SERVICE INSTRUCTIONS

12, 16, 18 & 20 Litre

Continuous Flow Gas Water Heater

TM040

First Issued: June 09

Revision: AH
Issued: October 16

Everhot	Solahart	AquaMAX	Vulcan	Rheem
274X20	10143202	3200000	244X16	874X12
276X20	10143203	3200001	246X16	876X12
	10143204	3200010	244X20	874X16
	10143205	3200011	246X20	876X16
		CG20-NG-50		874X18
		CG20-NG-60		876X18
		CG20-LP-50		874X20
		CG20-LP-60		876X20

CONTENTS

INTRODUCTION

The information provided in these service instructions is based on the water heater being installed in accordance with AS/NZS 5601 and the Installation Instructions provided with each water heater.

Should you require further technical advice on a continuous flow gas water heater, contact your nearest Rheem Service Department where genuine replacement parts are also available.

SAFETY WARNING

The purpose of this service manual is to provide sufficient information to allow a person with the skills as required by the Regulatory Authorities to carry out effective repairs to a continuous flow gas water heater in the minimum of time.

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

"Live" testing to be conducted. Personal Protective Clothing (PPE) shall be worn and an RCD shall be installed between the power point and 3-pin cord of the water heater to reduce the risk of electric shock.

Isolate power before conducting the indicated test

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

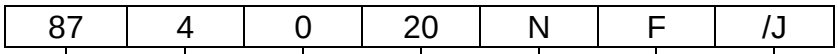
General warning symbol. Observe the instructions accompanying the symbol.

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

When conducting repairs to a gas appliance the gas train including injector sizes must not be altered or modified in any way.

WATER HEATER MODEL IDENTIFICATION

The identification numbers are designed to convey detailed information about the water heater to which it is attached. The model number consists of 6 digits and up to 3 letters.



Model Number
87 – Rheem
27 – Everhot
24 – Vulcan

Temperature Setting
4 – 60ºC Set temp
6 – 48ºC Set temp

0 – No reference
6 – 6 Star Model
E – 6 Star Builder Model
M – Builder Model

Capacity

Nominal litres/minute @ 25 ºC rise

Gas Type
N – Natural
P – Propane

F – Frost protection fitted

Casing Colour
J – Joey Grey
No letter – Refer below

Casing colour variations: Rheem - Antique White; Vulcan - Shale Grey; Everhot - Joey Grey

Solahart Model Identification	Natural Gas	Propane
Solahart Gas Ext CF 60º 20L 5*	10143202	10143203
Solahart Gas Ext CF 60º 20L 6*	10143204	10143205

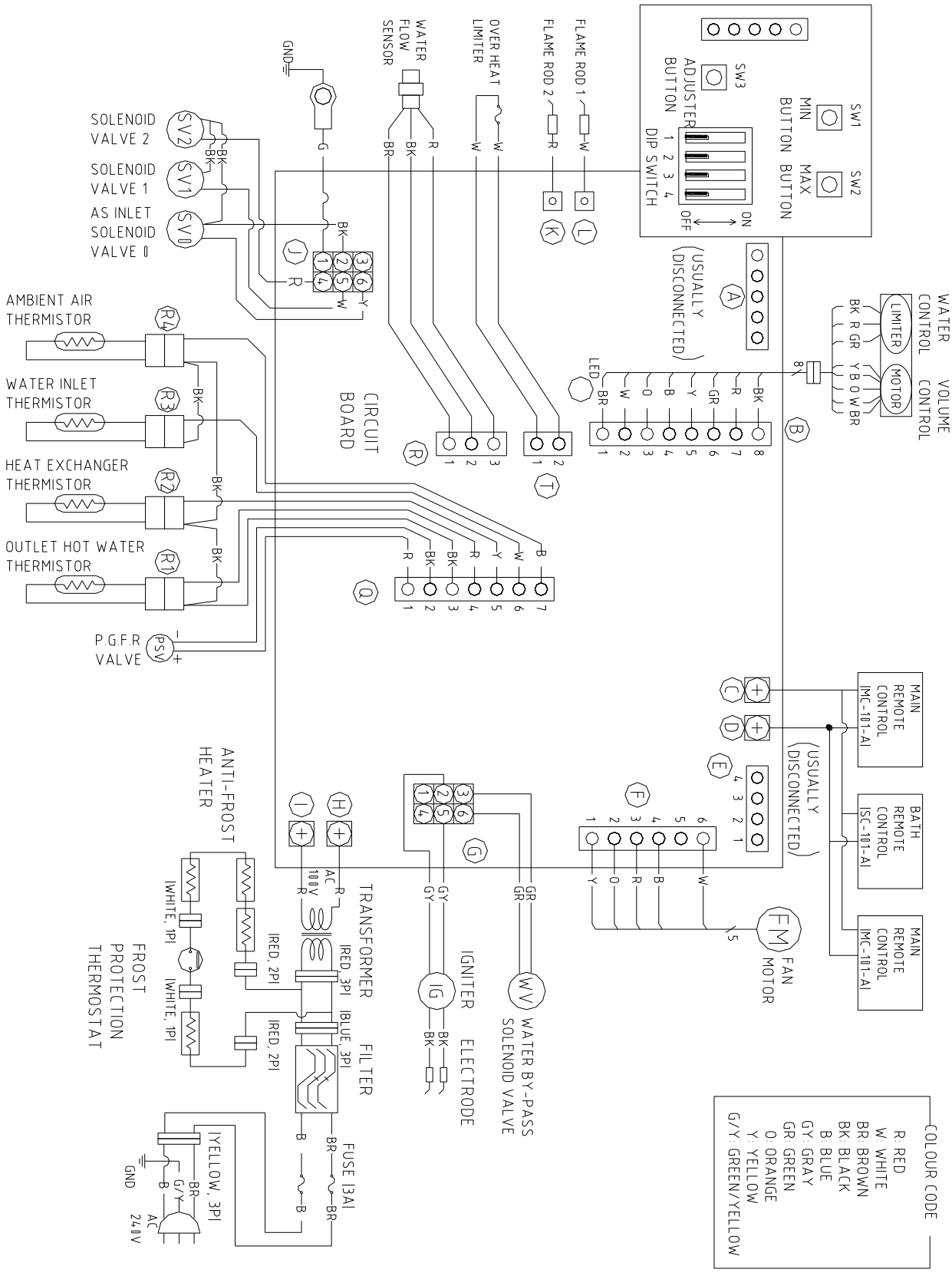
AquaMAX Model Identification	Natural Gas	Propane
AquaMAX Gas Ext 50º 20L 5*	3200000	3200010
AquaMAX Gas Ext 50º 20L 6*	CG20-NG-50	CG20-LP-50
AquaMAX Gas Ext 60º 20L 5*	3200001	3200011
AquaMAX Gas Ext 60º 20L 6*	CG20-NG-60	CG20-LP-60

