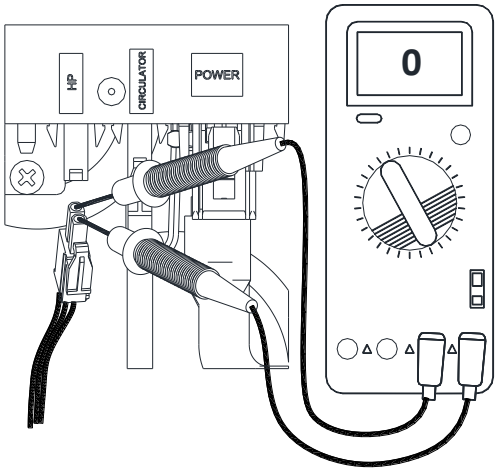
Test 14



Unplug the circulator from the controller and using a multimeter set on the resistance (ohms) scale, measure between the active (brown) and neutral (blue) pins of the circulator plug.

Normal resistance is 602Ω.

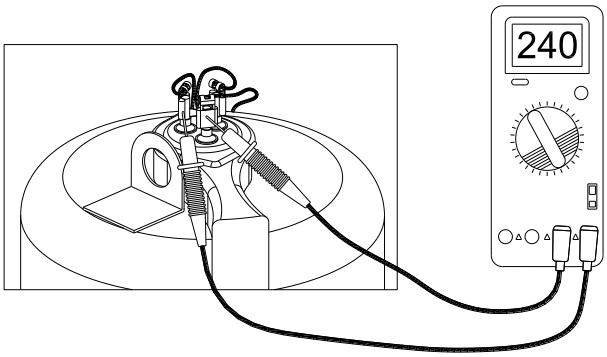
Test 15



Unplug the HP switch from the controller and using a multimeter set on the resistance (ohms) scale, measure between the pins of the HP switch plug.

Normal resistance when the HP switch is closed is 0 – 1Ω.

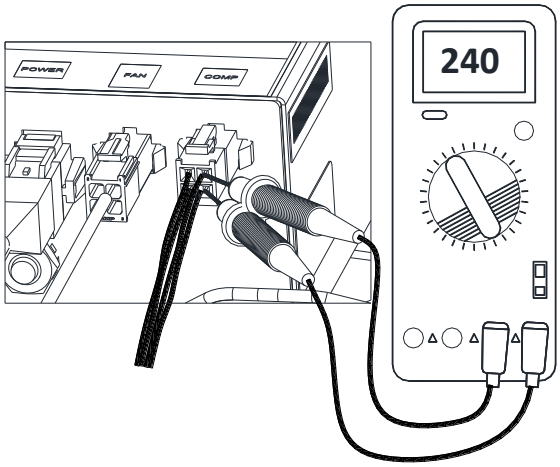
Test 16



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.

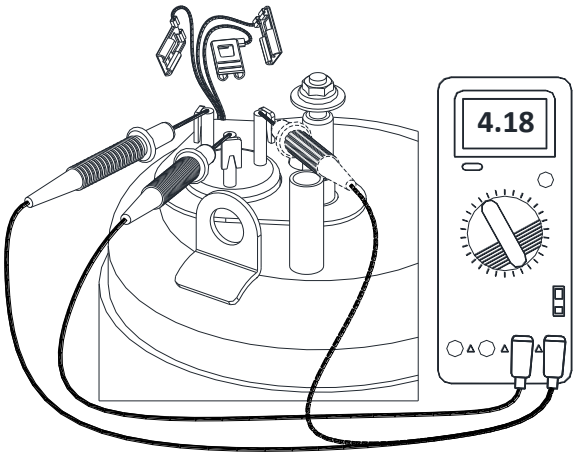
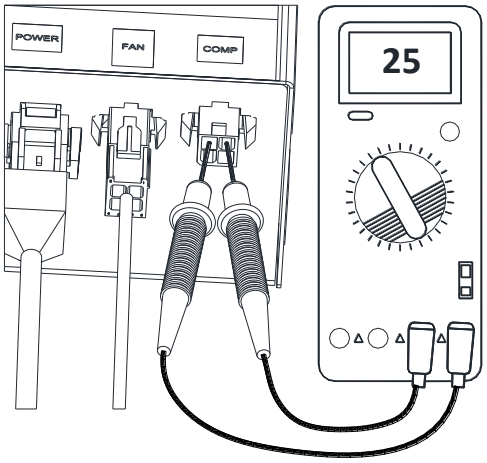
Test 17



Using a multimeter set on the AC voltage scale, measure between the active (red) and neutral (blue) terminals of the compressor plug at the controller.

Normal voltage is 240V AC.

Component Tests 18 and 19

Test 18	Test 19
 	 
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): 4.18Ω Red & black terminals (Start): 5.76Ω	Unplug the compressor from the controller and using a multimeter set on the capacitance (µF) scale, measure between the two front pins of the jack on the controller. Normal capacitance is 25 micro Farads (25µF).

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.

