Rheem Australia Pty Ltd

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SERVICE INSTRUCTIONS

PowerStore Grid Interactive Electric Water Heater

TM096A

Solahart

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INTRODUCTION

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

Should you require further technical advice on a Solahart PowerStore Grid Interactive Electric Water Heater contact Rheem Technical Support on 1300 712 863.

SAFETY WARNINGS

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 Solahart PowerStore Grid Interactive Water Heater in the minimum of time.

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

Isolate power before conducting the indicated test.

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

General warning symbol. Observe the instructions accompanying the symbol.

Live Testing

A number of test procedures detailed within this document 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'.

Under certain fault conditions it is possible for the metal jacket of a water heater to become live. To check for a shock hazard in a suspect installation, a Touch Voltage Test must be performed (refer page 4).

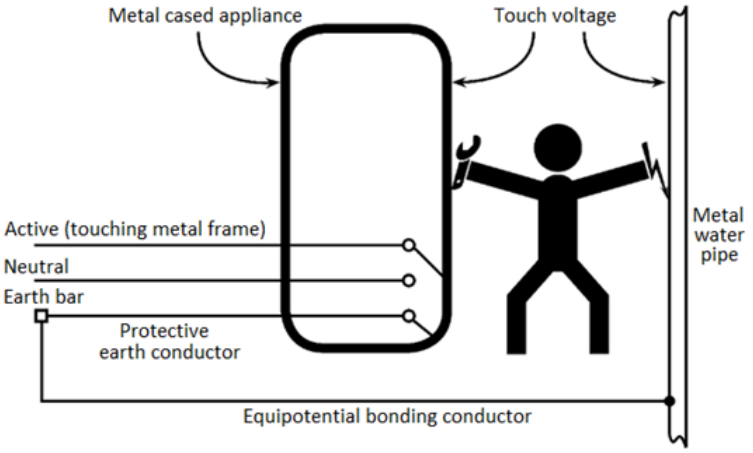
Heater Safety Warnings

This product contains electronic components that are sensitive to electrostatic discharge (ESD). Appropriate precautions shall be taken to prevent damage to electronic components.

Touch Voltage Testing

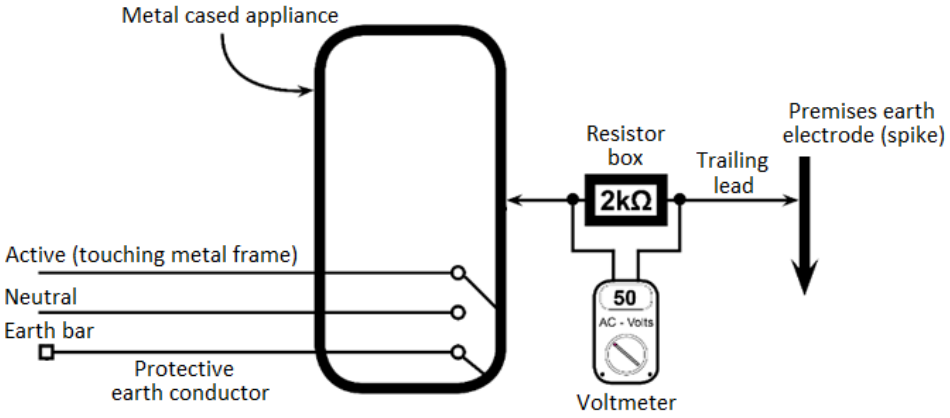
Under certain fault conditions it is possible for the metal jacket of a water heater to become live. The electrical fault may be an internal appliance issue or an issue with the premises wiring.

In the example opposite, the appliance metal jacket has become live due to the appliance active wire touching the metal frame.



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

1. A high impedance multimeter with an input impedance greater than 5 Megaohm.
2. A 2 kΩ resistor box fitted with contact terminals (the 2 kΩ resistor is used to simulate the body resistance of a typical person).
3. A long trailing lead for connection to the premises earth electrode.



Procedure

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

1. Connect resistance box between metal casing of appliance and premises main earth electrode (spike) using the long trailing lead (as depicted above).
2. Connect multimeter (set on AC voltage scale) to resistor box terminals and record reading.
3. If reading is higher than 50 VAC (dry) or 25 VAC (wet), then there is a fault either with the premises wiring or with the appliance.
4. To confirm earthing of the appliance:
   - Electrically isolate appliance from 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 continuity test is ok (≤ 0.5 ohms), the problem is with the premises wiring.

GLOSSARY OF ACRONYMS

CFH – Call for heat.

CT – Current transformer.

ECM – External Control Mode.

EMU – Energy management unit.

ECV – Expansion control valve.

GIEWH – Grid interactive electric water heater.

HEMS – Home energy management system.

N/A – Not applicable. Depending on context may also mean not fitted or not relevant.

N/C – Normally closed i.e. normally closed contact.

N/O – Normally open i.e. normally open contact.

O/C – Open circuit.

PLT – Powerline telecommunication (communication via heater power supply wiring).

PLV – Pressure limiting valve.

PV – Photovoltaic.

PCB – Printed circuit board.

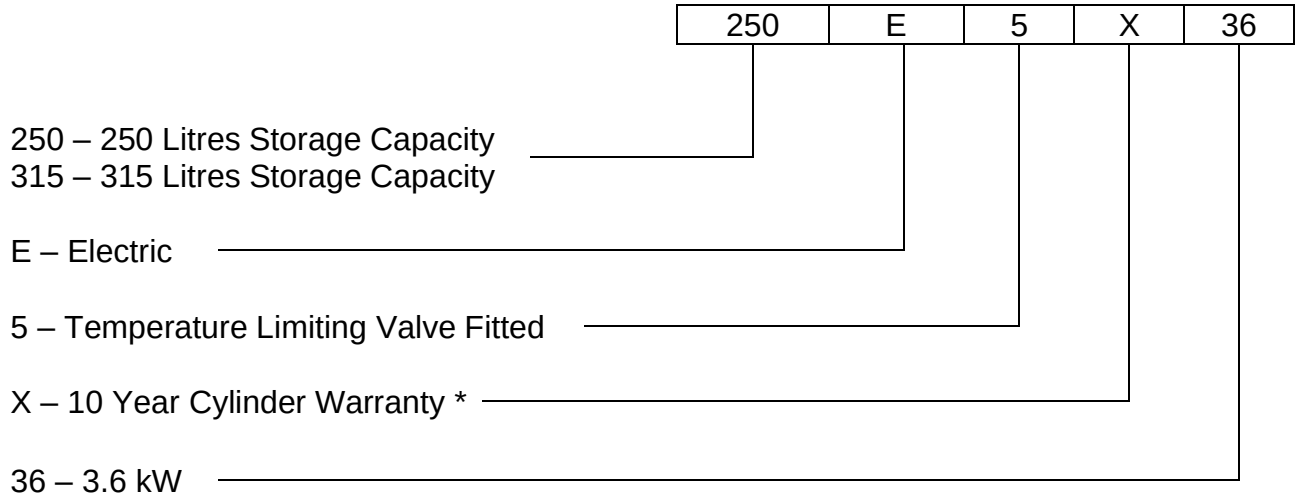
S/C – Short circuit.

T&PR – Temperature and pressure relief valve.

TLV – Temperature limiting valve.

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.



* When installed in a single-family domestic dwelling. Refer to Warranty section in Owners Guide and Installation Instructions supplied with heater for terms and conditions.

SPECIFICATIONS

General

Model		250E5	315E5
Rated Capacity		250 L	315 L
Maximum Water Supply Pressure (1)	With ECV	680 kPa	
	Without ECV	800 kPa	
Water Connections	Cold Water Inlet	G¾B	G¾B
	Hot Water Outlet	G¾B	G¾B
	T&PR	RP½/15	
Electrical	Power Supply	220 ~ 240 VAC 50 Hz Hard Wired	
	Nominal Power Max	3.6 kW	
	Nominal Current Max	15 A	
Water Temperature Setting (2)		70°C ~ 83°C	
Temperature Limiting Valve		Yes	Yes
Communication Protocols (using PLT)		TCP/IP	

(1) Where the mains water supply pressure exceeds the values shown, an approved pressure limiting valve is required.

(2) 70°C during normal operation via master controller. 80°C (± 3°C) via mechanical thermostats when operating in independent legionella sterilisation mode or critical fault mode.

Water Heater Components

Model		250E5	315E5
Anode		1 x 1140 mm	1 x 1395 mm
Temperature Limiting Valve Outlet Temperature		50ºC	
T&PR Valve		1000 kPa	
Master Controller		Solahart	
Top Heating Unit (3)	Element 1 Rating	3600 W	
Bottom Heating Unit (3)	Element 1 Rating	515 W	
	Element 2 Rating	1030 W	
	Element 3 Rating	2055 W	
Temperature Sensor Strip (Temp Sensors TH1 ~ TH5)		Refer to table on page 61	
Legionella Temperature Sensor TH7 (4)		Refer to table on page 60	
Bottom Temperature Sensor TH9 (4)			
Top Mechanical Thermostat	Make	Robertshaw ST1205134D80 (select)	
	Nominal Setting	Opens 80°C ± 3°C. Closes @ 72ºC ± 2°C	
	ECO	Trips @ 87 ~ 93°C. Manual reset @ 82°C	
Bottom Mechanical Thermostat	Make	Robertshaw ST1205134D80 (select)	
	Nominal Setting	Opens 80°C ± 3°C. Closes @ 72ºC ± 2°C	
	ECO	Trips @ 87 ~ 93°C. Manual reset @ 82°C	

(3) Only one heating unit can operate at a time (maximum 3600 W).

(4) Single unit dual sensor comprised of bottom temperature sensor TH9 and legionella temperature sensor TH7.

INSTALLATION

Solahart PowerStore Grid Interactive Electric Water Heaters are suitable for indoor or outdoor installation and must be installed in accordance with AS/NZS 3000, AS/NZS 3500.4, all local codes and regulatory authority requirements and the Installation Instructions supplied with the water heater and any ancillary components.

Note: If the water heater is installed without an EMU, or power meter, or connection to a home energy management system (HEMS), then it will operate as a conventional twin element electric water heater only, with a setpoint of 70ºC with element switching performed by the heater's master controller according to TH1 sensor for top element heating, and TH9 for bottom element heating.

PREVENTATIVE MAINTENANCE

Servicing must be performed by a suitably qualified person.

Annual Service

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

1. Check for discharge from the T&PR valve. When the element is operating a small discharge of water may be evident. Operate the valve easing lever to ensure the valve opens and resets properly. Always open and close the valve gently.
2. Check for discharge from the ECV if fitted. When the element is operating a small discharge of water may be evident. Operate the valve easing lever to ensure the valve opens and resets properly. Always open and close the valve gently.
3. Check for leaks at all tank fittings.
4. Check for signs of excessive corrosion on the water heater jacket.
5. Visually check the unit for any potential problems.
6. If a safe tray is installed, check to ensure the drainpipe is not blocked.
7. Ensure master controller fins have adequate airflow and are free of insects/debris.
8. ***Isolate power*** to the water heater and check all electrical connections for signs of overheating due to poor connection.
9. Remove TLV and clean or replace TLV cold water inlet strainer, non-return valve and hot water inlet strainer, then reinstall TLV. Refer to component replacement procedure 15 on page 75.
10. Check and adjust TLV if required. Refer to ‘Adjusting the Temperature Limiting Valve’ on page 65.
11. Contact CET Support by texting your mobile number to 0488 824 202 requesting a call back to assist in confirming that there are no faults present and that the water heater is functioning correctly.

Major Five Year Service

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

Note: The five year service and routine replacement of any components, such as the anode, relief valve(s) and TLV, are not included in the Solahart warranty. A charge is to be made for this work. Only genuine replacement parts should be used on the water heater.

1. Replace the T&PR valve. Refer to component replacement procedure 13 on page 74.
2. Replace the TLV. Refer to component replacement procedure 15 on page 75.
3. Inspect and flush the expansion control valve (if fitted). If required, replace the valve.
4. Inspect and if required, replace the anode.
5. For water supplies which are either softened or desalinated, or where the water supply may alternate between a water tank and a reticulated public supply or another supply, or where there is a variable supply (e.g. from a bore or public reticulated supply from various water sources), the anode must be inspected (and replaced if there is any sign of depletion) within five years of installation, and within every five years thereafter.

For all water supplies, if the anode is not replaced during a major service then in any event, the anode must be replaced at ten years. Refer to the 'Anode Inspection and Replacement' section in the Owner's Guide and Installation Instructions for full details.

6. Check electric heating units for excessive calcium build up or corrosion and replace if necessary.
7. Check for leaks at all tank fittings.
8. Check for signs of excessive corrosion on the water heater jacket.
9. Visually check the unit for any potential problems.
10. If a safe tray is installed, check to ensure the drainpipe is not blocked.
11. Ensure master controller fins have adequate airflow and are free of insects/debris.
12. ***Isolate power*** to the water heater and check all electrical connections for signs of overheating due to poor connection.
13. Restore power.
14. Contact CET Support by texting your mobile number to 0488 824 202 requesting a call back to assist in confirming that there are no faults present and that the water heater is functioning correctly.

System Components

Grid Interactive Electric Water Heater (GIEWH): The PowerStore GIEWH provides a means of storing energy by heating water utilising special grid tariffs and/or excess power from a PV system (if a PV system is installed). The GIEWH reports the heater's tank charge and status to the EMU via PLT communication, and the EMU reports to the web monitoring service via ethernet connection to the premises modem. Note: If the GIEWH is installed without an EMU, or power meter, or connection to a home energy management system (HEMS), then it will operate as a conventional twin element electric water heater only.

Energy Management Unit (EMU): A third-party electronic device utilised to communicate site specific and system status information with a third-party web monitoring service (such as CET onWatch portal). The EMU can also monitor the flow of power to and from the premises using a power meter and send heating requests to the heater to self-consume solar energy generated if a PV system is installed or if special grid tariffs are available.

Power Meter: A third-party electronic device utilised to monitor the flow of power to and from the premises (from premises only if a PV system is installed).

Home Energy Management System (HEMS): A combination of hardware and software that allows the user to automatically monitor and control energy production and usage in a premises. For GIEWHs, this is typically the EMU & power meter.

Heater Components

Master Controller: An electronic device utilised to control water heater operation during normal operation. Refer to 'Master Controller' on page 32 for more information.

Current Transformer (CT): An electrical device inside the master controller utilised for water heater power consumption measurements.

Heating Units: A tubular device containing electric resistance elements that convert electrical energy to heat. Each GIEWH has two heating units; one heating unit is located in the top section of the tank and the other near the bottom of the tank. Only one heating unit can be energised at a time.

The top heating unit has a single 3600 W element. The bottom heating unit has three elements; 515 W, 1030 W and 2055 W.

Temperature Sensors: Thermistor type sensors are utilised to sense the water temperature at various locations against the storage tank face and are monitored by the master controller. The resistance value of each sensor will change according to the detected temperature, and the master controller utilises the resistance value, which has a corresponding temperature value, to determine mode of operation. There are seven temperature sensors that are located at the following positions on the storage tank:

- Bottom/legionella temperature sensor. This is a single unit dual sensor comprised of bottom temperature sensor TH9 and legionella temperature sensor TH7. The sensor is fitted to a clip attached to the bottom mechanical thermostat and connects to the master controller via a plug-in ribbon cable. Bottom temperature sensor TH9 is utilised for bottom heating unit monitoring/control and controller legionella sterilisation monitoring/control. Legionella temperature sensor TH7 is utilised for independent (backup) legionella sterilisation monitoring/control.

- Temperature sensor strip comprised of five sensors (temperature sensors TH1 ~ TH5) and a 10 Kilo ohm resistor. Utilised for tank heat monitoring and heating calculations and located in a vertical aluminium duct in contact with the cylinder wall. The temperature sensor strip connects to the master controller via a plug-in ribbon cable.

Mechanical Thermostats: During normal operation, the water temperature is maintained by the master controller which utilises temperature sensors to determine the water temperature at various locations in the storage tank.

Top and bottom mechanical thermostats are also fitted to the water heater and are utilised to control the water temperature if the master controller enters independent legionella sterilisation mode or critical fault mode. Each thermostat's controlling contacts are set at 80°C and ***MUST NOT*** be altered (yellow dial).

Each mechanical thermostat has an integral double pole manual reset over temperature cut-out (ECO) to provide additional over temperature protection in case the mechanical thermostat controlling contacts fail.

The ECO contacts open at 87 ~ 93ºC. The ECO will not reset automatically and must be manually reset by pressing and releasing the ECO reset button after temperatures have fallen to a safe level (≤ 82°C). ***DETERMINE CAUSE OF OPERATION*.**

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.

Expansion Control Valve (ECV): A valve designed to provide automatic relief by discharging water in case of excessive pressure. Commonly utilised in areas with poor water quality in which case the pressure relief valve provides a safety back up.

The expansion control valve pressure rating must not exceed 80% of the T&PR valve rating

Temperature Limiting Valve (TLV): A valve that controls its outlet temperature to a preset value. The TLV mixes cold water with hot water from the cylinder hot water outlet to provide a hot water outlet temperature not exceeding 50ºC.

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

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.

Inlet 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.

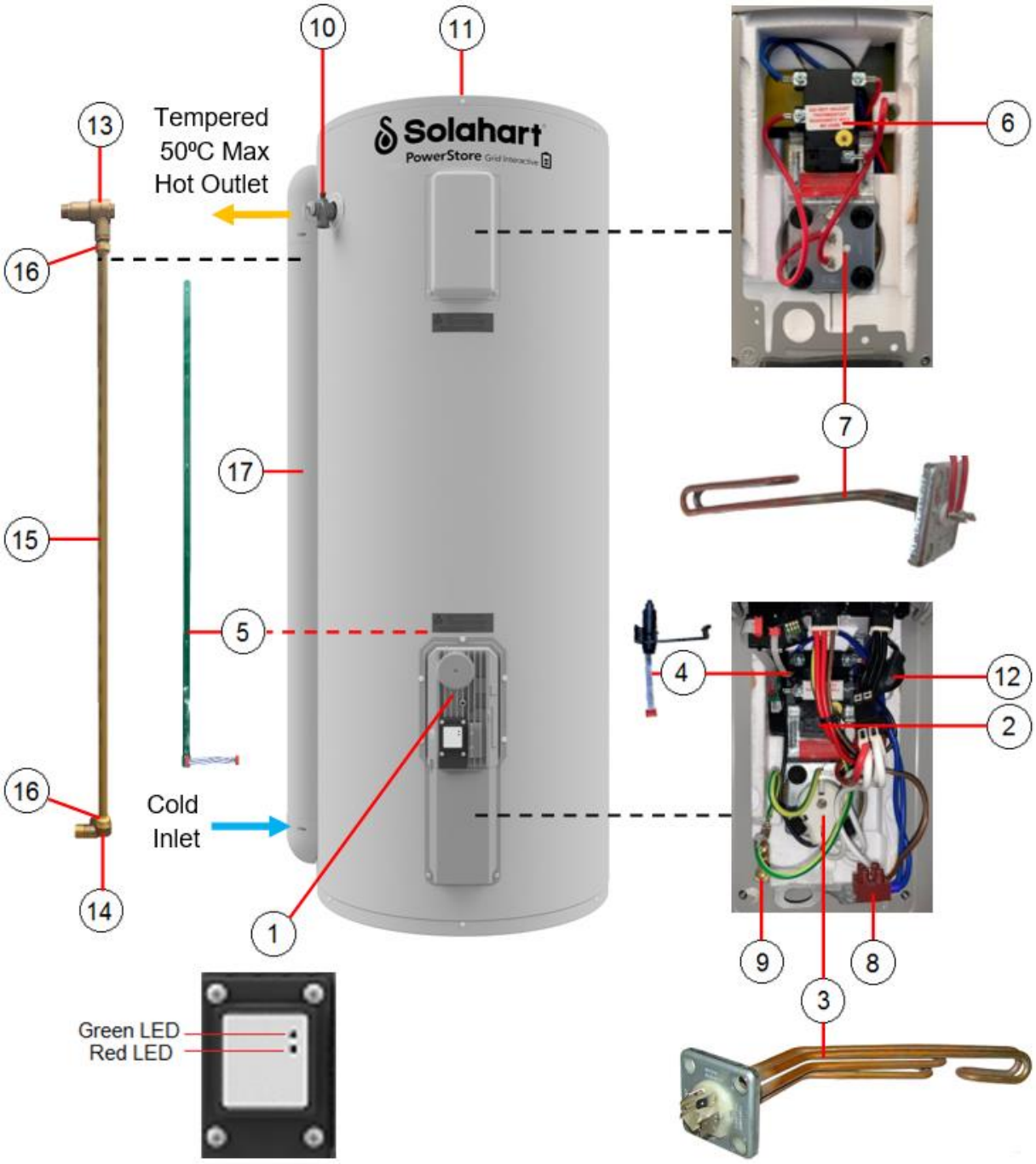
Fitting Liner: A plastic tube installed in the cold-water inlet of the water heater to provide protection against corrosion throughout the life of the water heater.

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

Rating Label: The rating label details the model number, serial number and other specifications and is located on the left hand side of the water heater above the T&PR valve.

Heater Component Overview Diagram

All Models



1	Master Controller	10	T&PR Valve
2	Bottom mechanical thermostat	11	Anode
3	Bottom Heating Unit *	12	EMI Filter Wiring Harness (discontinued)
4	Bottom/Legionella Temp Sensor (TH9 & TH7)	13	Temperature Limiting Valve **
5	Temperature Sensor Strip (TH1 ~ TH5)	14	Cold water Inlet Adapter
6	Top Mechanical Thermostat	15	Cold Water Flexible Pipe
7	Top Heating Unit (3600 W)	16	Quick Connect Fittings
8	Power Supply Terminal Block (A & N)	17	Plastic Insulated Covers
9	Power Supply Earth Connection		

* Bottom heating unit has three elements (515 W, 1030 W and 2055 W)

** TLV has two integral strainers and a non-return valve

EMI Filter Wiring Harness Discontinuation

An EMI filter wiring harness was fitted to models manufactured prior to 01/10/2021 and is not available as a spare part. (Refer to 'Water Heater Wiring Diagram – All Models' on page 13 to identify EMI filter wiring harness location if required).

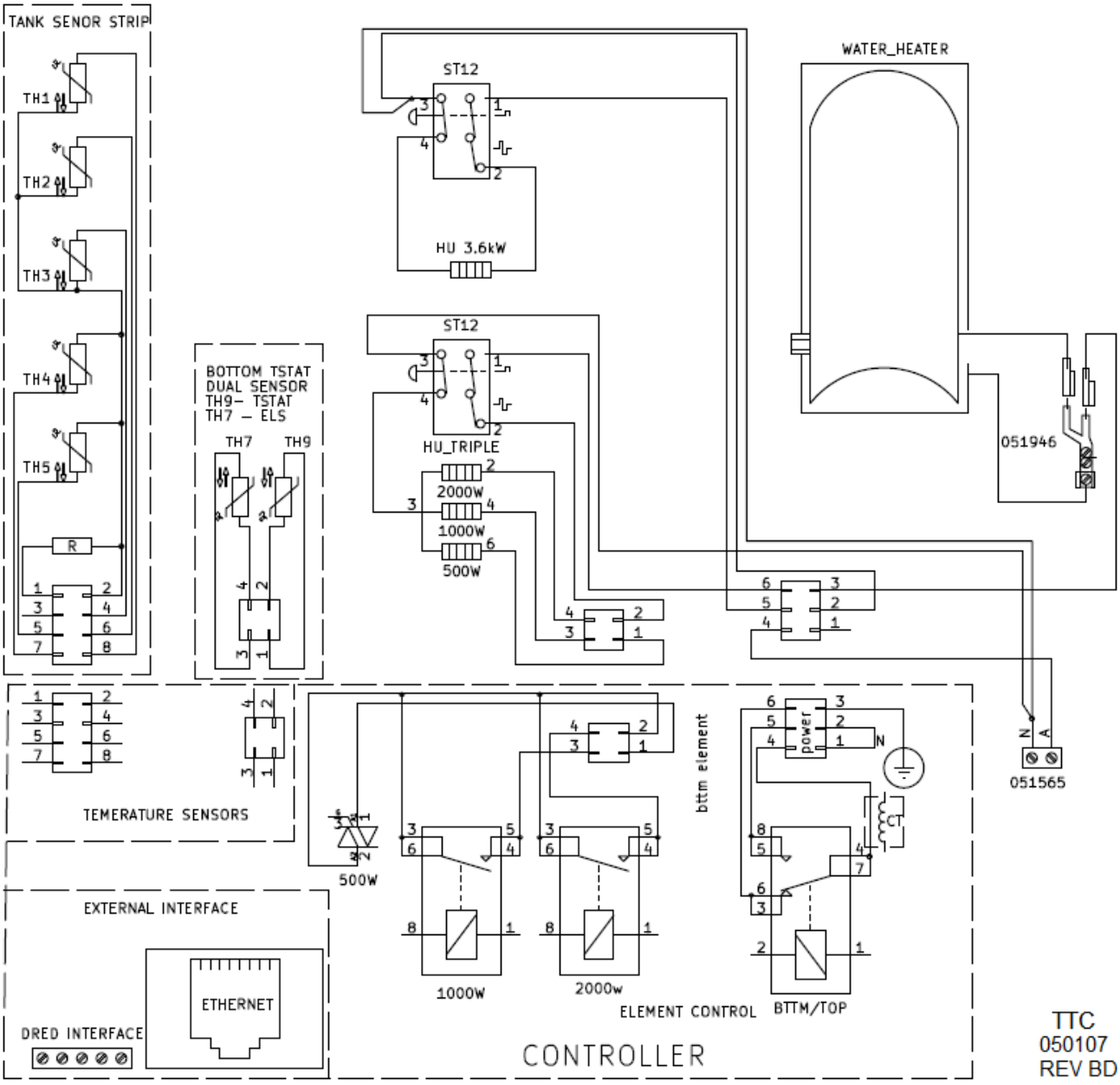
If an EMI filter wiring harness is found to be faulty, it must be removed and discarded, and a replacement master controller ***MUST*** be installed (replacement master controllers have a built-in EMI filter and ***MUST NOT*** have the EMI filter harness fitted as well).

To remove and discard an EMI filter wiring harness and replace the master controller, refer to component replacement procedure 4 on page 68.

Software Changes

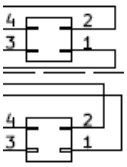
Solahart may, at its discretion, provide remote patches or upgrades to the firmware or software incorporated in the water heater, either directly or through a third-party service provider. Currently, remote upgrades can only be performed via the third-party service provider (such as CET), and are only possible if the water heater is connected to the internet via an external control device such as an EMU.

Water Heater Wiring Diagram – All Models



DRED & RJ45 ethernet external interface connections are for future use and are not currently utilised.

Wiring diagram plug and corresponding plug socket example



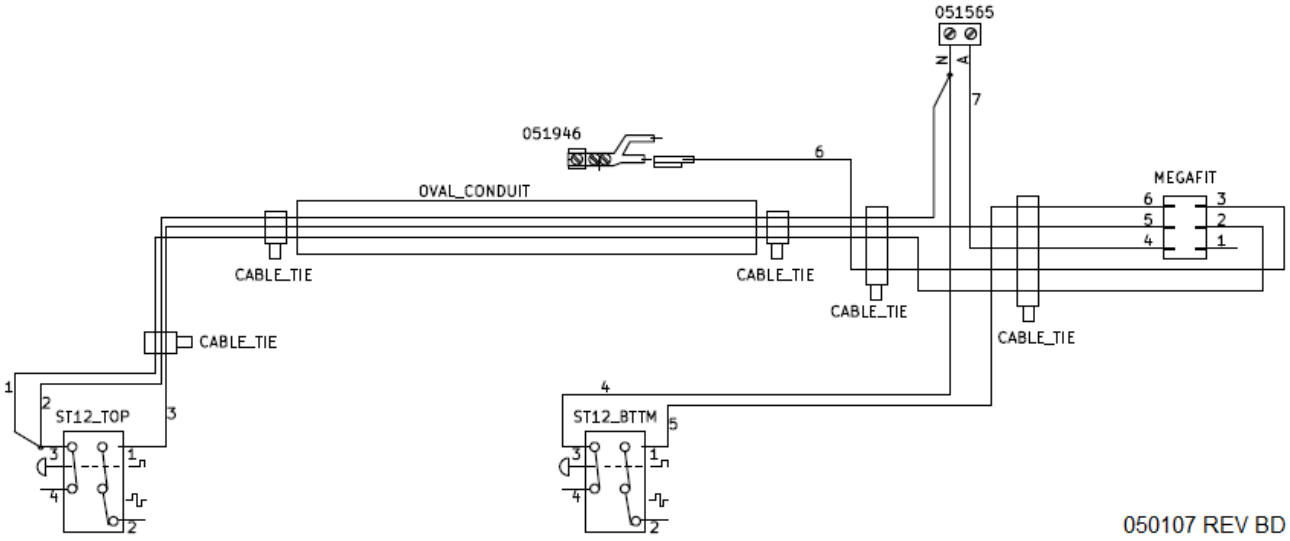
EMI Filter Wiring Harness *

If harness is present, it is connected between the two plug and plug socket example shown opposite.