SPECIFICATIONS

Model	874X12NF 876X12NF		874X12PF 876X12PF		244X16NF 874X16NF 246X16NF 876X16NF		244X16PF 874X16PF 246X16PF 876X16PF		874X18NF 876X18NF 18L Model NLA		874X18PF 876X18PF 18L Model NLA		CG20-NG-50 GC20-NG-60 10143204 244X20NF 274X20NF 874X20NF 246X20NF 276X20NF 876X20NF		CG20-NG-50 GC20-NG-60 10143205 244X20PF 274X20PF 874X20PF 246X20PF 276X20PF 876X20PF	
Gas Type	**NG**		**Prop**		**NG**		**Prop**		**NG**		**Prop**		**NG**		**Prop**	
Max gas consumption (MJ/Hr)	94				126				140				153			
Output (kW)	20.9				27.9				31.4				34.9			
Capacity (L/min @ 25ºC rise)	12				16				18				20			
Capacity (L/min @ 40ºC rise)	7.5				10.0				11.3				12.5			
Mass Empty (kg) 5 Star	15				15				15				15			
Mass Empty (kg) 6 Star	16				16				16				16			
Min inlet water pressure (kPa)	140				140				140				140			
Max inlet water pressure (kPa)	1000				1000				1000				1000			
Injector Orifice (qty x dia mm)	17 x 1.60		17 x 1.15		17 x 1.60		17 x 1.15		17 x 1.60		17 x 1.15		17 x 1.60		17 x 1.15	
Min inlet gas pressure (kPa)	1.13		2.75		1.13		2.75		1.13		2.75		1.13		2.75	
Max inlet gas pressure (kPa)	3.5				3.5				3.5				3.5			
Min burner gas test pressure (kPa)	0.190		0.160		0.170		0.190		0.170		0.190		0.170		0.190	
Max burner gas test pressure (kPa)	0.810		0.920		0.620		0.770		0.755		0.930		0.870		1.185	
Ignition System	Continuous Spark															
Power Consumption (Watts)[(1)]	138		132		142		143		143		147		144		151	
Gas connection diameter (mm)	R¾/20				R¾/20				R¾/20				R¾/20			
Water connection diameter (mm)	R¾/20				R¾/20				R¾/20				R¾/20			
Relief Valve Pressure (kPa)	1750				1750				1750				1750			
Kitchen Controller	Y				Y				Y				Y			
Bathroom 1 Controller	Y				Y				Y				Y			
Bathroom 2 Controller	Y				Y				Y				Y			
Deluxe Kitchen Controller	Y				Y				Y				Y			
Deluxe Bathroom 1 Controller	Y				Y				Y				Y			
Deluxe Bathroom 2 Controller	Y				Y				Y				Y			

(1) Maximum power consumption when anti-frost heaters are energised.

WIRING DIAGRAM

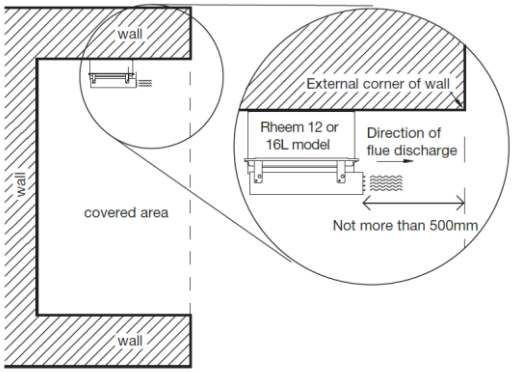


PRODUCT CHANGES

Flue Diverter Kit - 299881

Continuous flow water heaters are not able to be installed within a covered area that is open on only one side (eg: balcony) unless the water heater is located such that the flue terminal is no more than 500mm from the open side, discharges in the direction of the opening with a free flow of air across it and there are no openings into the building within 500mm. A flue diverter kit has been developed to provide a means of satisfying this requirement for 12 & 16L natural gas models. The flue diverter kit is available from September 2016.