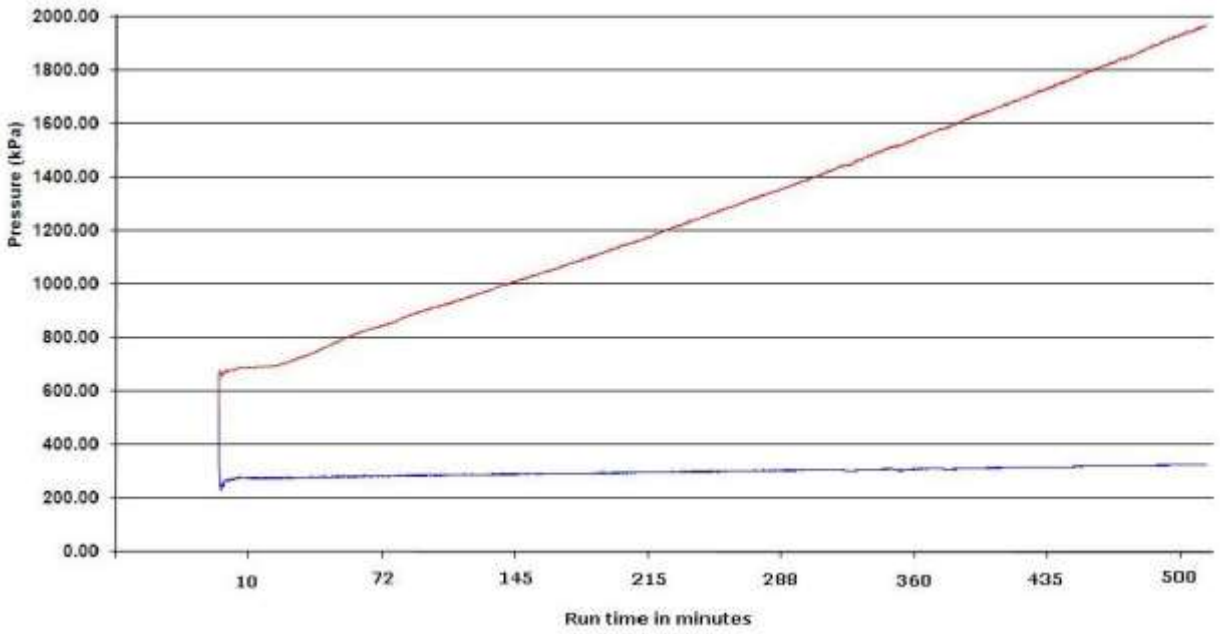
Indication of Shortage of Refrigerant

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.

Suction and Discharge Pressure Vs Run Time (20 degree ambient, from cold tank)



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 1 megaohm.

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 1 MΩ should be obtained.
5. If a reading below 1 MΩ is indicated, all component parts will need to be individually tested to locate the fault. Refer to flow diagram below.

Insulation Resistance of the Active Circuit: Reading should be above 1 megaohm.

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 1 MΩ should be obtained.
8. If a reading below 1 MΩ is indicated, all component parts will need to be individually tested to locate the fault. Refer to flow diagram below.

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 diagram (page 27) to determine the location of the faulty earth connection.

Storage Tank

Draining the Water Heater

1. ***Isolate 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. For AquaMax storage tanks only, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
4. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
5. Disconnect the cold water supply pipe.
6. Fit a drain hose to the cold-water connection and run the other end to a drain or safe location.
7. Open the T&PR valve or a hot tap to allow air into the system.

Temperature and Pressure Relief Valve

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 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.

Anode

1. ***Isolate 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 anode cap on the top of the storage tank.
4. Using a tube or socket spanner, unscrew and remove the anode. Use a 27mm tube or socket spanner for Rheem, Everhot and Solahart storage tanks, and a 35mm tube or socket spanner for AquaMax storage tanks.
5. 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 7 for the correct anode length.
6. Restore the water supply and check for leaks.
7. Refit the anode cap and restore power.

Mechanical Thermostat

1. ***Isolate power to the water heater***.
2. For AquaMax storage tanks only, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present***
4. Disconnect the wiring from the thermostat
5. Slide the thermostat out from under the retaining clamp.
6. Remove any scale from the cylinder surface.
7. Fit the replacement thermostat under the clamp.
8. Reconnect the wiring as per the wiring diagram on page 27.
9. Check water heater internal wiring insulation for cracking.
10. Conduct an Electrical Insulation Test – refer to pages 41 and 56.
11. Refit the access cover (and the heat pump module for AquaMax storage tanks) and restore the power supply.

Heating Element

1. ***Drain the water heater***. Refer to 'Draining the Water Heater' procedure on page 57.
2. Disconnect the heating element wiring from the thermostat and slide the thermostat out from under the retaining clamp.
3. Remove the two screws retaining the thermostat clamp

4. Loosen the two lower screws slightly. When water is below the heating element level, refit the cold water supply pipe.
5. Remove the two lower screws and withdraw the heating element 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 element and insert into water heater. **Note:** Ensure the element is installed in the same orientation.
7. Reassemble in reverse of the above.
8. Restore the cold water supply and purge air through hot taps, close each hot tap as water runs freely.
9. Check the heating element for leaks.
10. Refit the access cover.
11. Restore power supply to the water heater.