* Models manufactured prior to 01/10/2021 have an EMI filter wiring harness connected between the master controller and bottom element four pin wiring plugs. Models manufactured from this date do not have the EMI filter wiring harness (the EMI filter is built-in to the master controller after this date). Refer to ‘Product Changes’ section on page 12 for more information.

Water Heater Wiring Harness – All Models

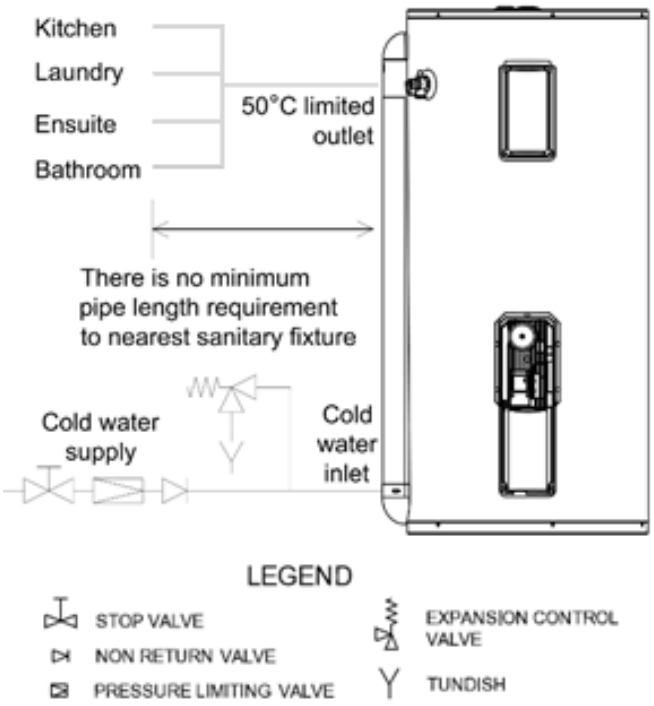
The wiring harness connects between the top and bottom electrical access covers and is also detailed in the wiring diagram on page 13.



PLUMBING DIAGRAM

PowerStore GIEWHs have an integral TLV and deliver water not exceeding 50°C in accordance with AS 3498.

There is no need to install a separate temperature limiting device to satisfy the requirements of the Plumbing Code of Australia (PCA) if a PowerStore GIEWH is installed serving an application where 50°C is the maximum permissible hot water temperature at the outlet of a fixture or appliance used primarily for personal hygiene, such as in a bathroom or ensuite.



Circulated Hot Water Flow & Return System

PowerStore GIEWHs must not be installed as part of a circulated hot water flow and return system in a building.

OPERATION

Operating Instructions

The start up and shut down procedures assume that the water heater is full of water and has been commissioned, and that all valves are positioned to allow water flow through the heater.

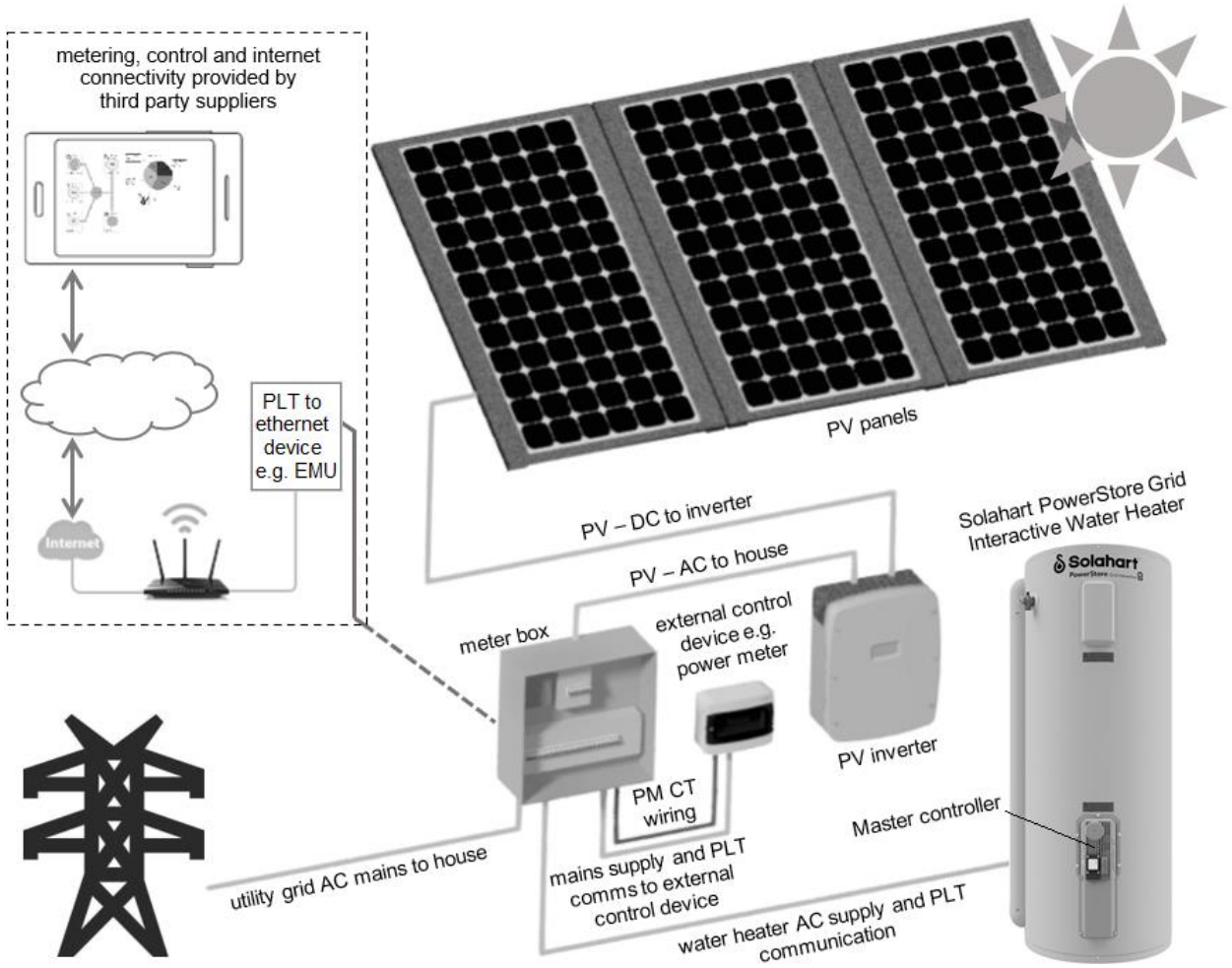
To Turn the Water Heater ON

1. Turn ON circuit breaker/electrical isolator in switchboard marked 'Water Heater' or ‘HWS’.
2. Turn ON water heater electrical isolator located adjacent to the heater (if installed).

When power is provided to the water heater, it will automatically operate in initialisation mode for 15 ~ 60 seconds after which time it will operate according to the master controller determined mode of operation.

To Turn the Water Heater OFF

1. Turn OFF water heater electrical isolator located adjacent to the heater (if installed).
2. Turn OFF circuit breaker/electrical isolator in switchboard marked 'Water Heater' or ‘HWS’.



The PowerStore GIEWH operates as a staged power input water heater at times when there are special grid tariffs or if there is excess PV power available (if a PV system is installed). When special grid tariffs or excess PV power is available and water heating is required, the water heater's master controller and the EMU and/or power meter react enabling the water heater to operate at or near an equivalent power consumption.

A combination of triple electric elements and electronic control enables a staged input from 515 Watts to full power (3600 Watts) for the bottom heating unit, and 3600 W for the single electric element top heating unit. This power control system allows the water heater to operate whenever smaller or larger amounts of excess PV power is detected and water heating is required.

An external control device (such as the Solahart CET Power Meter) monitors the flow of power to and from the premises and communicates the amount of excess PV power available to the EMU via PLT (powerline telecommunications). The EMU then passes the required power reading to the GIEWH master controller via PLT. The GIEWH master controller then adjusts the heating rate to consume the available excess power.

70 litres (250E models) or 90 litres (315E models) of 60ºC hot water is maintained regardless of excess PV power availability or special grid tariffs (ECM amenity maintenance mode).

Controller legionella protection is also ensured regardless of excess PV power availability or special grid tariffs, and a separate independent electronic circuit, including independent legionella temperature sensor TH7, provides a back up to ensure the entire tank volume is heated to ≥ 60°C once every 7 days if such heating has not occurred during normal day to day operation.

In the event of a component failure that causes the master controller to enter critical fault mode, the water heater defaults to operating as a 3600 W bottom element water heater controlled by a mechanical thermostat i.e. all three bottom heating unit elements are energised.

For monitoring and fault indication purposes, the system can interface with a third-party web monitoring portal (such as CET onSite) via the internet to provide feedback on the water heaters performance.

Note: If the water heater is installed without an EMU, or power meter, or connection to a home energy management system (HEMS), then it will operate as a conventional twin element electric water heater only, with a setpoint of 70ºC with element switching performed by the heater's master controller according to top temperature sensor TH1 for top element heating, and bottom temperature sensor TH9 for bottom element heating. In this instance it will not be able to be part of an intelligent water heating system or utilise special grid tariffs and/or excess PV power.

Sequence of Operation

The GIEWH master controller has 11 modes of operation and starts from initialisation mode when power is supplied/restored to the water heater, or if the master controller is reset via a third-party web monitoring portal.

1. Initialisation Mode.
2. Bottom Thermostat Trip Calibration Mode.
3. Standalone Control Mode.
4. External Control Mode – Amenity Maintenance.
5. External Control Mode – Heat Request.
6. External Control Mode – No Heat Request.
7. Controller Legionella Sterilisation Mode.
8. Independent Legionella Sterilisation Mode.
9. Critical Fault Mode.
10. External Control Mode – AS4755 Request (currently disabled – for future use).
11. Factory Test Mode (currently only utilised during manufacturing end of line testing).

During any mode of operation, only one heating unit can be energised at any one time i.e. top heating unit or bottom heating unit. Refer to 'Heating Unit Element Switching & Control' on page 22 for element switching/control methodology.

Whilst operating in any normal mode of operation (modes 1 ~ 8), the master controller continuously monitors the water heater and if a fault is detected the following occurs:

- **If a warning fault is detected:** A fault code is logged to memory and the heater operates as normal in the current mode of operation, but possibly with impeded functionality depending on the type of fault. The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **If a critical fault is detected:** The master controller red LED illuminates on solid and critical fault mode is entered to provide backup heating (refer to page 21 for operation when in critical fault mode). The fault code can only be viewed via the third-party web monitoring portal.

- **If an independent legionella control fault is detected:** A fault code (ELS_REPORTED) is logged to memory and independent legionella sterilisation mode is entered to provide sterilisation heating (refer to page 21 for operation when in independent legionella sterilisation mode). The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **If a major fault is detected:** A fault code is logged to memory and the heater operates in the current mode of operation but heating is unlikely to occur. The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **Loss of Network Connection:** If connection to EMU, power meter or ethernet is lost or has not been configured, the master controller red LED provides one flash every 10 seconds and enters standalone control mode (refer to page 19 for operation when in standalone control mode). Note: This is not a fault if an EMU or HEMS is not connected.

1. Initialisation Mode (Green & red LEDs fast flash)

Initialisation mode is entered when 240 VAC power is supplied to the water heater, or if a master controller reset is performed via the third-party web monitoring portal (such as CET onSite). Initialisation mode normally takes 15 ~ 60 seconds during which time the following actions are performed:

1. Master controller green and red LEDs fast flash (0.25 seconds on, 0.25 seconds off).
2. All master controller relays and triac output are de-energised (if energised).
3. Bottom/top changeover relay is energised for 5 seconds then de-energised.
4. Master controller performs a self-check routine.

If no faults are detected at step 4, the master controller determines the next mode of operation according to parameter settings and external control inputs. Note: Bottom thermostat trip calibration mode is immediately entered if first time operation.

2. Bottom Thermostat Trip Calibration Mode (No specific LED indication)

During first time operation, the master controller performs a heating cycle to determine at what bottom temperature sensor TH9 value the bottom mechanical thermostat trips (contacts open). The master controller utilises its internal current transformer (CT) output to determine when the thermostat has operated i.e. loss of power to element (thermostat trip) = 0 volt output from CT.

A bottom thermostat trip calibration may also be performed by resetting the master controller to default factory settings via the third-party web monitoring portal (such as CET onSite).

Bottom thermostat trip calibration normally takes 3 ~ 4 hours from a cold tank start during which time the following actions are performed:

1. Top heating unit is energised (single element on) and operates until the top mechanical thermostat opens (80ºC ± 3ºC) i.e. until CT provides 0 volt output.
2. Bottom heating unit is energised (all three elements on) and operates until the bottom mechanical thermostat opens (80ºC ± 3ºC) i.e. until CT provides 0 volt output. Bottom temperature sensor TH9 value at this point is recorded as B_TRIP value.

The master controller then determines the next mode of operation according to parameter settings and external control inputs.

3. Standalone Control Mode (No specific LED indication)

Standalone control mode is entered directly from initialisation mode (or from bottom thermostat trip calibration mode for first time operation) if an external control device has not been connected/detected, or if the last communication with an external control device has been > 15 minutes.

When in standalone control mode, the GIEWH functions similar to a standard twin heating unit water heater but heating is controlled by the master controller (not the mechanical thermostats) i.e., top heating unit is energised (single element on) until top temperature sensor TH1 detects 70°C. Heating then switches to bottom heating unit (all three elements on) and continues until bottom temperature sensor TH9 detects 70°C at which time all heating ceases.

Bottom heating is maintained between 68°C and 70°C as detected by bottom temperature sensor TH9 (i.e., 2ºC differential), and if top temperature sensor TH1 detects ≤ 68°C (i.e., hot water usage), power is redirected to the top heating unit until top temperature sensor TH1 detects 70°C.

4. External Control Mode – Amenity Maintenance (No specific LED indication)

ECM amenity maintenance mode is entered if an external control device has been detected by the master controller and the amenity maintenance volume of hot water is not available.

The amenity maintenance volume of hot water is 70 litres for 250E models and 90 litres for 315E models at a temperature of ≥ 60ºC and is calculated by the master controller based on sensor strip temperature sensor TH1 ~ TH5 values. ECM amenity maintenance mode ensures a usable amount of hot water is available during periods when there are no special grid tariffs or little or no excess PV power is available.

When in ECM – amenity maintenance mode, the top heating unit is energised (single element on) until top temperature sensor TH1 detects T_CUTOFF. If top mechanical thermostat contacts open (contacts open at 80ºC ± 3ºC) before top temperature sensor TH1 detects T_CUTOFF value, heating then switches to the bottom heating unit (all three elements on) and continues until top temperature sensor TH1 detects B_TRIP value at which time all heating ceases.

5. External Control Mode – Heat Request (No specific LED indication)

ECM heat request mode can only be entered if

- an external control device has been detected by the master controller, and
- special grid tariffs and/or excess PV power is available, and
- ECM amenity maintenance mode has been satisfied.

The master controller enters ECM heat request mode when it receives a heating request from the EMU. The EMU selects which element configuration is appropriate for grid management and the master controller energises the elements accordingly.

The element configuration can be any combination of bottom elements (515 W, 1033 W and/or 2055 W) or top element (3600 W) or no elements (0 W). There are a total of 8 element configurations plus an additional 8 element configurations using the bottom thermostat calibration trip point setting B_TRIP value determined when performing the initial bottom thermostat trip calibration mode. The additional 8 combinations allow the heater to store more energy at a setpoint just below the bottom mechanical thermostat calibrated trip point B_TRIP value (approximately 80ºC instead of 70ºC).

- Bottom 515W: Provides 515W total.
- Bottom 1030W: Provides 1030W total.
- Bottom1030W + Bottom 515W: Provides 1548W total.
- Bottom 2055W: Provides 2055W total.
- Bottom 2055W + Bottom 515W: Provides 2570W total.
- Bottom 2055W + Bottom 1030W: Provides 3085W total.
- Bottom 2055W + Bottom 1030W + Bottom 515W: Provides 3600W total.
- Top 3600W element: Provides 3600W total.

When in ECM heat request mode, the EMU provides the heat request and determines setpoint, e.g. 70ºC or B_TRIP value (approximately 80ºC), however call for heat operation is determined by the master controller utilising a 2ºC differential.

6. External Control Mode – No Heat Request (No specific LED indication)

ECM no heat request mode can only be entered if
- an external control device has been detected by the master controller, and
- special grid tariffs and/or excess PV power is available, and
- ECM amenity maintenance mode has been satisfied.

ECM no heat request mode is entered if the master controller does not receive a heating request from the EMU for 15 seconds and no other mode has priority. During normal operation, the master controller remains in ECM no heat request mode indefinitely or until the master controller determines that another mode of operation is required according to parameter settings and external control inputs.

7. Controller Legionella Sterilisation Mode (No specific LED indication)

Controller legionella sterilisation mode is entered if bottom temperature sensor TH9 does not detect ≥ 62°C for a minimum of 33 minutes within a 6 day (144 hour) period.

If top temperature sensor TH1 detects < 62°C, the master controller energises the top heating unit (single element on) until top temperature sensor TH1 detects ≥ 64°C (i.e., 2ºC differential). Heating then switches to the bottom heating unit (all three elements on) and continues until bottom temperature sensor TH9 detects ≥ 64°C at which time all heating ceases.

Bottom heating is maintained between 62°C and 64°C as detected by bottom temperature sensor TH9, and if top temperature sensor TH1 detects < 62°C (i.e., hot water usage), power is redirected to the top heating unit (single element on) until top temperature sensor TH1 detects 64°C.

Heating continues in this manner until bottom temperature sensor TH9 detects ≥ 62°C for 33 minutes in a single period. If bottom temperature TH9 detects < 62ºC at any stage, the 33 minute counter is reset to zero i.e. controller legionella sterilisation mode continues for another 33 minutes.

At expiry of the 33 minute sterilisation period, the master controller determines the next mode of operation according to parameter settings and external control inputs.

8. Independent Legionella Sterilisation Mode (No specific LED indication)

The master controller has an independent (backup) legionella circuit and control system, including independent legionella temperature sensor TH7, to ensure legionella sterilisation is performed in case there is a failure that prevents the master controller from performing controller legionella sterilisation mode.

Independent legionella sterilisation mode is entered if legionella temperature sensor TH7 does not detect > 62°C for a minimum of 32 minutes within a 6 day 19 hour (153 hour) period. Note that this is 19 hours after controller legionella sterilisation mode should have occurred. The detection time is also 1 minute less (32 min instead of 33) to prevent unnecessary double sterilisations.

Independent legionella sterilisation mode is also entered if an independent legionella control fault is detected by the master controller (ELS_REPORTED fault code).

When in independent legionella sterilisation mode, the master controller energises the bottom heating unit (all three elements on) with heating control determined by the bottom mechanical thermostat i.e. all bottom elements are energised until the bottom mechanical thermostat contacts open at 80°C (± 3°C).

Heating continues in this manner until bottom temperature sensor TH9 detects ≥ 62°C for 32 minutes in a single period. If bottom temperature TH9 detects < 62ºC at any stage, the 32 minute counter is reset to zero i.e. independent legionella sterilisation mode continues for another 32 minutes.

At expiry of the 32 minute sterilisation period, the master controller determines the next mode of operation according to parameter settings and external control inputs.

9. Critical Fault Mode (Red LED ON solid)

Critical fault mode is entered if the master controller detects a critical fault that prevents it from controlling heating (refer to ‘Fault Code Table’ on page 38 for a list of all fault codes and their meanings).

When in critical fault mode, the master controller red LED remains on solid and the master controller energises the bottom heating unit (all three elements on) with heating control determined by the bottom mechanical thermostat i.e. all bottom elements are energised until the bottom mechanical thermostat contacts open at 80°C (± 3°C).

10. External Control Mode – AS4755 Request (No specific LED indication)

ECM AS4755R mode is for future use. It is currently disabled and is not available.

11. Factory Test Mode

Currently only utilised during manufacturing end of line testing (EOLT). This mode is currently not available when installed.

Heating Unit Element Switching & Control

During any mode of operation, only one heating unit can be energised at any one time i.e. top heating unit or bottom heating unit. The master controller utilises its internal relays and triac to perform heating unit element switching as follows:

a) Top heating unit is energised when bottom/top changeover relay is energised by master controller.

b) Bottom heating unit elements are energised when bottom/top changeover relay is de-energised and element controlling triac (515W element) and/or 1030W relay (1030W element) and/or 2055W relay (2055W element) are energised by master controller.

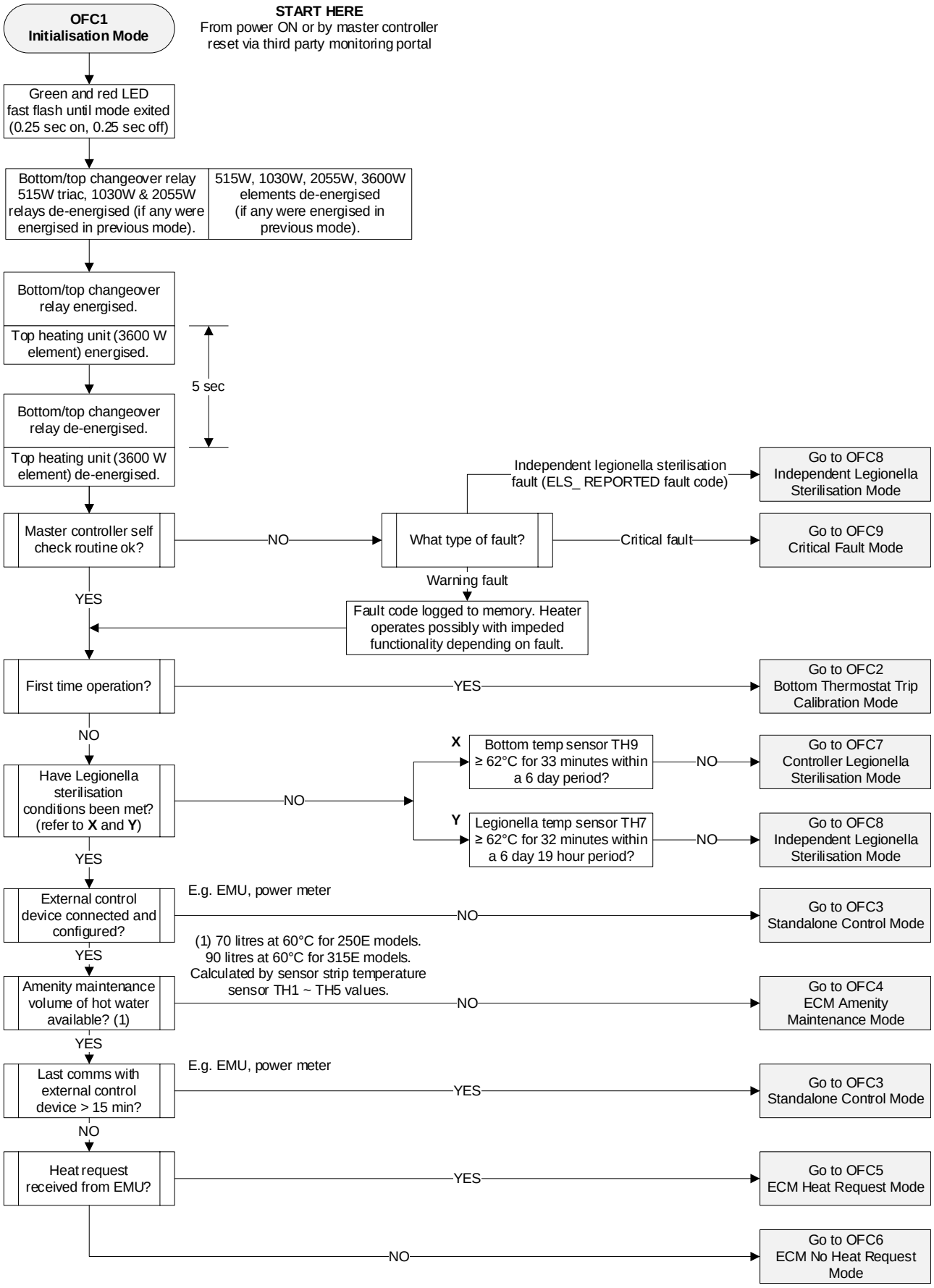
The following tables detail master controller internal relay coil and contact status when the relevant heating unit is energised during any mode of operation.

Top Heating Unit Energised	Master Controller Internal Relay Coil & Contact Status (1)	Element Powered From
3600W element	• Bottom/top changeover relay energised (N/O closed)	Heater 240 VAC power supply via changeover relay N/O contacts

Bottom Heating Unit Energised	Master Controller Internal Relay Coil & Contact Status (1)	Element Powered From
5150W element	• Bottom/top changeover relay de-energised (N/C closed) • Master controller triac output enabled	Master controller triac
1030W element	• Bottom/top changeover relay de-energised (N/C closed) • 1030W relay energised	Heater 240 VAC power supply via 1030W relay
2055W element	• Bottom/top changeover relay de-energised (N/C closed) • 2055W relay energised	Heater 240 VAC power supply via 2055W relay

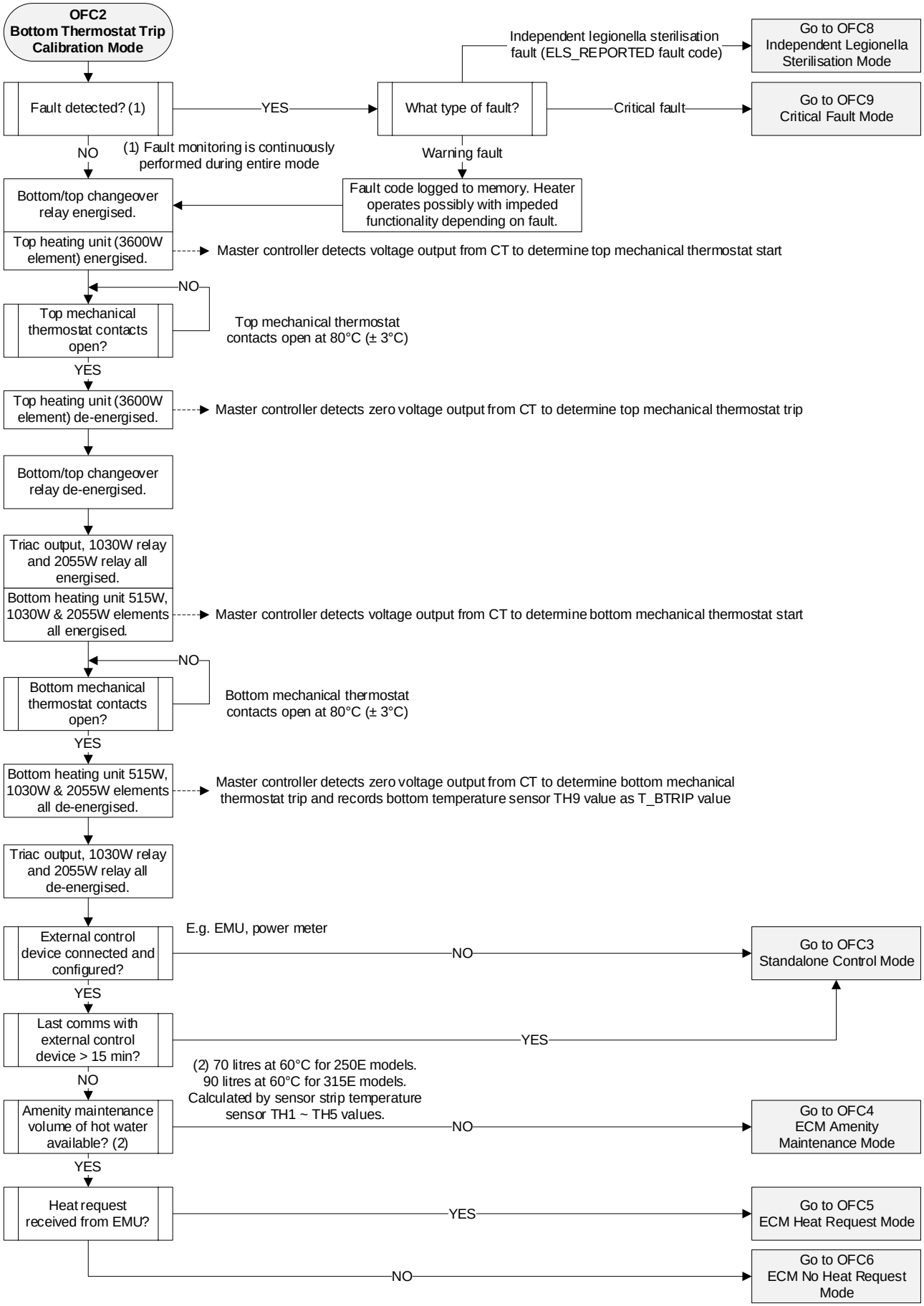
(1) Relays are an integral part of master controller and are non-replaceable.