Flue Diverter Kit - 299881



Set back up to 500mm from the wall edge

The diverter is able to be fitted to the water heater utilising the existing flue outlet and front cover fixing points.

The flue diverter kit is dual handed and is suitable for use for recess box or wall mount installations. The diverter includes a heat shield to protect occupants against injury should inadvertent contact be made with the flue surface during heater operation.

Unlike the 24L Integrity models, the flue diverter kit is able to be fitted to any 12 or 16L natural gas unit (both 50ºC & 60ºC models) without the need for a unique GTC or any adjustment to the dip switch settings.

Note: This product is available in **Western Australia, Queensland and South Australia** only.

Removal of 18L Models from Range

The 18L models listed below were removed from the 12 – 20L range in December 2015. Once existing stock is depleted these models will no longer be available.

874618NF	874618PF
876618NF	876618PF

A 20L heater can be used for replacement of any failed 18L unit.

6 Star Models Released

A 6 star version of the 12-20L CF models was released for production in September 2012.

The 5 and 6 star models can be differentiated by the model number. The model number of the 5 star units has a '0' or 'M' at the 4th digit, eg: 874**0**20NF / 874**M**16NF, the 6 star models have a '6' or 'E' at the 4th digit, eg: 874**6**20NF / 874**E**16NF.

The major changes to the 6 star models include:

1. Modified start-up sequence. The water flow during start-up is reduced to limit the amount of water that has to be drawn off before hot water is delivered.
2. EZ-link no longer requires a remote controller to operate.
3. Set point temperatures have been altered for the 50º model.
4. Fine temperature adjustment available for 50ºC models.
5. Unpackaged mass increased to 16kg.

EZ-Link™ system

With the release of the 6 star models it will no longer be mandatory for a remote temperature controller to be fitted to EZ-Linked models. Where a remote is fitted the unit with the remote connected is the master, whereas in a system where a remote is not fitted the master unit must be determined by the installer by modifying the dip switch settings (refer to page 21 for more information).

Preset Temperature Options for 50ºC Models

The preset temperature settings for the 50ºC models have been modified as per below:

Preset Temperature Settings	Flashes	246, 276, 876 series	
		5 Star	6 Star
Minimum temperature setting	1 flash	40°C	43°C
Mid temperature setting	2 flashes	43°C	45°C
Maximum temperature setting	3 flashes	48°C	48°C

Refer to page 9 for instructions regarding the modification of preset temperature settings.

Fine Temperature Adjustment for 50ºC Models

The maximum outlet temperature of a 246, 276 & 876 series water heater may be adjusted to compensate for temperature losses in the pipe work between the water heater outlet and sanitary fixtures. The fine temperature adjustment options are:

Flashes	246, 276, 876 series
1 flash	50°C
2 flashes	51°C
3 flashes	52°C
4 flashes	53°C

Refer to page 10 for further details regarding fine temperature adjustment.

PRODUCT CHANGES (continued)

Maximum Preset Outlet Temperature Setting

AS 3498 requires that a water heater provides the means to inhibit the growth of Legionella bacteria in potable water. When a 244, 274 or 874 model is used as an in-series booster for a solar water heater it can satisfy this AS 3498 requirement provided it is energised, the booster preset outlet temperature setting is 70ºC or higher, and that a remote temperature controller is not used.

In order to comply with this requirement the maximum preset outlet temperature setting is increased from 60ºC to 70ºC in all 244, 274 and 874 models manufactured from October 2010. These models will continue to be supplied at a factory preset outlet temperature of 60ºC.

Models with the increased 70ºC maximum preset outlet temperature setting can be identified by a manufacture date of October 2010 or later. **Note:** The modified 244, 274 and 874 models will no longer have a 50ºC outlet temperature option.

PRESET TEMPERATURE ADJUSTMENT

Factory pre-set and maximum hot water outlet temperature settings for each water heater series are shown below:

Model	Factory setting	Maximum Temp	Solar Compatible
244, 274, 874 Series*	60ºC	70ºC	Y
246, 276, 876 Series	48ºC	48ºC	N

*When used as an inline solar booster these models must be set at a minimum outlet temperature of 70ºC.

Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

To adjust the preset temperature:

1. Remove the front cover from the water heater.
2. Turn DIP switches 3 and 4 ON (up position) on the PCB.
3. The temperature setting will be displayed by a series of flashes from the red LED, with a three (3) second pause between each series of flashes. The temperature settings and series of flashes are:

Preset Temperature Settings	Flashes	60ºC Models		48ºC Models	
		244, 274, 874 series		246, 276, 876 series	
		Pre-Oct 10	From Oct 10	5 Star	6 Star
Minimum temperature setting	1 flash	50°C	55°C	40°C	43°C
Mid temperature setting	2 flashes	55°C	60°C	43°C	45°C
Maximum temperature setting	3 flashes	60°C	70°C	48°C	48°C

4. Press the MIN or MAX button, located above the DIP Switches, until the desired temperature is reached (indicated by the number of flashes from the red LED).
5. Turn DIP SWITCHES 3 and 4 off (down position).
6. The red LED will go out. The preset outlet temperature is now set.
7. Refit the front cover to the water heater.