Tank Sensor

1. ***Isolate the power supply to the water heater***.
2. For AquaMax storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. For Rheem, Everhot and Solahart storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
5. Disconnect the tank sensor wiring plug from the controller (refer to diagram on page 12).
6. **Stud Mount Type:**
   - Remove the lower electrical access cover from the storage tank.
   - Undo the retaining nut and remove the tank sensor from the locating stud. **NOTE**: When fitting the replacement sensor insure the grey heat transfer pad is in place.
   - Reassemble in reverse order of above

   External Jacket Mount Type:
   - Remove the securing screw.
   - The shaft of the sensor assembly is keyed and the hole in the storage tank jacket is slotted – rotate the sensor assembly until the sensor shaft keys align with the storage tank jacket slots.
   - Withdraw the sensor assembly.
   - Remove the protective cap from the new sensor assembly.
   - Insert the new sensor assembly in the hole in the storage tank jacket, so that the sensor shaft keys align with the storage tank jacket slots.
   - Rotate the sensor assembly so that the securing screw holes align.
   - Install the securing screw.
7. Reassemble in reverse order of steps 1 to 5 above.

Ball Valve (Heat pump cold water fitting, where fitted)

1. Remove the heat pump module. Refer to 'Heat Pump Module Removal' procedure on page 63.
2. Unscrew and remove the ball valve.

Check Valve (Heat pump hot water fitting, where fitted)

1. Remove the heat pump module. Refer to 'Heat Pump Module Removal' procedure on page 63.
2. Unscrew and remove the check valve.

Cold Water Connector (RheemPlus Models)

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

1. ***Drain the water heater***. Refer to 'Draining the Water Heater' procedure on page 57.
2. Remove cold water connector and cold pipe covers.
3. Disconnect plastic cold water pipe from cold water connector and unscrew cold water connector from heater.

   Note: Removal of the cold pipe requires the use of a special tool, part number 890330. To remove the cold pipe from the cold water connector slide the tool over the pipe and push down against the quick connect fitting whilst pulling up on the cold pipe.
4. Screw new cold water connector into cylinder using thread tape on threaded section.
5. Insert plastic cold pipe into cold water connector snap lock fitting and push down clicking plastic cold pipe into fitting (no tool required).
6. Reconnect cold water supply pipe, restore water supply and check for leaks.
7. Purge air from the system through hot taps.
8. Refit cold water connector and cold pipe covers.
9. When tank is full restore electrical supply.

Tempering Valve (RheemPlus Models)

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

1. ***Drain the water heater***. Refer to 'Draining the Water Heater' procedure on page 57.
2. Remove the tempering valve and cold pipe covers.
3. Disconnect cold and warm water pipes from tempering valve and unscrew tempering valve from heater.

   Note: Removal of the cold pipe requires the use of a special tool, part number 890330. To remove the cold pipe from the tempering valve slide the tool over the pipe and push up against the quick connect fitting whilst pulling down on the cold pipe.

4. Screw new tempering valve into heater using thread tape on threaded section.
5. Insert cold pipe into tempering valve quick connect fitting and push up to click pipe into place (no tool required).
6. Reconnect warm water pipe using thread tape on threaded section.
7. Close hot tap or T&PR valve, restore water supply and check for leaks.
8. Purge air from the system through hot taps.
9. Refit the tempering valve and cold pipe access covers.
10. When tank is full restore electrical supply.

After replacing the tempering valve the warm water temperature will need to be checked to ensure correct operation. Refer to 'Tempering Valve Adjustment Procedure (RheemPlus Models)' on page 61.

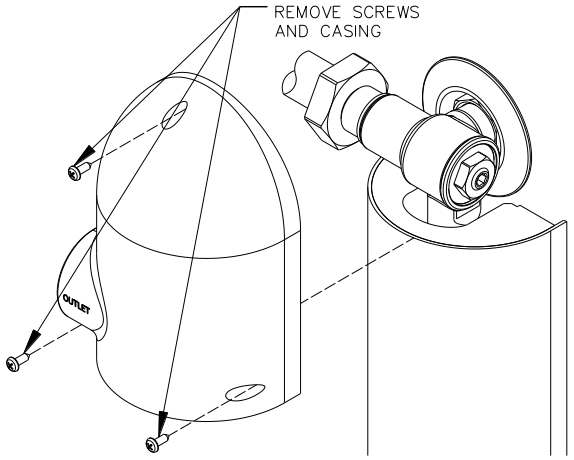
HOT

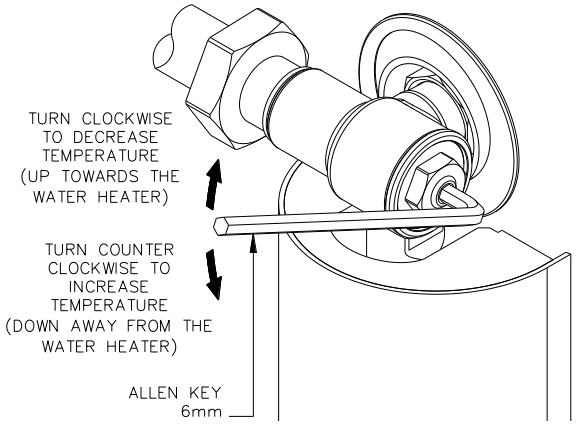
Tempering Valve Adjustment Procedure (RheemPlus Models)

1. Ensure heater is at operating temperature (60 - 70°C). This can be checked at the T&PR valve.
2. Remove the tempering valve cover.
3. Check temperature at the **NEAREST** warm water tap. A reading of 48°C +/- 1.5°C should be obtained.
4. If the water temperature is outside these limits, adjust the tempering valve using a 6 mm allen key.