OFC1 – Initialisation Mode

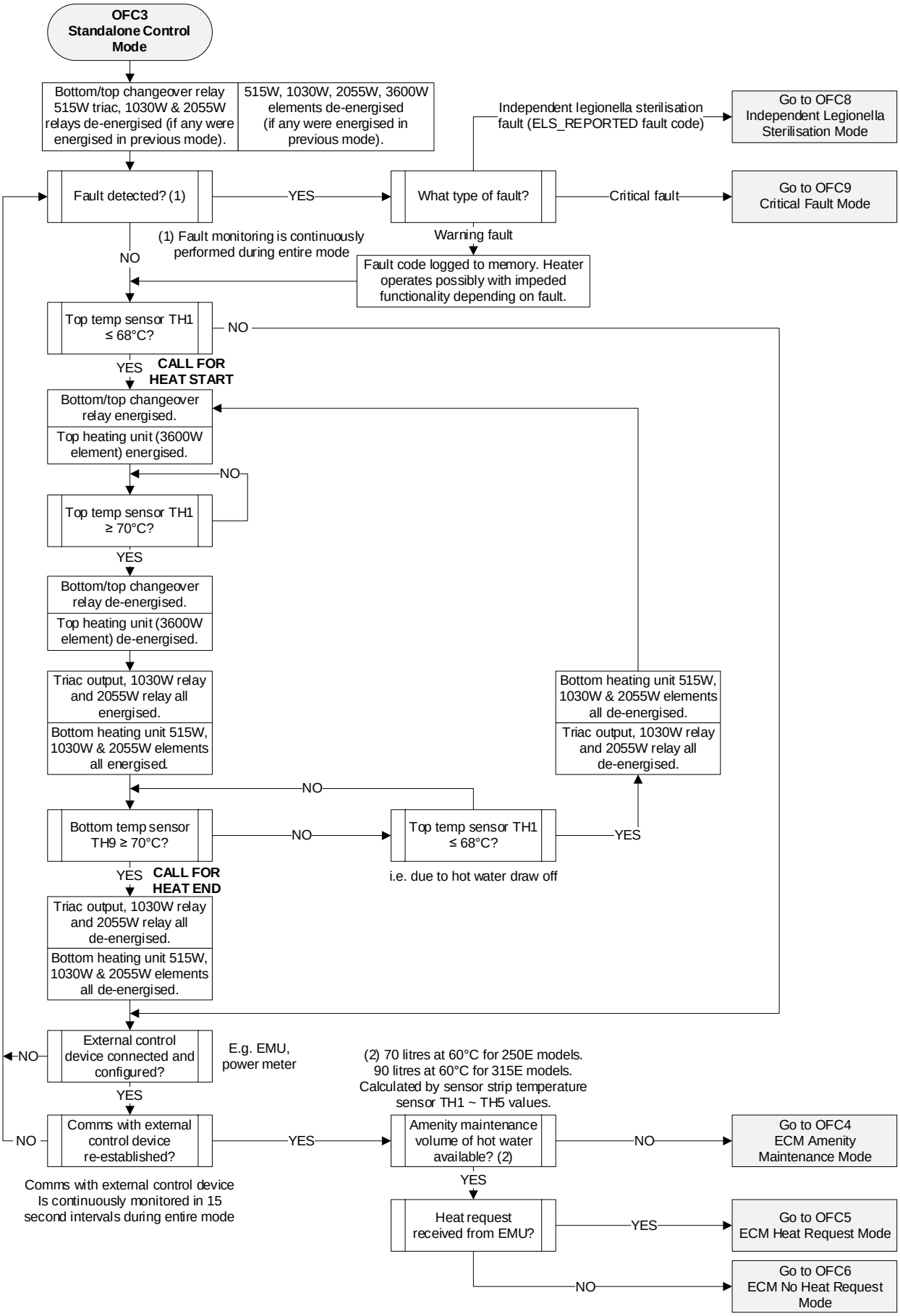


OFC2 – Bottom Thermostat Trip Calibration Mode

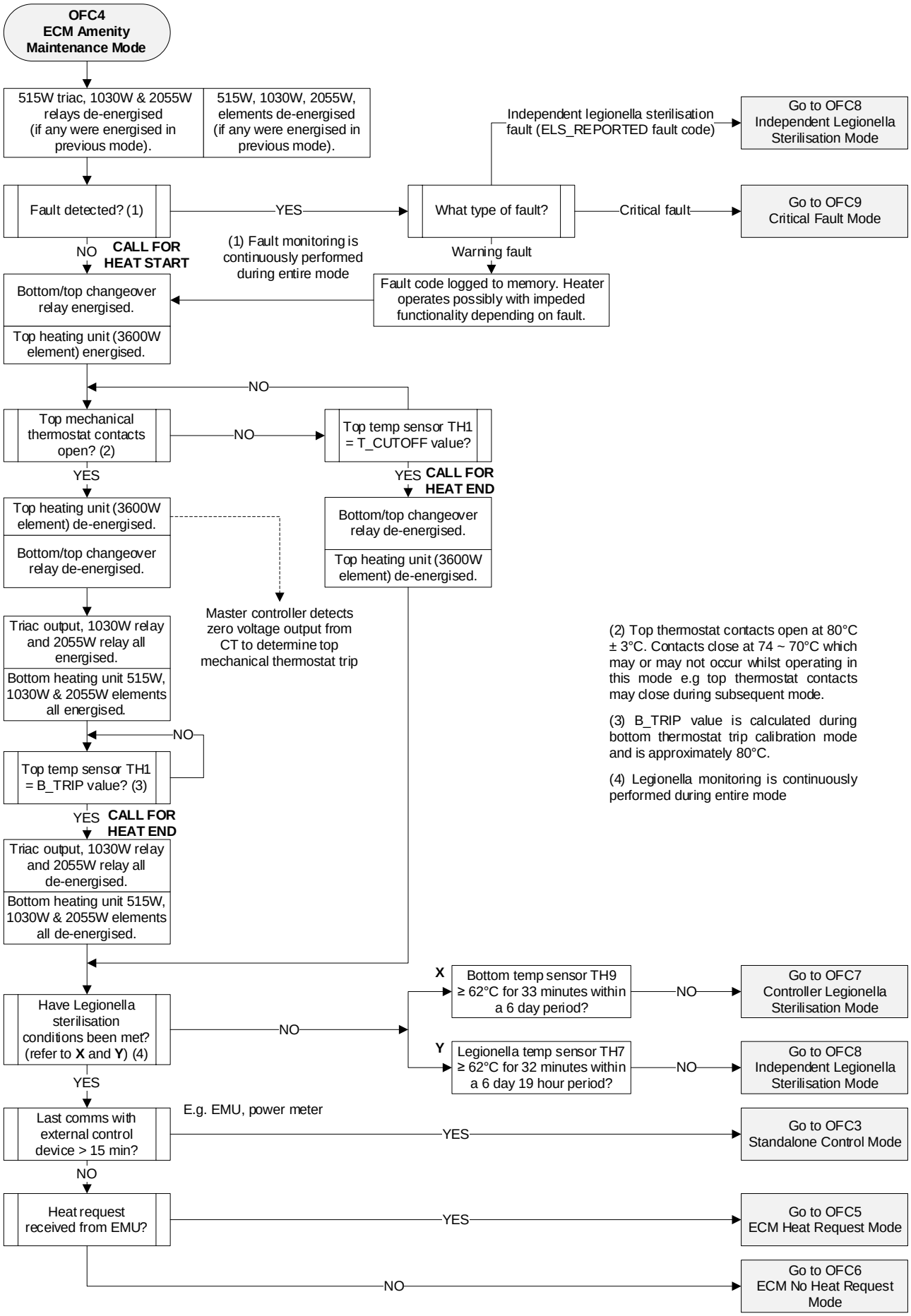
During bottom thermostat trip calibration mode, the master controller performs a heating cycle to determine at what bottom temperature sensor TH9 value the bottom mechanical thermostat operates (opens). The master controller utilisesIts internal current transformer (CT) output to determine when the thermostat has operated i.e. loss of power to element (thermostat trip) = 0 volt output from CT.



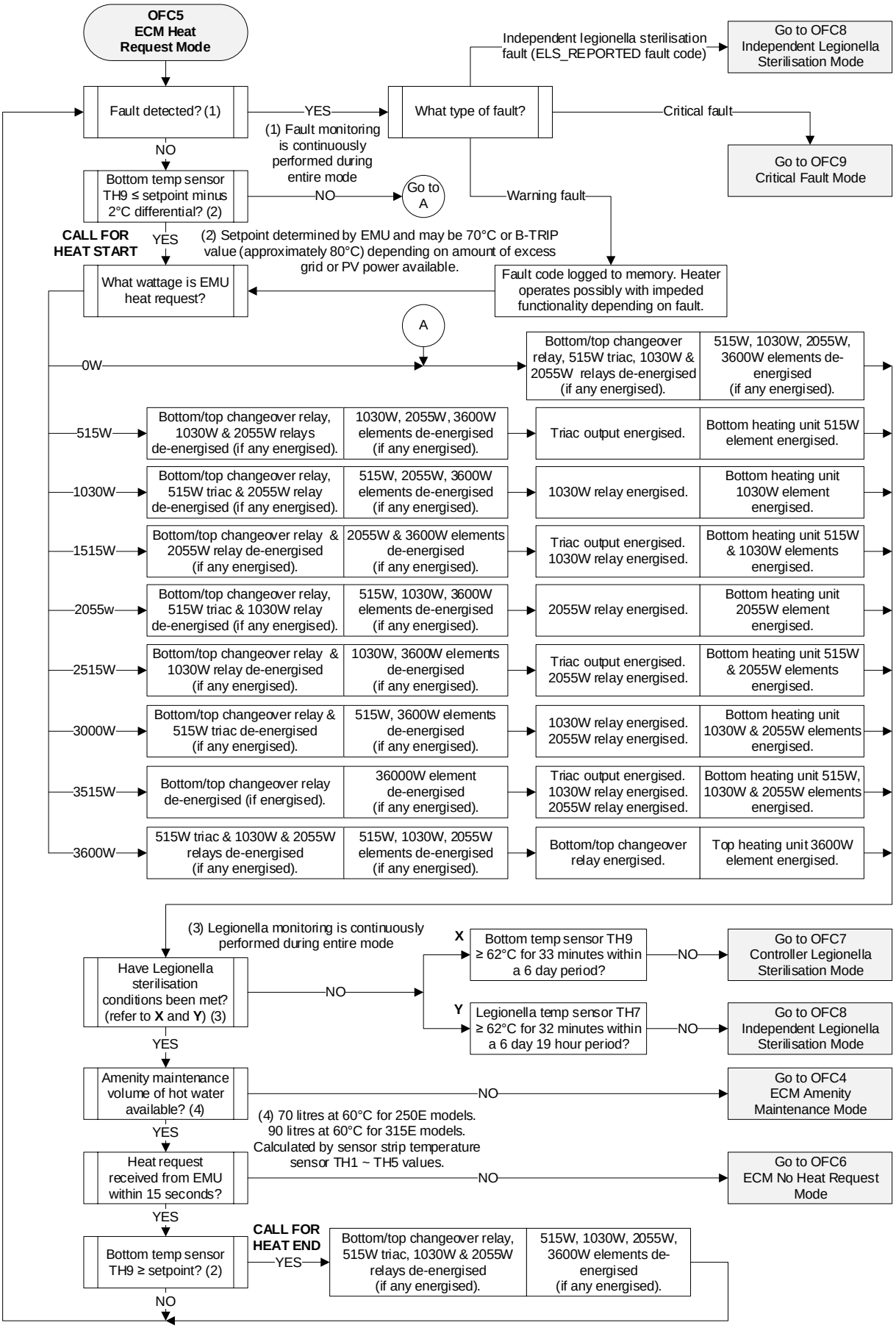
OFC3 – Standalone Control Mode



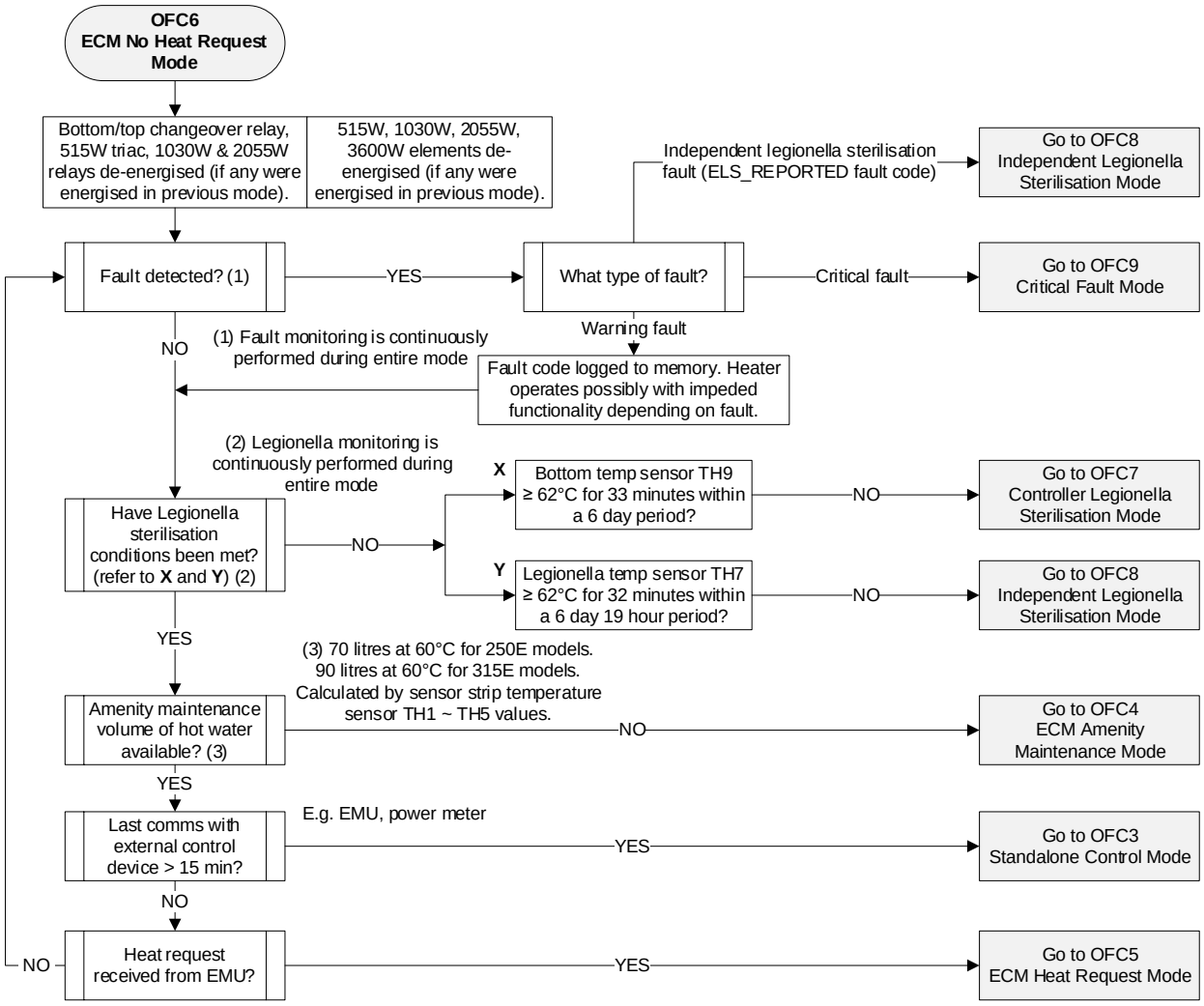
OFC4 – ECM Amenity Maintenance Mode



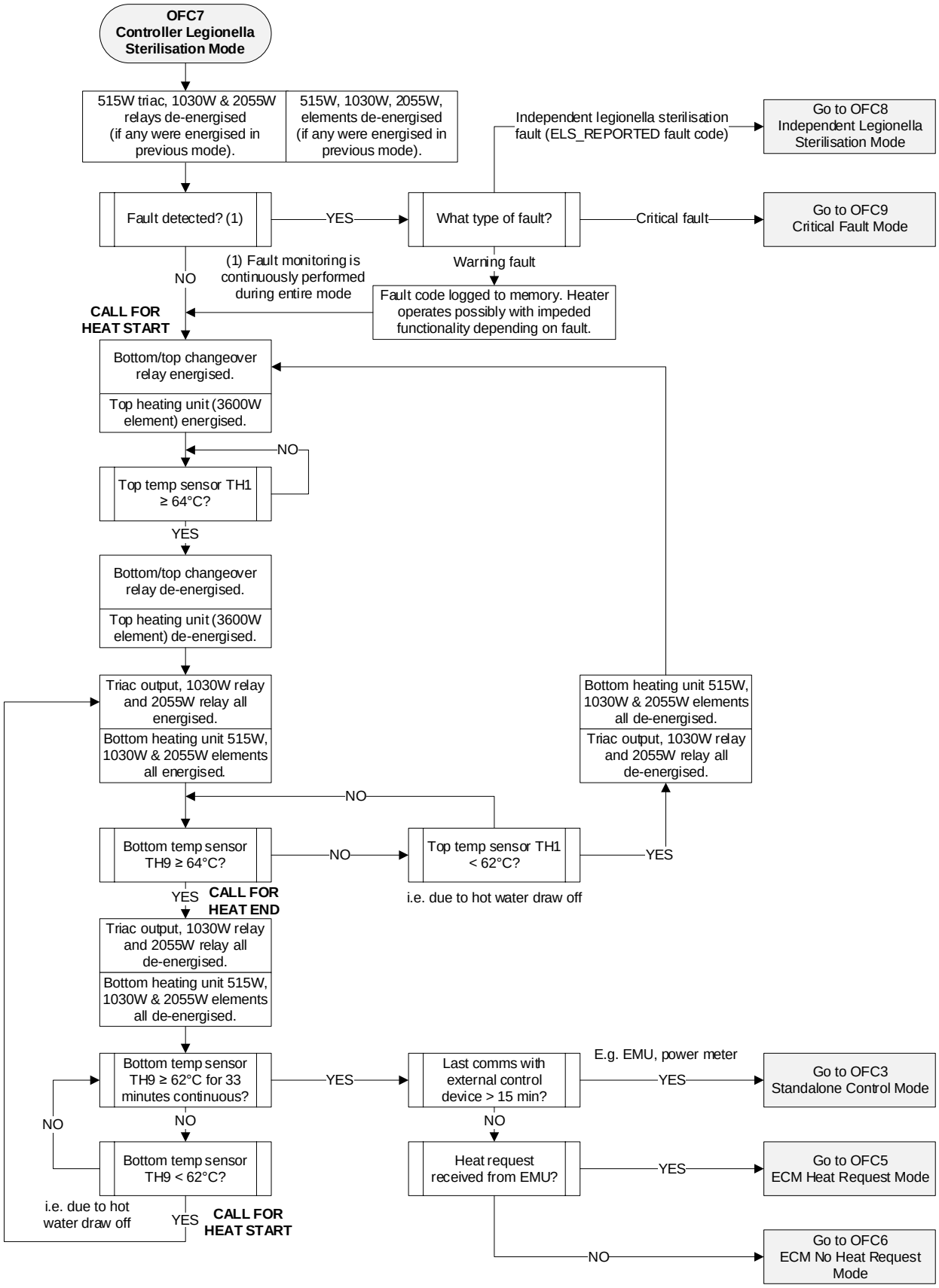
OFC5 – ECM Heat Request Mode



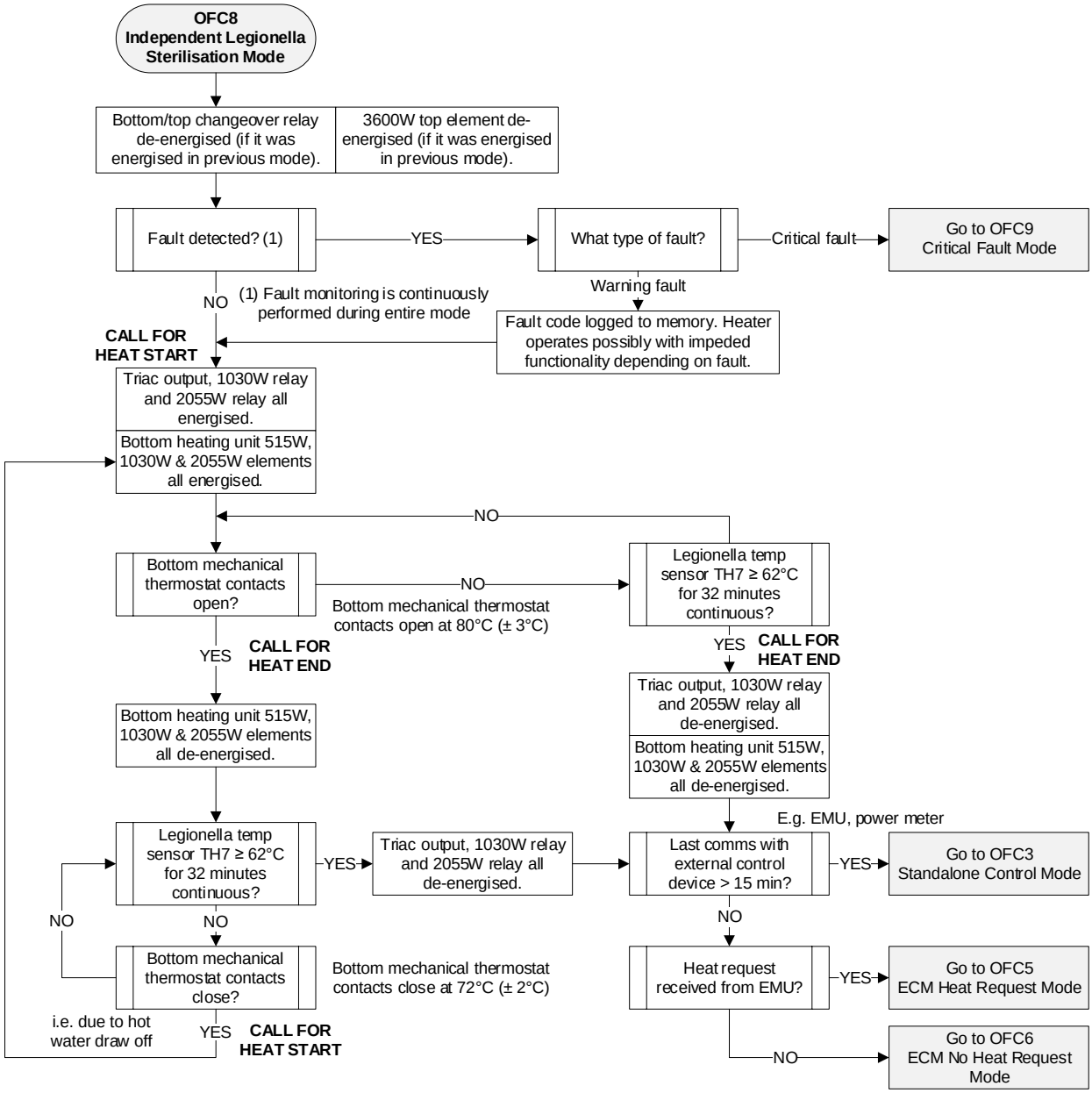
OFC6 – ECM No Heat Request Mode



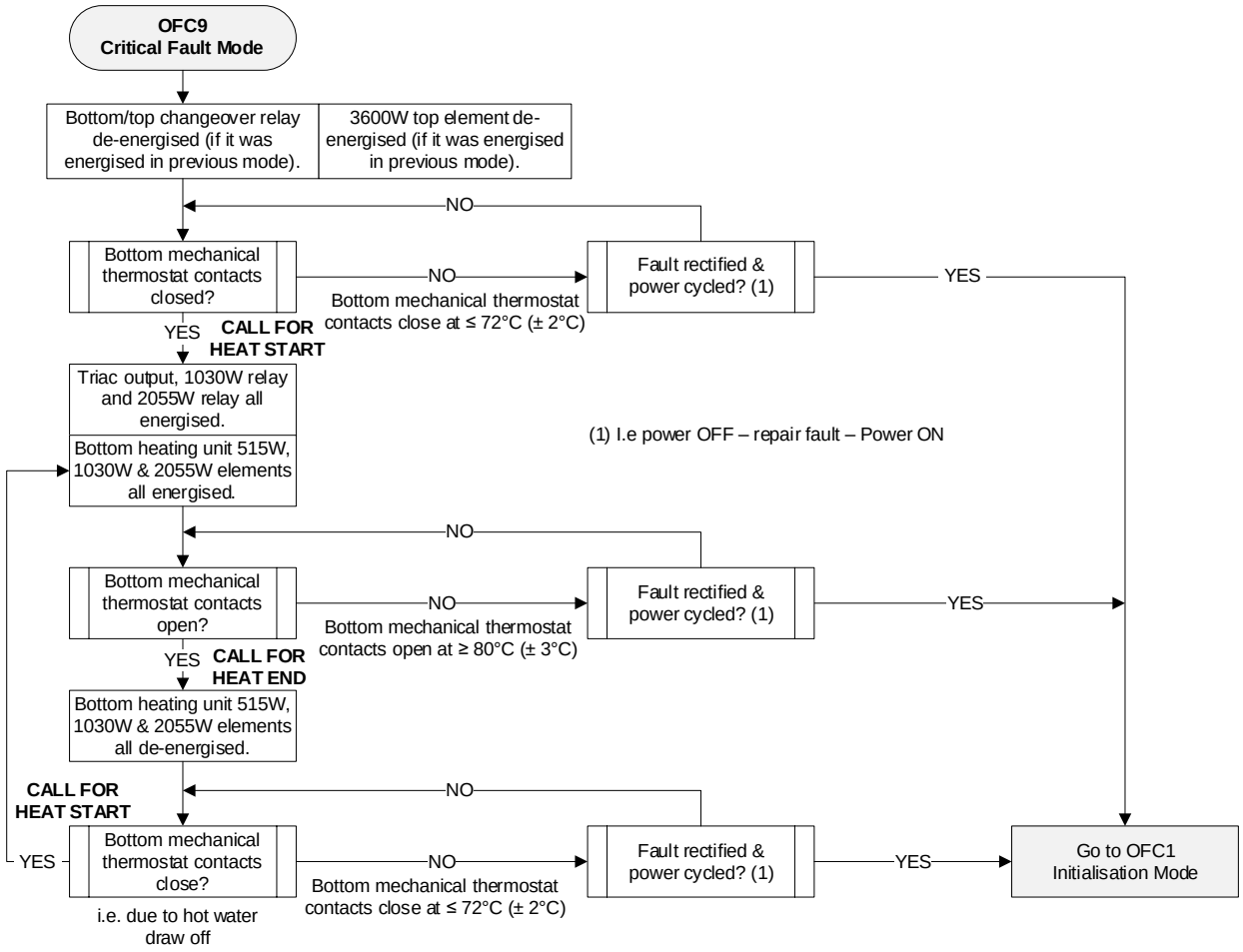
OFC7 – Controller Legionella Sterilisation Mode



OFC8 – Independent Legionella Sterilisation Mode



OFC9 – Critical Fault Mode



OFC10 – ECM AS4755 Mode

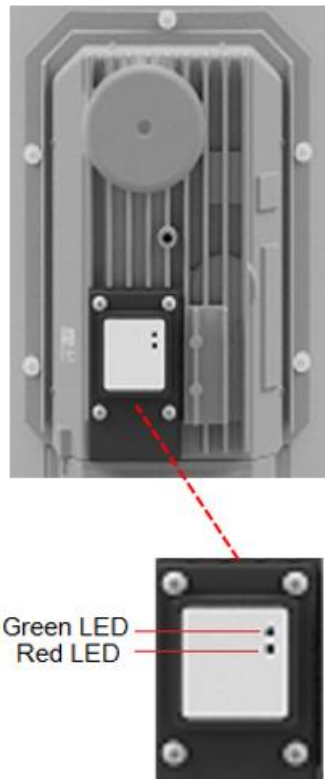
No operational flow chart – ECM AS4755R mode is for future use. It is currently disabled and is not available.