Fine Temperature Adjustment

The maximum outlet temperature of a 48ºC model (246, 276 & 876 series) may be adjusted to compensate for temperature losses in the pipe work between the water heater outlet and sanitary fixtures.

After adjustment, the water temperature from the first tap in the hot water pipe work after the water heater used for personal hygiene purposes, such as in a bathroom or ensuite, **MUST NOT** exceed:

- 48°C if a temperature controller is connected to the water heater, or
- 50°C if a temperature controller is not connected to the water heater.

If there is a tap, such as a kitchen or laundry tap, in the hot water pipe work between the water heater and the first tap used for personal hygiene purposes, then it is possible for a water temperature to be delivered from that tap of up to 3 - 5°C higher than the setting shown on the controller.

It is necessary to have the electrical supply to the water heater switched on during stages of the outlet temperature compensation adjustment procedure.

This procedure cannot be conducted with a temperature controller connected to the water heater or with an EZ-link system set up on the water heaters. Remote controls and EZ-link must be removed prior to conducting adjustment. If EZ-link is used, the DIP SWITCHES need to be reset to the off (down) position on both water heaters prior to the commencement of this procedure. The EZ-link cable does not need to be disconnected. The adjustment procedure has to be performed individually on both EZ-linked water heaters.

Note: The preset outlet temperature setting of this water heater must be set at 48°C prior to the commencement of this procedure.

Outlet Temperature Adjustment

To adjust the outlet temperature:

1) Switch on the electrical supply at the power outlet to the water heater.

2) Locate the first hot tap in the hot water pipe work after the water heater used for personal hygiene purposes.

3) Turn on the hot tap.

4) Using a thermometer, measure the temperature of the water from the tap, until the temperature stops increasing.

   If the water temperature is below:

   - 48°C if a temperature controller is connected to the water heater, or
   - 50°C if a temperature controller is not connected to the water heater

   the maximum outlet temperature of the water heater can be adjusted upwards.

5) Turn off the hot tap.

6) Switch off the electrical supply at the power outlet to the water heater.

7) Remove the screws holding the front panel to the jacket.

8) Gently disengage the front panel and pull forward to remove from the water heater.

9) Switch on the electrical supply at the power outlet to the water heater.

10) Switch DIP SWITCH 3 to the on (up) position on the PCB. The red LED will not flash with a preset outlet temperature setting of 48°C.

11) Press the MAX button once to increase the preset outlet temperature setting to the next increment. Each press of the MAX button will increase the temperature setting by one increment. The red LED will commence a series of flashes, with three (3) seconds between each series, to indicate the temperature setting.

    The increments above 48°C and the number of flashes for each temperature setting are:

1 flash	2 flash	3 flash	4 flash
50°C	51°C	52°C	53°C

    The MAX button is located above the DIP switches.

12) Switch DIP SWITCH 3 to the off (down) position on the PCB. The red LED will stop flashing.

13) Switch off the electrical supply at the power outlet to the water heater.

14) Reconnect the controller cables (if a temperature controller is fitted)

15) Reset the dip switches if the water heater is part of an EZ-link system installation.

16) Refit the front panel and screws to the water heater.

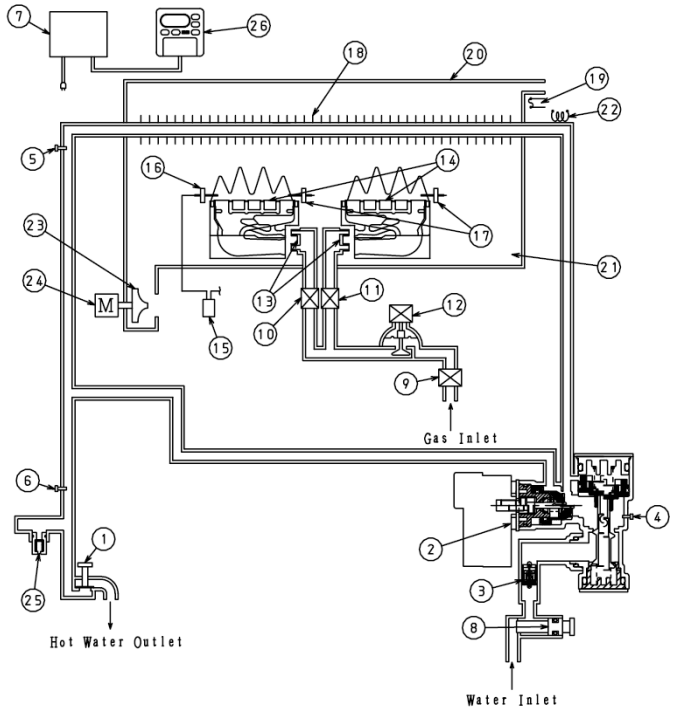
17) Switch on the electrical supply at the power outlet to the water heater.