   Turning the adjusting screw counter clockwise increases the outlet water temperature

   Turning the adjusting screw clockwise decreases the outlet water temperature.
5. Repeat the water temperature measurement at the same hot tap and continue making adjustments until the required temperature is achieved (refer to Step 3 above).
6. If the required temperature can not be achieved, the tempering valve should be replaced (refer to page 60).





Ensure Temperature at the warm water outlet nearest the water heater does not exceed 50 Deg C as required by AS3500.4 clause 1.9.2.

7. Refit all covers.

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

1. Remove the tempering valve. Refer to ‘Tempering Valve (RheemPlus Models)’ on page 60.
2. Dismantle and clean or replace hot water inlet filter. The “C” clip and filter can be removed by gently prising out with a small flat bladed screwdriver. When clean reassemble by inserting filter then the “C” clip.
3. Dismantle and clean or replace cold water inlet filter and non-return valve. Unscrew quick connect fitting and gently prise out filter and then non-return valve (a “C” clip is not fitted). Reassemble in reverse order ensuring that the “O” ring for the quick connect fitting is in place. No thread tape is required on the snap lock fitting thread.
4. Screw tempering valve back into heater using thread tape on threaded section.
5. Insert cold pipe into tempering valve quick connect fitting and push up to click pipe into place (no tool required).
6. Reconnect warm water pipe using thread tape on threaded section.
7. Close hot tap or T&PR valve and restore water supply.
8. Check for leaks.
9. Purge air from the system through hot taps.
10. When tank is full restore electricity.

After servicing the tempering valve the warm water temperature will need to be checked to ensure correct operation. Refer to ‘Tempering Valve Adjustment Procedure (RheemPlus Models)’ on page 61.

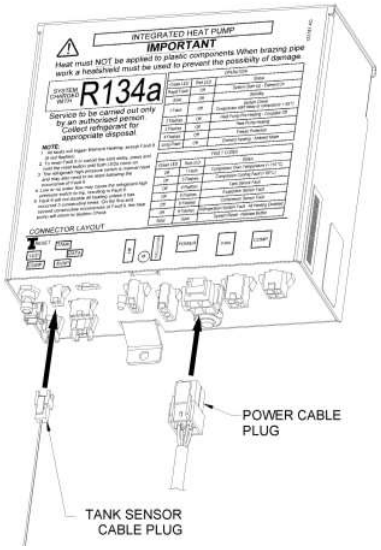
Heat Pump Module

WARNING: The suction line brace <u>MUST</u> be fitted whenever the heat pump is in operation – the suction line brace should never be removed from the evaporator coil unless the evaporator coil is being replaced.

Heat Pump Module Removal

If the heat pump module is being removed for replacement, the following modifications may be required.

Heat Pump Module Replacement: If replacing a heat pump module that does not have a hot water braided hose with an angle fitting at the storage tank end, it will be necessary to remove the elbow fittings and non-return valve from the storage tank (where fitted) and replace them with ¾" x ½" reducing nipples.



1. ***Isolate power to the water heater***.
2. For AquaMax storage tanks only, go to Step 6.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. Remove the heat pump module access panel and disconnect the power wiring and tank sensor wiring between the storage tank and heat pump module at the controller (refer to the diagram opposite).
5. Where a ball valve and check valve are fitted to the storage tank, isolate the water supply to the water heater, relieve pressure from the water heater through the T&PR valve or a hot tap and close the ball valve.

   Where a ball valve and check valve are not fitted to the storage tank, **d*rain the water heater***. Refer to 'Draining the Water Heater' procedure on page 57.
6. If the condensate drain has been extended, disconnect the drain at the joint between the heat pump module condensate drain and the extension pipework.
7. Remove the 6 screws / nuts (3 each side) retaining the heat pump module to the storage tank.
8. Slightly lift the heat pump module to disengage the lower locating tabs from the storage tank and remove the module to the limit of the flexible hoses.
9. For AquaMax storage tanks only, carry out Steps 3 – 0 above.
10. Disconnect the heat pump module inlet and outlet hoses from the storage tank and lift the heat pump module clear.

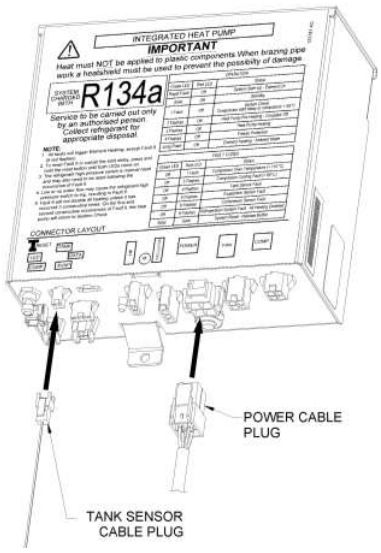
Outer Jacket

1. ***Isolate power to the water heater.***
2. For AquaMax storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure above.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure above.