OFC11 – Factory Test Mode

No operational flow chart – Currently only used during manufacturing end of line testing.

MASTER CONTROLLER

The master controller controls water heater operation and receives information from an external control device (such as Solahart CET EMU) on the amount of excess PV power available, or if a special grid tariff is available. If water heating is required, and if excess PV power is available, the power consumption of the GIEWH is varied from 515W ~ 3600W in increments to utilise the excess PV power for water heating rather than exported it to the grid.



The master controller communicates with the external control device via Powerline Telecommunications (via heater 240 VAC power supply wiring) and can also report tank charge status, current operation status, legionella countdown and any detected faults or warnings to a third-party web monitoring portal (such as CET onSite).

The master controller monitors the bottom temperature sensor TH9 and the temperature sensor strip comprised of temperature sensors TH1 ~ TH5, and if a call for heat is required, the master controller utilises its internal element switching relays and a triac to energise and de-energise electric elements to heat the water in the storage tank, i.e. the master controller switches between the top and bottom heating units electric elements by energising or de-energising its internal bottom/top changeover relay, 515W triac and 1030W and 2055W relays.

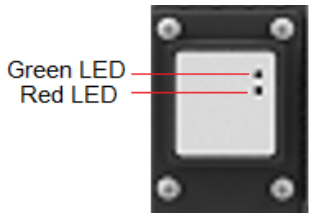
The master controller has a green LED and a red LED that are utilised to indicate water heater operational status (refer to ‘LED Indication’ on page 33).

The following table provides page numbers/links to all master controller information and procedures:

Information/Procedure	Page
Sequence of Operation – Written Version (details all modes of operation)	17
Sequence of Operation – Flow Chart Version (details all modes of operation)	23
LED Indication	33
Fault Indication	37
Fault Code Table	38
Master Conrtroller Component Replacement Procedure	68

LED INDICATION

The master controller has a green LED and a red LED (located on the front bottom section of the water heater) that are utilised to indicate water heater operational status. There are five types of LED illumination which are as follows:



Illumination Type	Duration	LEDs
OFF	Remains OFF	Green & red
ON Solid	Remains ON	Green & red
Standard Flash	1 sec ON, 1 sec OFF	Green
Fast Flash	0.25 sec ON, 0.25 sec OFF	Green & red
Slow Flash	0.25 sec ON, 9.75 sec OFF	Red

Green LED

The green LED generally indicates various stages of normal operation.

Green LED	Operational Status
OFF	• No power or fault with heater
ON Solid	• Water heated to setpoint temperature, or heat request not received (1)
Standard Flash	• Top or bottom heating unit energised i.e. heating
Fast Flash (with red LED also fast flashing)	• During initialisation mode (≤ 60 seconds) – Normal operation • During firmware update (≤ 60 seconds) – Normal operation • If > 10 minutes, master controller firmware may be corrupted.

(1) Not currently heating – Normal operation. Setpoint temperature will depend on mode of operation.

Red LED

The red LED generally indicates a fault with the water heater.

Red LED	Operational Status
OFF	• With green LED OFF – No power or fault with heater • With green LED ON solid or green LED standard flashing – Normal operation
ON Solid	• Critical fault detected and heater operating in critical fault mode
Fast Flash (with green LED also fast flashing)	• During initialisation mode (≤ 60 seconds) – Normal operation • During firmware update (≤ 60 seconds) – Normal operation • If > 10 minutes, master controller firmware may be corrupted.
Slow Flash	• EMU or PLT network not detected (2)

(2) Normal operation if EMU or HEMS is not connected. Fault if EMU or HEMS is connected.

FAULT FINDING

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.

Insufficient Hot Water

Complaints of insufficient hot water and no hot water can on many occasions be attributed to hot water usage exceeding the capacity of the water heater to provide hot water. Establish the probable hot water usage by querying the usage habits of the household and compare this with the potential delivery of the model water heater installed. It can then be established if the usage is within or outside the capacity of the model. Areas to check for excessive usage are:

1. Automatic washing machines.
2. Showers exceeding 12 L/minute for mixed water and 5 minutes in duration.
3. Two or more showers operating at the same time.
4. Change of occupancy or an increase in the number of persons.
5. High water pressure area (look for excessive pressure relief valve discharge).
6. Plumbing leaks.
7. Crossed connection.

Mixing or Crossed Connections

If an automatic dishwasher, washing machine, flick mixer tap 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 stopcock on cold water supply to water heater.
2. Open a hot tap. If water flow is persistent and cold, then a cross connection exists.

Discoloured Water

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

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

Water Hammer

A water heater will not cause water hammer, however valves associated with the water heater may be the source of the problem. For example, 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 pipe work, 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 premises cold water pressure will usually solve most problems.

High Power Bills

Complaints high power bills can on many occasions be attributed to one or more of the following conditions:

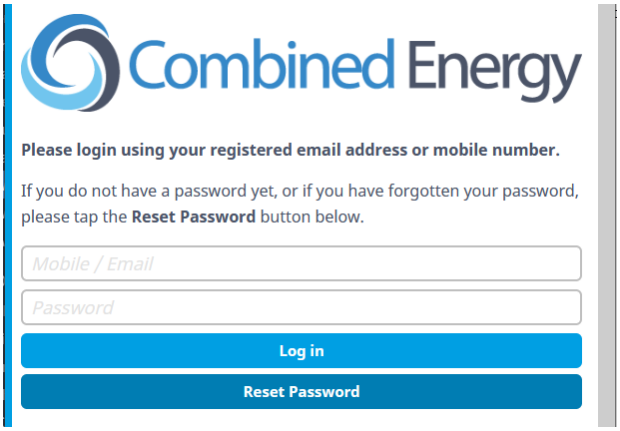
- Hot water plumbing leaks: If hot water has not been used for a period of time, feeling the temperature of the hot water line may give an indication of water flow due to a leak if the pipe is warm. The method of checking for plumbing leaks is:
  1. Turn off stopcock on cold water supply to water heater.
  2. Open a hot tap to ensure the flow of water stops. This will confirm if the stopcock is operating correctly.
  3. Turn off hot tap.
  4. Turn on stopcock to make up water pressure in the cylinder, then turn 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 should be no leaks in the plumbing system.
- Insufficient excess PV power: Insufficient or no excess PV power can cause the water heater to use excessive power from the grid. Check the following:
  1. Water heater not communicating with external control device and therefore continuously operating in standalone control mode (master controller red LED provides one flash every 10 seconds if communication with EMU or PLT network is not detected). Note: This is normal operation if an EMU or HEMS is not connected.
  2. Undersized PV system i.e. not able to provide any excess PV power for water heating. Review the power usage of the household and compare this with the size of the PV system installed to establish if the PV system is large enough and can supply excess PV power for water heating.
  3. Underperforming PV system, due to orientation, inclination or excessive shading of PV array(s), particularly in winter.
  4. Failed or underperforming PV module(s), optimiser(s) or inverter.
  5. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Confirming Powerstore Communications

The **Powerstore** is a smart connected appliance that forms part of the site's Home Energy Management System (HEMS) which is managed by Combined Energy Technologies (CET).

It is important to verify that a new or repaired Powerstore water heater is functioning correctly and communicating with the Combined Energy system before leaving the site.

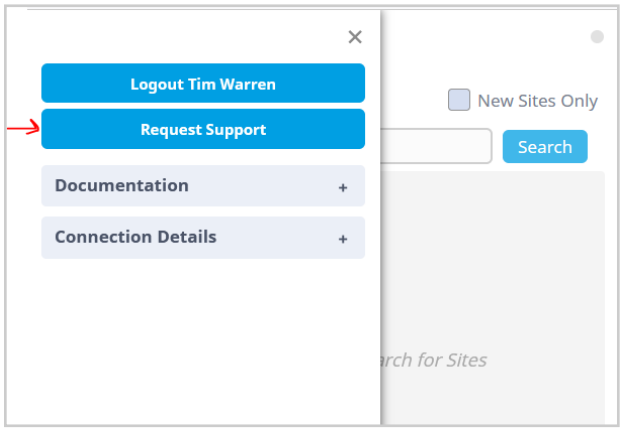
Please contact CET Support by logging in to **https://onsite.combined.energy/** using your Rheem email address or work mobile phone number:



If you have not logged in previously or can't remember your password, please use the **Reset Password** feature.

If you are unable to log in please contact CET by email at **support@combined.energy**.

Once logged in, please use the **Request Support** button in the menu to request a call from CET.



Test Equipment

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

Part	Part Number
Fine probe adapter kit	WH0020082

Fault Indication

The master controller is capable of detecting warning faults, critical faults, major faults, independent legionella control faults and loss of network connection.

- **Warning Fault:** A fault code is logged to memory and the heater operates as normal in the current mode of operation, but possibly with impeded functionality depending on the type of fault. The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **Critical Fault:** The master controller red LED illuminates ON solid and critical fault mode is entered to provide backup heating (refer to page 21 for operation when in critical fault mode). The fault code can only be viewed via the third-party web monitoring portal.
- **Independent Legionella Control Fault:** A fault code (ELS_REPORTED) is logged to memory and independent legionella sterilisation mode is entered to provide sterilisation heating (refer to page 21 for operation when in independent legionella sterilisation mode). The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **Major Fault:** A fault code is logged to memory and heating is unlikely to occur. The fault code can only be viewed via the third-party web monitoring portal and no LED indication is provided.
- **Loss of Network Connection:** If connection to EMU, power meter or ethernet is lost or has not been configured: The master controller red LED provides one flash every 10 seconds and enters standalone control mode (refer to page 19 for operation when in standalone control mode). Note: This is not a fault if an EMU or HEMS is not connected.

Fault Indication Notes

- All fault codes have a fault delay period i.e. fault code is activated after fault delay period expires, or reoccurs after fault delay period expires if a power cycle, firmware update or third-party web monitoring portal reset is performed and the fault is still present. Refer to ‘Fault Code Table’ on page 38 for a list of all available fault codes and their descriptions, including fault delay periods and fault finding chart references.
- Most fault codes have a hold-on period of 15 ~ 30 minutes after the fault has been rectified i.e. fault code remains until hold-on period expires. After rectifying fault, perform a power cycle to negate the hold on period and clear the fault code. To perform a power cycle, switch power supply to heater OFF for 10 seconds then switch back ON.
- Also refer to ‘LED Indication’ on page 33.

Fault Code Table

Fault codes can only be viewed via the third-party web monitoring portal. The following table details available fault codes and links to relevant fault finding charts.

Also refer to ‘Fault Indication’ on page 37 for information on fault delay periods, fault code hold-on periods and clearing fault codes (negating fault code hold-on periods).

Table Legend

Warning fault. Heater operates as normal in current mode of operation, but possibly with impeded functionality depending on type of fault.

Critical fault. Master controller enters critical fault mode to provide backup heating. (Refer to page 21 for operation when in critical fault mode).

Independent legionella control fault. Master controller enters independent legionella sterilisation mode heating. (Refer to page 21 for operation when in independent legionella sterilisation mode).

Major fault. Heating is unlikely to occur.

Fault Code	Fault Description	Fault Delay	Fault Finding	
			Chart	Page
ELS_T_DIFF	Legionella temp sensor TH7 and bottom temp sensor TH9 differ by X degrees for 1 minute	1 min	1.0	41
ELS_ACTIVE	Independent legionella control is performing sterilisation	5 sec	1.1	41
ELS_REPORTED	Independent legionella control circuit fault	5 sec	1.0	41
ELS_COMMS	Independent legionella control comms fault	1 hour	1.2	42
TANK_ID	Temp sensor strip id resistor invalid	0 sec	1.3	43
TS_ALL	All temp sensors are faulty	1 min	1.3	43
TS_MANY	3 or more temp sensors are faulty	1 min	1.3	43
TS_1	TH1 on temp sensor strip faulty	1 min	1.3	43
TS_2	TH2 on temp sensor strip faulty	1 min	1.3	43
TS_3	TH3 on temp sensor strip faulty	1 min	1.3	43
TS_4	TH4 on temp sensor strip faulty	1 min	1.3	43
TS_5	TH5 on temp sensor strip faulty	1 min	1.3	43
TS_BEL	TH9 bottom temp sensor faulty	1 min	1.0	41
COLD_NO_POWER	No power draw & tank < 60ºC. Note: EC_ fault will also occur – Fault find for relevant EC_ fault	10 min	Refer relevant EC_ fault code	
EC_ALL	All heating unit element circuits faulty	1 min	1.4	44
EC_MANY	3 or more element circuits are faulty	1 min	1.4	44
EC_1_OPEN_CIRCUIT	515W bottom element circuit O/C	8 sec	1.4	44
EC_2_OPEN_CIRCUIT	1030W bottom element circuit O/C	8 sec	1.4	44
EC_3_OPEN_CIRCUIT	5150W & 1033W bottom element circuit O/C	8 sec	1.4	44
EC_4_OPEN_CIRCUIT	2055W bottom element circuit O/C	8 sec	1.4	44
EC_5_OPEN_CIRCUIT	5150W & 2055W bottom element circuit O/C	8 sec	1.4	44
EC_6_OPEN_CIRCUIT	1030W & 2055W bottom element circuit O/C	8 sec	1.4	44
EC_7_OPEN_CIRCUIT	515W, 1030W & 2055W bottom element circuit O/C	8 sec	1.4	44
EC_8_OPEN_CIRCUIT	3600W top element circuit O/C	8 sec	1.5	45
EC_1_UNDER_POWER	515W bottom element under power	10 sec	1.4	44
EC_2_UNDER_POWER	1030W bottom element under power	10 sec	1.4	44
EC_3_UNDER_POWER	515W & 1030W bottom elements under power	10 sec	1.4	44
EC_4_UNDER_POWER	2055W bottom element under power	10 sec	1.4	44
EC_5_UNDER_POWER	515W & 2055W bottom elements under power	10 sec	1.4	44

Table continued on next page

Table continued from previous page

Fault Code	Fault Description	Fault Delay	Fault Finding	
			Chart	Page
EC_6_UNDER_POWER	1030W & 2055W bottom elements under power	10 sec	1.4	44
EC_7_UNDER_POWER	515W, 1030W & 2055W bottom elements under power	10 sec	1.4	44
EC_8_UNDER_POWER	3600W top element under power	10 sec	1.5	45
EC_0_OVER_POWER	Power draw during 0W heat request from EMU	10 sec	1.6	45
EC_1_ OVER_POWER	515W bottom element over power	10 sec	1.7	46
EC_2_ OVER_POWER	1030W bottom element over power	10 sec	1.7	46
EC_3_ OVER_POWER	515W & 1030W bottom elements over power	10 sec	1.7	46
EC_4_ OVER_POWER	2055W bottom element under over power	10 sec	1.7	46
EC_5_ OVER_POWER	515W & 2055W bottom elements over power	10 sec	1.7	46
EC_6_ OVER_POWER	1030W & 2055W bottom elements over power	10 sec	1.7	46
EC_7_ OVER_POWER	515W, 1030W & 2055W bottom elements over power	10 sec	1.7	46
EC_8_ OVER_POWER	3600W top element over power	10 sec	1.8	46
TSTAT_BOTTOM	Bottom element or bottom mechanical thermostat fault. Note: EC_ fault will also occur – Fault find for relevant EC_ fault	0 sec	Refer relevant EC_ fault code	
TSTAT_TOP	Top element or top mechanical thermostat fault. Note: EC_ fault will also occur – Fault find for relevant EC_ fault	0 sec	Refer relevant EC_ fault code	
TS_PCB	Master controller internal PCB thermistor has failed (thermistor is utilised for master controller over temp cut-out only)	10 sec	1.9	46
PCB_T_HIGH	Master controller internal PCB temp > 100ºC	10 sec	1.10	47
OVERPOWER	25% over power draw. Note: EC_ fault will also occur – Fault find for relevant EC_ fault	30 sec	Refer relevant EC_ fault code	
UNDERPOWER	25% under power draw. Note: EC_ fault will also occur – Fault find for relevant EC_ fault	30 sec	Refer relevant EC_ fault code	
PM	Master controller internal power meter comms fault. Note: A PM fault will also trigger EC_ALL fault – Fault find for PM fault first which should clear EC_ALL fault	30 sec	1.11	47
PLC_COMMS	Master controller Internal comms fault	30 sec	1.2	42
AS4755_USAGE	Multiple AS4755 inputs closed (1)	30 sec	1.2	42
AMENITY_LIMIT_ ABOVE_MAX	Bottom mechanical thermostat trip setting does not match B-TRIP calibration setting	30 sec	1.12	48
ELS_LS_LONG_ ACIVE	Controller or independent legionella sterilisation mode not exited after 8 hours.	8 hours	1.13	48
NOT_RELEASE	Factory debug still enabled	0 sec	1.2	42

(1) ECM AS4755 input mode is for future use and is currently disabled, therefore this fault should not occur.

Fault Diagnosis Sequence – Fault Finding Charts

Fault Finding Chart Notes

All fault finding charts must only be entered if directed to after starting from the beginning of the general finding chart on page *Error! Bookmark not defined.*. ***Direct entry into any other fault finding chart will most likely result in an incorrect diagnosis.***

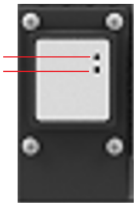
If a master controller is found to be faulty and is replaced, Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly This step MUST be performed for the water heater to utilise special grid tariffs and/or excess PV power.

Refer to 'Fault Finding Chart Notes' on page 39 for important information when using fault finding charts.

GENERAL FAULT FINDING CHART

Is this a new installation?
Most faults on new installations can be attributed to incorrect plumbing and/or installation methods and/or network communication issues. Ensure installation complies with installation instructions provided with water heater before using fault finding charts.

Ensure power to water heater has been ON for a minimum of 1 minute to enable master controller to initialise/ stabilise



Is 240 VAC power supply present at water heater? (TEST 3)
- NO → 2.3
- YES → Switch power supply to water heater OFF for 10 seconds then switch back ON. If master controller green LED is still OFF replace master controller.

Is master controller green LED OFF?
- YES → Are all plugs firmly plugged into master controller plug sockets?
  - NO → Firmly connect all plugs to master controller plug sockets.
  - YES
- NO

Is master controller green LED fast flashing?
- YES → Is master controller red LED also fast flashing?
  - YES → Master controller may be initialising or performing firmware update. If a firmware update is not being performed and LED status does not change after 10 minutes, switch power supply to water heater OFF for 10 seconds then switch back ON. If same fault persists after another 10 minutes, replace master controller.
  - NO → Switch power supply to water heater OFF for 10 seconds then switch back ON. If same fault persists replace master controller.

Fast flashing = 0.25 sec ON / 0.25 sec OFF continuously

NO

Is master controller red LED ON solid?
- YES → A critical fault has been detected. Contact CET support by following the instructions on page 36 to assist in providing a fault code, then refer to relevant fault finding chart for fault code provided (refer to 'Fault Code Table' on previous pages). ***If CET support cannot be contacted*** and heater operation is in doubt, perform an unsupported field test ***as a last resort*** by proceeding directly to fault finding chart 2.

NO

Slow flashing = 0.25 sec ON / 9.25 sec OFF

Is master controller red LED slow flashing?
- YES → Is either an EMU or home energy management system (HEMS) installed?
  - YES → EMU or PLT network not detected. Contact CET support by Following the instructions in page 36 to assist in determining fault. Proceed as directed by CET support.
  - NO (normal operation)

NO

Is master controller green and red LED operation undefined/ erratic?
- YES → Switch power supply to water heater OFF for 10 seconds then switch back ON. If same fault persists replace master controller.

I.e. green and red LED's operate in a manner other than as described in the 'LED Indication' section

NO

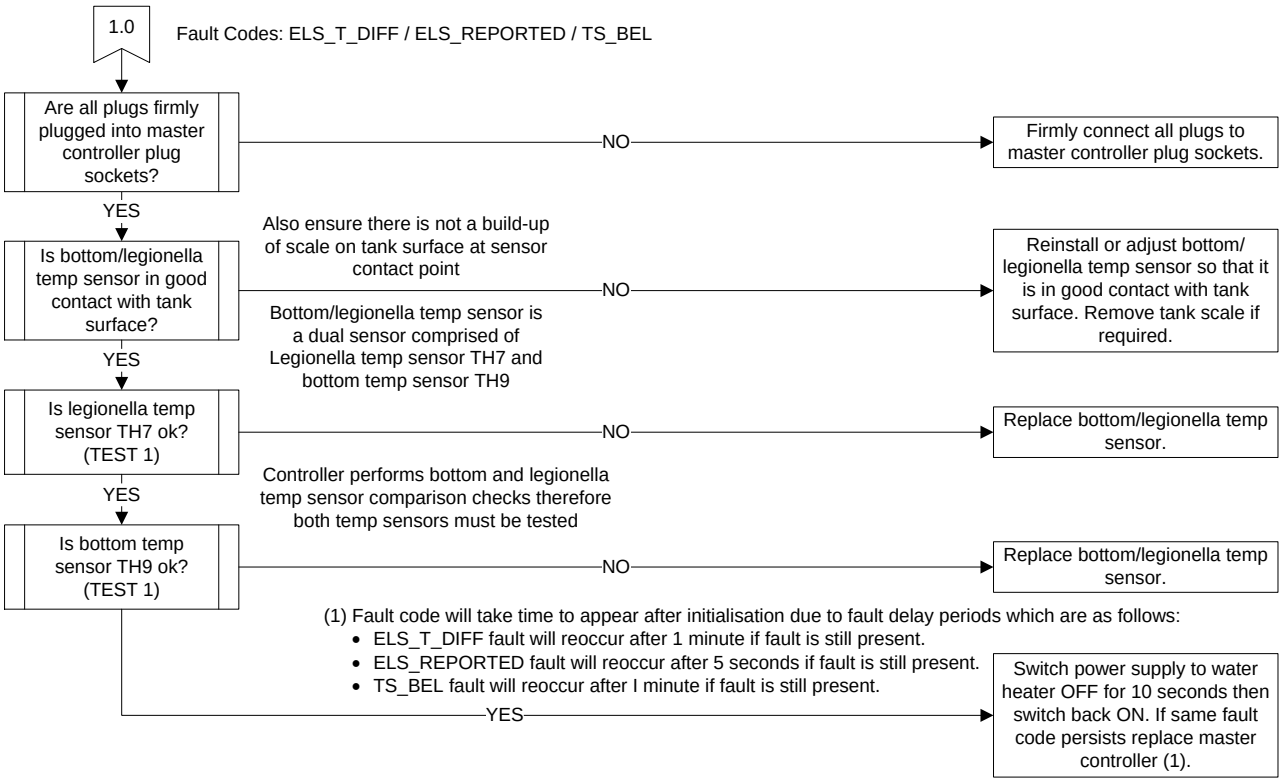
Contact CET Support by following the instructions on page 36 to assist in providing a fault code or heater status information.

- A fault code was provided → Refer to relevant fault finding chart for fault code provided (refer to 'Fault Code Table' on previous pages).
- Heater status ok (no fault code) however HEMS or network error → Proceed as directed by CET support.
- CET support cannot be contacted and I would like to perform an unsupported field test ***as a last resort*** → 2
- CET support advised no fault code, heater status ok, HEMS and network ok

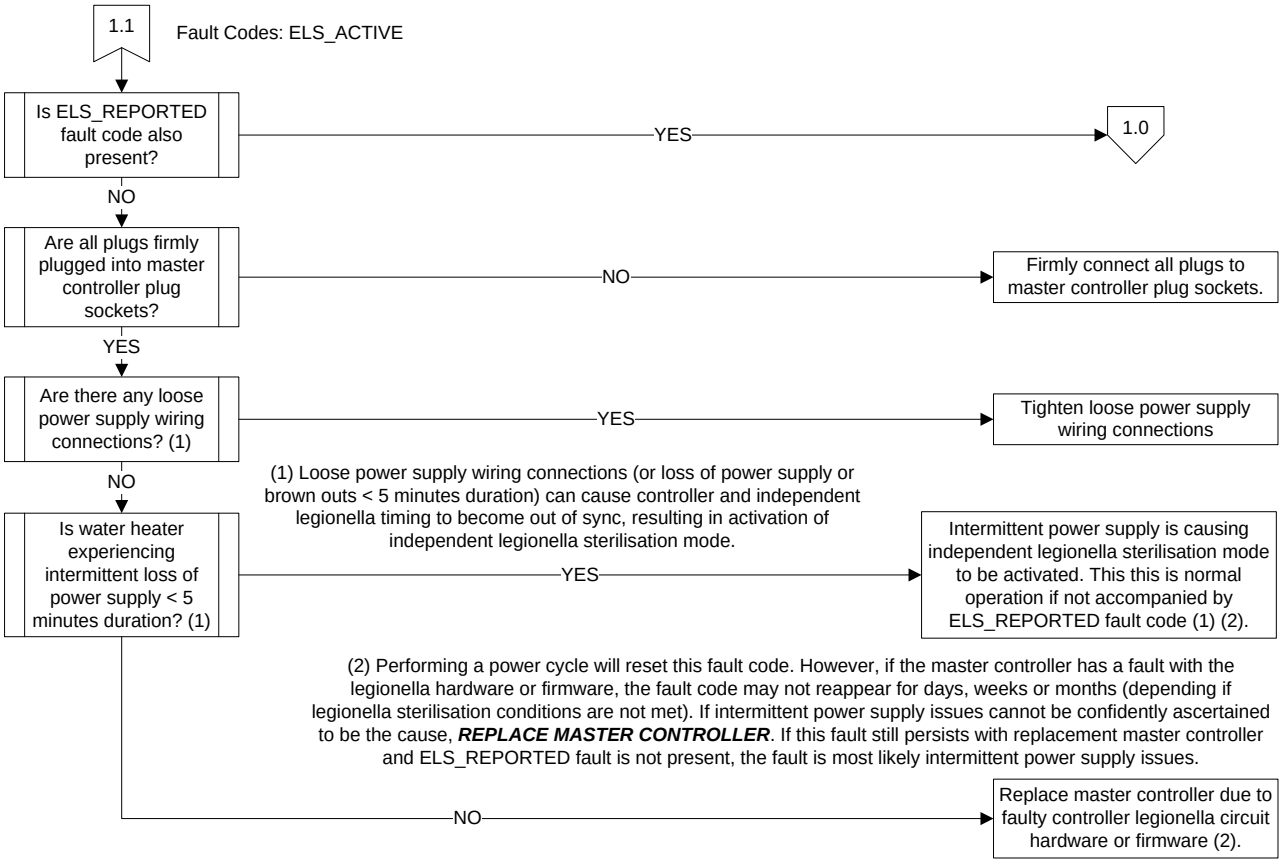
X

What is complaint?
- No or Insufficient hot water / Water not hot enough → 3
- Water too hot → 4
- High energy bills → 5
- Leaking water heater → 6
- Noisy Water heater → 7