SEQUENCE OF OPERATION

Refer to 'Sequence of Operation Component Diagram' on page 13 to view components shown in brackets e.g. **(1)**

1. When a hot water tap **(1)** is opened, cold water (or preheated water if a solar pre-heater is installed) enters the water heater and passes through the Water Flow Sensor **(3)** and Heat Exchanger **(18)**. Note: The inlet water temperature must be less than or equal to 58ºC and less than or equal to the set point temperature minus 2ºC for operation to occur past this point; otherwise water will pass straight through the heat exchanger and fan and burner operation will not occur (for more information on this subject refer to the section titled 'In-series Gas Boosting' on page 14).
2. The Water Flow Sensor **(3)** sends a pulse signal to the PCB **(7)**. Once the pulse signal reaches a pre designated frequency (at a min. flow rate of 2.5lpm) the PCB **(7)** activates the Fan Motor **(24)** and the Fan **(23)** starts rotating.
3. After the Fan **(23)** completes a pre purge, the Gas Inlet Solenoid Valve **(9)**, Gas Solenoid Valve 1 **(10)** and Gas Solenoid Valve 2 **(11)** open at the same time. The Proportional Gas Flow Regulating Valve **(12)** adjusts the gas flow rate to ensure adequate gas for ignition and gas is then supplied to the Burner **(14)**.
4. At the same time the Gas Solenoid Valves open the Igniter **(15)** starts sparking continuously and ignites the gas at the Burner **(14)**. After the flame sensor **(17)** detects burner flame, the Proportional Gas Valve **(12)** begins to control the gas flow rate. If there is a difference between the hot water temperature detected by the Hot Water Outlet Thermistor **(6)** and that set on the water heater or selected on the controller (if fitted) the PCB **(7)** adjusts the hot water temperature by opening and closing the Gas Solenoid Valve 1 **(10),** the Gas Solenoid Valve 2 **(11)** and the Proportional Gas Flow Regulating Valve **(12)**. The water flow rate is also adjusted via the Water Flow Servo Motor **(2)** to ensure the selected temperature of hot water is delivered.
5. As the gas flow rate, controlled by the Proportional Gas Flow Regulating Valve **(12)** changes, the PCB **(7)** varies the speed of the Fan Motor **(24)** to maintain the correct air gas mix ratio.
6. When the hot tap **(1)** is closed, the pulse signal from the Water Flow Sensor **(3)** stops and the burner flame is extinguished by closing Gas Solenoid Valves 1 **(10)**, 2 **(11)**, and the Gas Inlet Solenoid Valve **(9)**. The post purge operation then commences.
7. Once the post-purge operation ends (up to 6 minutes) power to the Fan Motor **(24)** is cut and the Fan **(23)** stops.

Sequence of Operation Component Diagram



1) Hot Water Tap
2) Water Flow Servo Motor
3) Water Flow Sensor
4) Inlet Water Temperature Thermistor
5) Combustion Chamber Thermistor
6) Outlet Water Temperature Thermistor
7) PCB
8) Water Filter (Strainer)
9) Gas Inlet Solenoid Valve
10) Gas Solenoid Valve 1
11) Gas Solenoid Valve 2
12) Proportional Gas Solenoid Valve
13) Nozzle
14) Burner
15) Igniter
16) Igniter Electrode
17) Flame Sensor
18) Heat Exchanger
19) Over Temperature Limiter
20) Exhaust (Flue) Outlet
21) Combustion Chamber
22) Anti Frost Heater
23) Fan
24) Fan Motor
25) Drain Plug With Relief Valve.
26) Controller (Optional)

Bypass Operation

The bypass is a section of copper pipe work connected between the water body assembly and the outlet of the heat exchanger and allows a quantity of cold water to bypass the heat exchanger. The purpose of the bypass is to ensure the heat exchanger operates at temperatures above the dew point of the combustion gases, ensuring condensate is not produced, but low enough to maximise the heat exchangers life. A solenoid valve fitted to the water body assembly controls the bypass. The PCB activates the solenoid based on heat exchanger temperature and selected outlet water temperature.

Anti-Frost Heater Circuit

All models have an anti frost heater circuit. The anti-frost heaters are wired in series and operate independently from the water heater.

A thermostat sensing ambient air temperature, positioned in the wiring loom near the bottom of the water heater, activates the anti-frost heaters when the ambient air temperature falls to 4ºC +4ºC/-2ºC and deactivates the anti-frost heaters when the temperature rises above 12ºC.

In the event a heater block becomes open circuit the total heater circuit is rendered inoperable. The circuit is split into two sections with 4 heaters in total.

Refer to ‘Anti-Frost Heaters’ on page 55 for replacement procedure.

IN-SERIES GAS BOOSTING

Temperature controllers must not be fitted if this water heater is installed as part of a solar water heater system because water at a temperature much higher than the controller setting can be delivered.