5. Remove the heat pump module access panel.
6. Remove the screws retaining the heat pump module jacket top and lift the jacket top clear.
7. Remove the condensate drain retaining saddle and disconnect the condensate drain from the condensate tray.
8. Using a small screwdriver, gently pry out the black plug in the dress cover between the fan grille and the LED label.
9. Remove the screw behind the plug and remove the dress cover.
10. Remove the screw directly above the fan grille retaining the outer jacket to the fan shroud.
11. Remove the remaining screws retaining the outer jacket to the chassis of the heat pump module.
12. On Solahart models, disconnect the LED cable from the controller.
13. Gently lift the jacket clear of the heat pump module chassis.
14. On Solahart models, gently release the LED cable from its fixings and withdraw the cable as the outer jacket is removed and access becomes available.
15. Remove the handles, speed clips, LED panel and LED label (integrated LED on Solahart models) if required.
16. Reassemble in reverse order of above. **NOTE:** The jacket is quite flexible, care should be taken to ensure it does not kink during replacement.

Controller

1. ***Isolate power to the water heater.***
2. For AquaMax storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. Remove the heat pump module access panel and disconnect the power wiring and tank sensor wiring between the storage tank and heat pump module at the controller (refer to the diagram opposite).
5. Disconnect all wiring plugs from the bottom of the controller.
6. Remove the screw retaining the controller to the mounting bracket, located underneath the controller.
7. Slide the complete controller up, at the same time as applying outward pressure from behind the controller at the top, in order to aid the controller in clearing the black grommet (on the flexible hose opening) as it slides up.
8. Remove the complete controller from the heat pump module.
9. Reassemble in reverse order of above.



Circulator

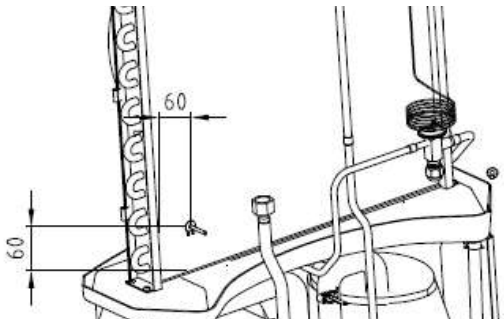
1. ***Drain the water heater***. Refer to 'Draining the Water Heater' on page 57***.***
2. Remove the heat pump module access panel.
3. Disconnect the circulator plug from the controller.
4. Undo the (large) water connections at the circulator.
5. Remove the circulator from the heat pump module.
6. Replace the washers in the circulator union assemblies.
7. Reassemble in the reverse order of above.

Compressor Sensor

1. ***Isolate power to the water heater.***
2. For AquaMax storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
5. Remove the heat pump module access panel.
6. Disconnect the compressor sensor plug from the controller.
7. Release the sensor cable from its fixings.
8. Gently peel back the discharge pipe insulation to reveal the sensor.
9. Unclip the sensor from the discharge pipe.
10. Reassemble in reverse order of above.

Evaporator Sensor

1. ***Isolate power to the water heater.***
2. For AquaMax storage tanks, remove the heat pump module. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. ***Remove the storage tank upper electrical access cover and confirm with a multi-meter across thermostat terminals 1 and 3 that voltage is not present.***
4. Follow steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
5. Remove the heat pump module access panel.
6. Disconnect the evaporator sensor plug from the controller.
7. Release the sensor cable from its fixings.
8. Pull the clip retaining the sensor in the evaporator coil and gently slide out of the evaporator.
9. Refit the evaporator sensor and clip into the evaporator coil. **Note:** The sensor must be positioned in the evaporator in the correct location (refer to the diagram opposite).
10. Reassemble in reverse order of above.



Heat Exchanger Water Outlet Sensor

1. Remove the heat pump module outer jacket. Follow steps 1 – 14 of the 'Outer Jacket' procedure on page 63.
2. Disconnect the heat exchanger water outlet sensor plug from the controller.
3. Release the sensor cable from its fixings.
4. Use a socket to remove the nut retaining the sensor to the stud on the back of the heat exchanger.
5. Use a pair of long-nose pliers to withdraw the sensor from the stud on the heat exchanger.
6. Reassemble in reverse order of above.

LED Panel

1. Remove the heat pump module outer jacket. Follow steps 1 – 14 of the 'Outer Jacket' procedure on page 63.
2. Disconnect the LED cable plug from the controller.
3. Release the LED cable from its fixings.
4. Remove the insulating layer from the back of the LED panel.
5. Gently pry the LED panel away from the jacket.

   NOTES:

   i. If the LED panel is damaged during this step it will require replacement.

   ii. On all models other than Solahart models, the LED label is an adhesive label and is not physically connected to the LED panel.

   iii. On Solahart models, the LED panel and label are a single part.
6. Reassemble in reverse order of above.

Evaporator Fan

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

The correct fan grille MUST be used to ensure protection is retained from access to the rotating fan blade.

1. Remove the heat pump module outer jacket. Follow steps 1 – 14 of the 'Outer Jacket' procedure on page 63.
2. Disconnect the fan plug from the controller.
3. Release the fan cable from its fixings.
4. Remove the 4 screws retaining the fan motor and grille assembly to the fan shroud and pivot the fan motor assembly downwards.
5. Remove the wiring grommet from the fan shroud and remove the fan motor assembly.
6. Remove the plastic cover from the fan grille centre, for re-use on the replacement fan assembly.
7. The replacement fan is supplied with alternative grilles and fixings – the offset grille must be used. A Loctite thread locker must be used with the screws securing the fan grille to the motor body.
8. Reassemble 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**

Filter Drier (30 minutes*)

WARNING: The 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 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. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Recover the refrigerant from the sealed refrigeration system.
4. Disconnect the pipework from the filter drier.