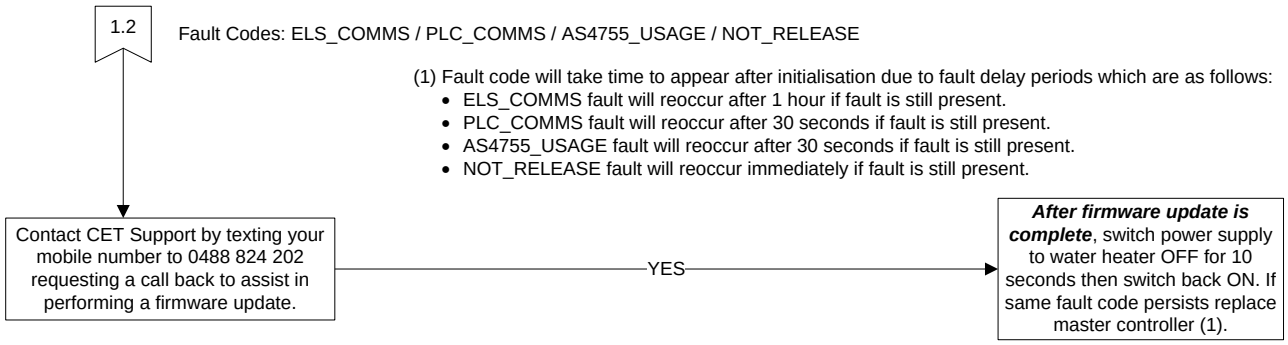
Fault Finding Chart 1.0



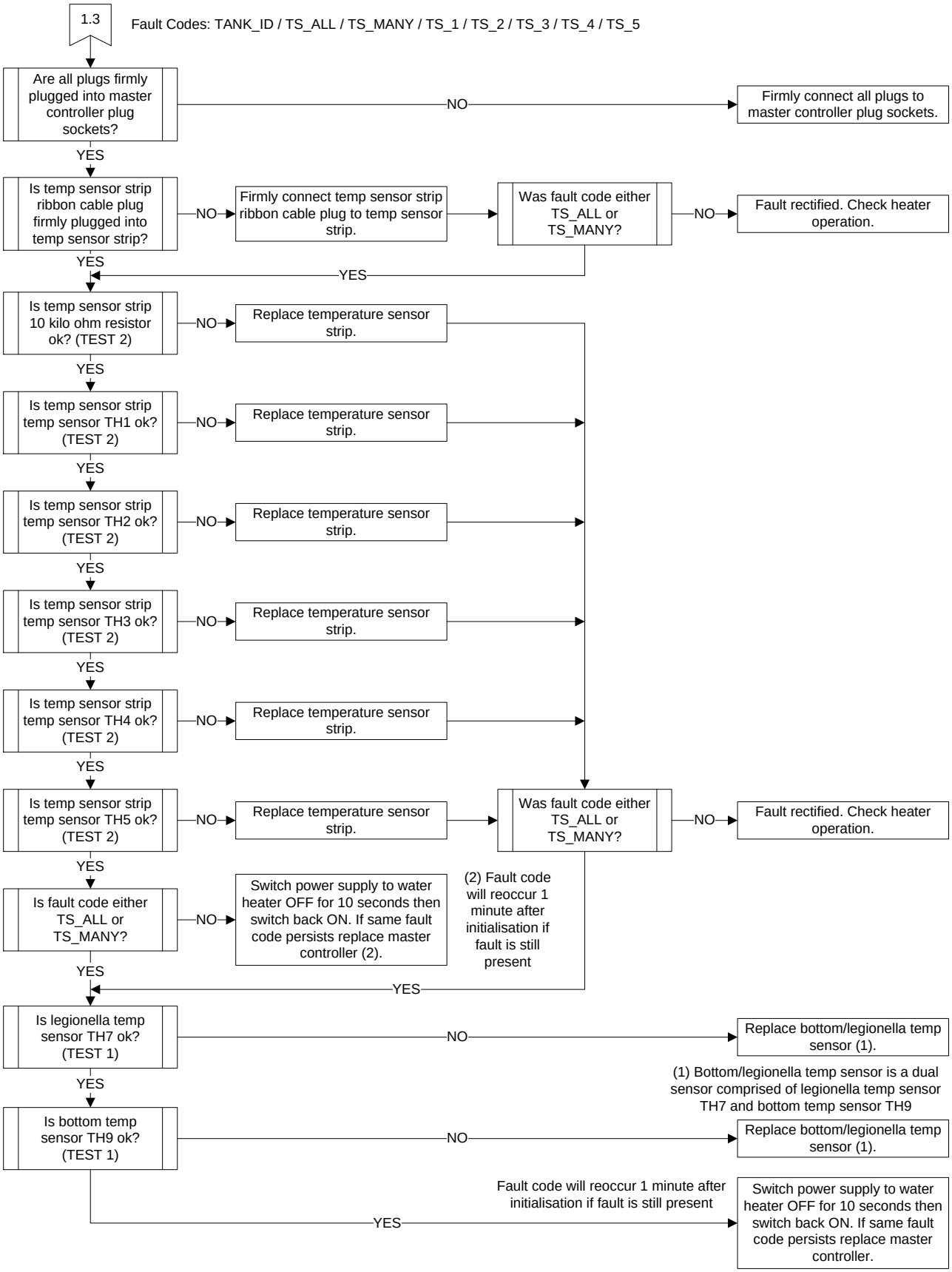
Fault Finding Chart 1.1



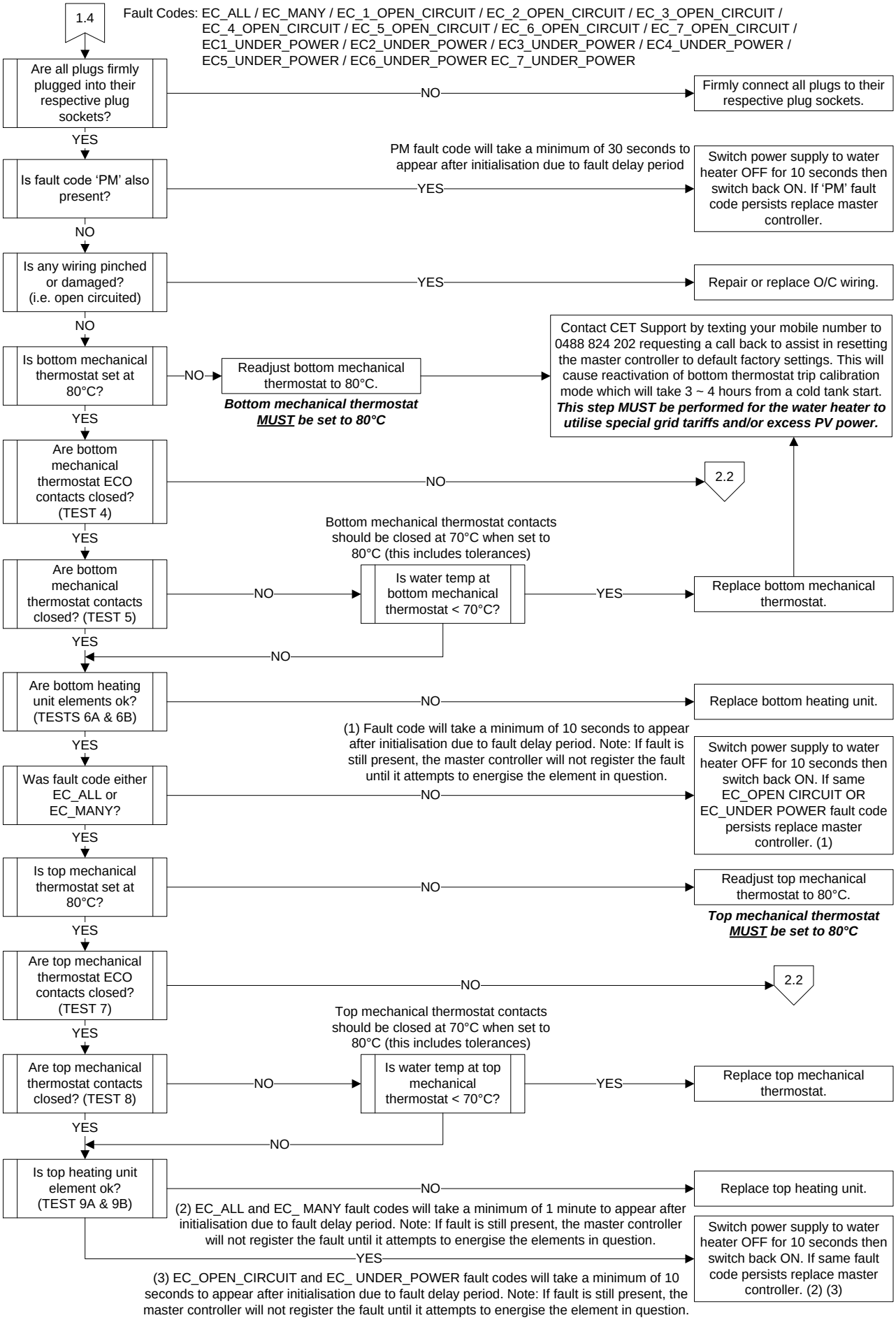
Fault Finding Chart 1.2



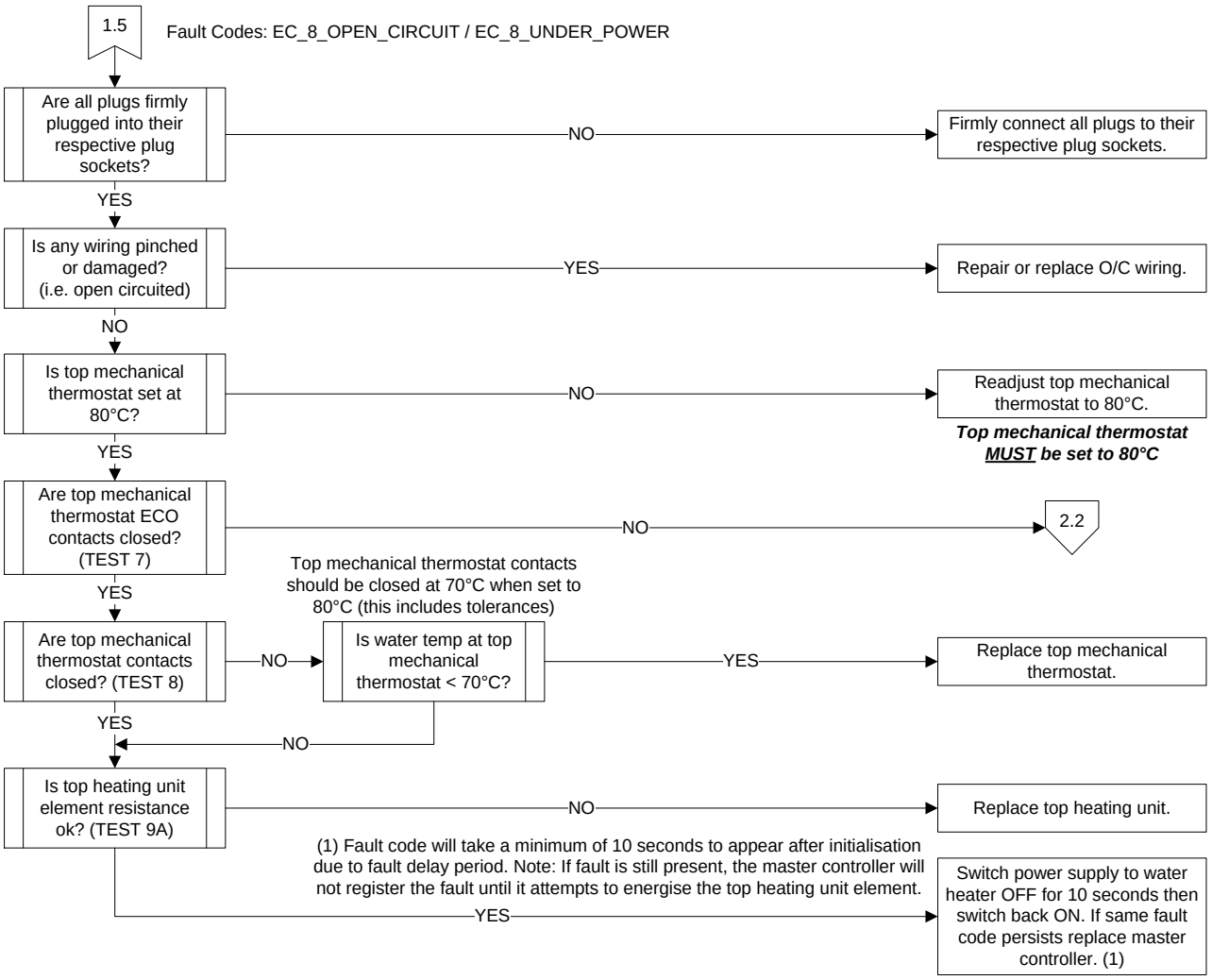
Fault Finding Chart 1.3



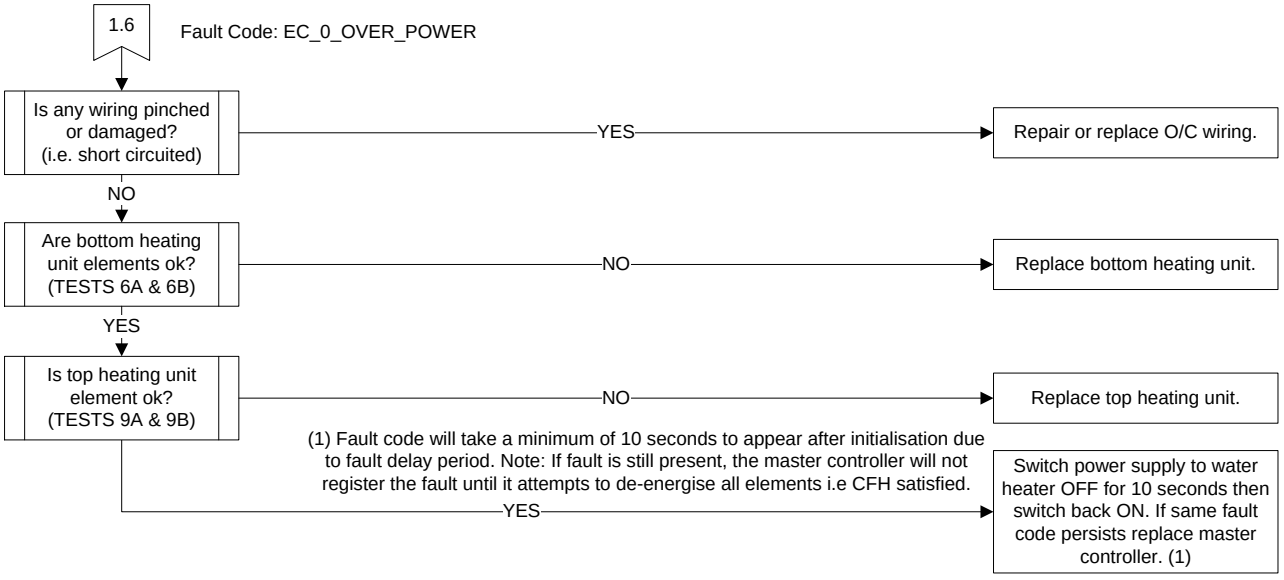
Fault Finding Chart 1.4



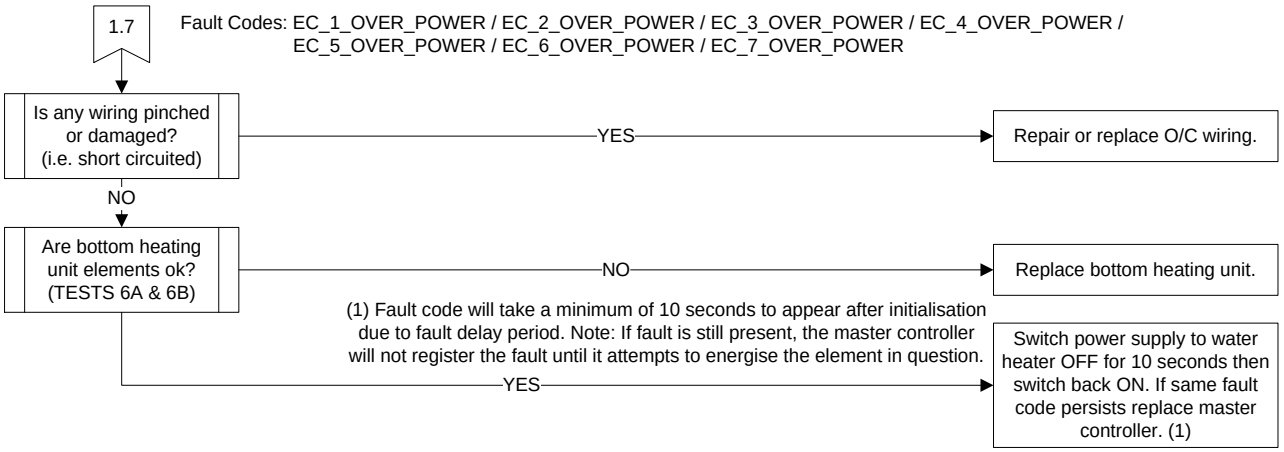
Fault Finding Chart 1.5



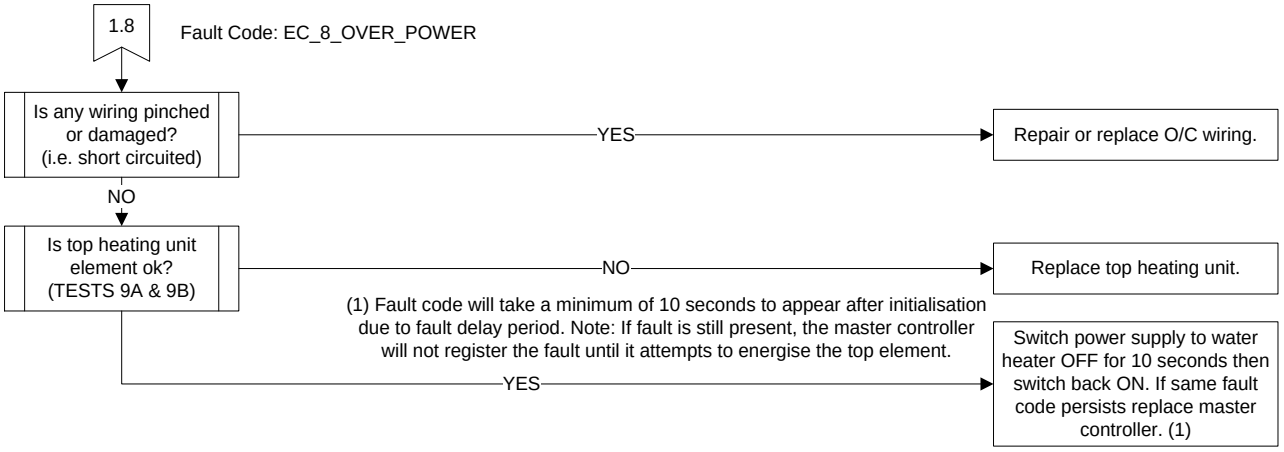
Fault Finding Chart 1.6



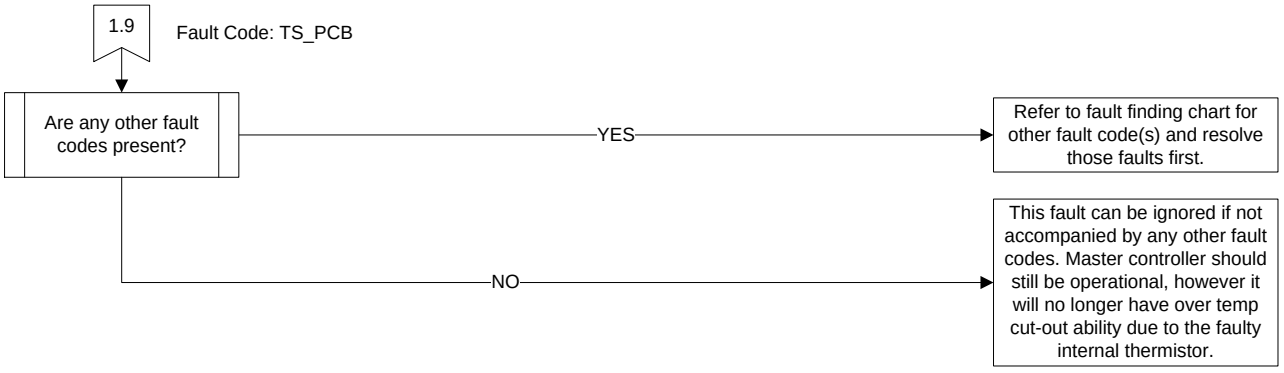
Fault Finding Chart 1.7



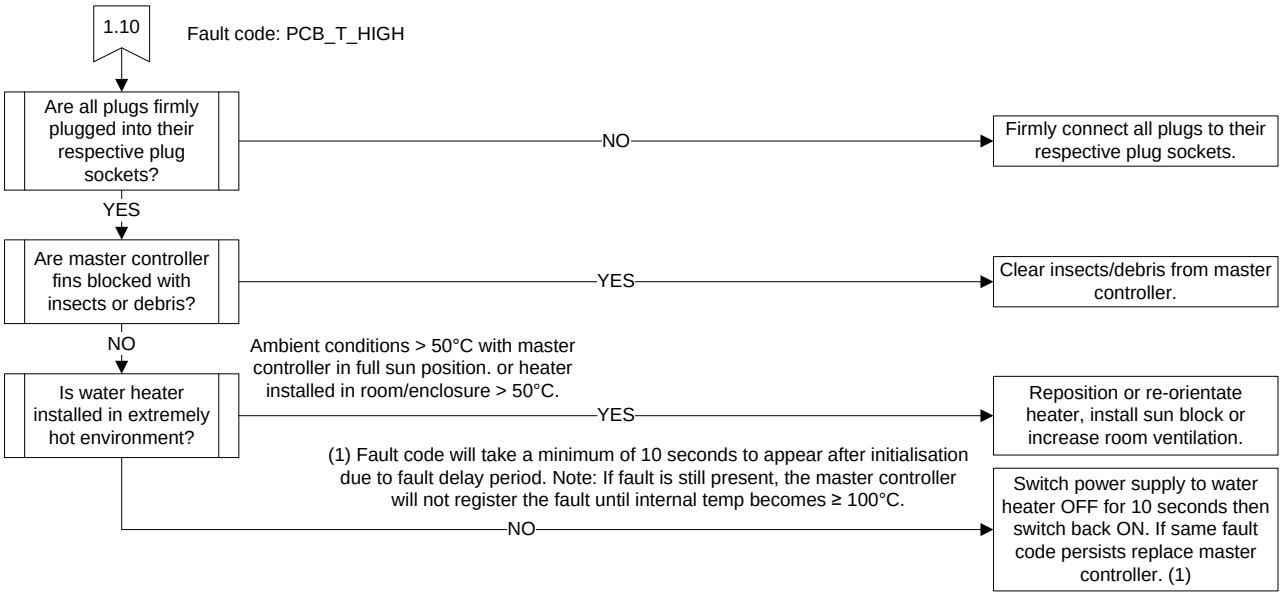
Fault Finding Chart 1.8



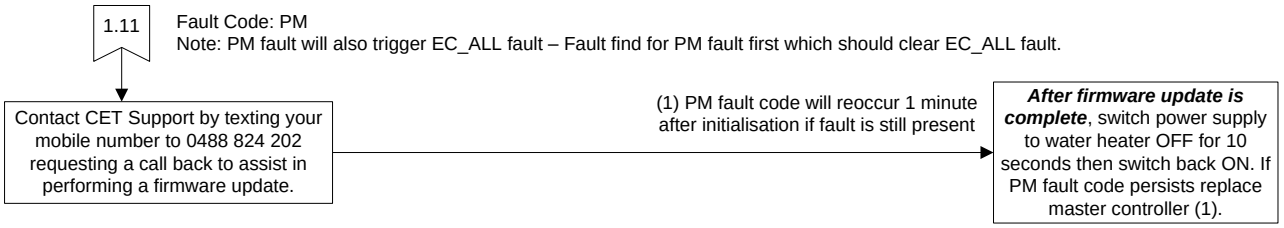
Fault Finding Chart 1.9



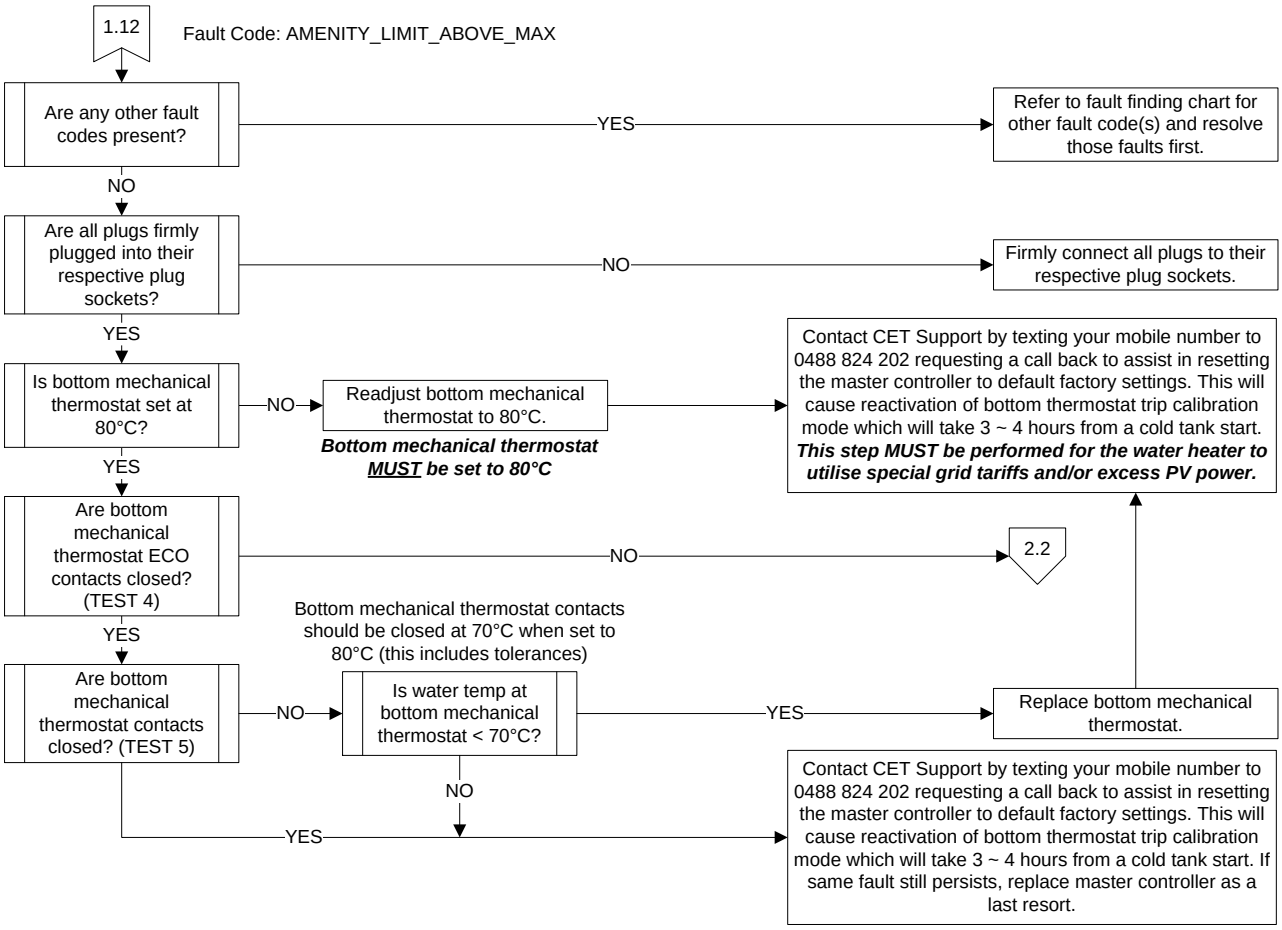
Fault Finding Chart 1.10



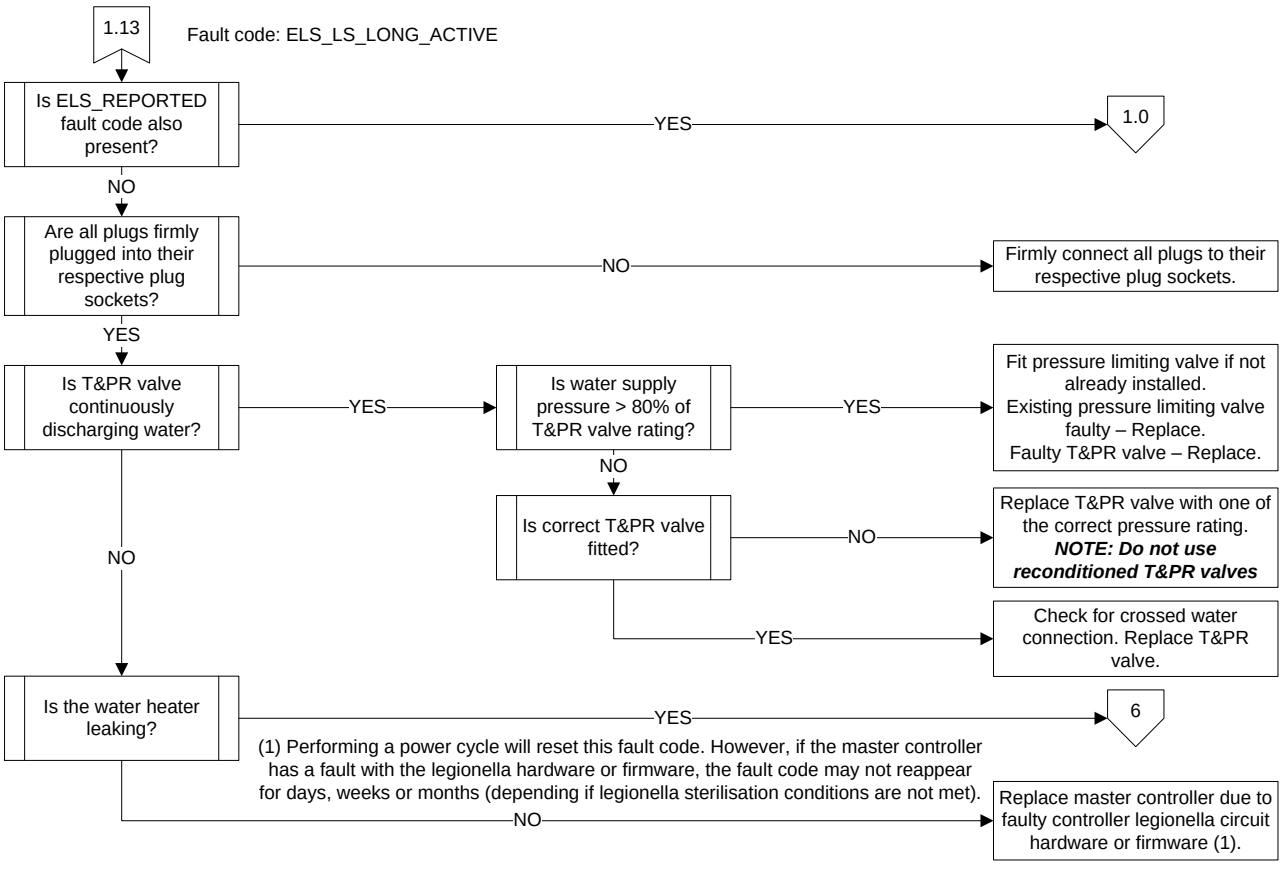
Fault Finding Chart 1.11



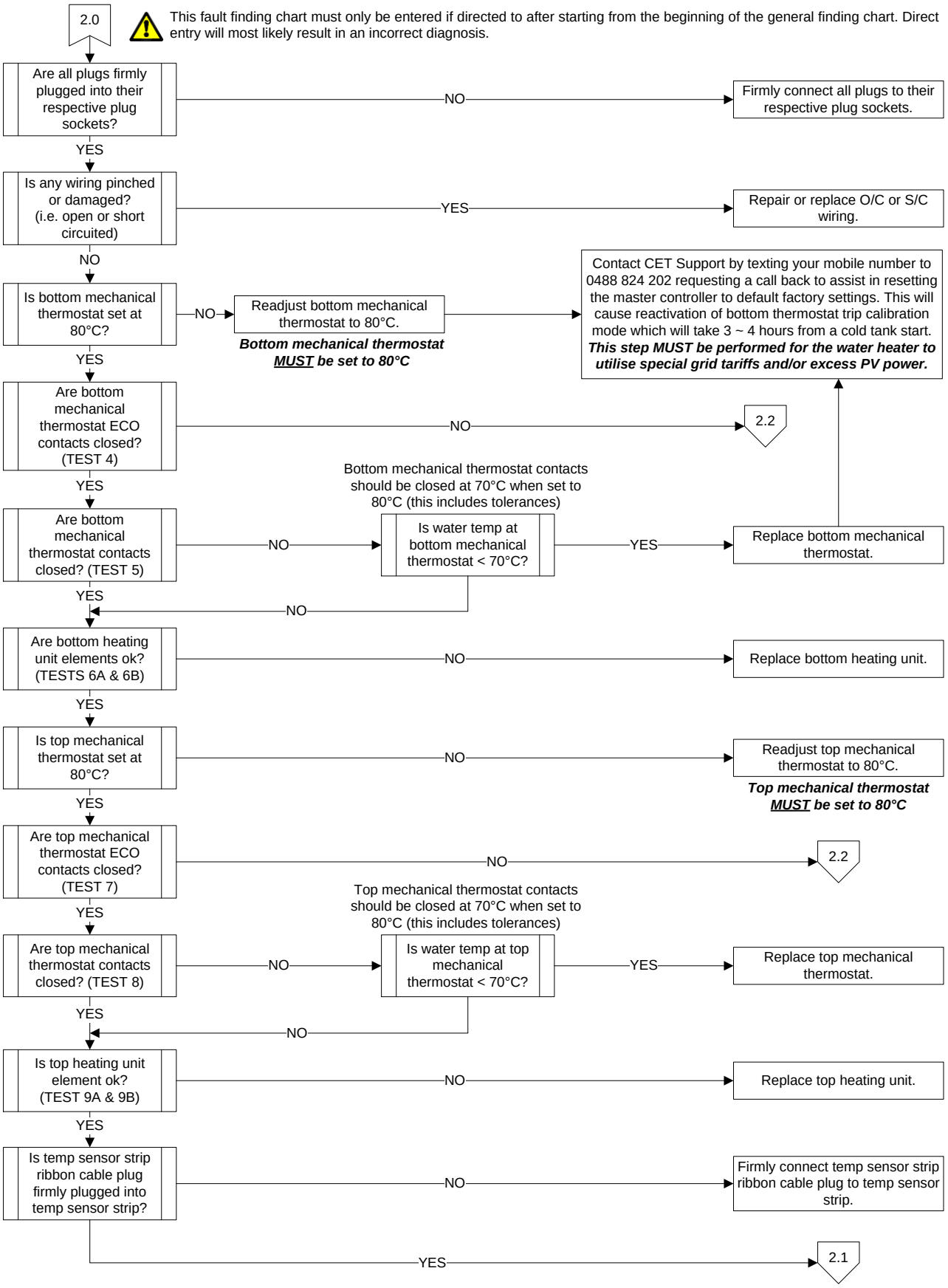
Fault Finding Chart 1.12



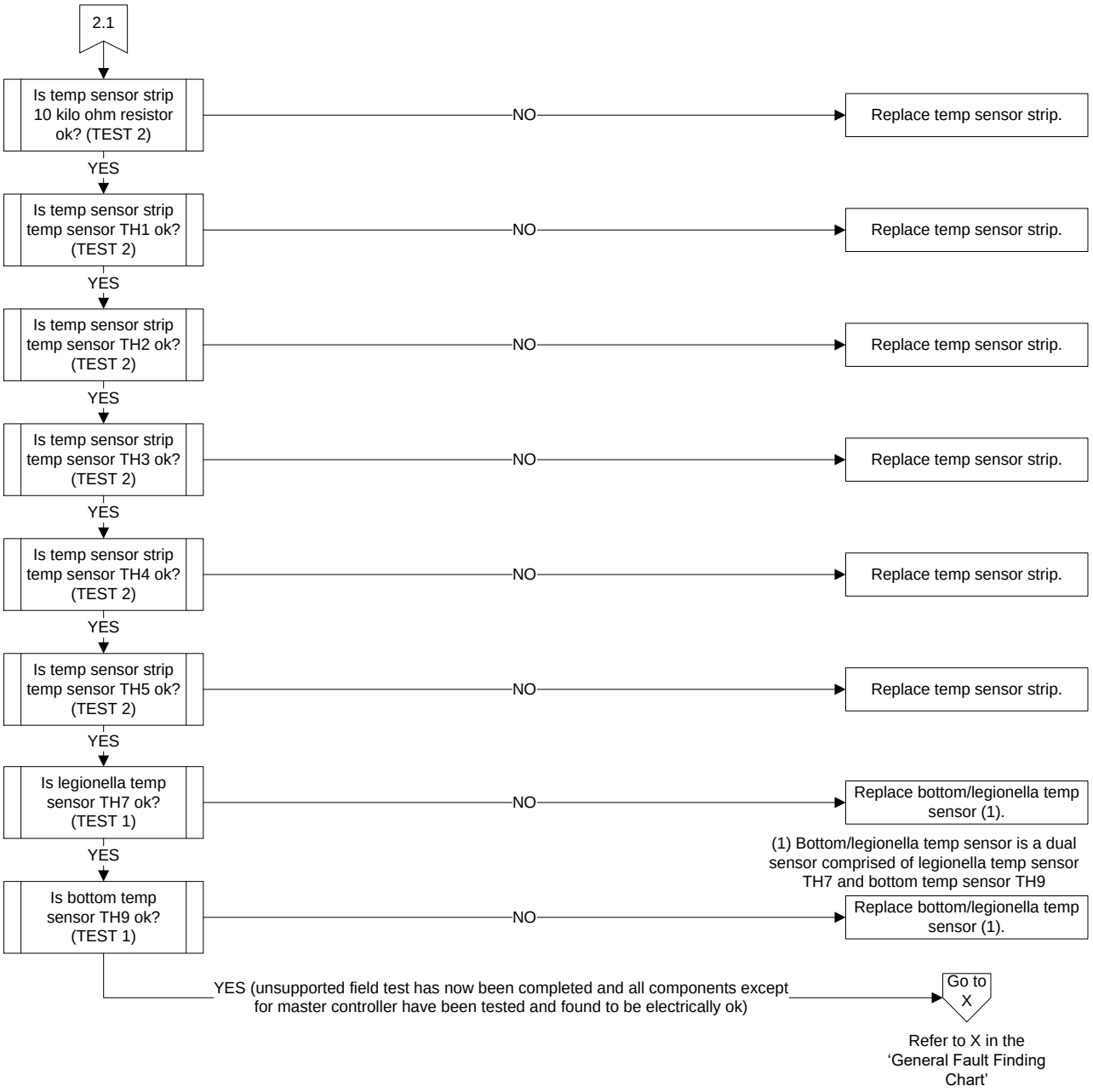
Fault Finding Chart 1.13



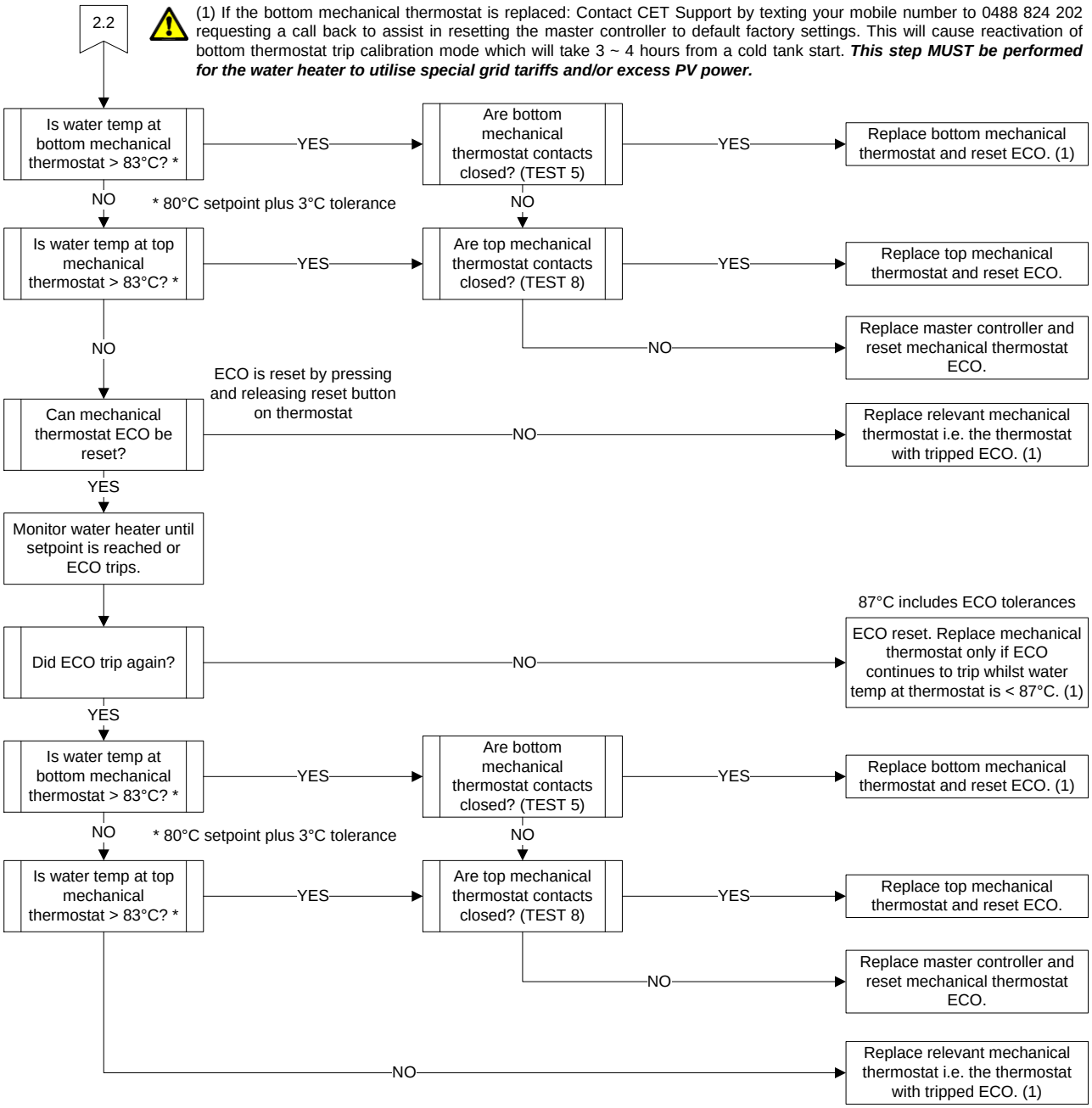
Fault Finding Chart 2.0



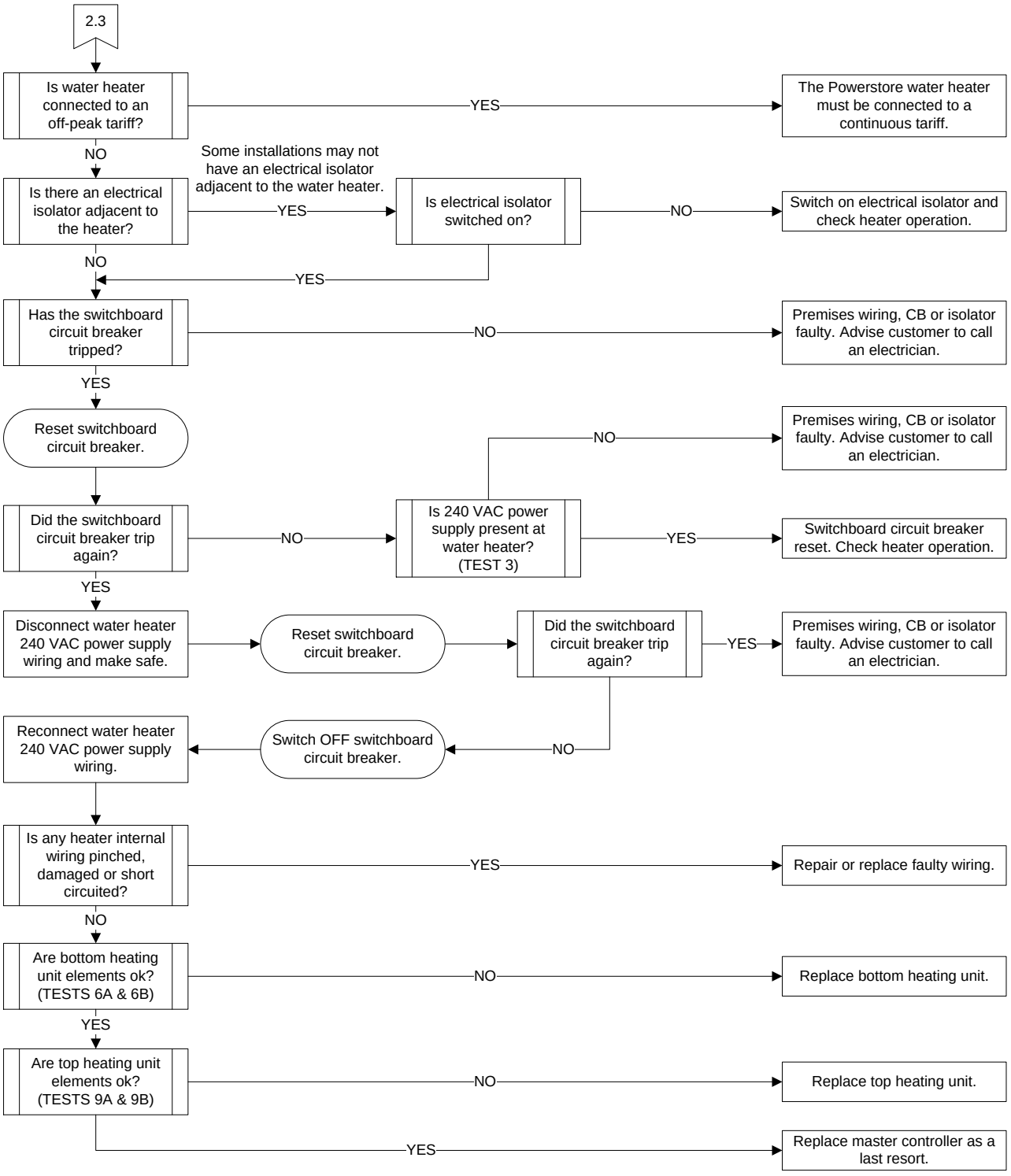
Fault Finding Chart 2.1



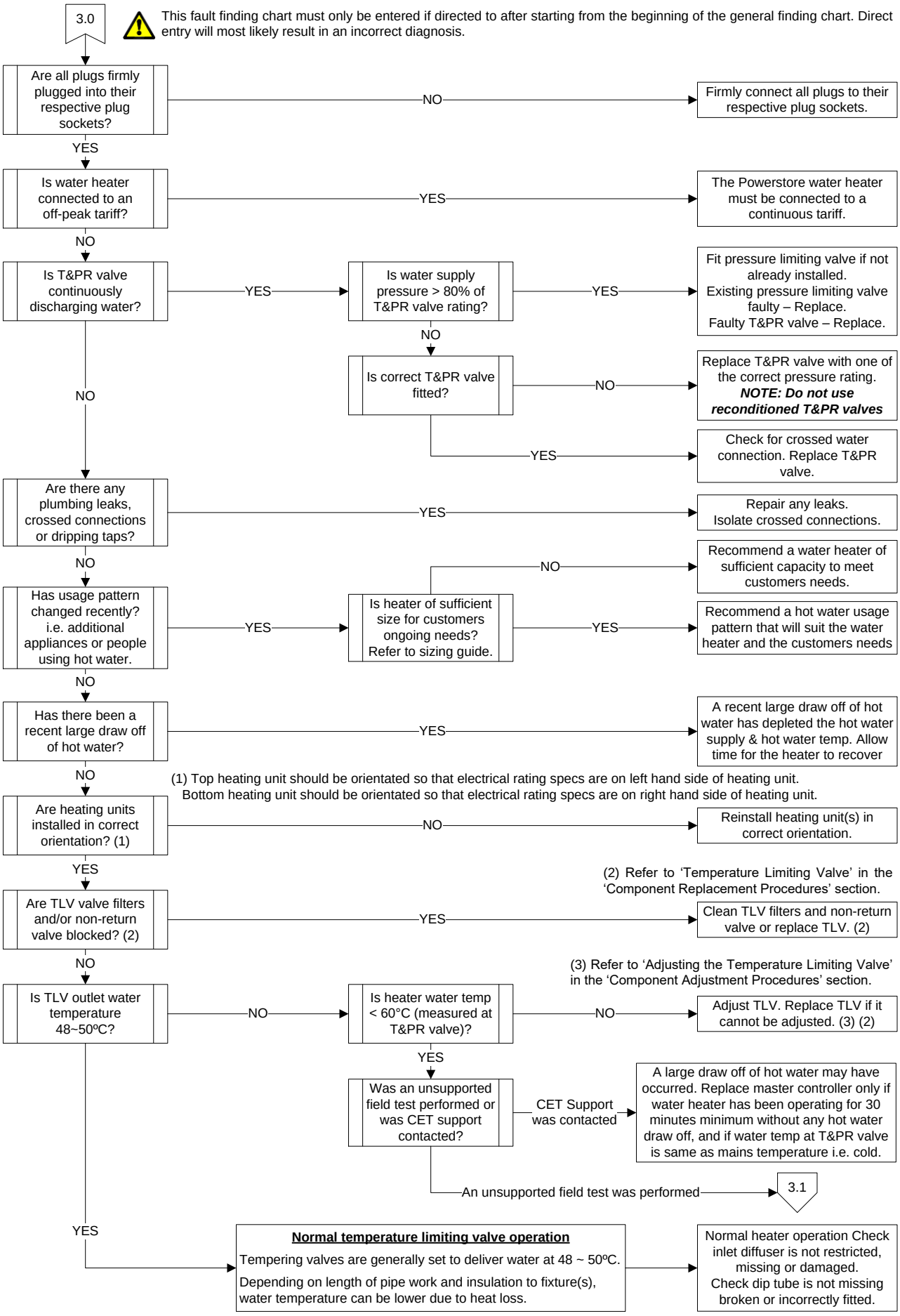
Fault Finding Chart 2.2



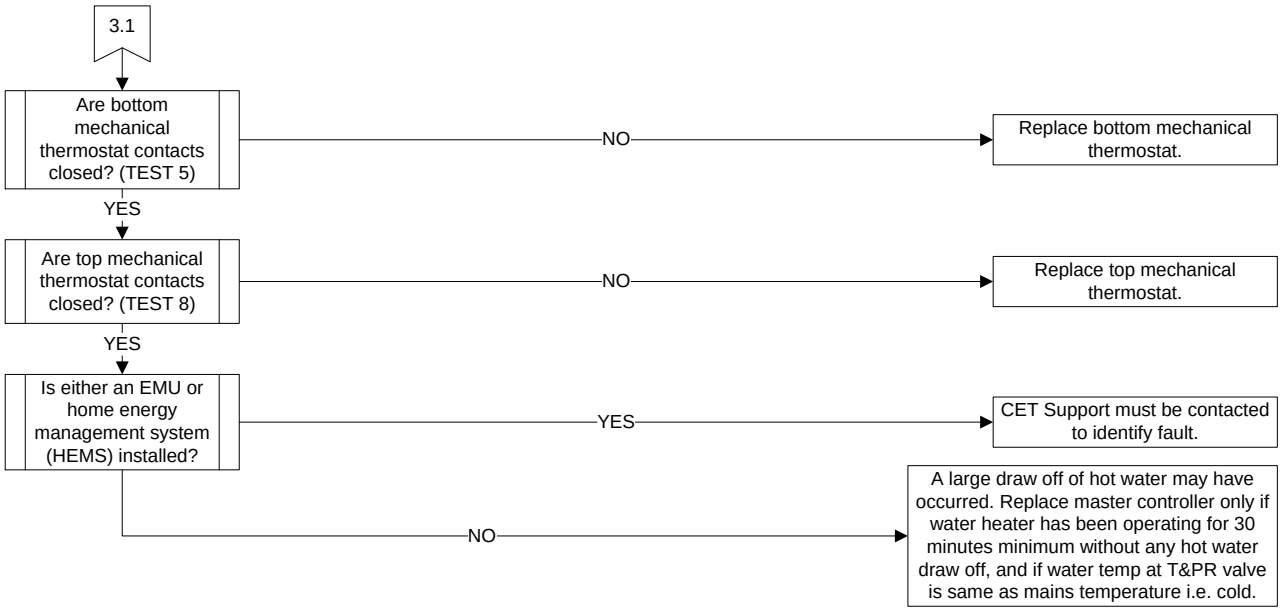
Fault Finding Chart 2.3



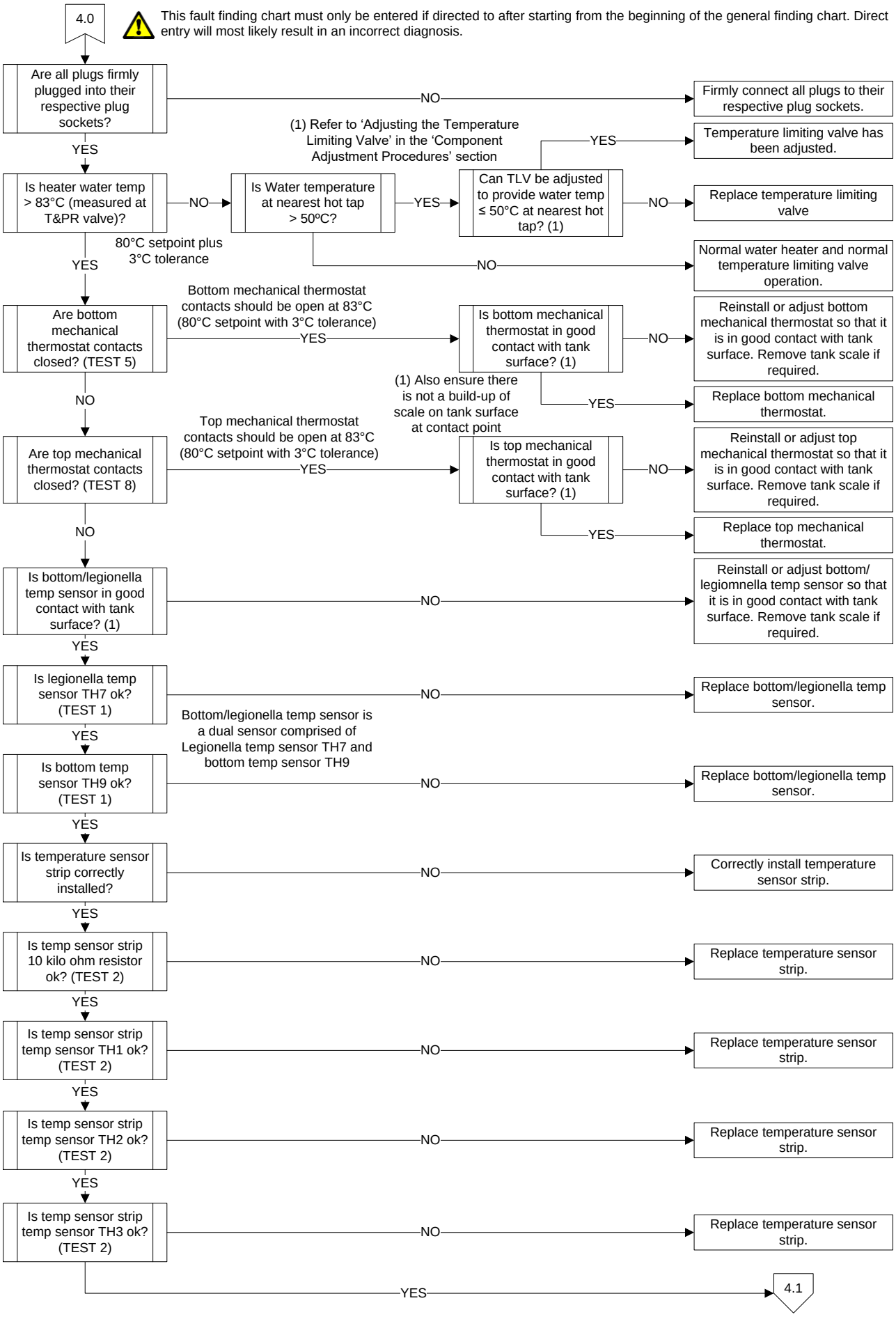
Fault Finding Chart 3.0



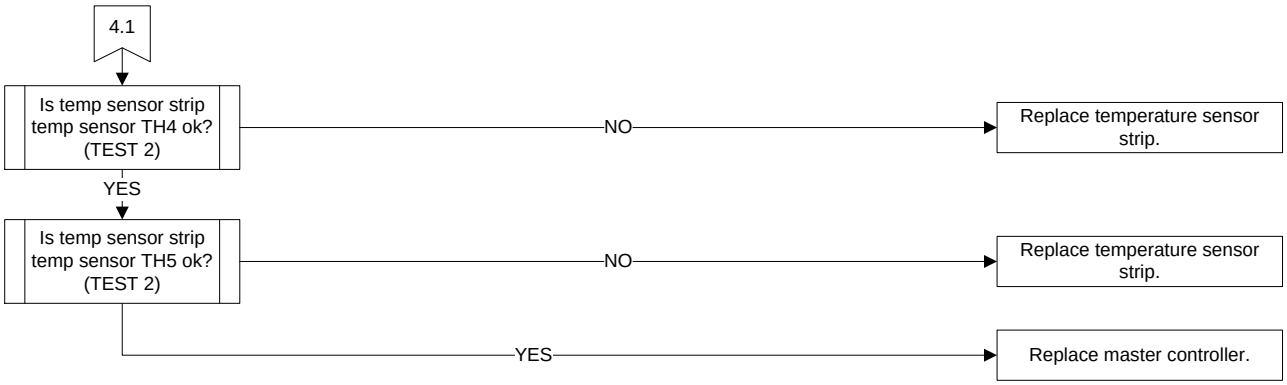
Fault Finding Chart 3.1



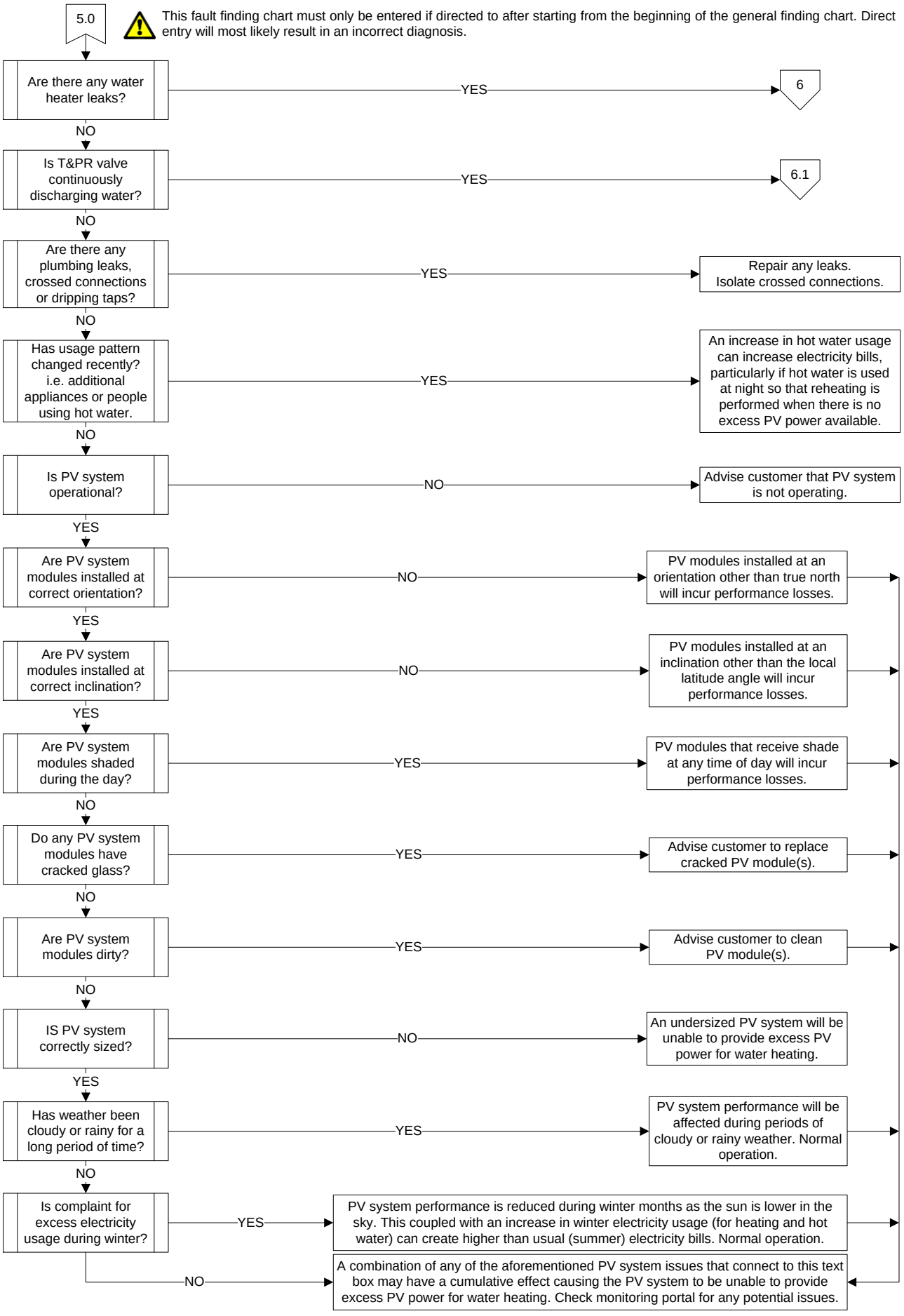
Fault Finding Chart 4



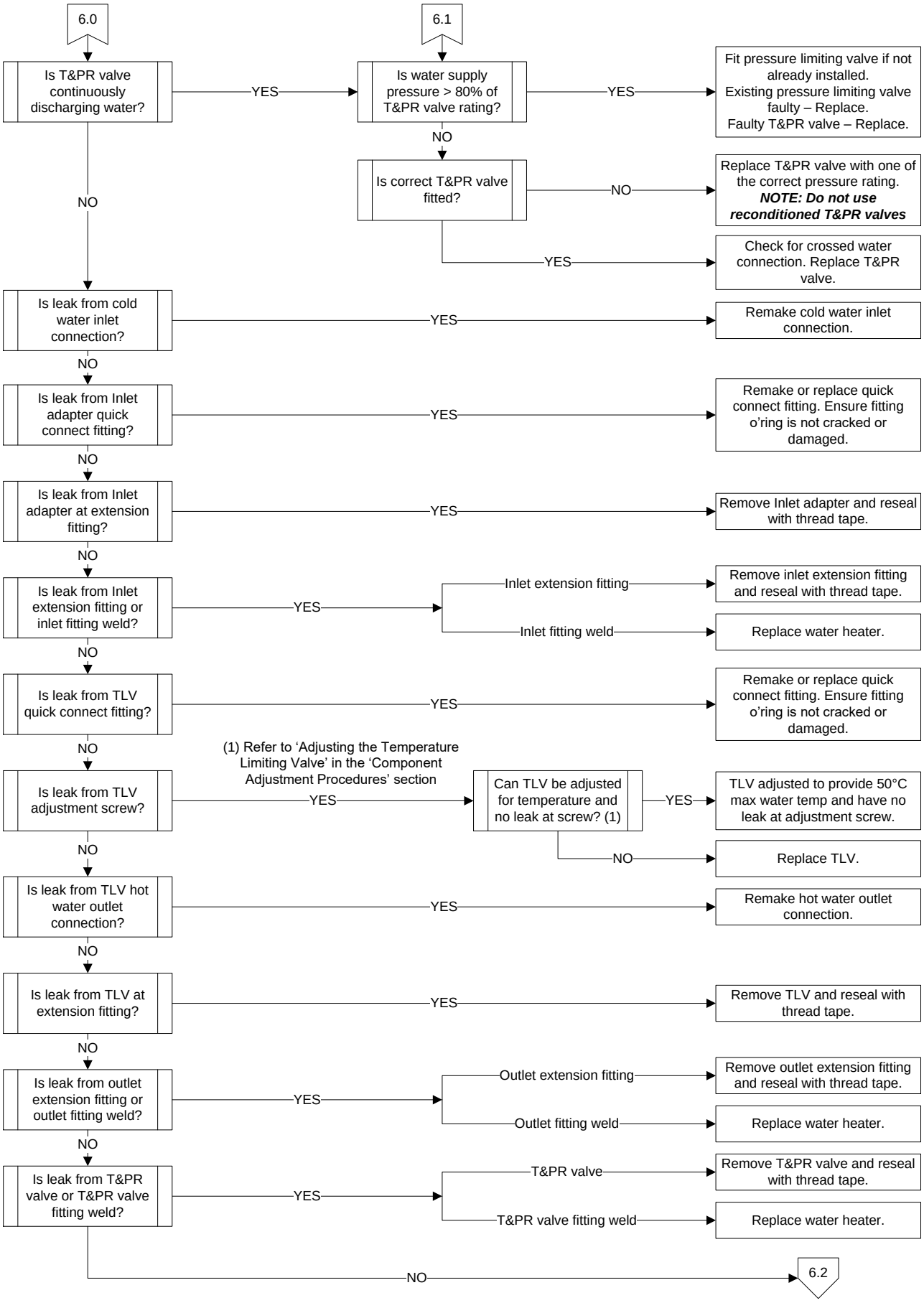
Fault Finding Chart 4.1



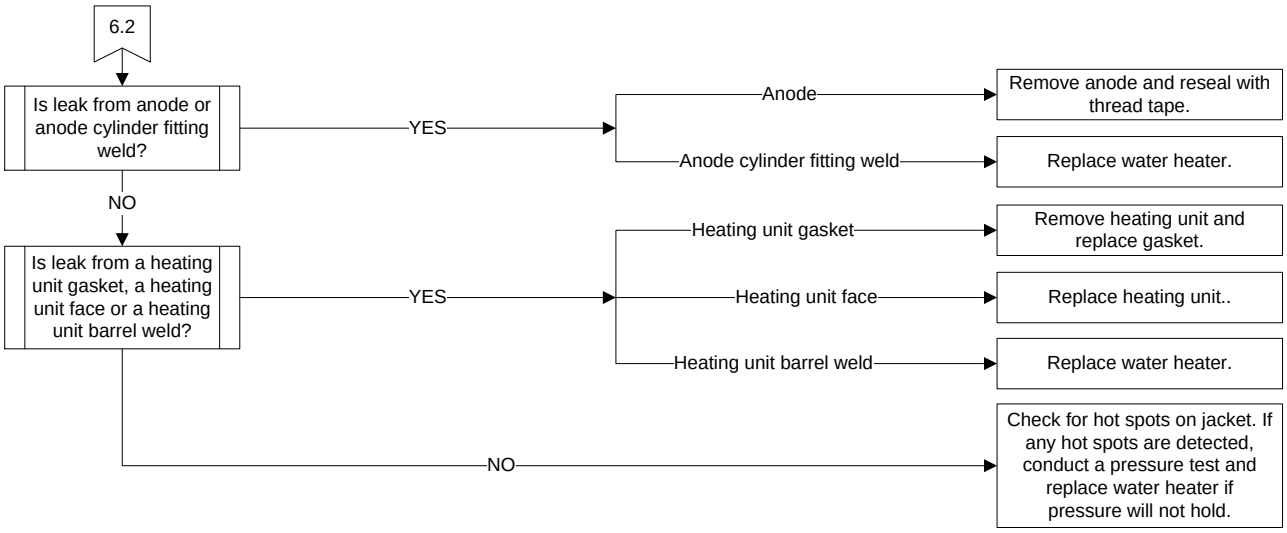
Fault Finding Chart 5



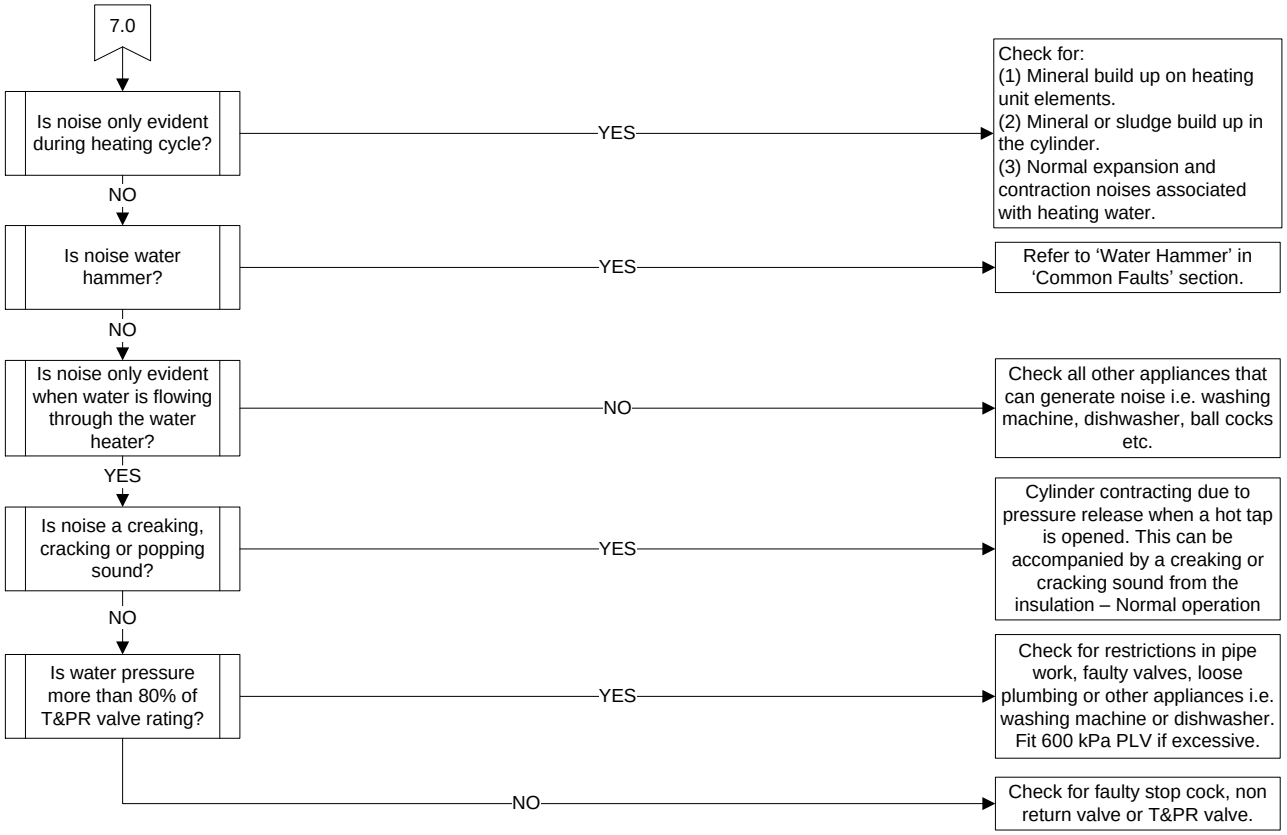
Fault Finding Chart 6 & 6.1



Fault Finding Chart 6.2



Fault Finding Chart 7



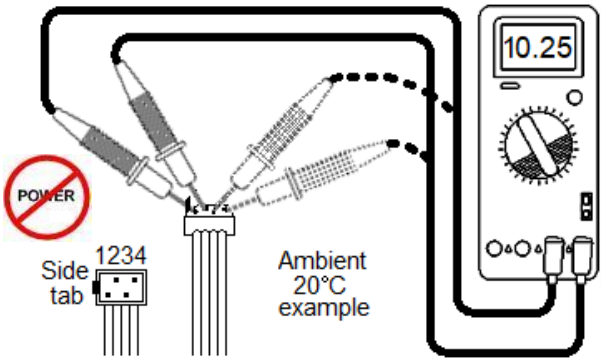
Test 1 – Testing the Bottom/Legionella Temperature Sensor

The bottom/legionella temperature sensor is a single unit dual sensor comprised of bottom temperature sensor TH9 and legionella temperature sensor TH7 and comes complete with retaining clip and ribbon cable. Perform the following test for each sensor:

1. Remove bottom/legionella temperature sensor from bottom mechanical thermostat and allow sensor to cool to ambient air temperature (refer to component replacement procedure 7 on page 70).
2. Using a multimeter on the kΩ scale, measure between the sensor plug wiring pins. Use fine probe adaptors (part number WH0020082).

Temperature Sensor	Plug Wiring Pins
Bottom Temperature Sensor TH9	1 & 2
Legionella Temperature Sensor TH7	3 & 4

3. Measure ambient air temperature at sensor location using a digital thermometer.
4. 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 'Bottom/Legionella Temperature Sensor Temperature/Resistance Table' below. Allow for a tolerance of ± 1°C.



Bottom/Legionella Temperature Sensor Temperature/Resistance Table

ºC	kΩ	ºC	kΩ	ºC	kΩ	ºC	kΩ