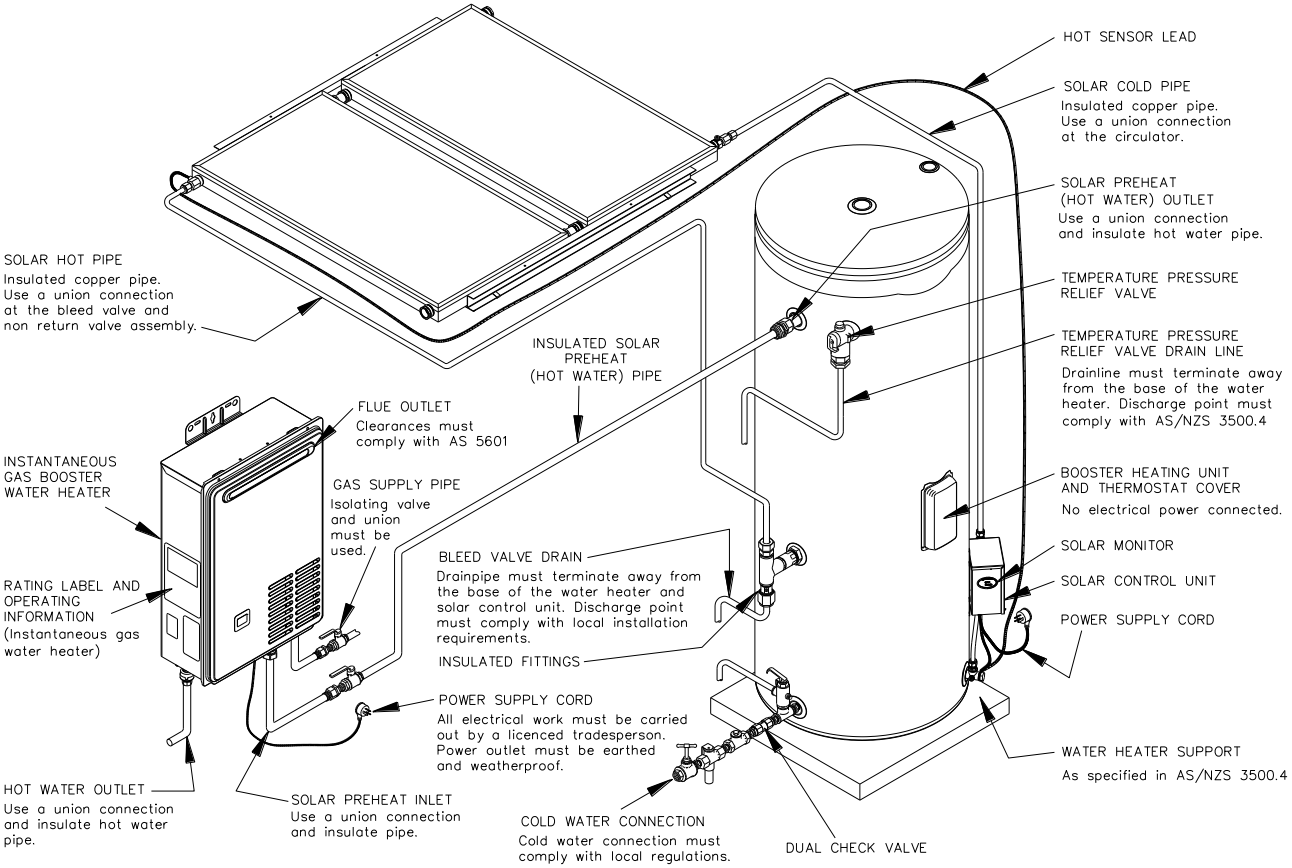
50º fixed model water heaters are not suitable for use as in-series solar gas boosters.

A 60ºC model may be used as an in-series booster water heater to a solar preheat water heater. When the inlet water temperature is 58°C or higher the fan and burner will not operate despite water flowing through the heat exchanger. When the inlet water temperature is less than or equal to 57°C the burner will fire and boost the outlet temperature to the preset outlet temperature setting provided the flow rate is greater than 3 litres per minute.