   The following steps MUST be carried out on the removed filter drier:

   - Empty any retained oil out of the filter drier into a safe oil collection container, whilst holding the 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 filter drier and install the caps onto the removed filter drier. The caps may be split so be sure to securely tape the caps in place on the removed filter drier.
5. Braze the replacement filter drier into place, being sure to nitrogen purge.
6. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
7. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
8. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.
9. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
10. ***Isolate power*** and remove gauges.
11. Check the flexible hose connections for water leaks.
12. Refit the heat pump module access cover and restore power supply to the water heater.

Compressor (1 hour*)

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

1. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Remove the insulation from on top of and around the compressor.

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 pipe insulation from the discharge line.
7. Remove the compressor sensor from the discharge line.
8. Recover the refrigerant from the sealed refrigeration system.
9. Disconnect the discharge pipework from the compressor and the suction pipework from the accumulator.
10. Remove the 3 bolts retaining the compressor and remove the compressor through the rear of the module.
11. Install replacement compressor and braze pipework, being sure to nitrogen purge.
12. Reconnect compressor wiring and refit the terminal cover.
13. Refit the compressor sensor to the discharge line.
14. Replace the filter drier. Follow steps 4 and 5 of the 'Filter Drier' procedure on page 68.
15. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
16. Refit and secure pipework insulation to the discharge line.
17. Refit compressor insulation. **NOTE:** The insulation around the compressor should sit on the chassis and wrap around the mounting feet.
18. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
19. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.
20. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
21. ***Isolate power*** and remove gauges.
22. Check the flexible hose connections for water leaks.
23. Refit the heat pump module access cover and restore power supply to the water heater.

Refrigerant High Pressure Switch (45 minutes*)

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

1. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Remove the pipe insulation from the discharge line.
4. Remove the compressor sensor from the discharge line.
5. Recover the refrigerant from the sealed refrigeration system.
6. Disconnect the refrigerant high pressure switch from the discharge line.
7. Braze the replacement refrigerant high pressure switch into place, being sure to nitrogen purge.

8. Refit the compressor sensor to the discharge line.
9. Replace the filter drier. Follow steps 4 and 5 of the ‘Filter Drier’ procedure on page 68.
10. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
11. Refit and secure pipework insulation to the discharge line.
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 the Specifications – Heat Pump Module table on page 8.
14. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
15. ***Isolate power*** and remove gauges.
16. Check the flexible hose connections for water leaks.
17. Refit the heat pump module access cover and restore power supply to the water heater.

Discharge Check Valve (1 hour*)

1. Remove the heat pump module. Refer to the ‘Heat Pump Module Removal’ procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the ‘Outer Jacket’ procedure on page 63.
3. Remove the pipe insulation from the discharge line.
4. Remove the compressor sensor from the discharge line.
5. Recover the refrigerant from the sealed refrigeration system.
6. Disconnect the pipework from the discharge check valve.
7. Braze the replacement discharge check valve into place, being sure to nitrogen purge.
8. Refit the compressor sensor to the discharge line.
9. Replace the filter drier. Follow steps 4 and 5 of the ‘Filter Drier’ procedure on page 68.
10. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
11. Refit and secure pipework insulation to the discharge line.
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 the Specifications – Heat Pump Module table on page 8.
14. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
15. ***Isolate power*** and remove gauges.
16. Check the flexible hose connections for water leaks.
17. Refit the heat pump module access cover and restore power supply to the water heater.

Heat Exchanger (Condenser) (2 hours*)

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

1. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Remove the controller. Follow steps 5 – 8 of the 'Controller' procedure on page 64.
4. Remove the circulator. Follow steps 4 – 6 of the 'Circulator' procedure on page 65.

   NOTE: Only the circulator's heat exchanger connection need be undone – the flexible hose on the other connection may be removed with the circulator.
5. Remove the heat exchanger water outlet sensor. Follow steps 3 – 5 of the 'Heat Exchanger Water Outlet Sensor' procedure on page 66.
6. Remove the flexible hose from the top water fitting on the heat exchanger.
7. Remove the pipe insulation from the discharge line.
8. Remove the compressor sensor from the discharge line.
9. Recover the refrigerant from the sealed refrigeration system.
10. Disconnect the filter drier from the sight glass.
11. Disconnect the discharge line from the compressor.
12. Remove the 2 screws securing the evaporator coil to the chassis side member, on the heat exchanger end only.
13. Gently lift the evaporator coil to create enough clearance to lift and slide the heat exchanger assembly out of the heat pump module, whilst carefully releasing any cabling from fixings as required. The heat exchanger assembly will need to be lifted high enough to allow the heat exchanger bottom bracket tabs to be clear of the chassis base.
14. Slide the brackets off the top and bottom of the heat exchanger.
15. Cut the cable tie retaining the styrene insulation to the heat exchanger, and remove the insulation.
16. Remove the union assembly from the bottom water fitting on the heat exchanger.
17. Disconnect the liquid line tail (and filter drier) and the discharge line assembly from the heat exchanger. **Note the orientation of the pipework to ensure they are correctly positioned in the replacement heat exchanger**.
18. Disconnect the filter drier from the liquid line tail and replace with a new filter drier.