0	23.52	23	9.13	46	3.98	69	1.91
1	22.50	24	8.79	47	3.85	70	1.86
2	21.54	25	8.46	48	3.72	71	1.80
3	20.63	26	8.14	49	3.60	72	1.75
4	19.76	27	7.84	50	3.48	73	1.70
5	18.93	28	7.55	51	3.37	74	1.65
6	18.14	29	7.28	52	3.26	75	1.60
7	17.39	30	7.01	53	3.16	76	1.56
8	16.67	31	6.76	54	3.06	77	1.51
9	15.99	32	6.52	55	2.96	78	1.47
10	15.34	33	6.28	56	2.87	79	1.43
11	14.72	34	6.06	57	2.78	80	1.39
12	14.12	35	5.85	58	2.69	81	1.35
13	13.56	36	5.64	59	2.60	82	1.31
14	13.02	37	5.44	60	2.52	83	1.27
15	12.50	38	5.25	61	2.45	84	1.24
16	12.01	39	5.07	62	2.37	85	1.21
17	11.54	40	4.90	63	2.30	86	1.17
18	11.09	41	4.73	64	2.23	87	1.14
19	10.66	42	4.57	65	2.16	88	1.11
20	10.25	43	4.41	66	2.10	89	1.08
21	9.86	44	4.26	67	2.03	90	1.05
22	9.49	45	4.12	68	1.97	91	1.02

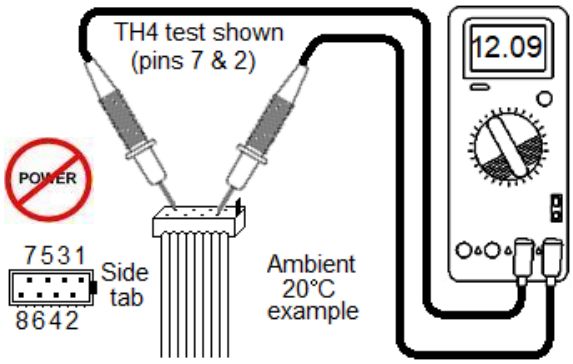
Test 2 – Testing the Temperature Sensor Strip

The temperature sensor strip is comprised of five temperature sensors (TH1 ~ TH5) and a 10 Kilo ohm resistor, and comes complete with ribbon cable. Perform the following test for each sensor and resistor:

1. Remove temperature sensor strip and allow sensors to cool to ambient air temperature (refer to component replacement procedure 8 on page 70).
2. Using a multimeter on the kΩ scale, measure between the sensor strip plug wiring pins. Use fine probe adaptors (part number WH0020082).

Resistor / Temperature Sensor	Plug Wiring Pins
10 Kilo ohm Resistor	1 & 2 (should always be 9.95 ~ 10.05 kilo ohms)
Top Temperature Sensor TH1	8 & 2
Temperature Sensor TH2	6 & 2
Temperature Sensor TH3	4 & 2
Temperature Sensor TH4	7 & 2
Temperature Sensor TH5	5 & 2

3. Measure ambient air temperature at sensor strip location using a digital thermometer.
4. As the resistance of TH1 ~ TH5 sensors will change according to their temperature, the resistance measurements for each sensor will need to be checked against the 'Temperature Sensor Strip Temperature /Resistance Table' below. Allow for a tolerance of ± 1°C.

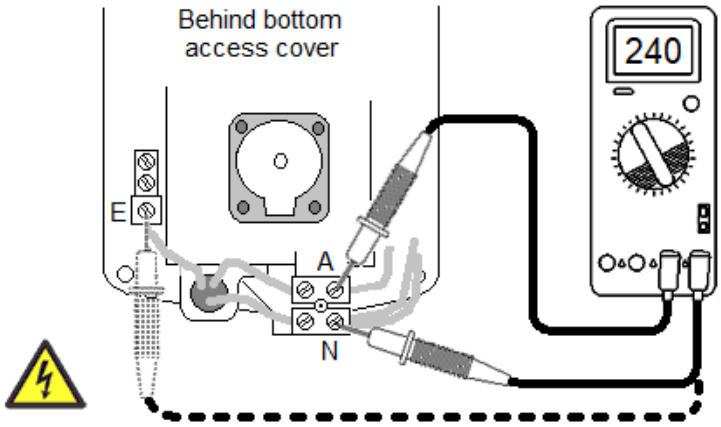


Temperature Sensor Strip Temperature/Resistance Table (TH1 ~ TH5)

°C	kΩ	°C	kΩ	°C	kΩ	°C	kΩ
0	27.28	23	10.78	46	4.75	69	2.29
1	26.14	24	10.38	47	4.59	70	2.23
2	25.05	25	10.00	48	4.44	71	2.16
3	24.01	26	9.63	49	4.30	72	2.10
4	23.02	27	9.28	50	4.16	73	2.04
5	22.07	28	8.94	51	4.02	74	1.98
6	21.17	29	8.62	52	3.89	75	1.92
7	20.31	30	8.31	53	3.77	76	1.87
8	19.49	31	8.01	54	3.65	77	1.82
9	18.71	32	7.73	55	3.54	78	1.76
10	17.96	33	7.46	56	3.42	79	1.72
11	17.25	34	7.19	57	3.32	80	1.67
12	16.57	35	6.94	58	3.21	81	1.62
13	15.91	36	6.70	59	3.11	82	1.58
14	15.29	37	6.47	60	3.02	83	1.53
15	14.70	38	6.24	61	2.93	84	1.49
16	14.13	39	6.03	62	2.84	85	1.45
17	13.59	40	5.83	63	2.75	86	1.41
18	13.07	41	5.63	64	2.67	87	1.37
19	12.57	42	5.44	65	2.59	88	1.34
20	12.09	43	5.25	66	2.51	89	1.30
21	11.64	44	5.08	67	2.44	90	1.27
22	11.20	45	4.91	68	2.36	91	1.23