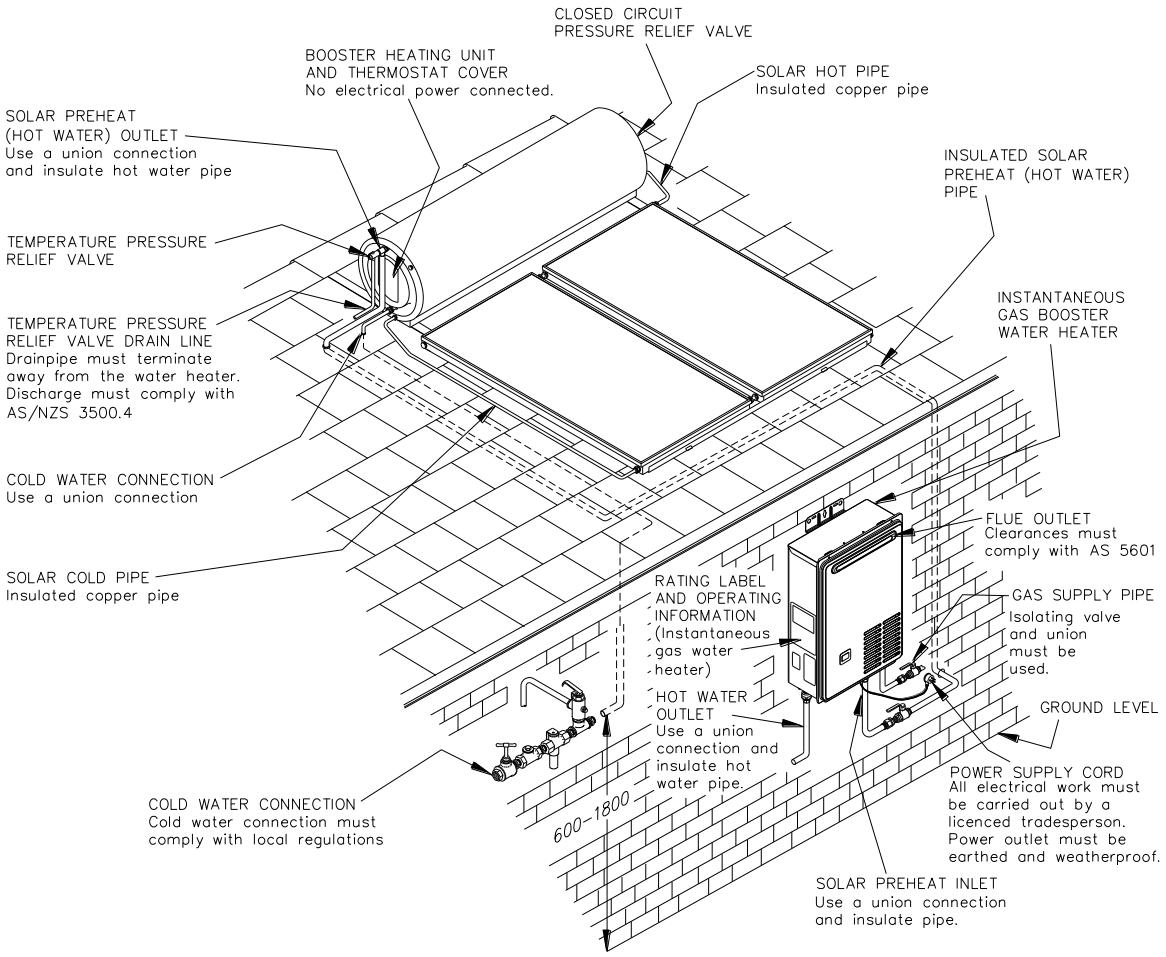
In this application the preset outlet temperature setting of the heater must be set at 70°C to comply with the requirements of AS 3498. Refer to page 9 for details on checking and adjusting the preset outlet temperature. **Note:** 60ºC models manufactured prior to October 2010 do not have a 70ºC hot water outlet setting and must be set at 60ºC.

Note: If an existing 871 series Integrity water heater with a bypass valve is replaced the solar bypass valve must be removed and the plumbing connections remade directly to the inlet and outlet water connections of the replacement water heater.

In-series Gas Boosting - Solar Loline Installation



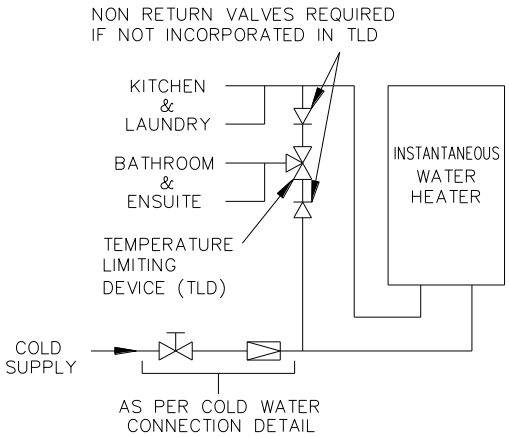
In-series Gas Boosting - Solar Hiline Installation



TEMPERING VALVES

48°C models (246, 276, 876 series) comply with AS/NZS 3498 and therefore do not require a tempering valve to be fitted unless the unit is installed in an early childhood centre, school, nursing home or a facility for young, aged, sick or disabled people.

It may be required by regulations that an approved temperature limiting device be fitted on 60°C models (244, 274, 874 series). Where a tempering valve is fitted and there is not a separate untempered line for the kitchen or laundry areas, the kitchen temperature controller will be able to display temperatures above 50°C however the delivered water temperature at the tap will be that set by the tempering valve which will be no hotter than 50°C.



To enable delivery of hot water at temperatures above 50°C a separate untempered line must be provided that supplies hot water exclusively to kitchen and laundry areas (refer to diagram).

CONTROLLERS

Continuous flow gas water heaters can be fitted with optional controllers as long as they are not being used in conjunction with a solar system. There are 2 types of controllers available, standard or deluxe:

Controller Type	Bathroom 1	Bathroom 2	Kitchen
Standard	299854	299855	299853
Deluxe	299859	299860	299858

Standard and deluxe controllers **cannot** be mixed in a single installation; other manufacturers' controllers cannot be used.

One, two or three unique controllers can be installed, however if a Bathroom controller is installed without a Kitchen controller then the maximum selectable hot water temperature will be limited to 50°C when connected to a 60°C model (244, 274, 874 series) 48°C when connected to a 48°C model (246, 276, 876 series).

48°C models (246, 276, 876 series) are factory set so that they cannot deliver water hotter than 48°C.

When no hot water is flowing, temperatures can be selected between 37°C and 43°C by pressing and holding the temperature control buttons, to select temperatures above 43°C press the temperature control button once for each selection.

A controller must be turned on and must display the 'Priority' indicator in order to allow adjustment of water temperature.

When hot water is flowing, the temperature can be increased from 37°C to 43°C only. The water temperature can be decreased from any setting whether hot water is flowing or not.