    The following steps MUST be carried out on the removed filter drier:

    - Empty any retained oil out of the filter drier into a safe oil collection container, whilst holding the 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 filter drier and install the caps onto the removed filter drier and sight glass assembly. The caps may be split so be sure to securely tape the caps in place on the removed filter drier.

19. Braze the liquid line tail (and new filter drier) and the discharge line assembly in to the replacement heat exchanger, ensuring they are in the correct orientation and being sure to nitrogen purge. **NOTE:** If possible, the heat exchanger should be partially immersed in a water bath while brazing the pipework.
20. Fit the union assembly to the bottom water fitting on the replacement heat exchanger.
21. Fit the heat exchanger into the styrene insulation and secure the insulation using a cable tie.
22. Fit the heat exchanger brackets over the top and bottom of the heat exchanger, ensuring they are orientated correctly.
23. Gently lift the evaporator coil at the heat exchanger end to create enough clearance to relocate the heat exchanger assembly into the heat pump module. Ensure the heat exchanger bracket tabs sit correctly into the chassis base and the evaporator drip tray. Refit any cabling to fixings as required.
24. Refit the 2 screws that secure the evaporator coil to the chassis side member (through the evaporator drip tray).
25. Braze the filter drier to the sight glass, being sure to nitrogen purge.
26. Braze the discharge line to the compressor, being sure to nitrogen purge.
27. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
28. Refit the compressor sensor to the discharge line.
29. Refit and secure pipework insulation to the discharge line.
30. Refit the flexible hose to the top water fitting on the heat exchanger.
31. Refit the heat exchanger water outlet sensor.
32. Refit the circulator.
33. Refit the controller.
34. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
35. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.
36. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
37. ***Isolate power*** and remove gauges.
38. Check all water connections for water leaks.
39. Refit the heat pump module access cover and restore power supply to the water heater.

Sight Glass (45 minutes*)

1. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Recover the refrigerant from the sealed refrigeration system.
4. The filter drier must also be replaced – disconnect the pipework from the filter drier inlet and the sight glass outlet.

   The following steps MUST be carried out on the removed filter drier and sight glass assembly:

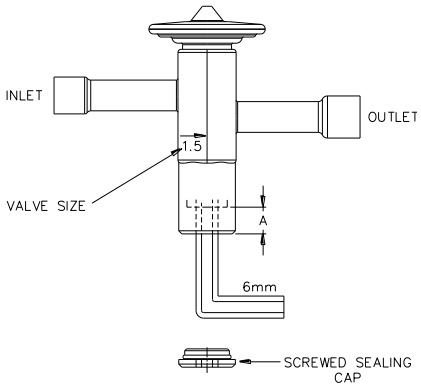
   - Empty any retained oil out of the filter drier into a safe oil collection container, whilst holding the filter drier at a safe distance and taking care to ensure the pipes are never pointed towards the face.
   - Remove the pipe caps from the new filter drier and install the caps onto the removed filter drier and sight glass assembly. The caps may be split so be sure to securely tape the caps in place on the removed filter drier.
5. Braze the replacement sight glass and filter drier into place, being sure to nitrogen purge.
6. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
7. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
8. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.
9. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
10. ***Isolate power*** and remove gauges.
11. Check the flexible hose connections for water leaks.
12. Refit the heat pump module access cover and restore power supply to the water heater.

TX Valve Adjustment

1. ***Isolate power to the water heater***.
2. Remove the heat pump module by following steps 6 – 8 of the 'Heat Pump Module Removal' procedure on page 63.
3. Remove the heat pump module access cover and fit pressure gauges to the low side access valve.
4. Restore power and allow the heat pump to run for at least 15 minutes.

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

5. 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).
6. Note the saturated suction temperature indicated by the gauge. The current superheat setting is the suction line temperature minus the saturated suction temperature.
7. Remove the TX valve cap (see diagram opposite) and use an allen key to adjust the superheat. Nominal superheat setting is 6K at 10ºC saturated suction temperature.



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

To adjust the superheat, turn the adjusting spindle as follows:

Clockwise = Reduced refrigerant flow, increased superheat.

Anticlockwise = Increased refrigerant flow, decreased superheat.

8. Refit and tighten the TX valve cap to a torque of 10Nm, and apply a ‘leak-lock’ sealant to the cap thread.
9. Refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
10. ***Isolate power*** and remove gauges.
11. Check the flexible hose connections for water leaks.
12. Refit the heat pump module access cover and restore power supply to the water heater.

TX Valve Replacement (1.25 hours*)

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

1. Remove the heat pump module. Refer to the ‘Heat Pump Module Removal’ procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the ‘Outer Jacket’ procedure on page 63.
3. Remove the insulation to expose the TX valve bulb and remove the bulb from the suction line.
4. Recover the refrigerant from the sealed refrigeration system.
5. Disconnect the pipework from the TX valve.