Tests 3 ~ 5

Test 3



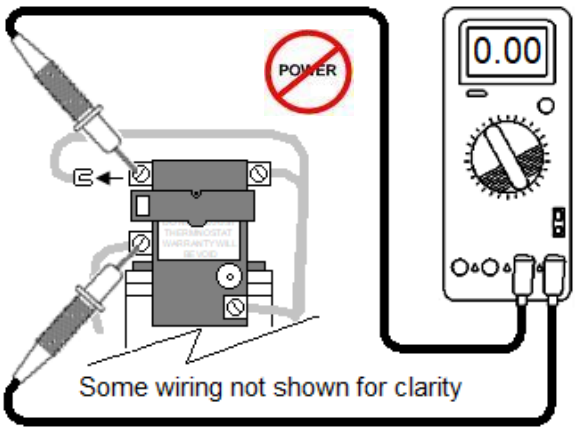
Using a multimeter on the AC voltage scale, measure between the water heater power supply terminal block active terminal, neutral terminal and earth tab. The following results should be obtained:

Active terminal (brown wire) ~ Neutral terminal (blue wires): 240V AC.

Active terminal (brown wire) ~ Earth tab: 240V AC.

Neutral terminal (blue wires) ~ Earth tab: 0 Volts.

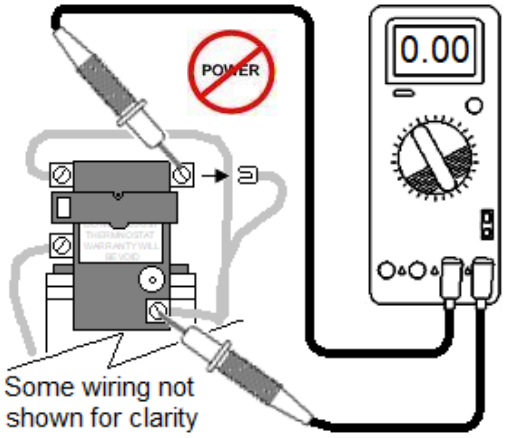
Test 4



Disconnect top left hand side wire from bottom mechanical thermostat, then using a multimeter on the resistance scale, measure between the mechanical thermostat two left side (ECO) terminals. The following result should be obtained when the ECO contacts are closed (not tripped):

Less than 1 ohm.

Test 5

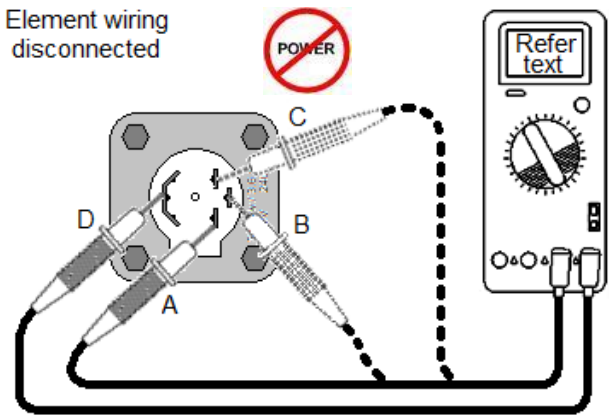


Disconnect top right hand side wire from bottom mechanical thermostat, then using a multimeter on the resistance scale, measure between the mechanical thermostat two right side (thermostat) terminals. The following result should be obtained when the thermostat contacts are closed:

Less than 1 ohm.

Fault Finding Test 6A ~ 8

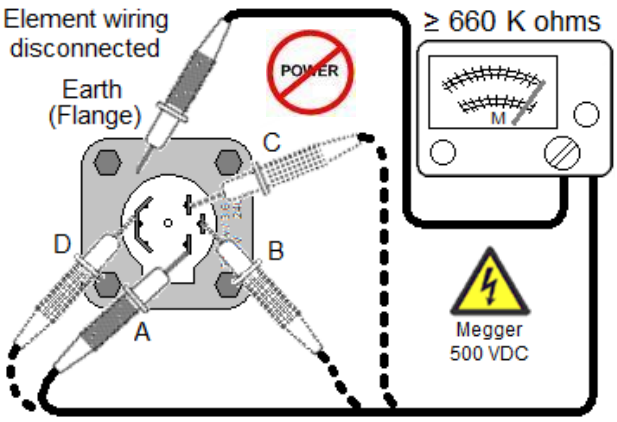
Test 6A



1. Remove single Phillips head screw retaining element terminal cover and remove cover.
2. Mark and disconnect all element wiring.
3. Using a multimeter on the resistance scale, measure between the element terminals. The following results should be obtained:

A ~ D (515W): 109.6 ~ 121.8 ohms.
B ~ D (1030W): 54.8 ~ 60.9 ohms.
C ~ D (2055W): 27.5 ~ 30.5 ohms.

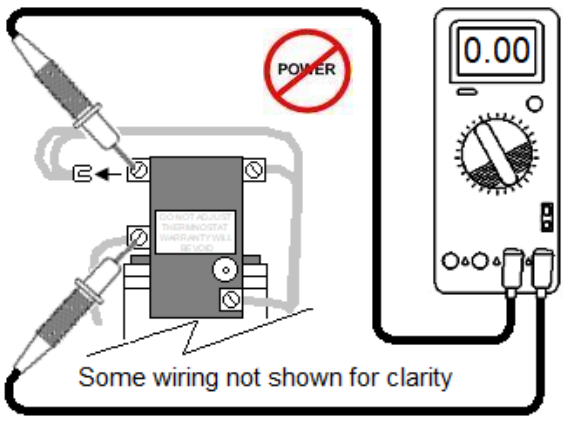
Test 6B



1. Remove single Phillips head screw retaining element terminal cover and remove cover.
2. Mark and disconnect all element wiring.
3. Using a Megger on the 500 VDC scale, measure between each element terminal and the heating unit metal flange (earth) as detailed below. The following results should be obtained:

A ~ Earth (515W): ≥ 660 Kilo ohms.
B ~ Earth (1030 W): ≥ 660 Kilo ohms.
C ~ Earth (2055 W): ≥ 660 Kilo ohms.
D ~ Earth (neutral): ≥ 660 Kilo ohms.

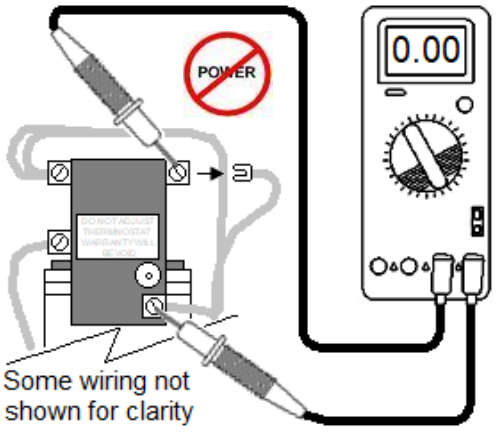
Test 7



Disconnect top left hand side wires from top mechanical thermostat, then using a multimeter on the resistance scale, measure between the mechanical thermostat two left side (ECO) terminals. The following result should be obtained when the ECO contacts are closed (not tripped):

Less than 1 ohm.

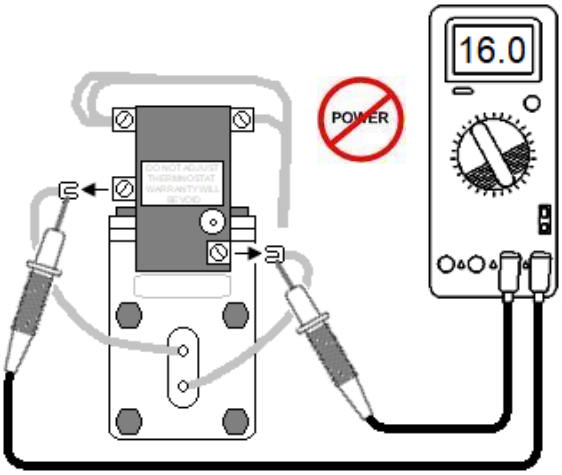
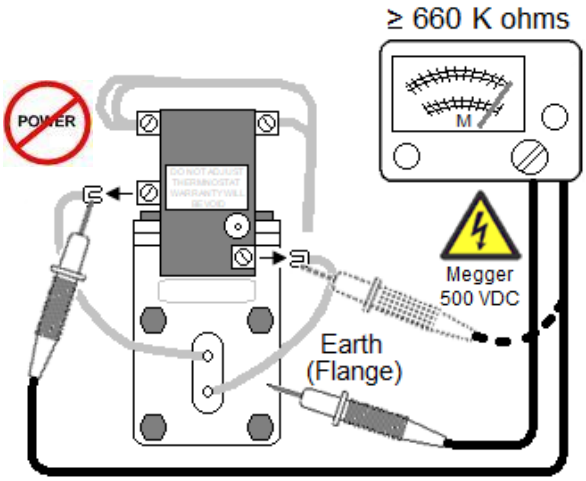
Test 8



Disconnect top right hand side wire from top mechanical thermostat, then using a multimeter on the resistance scale, measure between the mechanical thermostat two right side (thermostat) terminals. The following result should be obtained when the thermostat contacts are closed:

Less than 1 ohm.

Fault Finding Tests 9A ~ 9B

Test 9A	Test 9B
	
Mark and disconnect element wires from top mechanical thermostat, then using a multimeter on the resistance scale, measure between the two disconnected element wires. The following results should be obtained: 15 ~ 17 ohms (3600 W element).	Mark and disconnect element wires from top mechanical thermostat, then using a Megger on the 500 VDC scale, measure between each disconnected element wire and the heating unit metal flange (earth). The following results should be obtained: Element wire 1 ~ Earth: ≥ 660 Kilo ohms. Element wire 2 ~ Earth: ≥ 660 Kilo ohms.

COMMISSIONING PROCEDURE

1. Check to ensure all valves are in the correct position to permit water flow through the water heater and that the water heater has been filled with water and purged of air.
2. Turn ON circuit breaker/electrical isolator in switchboard marked 'Water Heater' or ‘HWS’.
3. Turn ON water heater electrical isolator located adjacent to the heater (if installed).

   When power is provided to the water heater, it will automatically operate in initialisation mode for 15 ~ 60 seconds after which time it will operate according to the master controller determined mode of operation. Note: If first time operation, the master controller will enter bottom thermostat trip calibration mode which normally takes 3 ~ 4 hours from a cold tank start.
4. Contact CET Support by texting your mobile number to 0488 824 202 requesting a call back to assist in performing connection/setup procedure with third-party external control devices.
5. Have CET Support confirm that there are no faults present and that the water heater is functioning correctly.

Adjusting the Temperature Limiting Valve

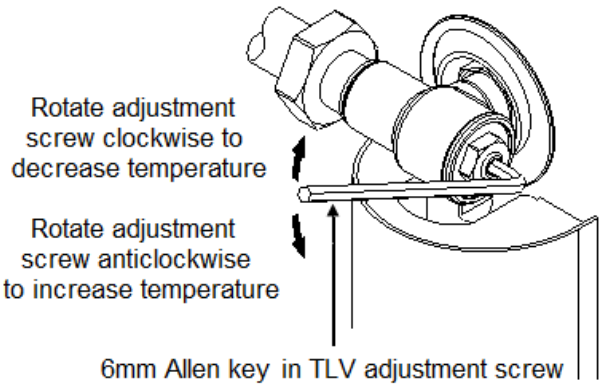
After TLV adjustment, the water temperature at the first tap in the hot water pipe work from the water heater used for personal hygiene, such as in a bathroom or ensuite <u>MUST NOT</u> exceed 50°C.

Procedure Notes

- The TLV has a maximum (anticlockwise) temperature adjustment stop point, and the temperature cannot be increased beyond this point. Due to TLV tolerances and premises pipe work design, it is possible that 50°C water temperature may not be attainable at the hot tap.
- The TLV does not have a minimum (clockwise) temperature adjustment stop point, however if adjusted too far clockwise, the adjustment screw will disengage and a water leak will result. If this occurs, rotate the adjustment screw anticlockwise to re-engage the screw and stop the leak.

Procedure

1. Ensure heater water temperature is ≥ 60°C (measure at T&PR valve using a thermometer).
2. Using a Phillips head screwdriver, remove three screws retaining TLV plastic cover and remove cover complete with foam insulation.
3. Locate first tap in hot water pipe work from water heater used for personal hygiene, then open hot tap and measure hot water outlet temperature using a digital thermometer. ***Open hot tap fully to achieve maximum flow and measure until the temperature stops increasing.***
4. Proceed according to relevant bullet point:
   - If hot tap outlet temperature is < 50ºC: Using a 6 mm Allen key, rotate TLV adjustment screw anticlockwise until the water temperature at step 3 hot tap is increased to 48.5 ~ 50ºC maximum.
   - If hot tap outlet temperature is > 50ºC: Using a 6 mm Allen key, rotate TLV adjustment screw clockwise until the water temperature at step 3 hot tap is decreased to 48.5 ~ 50ºC maximum.



5. Repeat steps 3 and 4 until TLV adjustment is complete then close hot tap.
6. Replace TLV plastic cover complete with foam insulation and refix using three Phillips head screws.

Mechanical Thermostat Temperature Adjustment

This procedure details how to check and if required adjust the top and bottom mechanical thermostats to 80°C.

The top and bottom mechanical thermostats <u>MUST</u> both be set to 80°C. A setting other than 80°C will cause the heater to operate outside design parameters which will drastically reduce the efficiency of the water heater by reducing the usage of any special grid tariffs or the amount of excess PV power that can be utilised for water heating.

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
5. Using a small flat bladed screwdriver, rotate top mechanical thermostat yellow adjustment dial so that '80' on dial aligns with black raised line on thermostat.
6. Using a small flat bladed screwdriver, rotate bottom mechanical thermostat yellow adjustment dial so that '80' on dial aligns with black raised line on thermostat.

7. Reassemble in reverse order of steps 4 ~ 1.
8. If the bottom mechanical thermostat was adjusted at step 6, Contact CET Support by texting your mobile number to 0488 824 202 requesting a call back to assist in resetting the master controller to default factory settings. This will cause reactivation of bottom thermostat trip calibration mode which will take 3 ~ 4 hours from a cold tank start. ***This step MUST be performed for the water heater to utilise special grid tariffs and/or excess PV power.***
9. Have CET Support confirm that there are no faults present and that the water heater is functioning correctly.

Resetting Mechanical Thermostat ECOs

This procedure details how to reset the top and/or bottom mechanical thermostat ECOs.

Test 4 on page 62 can be performed on the bottom mechanical thermostat to determine if the thermostat's ECO has tripped (opened).

Test 7 on page 63 can be performed on the top mechanical thermostat to determine if the thermostat's ECO has tripped (opened).

If either ECO has tripped, determine cause of operation before heater is put back in service. Start from beginning of 'General Fault Finding Chart' on page *Error! Bookmark not defined.* ***to diagnose fault.***

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.

3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
5. Using a small Phillips head screwdriver, press and release ECO ‘RESET’ button on top mechanical thermostat.
6. Using a small Phillips head screwdriver, press and release ECO ‘RESET’ button on bottom mechanical thermostat (ECO reset button is accessed via centre U aperture in bottom/legionella temperature sensor retaining clip).

7. Reassemble in reverse order of steps 4 ~ 1.
8. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly. ***Cause of ECO trip must be determined and rectified.***

COMPONENT REPLACEMENT PROCEDURES

Warnings

When performing any component replacement procedure, water, components or pipe work of an elevated temperature may be present. Ensure PPE is worn to prevent the risk of scalding.

Ensure PPE is worn when testing for voltages to reduce the risk of electric shock.

Draining the Water Heater (Procedure 1)

1. ***Isolate power and water supplies to water heater.***
2. ***Relieve pressure from water heater through T&PR valve or a hot tap.***
3. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
4. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
5. Disconnect cold water supply pipe.
6. Fit a drain hose to cold water connection and run other end to a drain or safe location.
7. Open T&PR valve to allow air into the water heater to facilitate drainage.

Bottom Access Cover (Procedure 2)

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. Reassemble in reverse order of above.

Top Access Cover (Procedure 3)

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
3. Reassemble in reverse order of above.

Master Controller (Procedure 4)

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Unplug bottom temperature sensor ribbon cable wiring plug from master controller.
5. Unplug temperature sensor strip ribbon cable wiring plug from master controller.
6. Unplug power supply wiring plug from master controller by depressing locking tab on plug and then pulling plug down.

7. Unplug bottom element wiring plug from master controller by depressing locking tab on plug and then pulling plug down.
8. Remove five large head Phillips head screws retaining master controller to heater jacket and remove master controller.
9. If an EMI filter wiring harness is fitted to the element wiring plug disconnected in step 7 (and depicted opposite), disconnect harness plug from bottom element wiring plug socket and discard harness, otherwise skip this step. Note: Replacement controllers have a built-in EMI filter and ***MUST NOT*** have the EMI filter wiring harness fitted as well.

10. Reassemble in reverse order of steps 8 ~ 2 using replacement master controller.
11. Restore power supply. The master controller will restart in initialisation mode (up to 60 seconds) after which time it will enter bottom thermostat trip calibration mode which will take 3 ~ 4 hours from a cold tank start.
12. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly. ***This step MUST be performed for the water heater to utilise special grid tariffs and/or excess PV power.***

EMI Filter Wiring Harness (Procedure 5)

An EMI filter wiring harness is only fitted to models manufactured prior to 01/10/2021 and is not available as spare part. (Refer to 'Water Heater Wiring Diagram – All Models' on page 13 to identify EMI filter wiring harness location if required).

If an EMI filter wiring harness is found to be faulty, it must be removed and discarded, and a replacement master controller ***MUST*** be installed (replacement master controllers have a built-in EMI filter and ***MUST NOT*** have the EMI filter harness fitted as well).

To remove and discard an EMI filter wiring harness and replace the master controller, refer to procedure 4 on page 68.

Water Heater Wiring Harness (Procedure 6)

The water heater wiring harness comes complete with six pin plug and includes wiring to top mechanical thermostat. Refer to wiring diagram 'Water Heater Wiring Harness – All Models' on page 14.

1. ***Isolate power supply to water heater, check to ensure a voltage is not present at heater power supply terminals*** and remove master controller by performing steps 1 ~ 8 of procedure 4 on page 68.
2. Disconnect wiring harness earth wire from heater jacket earth tab.
3. Disconnect brown and blue wires from heater power supply terminals.
4. Disconnect red and blue wires from bottom mechanical thermostat top terminals marked '1' (red wire) and '3' (blue wire).
5. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
6. Disconnect red, black and blue wires from top mechanical thermostat top terminals marked '1' (red wire) and '3' (black and blue wires).
7. Securely tie a draw wire to red, black and blue wires disconnected in step 6, then cut cable tie retaining these wires.

8. Pull blue, black and red wires out from conduit via bottom access cover opening, then cut draw wire from wiring leaving draw wire inside conduit. Discard removed wiring harness.
9. Securely tie replacement wiring harness top mechanical thermostat red, black and blue wires to bottom of draw wire, then cut cable tie retaining these wires.
10. Wrap draw wire / wiring join with electrical tape.
11. Pull draw wire and wiring up through conduit via top access cover opening.
12. Remove electrical tape and untie draw wire.
13. Complete reassembly in reverse order of steps 6 ~ 1.
14. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Bottom/Legionella Temperature Sensor (Procedure 7)

The bottom/legionella temperature sensor is a single unit dual sensor comprised of bottom temperature sensor TH9 and legionella temperature sensor TH7 and comes complete with retaining clip and ribbon cable.

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Unplug bottom temperature sensor ribbon cable wiring plug from master controller.
5. Note position of bottom temperature sensor retaining clip on bottom mechanical thermostat, then flick out right side of clip with finger to remove clip complete with sensor.
6. Remove scale or corrosion from cylinder surface (if any) where bottom temperature sensor face is located.
7. Reassemble in reverse order of steps 5 ~ 1 and check the following before replacing bottom access cover:
   - Ensure bottom mechanical thermostat is fully pushed down into retaining clamp and is hard up against cylinder wall.
   - Ensure bottom temperature sensor retaining clip is correctly installed i.e. hard up against front face of mechanical thermostat.
8. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Temperature Sensor Strip (Procedure 8)

The temperature sensor strip is located in a vertical aluminium duct in contact with the cylinder wall.

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.

3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Unplug temperature sensor strip ribbon cable wiring plug from master controller.
5. Lift bottom of temperature strip PCB out of 2mm retaining lip, then pull temperature sensor strip down, bend out of bottom access area and continue to pull out from aluminium duct. (Note for later reassembly: Wiring plug on sensor strip faces towards front of heater).
6. Reassemble in reverse order of above.
7. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Bottom Mechanical Thermostat (Procedure 9)

1. ***Isolate power supply to water heater*.**
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Unplug power supply wiring plug from master controller by depressing locking tab on plug and then pulling plug down.
5. Unplug bottom element wiring plug from master controller by depressing locking tab on plug and then pulling plug down.
6. Unplug bottom temperature sensor ribbon cable wiring plug from master controller.
7. Note position of bottom temperature sensor retaining clip on bottom mechanical thermostat, then flick out right side of clip with finger to remove clip complete with sensor.
8. Mark and disconnect all wiring from mechanical thermostat.
9. Slide mechanical thermostat out of thermostat retaining clamp (push up thermostat).
10. Remove scale or corrosion from cylinder surface (if any) where thermostat rear face and bottom temperature sensor face are located.
11. Reassemble in reverse order of steps 9 ~ 1 and check the following before replacing bottom access cover:
    - Ensure mechanical thermostat is fully pushed down into retaining clamp and is hard up against cylinder wall.
    - Ensure bottom temperature sensor retaining clip is correctly installed i.e. hard up against front face of mechanical thermostat.
    - Ensure mechanical thermostat is set to 80ºC and press and release ECO reset button to ensure ECO is reset (ECO reset button is accessed via centre U aperture in bottom temperature sensor retaining clip). ***Note: DO NOT use any setting other than 80ºC.***
12. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly. This will cause reactivation of bottom thermostat trip calibration mode which will take 3 ~ 4 hours from a cold tank start. ***This step MUST be performed for the water heater to utilise special grid tariffs and/or excess PV power.***

Bottom Heating Unit (Procedure 10)

1. ***Isolate power and water supplies to water heater.***
2. Drain water heater by performing steps 2 ~ 7 of procedure 1.
3. Remove single Phillips head screw retaining heating unit terminal cover and remove cover.
4. Mark and disconnect all wiring from heating unit and disconnect earth wire from thermostat retaining clamp.
5. Using a 12 mm socket, remove 4 bolts retaining heating unit and thermostat retaining clamp then remove thermostat retaining clamp.
6. Withdraw heating unit complete with gasket from cylinder. Care must be taken to ensure heating unit loop does not catch on cylinder opening and open out inside the cylinder. ***Do not cut off heating unit and leave a portion inside the cylinder.***
7. Clean around cylinder heating unit face, fit replacement gasket to replacement heating unit then slide heating unit into cylinder. ***Ensure heating unit is in correct orientation*** (electrical rating specs should be on right hand side of heating unit).
8. Reassemble in reverse order of steps 5 ~ 3 and check the following:
   - Ensure mechanical thermostat is fully pushed down into retaining clamp and that thermostat is hard up against cylinder wall.
   - Ensure bottom temperature sensor retaining clip is correctly installed i.e. hard up against front face of mechanical thermostat.
   - Ensure mechanical thermostat is set to 80ºC and press and release ECO reset button to ensure ECO is reset (ECO reset button is accessed via centre U aperture in bottom temperature sensor retaining clip). ***Note: DO NOT use any setting other than 80ºC.***
9. Remove drain hose and reconnect cold water supply pipe.
10. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
11. Check for water leaks.
12. Purge air from system via premises hot taps.
13. Using a multimeter on the resistance scale, measure between the internal cylinder wall and the main earth connection of the water heater. The resulting reading **MUST NOT** be more than 0.5 ohms. If a reading greater than 0.5 ohms is obtained, ensure heating unit metal surround is in good contact with cylinder flange then retest.
14. Refit bottom access cover.
15. Restore power.
16. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Top Mechanical Thermostat (Procedure 11)

1. ***Isolate power supply to water heater.***
2. Remove two Phillips head screws retaining bottom access cover and remove cover by pulling bottom of cover out and then down.
3. ***Using a multimeter set on the AC voltage scale, check to ensure a voltage is not present at heater power supply terminals.***
4. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
5. Mark and disconnect all wiring from mechanical thermostat.
6. Slide mechanical thermostat out of thermostat retaining clamp (push up thermostat).
7. Remove scale or corrosion from cylinder surface (if any) where thermostat rear face is located.
8. Reassemble in reverse order of steps 6 ~ 1 and check the following before replacing access covers:
   - Ensure mechanical thermostat is fully pushed down into retaining clamp and that thermostat is hard up against cylinder wall.
   - Ensure mechanical thermostat is set to 80ºC and press and release ECO reset button to ensure ECO is reset. ***Note: DO NOT use any setting other than 80ºC.***
9. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Top Heating Unit (Procedure 12)

1. ***Isolate power and water supplies to water heater.***
2. Partially drain water heater to below level of top heating unit by performing steps 2 ~ 7 of procedure 1. ***Ensure adequate water is drained to prevent damaging electrical components with water when heating unit is removed later in this procedure.***
3. Remove two Phillips head screws retaining top access cover and remove cover by pulling bottom of cover out and then down.
4. Mark and disconnect heating unit wiring from top mechanical thermostat.
5. Using a 12 mm socket, remove 4 bolts retaining heating unit and thermostat retaining clamp and remove thermostat retaining clamp.
6. Withdraw heating unit complete with gasket from cylinder. Care must be taken to ensure heating unit loop does not catch on cylinder opening and open out inside the cylinder. ***Do not cut off heating unit and leave a portion inside the cylinder.***
7. Clean around cylinder heating unit face, fit replacement gasket to replacement heating unit then slide heating unit into cylinder. ***Ensure heating unit is in correct orientation*** (electrical rating specs should be on left hand side of heating unit).
8. Reassemble in reverse order of steps 6 ~ 4 and check the following:
   - Ensure mechanical thermostat is fully pushed down into retaining clamp and that thermostat is hard up against cylinder wall.
   - Ensure mechanical thermostat is set to 80ºC and press and release ECO reset button to ensure ECO is reset. ***Note: DO NOT use any setting other than 80ºC.***
9. Remove drain hose and reconnect cold water supply pipe.

10. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
11. Check for water leaks.
12. Purge air from system via premises hot taps.
13. Refit top and bottom access covers.
14. Restore power.
15. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Temperature & Pressure Relief Valve (Procedure 13)

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

1. ***Isolate power and water supplies to water heater.***
2. Partially drain water heater to below level of T&PR valve by performing steps 2 ~ 7 of procedure 1.
3. Disconnect T&PR valve drain line.
4. Unscrew and remove T&PR valve.
5. Confirm replacement T&PR valve is correct rating and refit using thread tape.
6. Reconnect T&PR valve drain line.
7. Remove drain hose and reconnect cold water supply pipe.
8. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
9. Check for water leaks.
10. Purge air from system via premises hot taps.
11. Refit bottom access cover.
12. Restore power.
13. Contact CET Support by following the instructions on page 36 to assist in reconfiguring the controller, confirming that there are no faults present and that the water heater is functioning correctly.

Cold Water Flexible Pipe Covers & Insulation (Procedure 14)

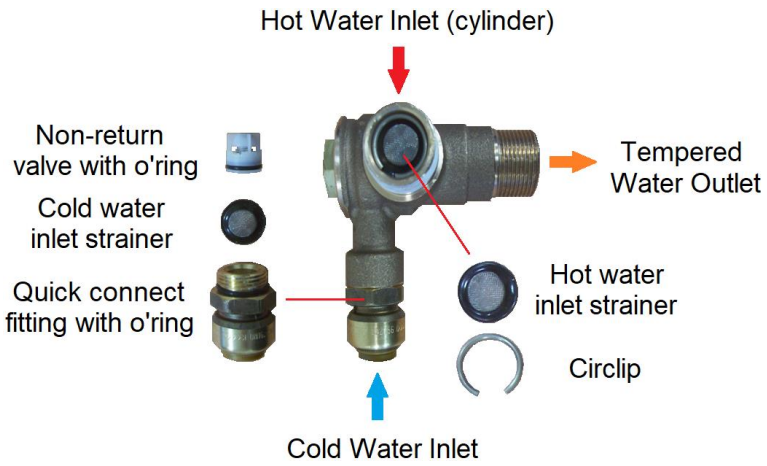
1. Using a Phillips head screwdriver, remove three screws retaining TLV plastic cover and remove cover complete with foam insulation.
2. Remove cold water flexible pipe cover complete with foam insulation as follows: Lift top of cover out, then pull cover up and out of bottom plastic cover. (Note for later reassembly: Top of foam insulation has recessed section).
3. Using a Phillips head screwdriver, remove two screws retaining cold water inlet adapter plastic cover and remove cover complete with foam insulation.
4. Reassemble in reverse order of above.

Temperature Limiting Valve (Procedure 15)

This procedure details how to remove the TLV complete with integral cold water inlet strainer, non-return valve, hot water inlet strainer and quick connect fitting; or to remove the TLV and remove the integral cold water inlet strainer, non-return valve and hot water inlet strainer for inspection, cleaning or replacement.

1. ***Isolate power and water supplies to water heater.***
2. Partially drain water heater to 100 mm below TLV by performing steps 2 ~ 7 of procedure 1.
3. Using a Phillips head screwdriver, remove three screws retaining TLV plastic cover and remove cover complete with foam insulation.
4. Remove cold water flexible pipe cover complete with foam insulation as follows: Lift top of cover out, then pull cover up and out of bottom plastic cover. (Note for later reassembly: Top of foam insulation has recessed section).
5. Disconnect hot water outlet pipe work from TLV.
6. Disconnect cold water flexible pipe from TLV as follows: Using a quick connect removal tool (part number 8903630), depress quick connect retaining ring and pull cold water flexible pipe out from TLV. (Note for later reassembly: Ensure cold water flexible pipe is fully pushed into quick connect fitting).
7. Unscrew and remove TLV from heater then proceed according to relevant bullet point:
   - If checking, cleaning or replacing the TLV cold water inlet strainer, non-return valve and hot water inlet strainer, procced directly to step 9 in this procedure.
   - If replacing the TLV complete with integral cold water inlet strainer, non-return valve and hot water inlet strainer, procced directly to step 14 in this procedure.
8. Unscrew and remove quick connect fitting from TLV.
9. Using a small flat bladed screwdriver, carefully prise out TLV cold water inlet strainer and non-return valve.

Non-return Valve & Cold Water Inlet Strainer Exploded View



TLV Exploded View

10. Using a small flat bladed screwdriver, carefully prise out TLV hot water inlet strainer circlip and remove hot water inlet strainer.
11. Refit cleaned or replacement TLV hot water inlet strainer and retaining circlip into TLV.

12. Refit cleaned or replacement non-return valve, cold water inlet strainer and quick connect fitting into TLV. Note: Ensure non-return valve and quick connect fitting o'rings are clean and not cracked or damaged, and do not use thread tape on quick connect fitting.
13. Refit TLV (or replacement TLV) to cylinder hot water outlet using thread tape.
14. Reassemble in reverse order of steps 6 ~ 5.
15. Remove drain hose and reconnect cold water supply pipe.
16. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
17. Check for water leaks.
18. Purge air from system via premises hot taps.
19. Refit bottom access cover.
20. Restore power.
21. ***Adjust TLV outlet temperature*** (refer to 'Adjusting TLV Outlet Temperature' on page 65).
22. Refit cold water flexible pipe cover and insulation (reverse order of step 4).
23. Refit TLV plastic cover and insulation (reverse order of step 3).
24. Contact CET Support by texting your mobile number to 0488 824 202 requesting a call back to assist in confirming that there are no faults present and that the water heater is functioning correctly.

Cold Water Inlet Adapter (Procedure 16)

The cold water inlet adapter comes complete with quick connect fitting.

1. ***Isolate power and water supplies to water heater.***
2. Drain water heater by performing steps 2 ~ 7 of procedure 1.
3. Using a Phillips head screwdriver, remove two screws retaining cold water inlet adapter plastic cover and remove cover complete with foam insulation.
4. Remove cold water flexible pipe cover complete with foam insulation as follows: Lift bottom of cover out, then pull cover down and out of top plastic cover. (Note for later reassembly: Top of foam insulation has recessed section).
5. Disconnect cold water inlet pipe work from cold water inlet adapter.
6. Disconnect cold water flexible pipe from cold water inlet adapter as follows: Using a quick connect removal tool (part number 8903630), depress quick connect retaining ring and pull cold water flexible pipe out from cold water inlet adapter. (Note for later reassembly: Ensure cold water flexible pipe is fully pushed into quick connect fitting).
7. Unscrew and remove cold water inlet adapter from heater.
8. Refit replacement cold water inlet adapter to cylinder cold water inlet using thread tape.
9. Reassemble in reverse order of steps 6 ~ 5.
10. Remove drain hose and reconnect cold water supply pipe.
11. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
12. Check for water leaks.

13. Purge air from system via premises hot taps.
14. Refit bottom access cover.
15. Restore power.
16. Refit cold water flexible pipe cover and insulation (reverse order of step 4).
17. Refit cold water inlet adapter plastic cover and insulation (reverse order of step 3).

Cold Water Flexible Pipe (Procedure 17)

1. ***Isolate power and water supplies to water heater.***
2. Drain water heater by performing steps 2 ~ 7 of procedure 1.
3. Using a Phillips head screwdriver, remove three screws retaining TLV plastic cover and remove cover complete with foam insulation.
4. Remove cold water flexible pipe cover complete with foam insulation as follows: Lift top of cover out, then pull cover up and out of bottom plastic cover. (Note for later reassembly: Top of foam insulation has recessed section).
5. Using a Phillips head screwdriver, remove two screws retaining cold water inlet adapter plastic cover and remove cover complete with foam insulation.
6. Disconnect cold water flexible pipe from TLV cold water inlet as follows: Using a quick connect removal tool (part number 8903630), depress quick connect retaining ring and pull cold water flexible pipe out from TLV. (Note for later reassembly: Ensure cold water flexible pipe is fully pushed into quick connect fitting).
7. Disconnect cold water flexible pipe from cold water inlet adapter as follows: Using a quick connect removal tool, depress quick connect retaining ring and pull cold water flexible pipe out from cold water inlet adapter. (Note for later reassembly: Ensure cold water flexible pipe is fully pushed into quick connect fitting).
8. Reassemble in reverse order of steps 7 ~ 6.
9. Remove drain hose and reconnect cold water supply pipe.
10. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
11. Check for water leaks.
12. Purge air from system via premises hot taps.
13. Refit bottom access cover.
14. Restore power.
15. Refit cold water inlet adapter plastic cover and insulation (reverse order of step 5).
16. Refit cold water flexible pipe cover and insulation (reverse order of step 4).
17. Refit TLV plastic cover and insulation (reverse order of step 3).

Dip Tube (Procedure 18)

1. ***Isolate power and water supplies to water heater.***
2. Partially drain water heater to 100 mm below TLV by performing steps 2 ~ 7 of procedure 1.
3. Remove TLV by performing steps 3 ~ 7 of procedure 15.
4. Unscrew and remove hot water outlet brass extension fitting.

5. Using a flat blade screwdriver, gently split outer rim at top and bottom of dip tube face and prise dip tube out of cylinder fitting.
6. Fit replacement dip tube into cylinder fitting ensuring the flat section lines up with fitting (dip tube facing up) then gently drive dip tube into fitting a short distance.
7. Apply thread tape to brass extension fitting and refit; this will push dip tube into the correct location.
8. Reconnect TLV to brass extension fitting using thread tape.
9. Reconnect quick connect fitting to TLV using thread tape.
10. Reconnect cold water flexible pipe to TLV quick connect fitting. Ensure cold water flexible pipe is fully pushed into quick connect fitting.
11. Reconnect hot water outlet pipe to TLV.
12. Remove drain hose and reconnect cold water supply pipe.
13. Restore water supply and fill heater. Release air by ***gently*** lifting easing lever on T&PR valve until water runs freely from T&PR valve drain line without sputtering.
14. Check for water leaks.
15. Purge air from system via premises hot taps.
16. Refit bottom access cover.
17. Restore power.
18. Refit cold water flexible pipe cover and insulation.
19. Refit TLV plastic cover and insulation.

Anode (Procedure 19)

1. ***Isolate power and water supplies to water heater.***
2. ***Relieve water pressure*** by opening and then closing the T&PR valve or a hot tap.
3. Remove anode cap and using a 27 mm socket or tube spanner, remove anode.
4. Apply thread tape to replacement anode and refit. **Note:** It may be necessary to cut anode to length prior to fitting (anode length should be 1140 mm for 250 litre models and 1395 mm for 315 litre models).
5. Restore water supply and check for leaks.
6. Purge air from system via premises hot taps.
7. Refit anode cap.
8. Restore power.

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Rev	**Details of change**	**Issued**
00	Service Instructions issued for PowerStore Grid Interactive Electric Water Heaters	12/21
AA	CET contact details added	08/22
AB	Correction to lower element power ratings	04/23

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