6. 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.**
7. Attach the TX valve bulb firmly to the suction line at the 1 o'clock position and refit the insulation.
8. Replace the filter drier. Follow steps 4 and 5 of the 'Filter Drier' procedure on page 68.
9. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
10. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
11. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.
12. Restore power and allow the heat pump to run for at least 15 minutes.

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

13. Check the TX valve superheat setting and adjust if necessary. Refer to steps 5 – 8 of the 'TX Valve Adjustment' procedure on page 73.
14. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
15. ***Isolate power*** and remove gauges.
16. Check the flexible hose connections for water leaks.
17. Refit the heat pump module access cover and restore power supply to the water heater.

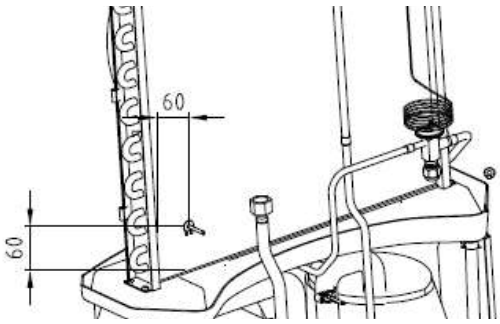
Evaporator Coil (1 hour*)

WARNING: Heat must NOT be applied to plastic components. When brazing pipework as indicated in this procedure, a heat shield must be used to prevent the possibility of damage.

1. Remove the heat pump module. Refer to the 'Heat Pump Module Removal' procedure on page 63.
2. Remove the heat pump module outer jacket. Follow steps 6 – 14 of the 'Outer Jacket' procedure on page 63.
3. Remove the evaporator sensor from the evaporator coil.
4. Disconnect the fan plug from the controller.
5. Release the fan cable from its fixings.
6. Remove the 6 spring clips retaining the fan assembly and shroud to the evaporator coil, slide the assembly forward and remove.
7. Remove the insulation to expose the TX valve bulb and remove the bulb from the suction line.
8. Slide the section of pipe insulation on the suction line where it crosses the liquid line down as far as possible, to expose the joint in the suction line.
9. Remove the 4 screws securing the evaporator coil to the chassis side members.
10. Recover the refrigerant from the sealed refrigeration system.
11. Disconnect the evaporator pipework at the TX valve outlet and the joint in the suction line exposed in step 8 above. **NOTE: The TX valve must be cooled whilst separating pipework, to prevent internal damage.**
12. Remove the evaporator coil.

13. Measure and note the position of the suction line brace on the evaporator coil. Remove the suction line brace and retain for re-use on the replacement evaporator coil.

    To remove the suction line brace, remove the nut from the pipe clip that secures the suction line to the brace. Free the pipe clip from the brace and pipe, and retain the pipe clip for re-use on the new evaporator coil.
14. Remove the 2 screws retaining the brace to the evaporator coil end plates, and remove the brace by sliding it up and off the evaporator coil.
15. Fit the suction line brace to the replacement evaporator coil, by sliding the brace down from the top of the coil to the correct location as noted in step 13 above, and secure with 2 screws.
16. Fit the pipe clip and nut to the suction line brace now installed on the replacement evaporator coil.
17. Braze the replacement evaporator coil into place, being sure to nitrogen purge. **NOTE: The TX valve must be cooled whilst brazing pipework, to prevent internal damage.**
18. Refit the 4 screws that secure the evaporator coil to the chassis side members (through the evaporator drip tray).
19. Attach the TX valve bulb firmly to the suction line at the 1 o'clock position and refit the insulation.
20. Replace the filter drier. Follow steps 4 and 5 of the 'Filter Drier' procedure on page 68.
21. Pressurise the refrigeration system with nitrogen to 2500kPa and conduct a leak test.
22. Slide the section of pipe insulation on the suction line back up to its correct location where the suction line crosses the liquid line.
23. Re-fit the fan assembly and shroud to the evaporator coil, using the 6 spring clips.
24. Re-route the fan cable and plug it back in to the controller.
25. Refit the evaporator sensor and clip into the evaporator coil. **Note:** The sensor must be positioned in the evaporator in the correct location (refer to the diagram opposite).
26. Evacuate system to 500 microns of mercury (65Pa absolute) for at least 30 minutes.
27. Recharge the system with the correct refrigerant. Refer to the Specifications – Heat Pump Module table on page 8.



28. Restore power and allow the heat pump to run for at least 15 minutes

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

29. Check the TX valve superheat setting and adjust if necessary. Refer to steps 5 – 8 of the 'TX Valve Adjustment' procedure on page 73.
30. Refit the heat pump outer jacket and refit/re-install the heat pump module, restore power and allow the heat pump to run for at least 10 minutes – confirm operating pressures are acceptable (refer to page 55).
31. ***Isolate power*** and remove gauges.
32. Check the flexible hose connections for water leaks.
33. Refit the heat pump module access cover and restore power supply to the water heater.

DOCUMENT REVISION HISTORY

Title: 325 & 410 Series II Heat Pump Service Instructions		**Document Nº:** TM077
Revision	**Details of Change**	**Date of Issue**
First Issue	Service Instructions issued for 325 & 410 Series II Heat Pump.	04/14
AA	Addition of Touch Voltage Test and Solahart Atmos model	04/19