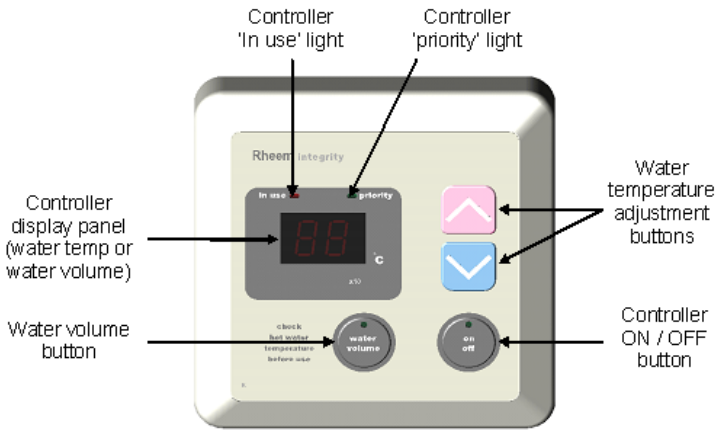
Standard Controller

Note: If one or more controllers are installed, at least one must be ON for the water heater to operate. If all controllers are OFF the water heater will only deliver cold water.

Selectable Temperatures:

Kitchen Controller:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50[(2)], 55[(2)], 60°C[(2)]

Bathroom Controllers:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50°C[(2)]



[(2)] Temperatures of 50°C and higher are not available on controllers fitted to 48ºC models (246, 276, 876 series) as these units have a maximum selectable temperature of 48°C at all locations.

Standard Controllers (cont'd)

ON / OFF button	This button must be pressed once to turn on the controller. The light in the button will glow when the controller is on. A controller cannot be turned on if water is flowing from a hot tap. To turn off a controller, press the on / off button once. The light will go out. A controller can be turned off whilst water is flowing.
Priority light	This light will glow on a controller when that controller has priority. The Bathroom controller(s), if they are turned on, have priority over the Kitchen controller. Priority means that controller has control of the water heater temperature setting. The water temperature setting can only be adjusted by the controller that has priority.
In use light	This light will glow on all controllers, whether they are on or off, when hot water is flowing, regardless of which controller has priority.
Display panel	The current temperature setting is displayed on all controllers (whether hot water is flowing or not), when any controller is on. If all controllers are off, then the display remains blank. The water volume can also be displayed on the Kitchen controller. The x10*l* symbol glows when the water volume is displayed.
⮝ (up button)	The up button increases the temperature setting.
⮟ (down button)	The down button decreases the temperature setting.
water volume button	(Kitchen controller only) – This feature enables an alarm to sound when a set volume of water has flowed through the water heater (refer to notes below).

Water volume notes:

- The water volume function is designed to warn, by a beeping sound, that a certain volume of water has been delivered from the water heater. **It does not stop either the flow of or the heating of water.**
- The Kitchen controller does not require priority nor to be on in order to set the water volume function.
- The water volume function can be set whilst a hot tap is open.
- The water volume alarm will only sound from the kitchen controller.
- The factory preset water volume is 180 litres.
- To turn off the water volume function before the alarm sounds, press the water volume button twice.
- The water volume is measured as the water flows through the water heater. Therefore if more than one hot tap is open, the alarm will respond to the total water volume drawn from all taps and the expected water volume from the first tap will be decreased.
- If the hot tap is closed before the set water volume flows through the water heater and the water volume button is left on, then the alarm will sound when the remaining water volume is consumed during a later operation. To prevent the alarm from sounding, press the water volume button twice to turn it off.

Deluxe Controller
(Shown with Bath-Fill control cover open)

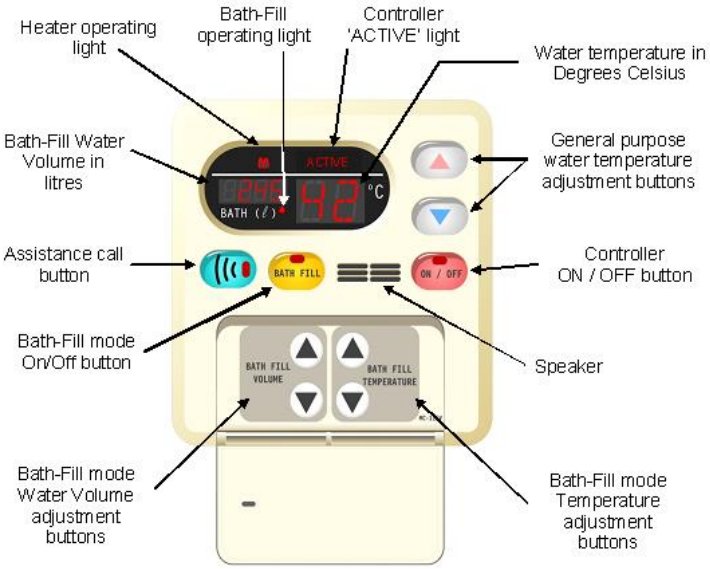
Note: If one or more controllers are installed, at least one must be ON for the water heater to operate. If all controllers are OFF the water heater will only deliver cold water.

Selectable Temperatures:

Deluxe Kitchen Controller:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50[3], 55[3], 60°C[3]

Deluxe Bathroom Controllers:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50°C[3]

Bath-Fill Mode – All Deluxe Controllers:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48°C



[3] Temperatures of 50°C and higher are not available on controllers fitted to 48ºC models (246, 276, 876 series) as these units have a maximum selectable temperature of 48°C at all locations.

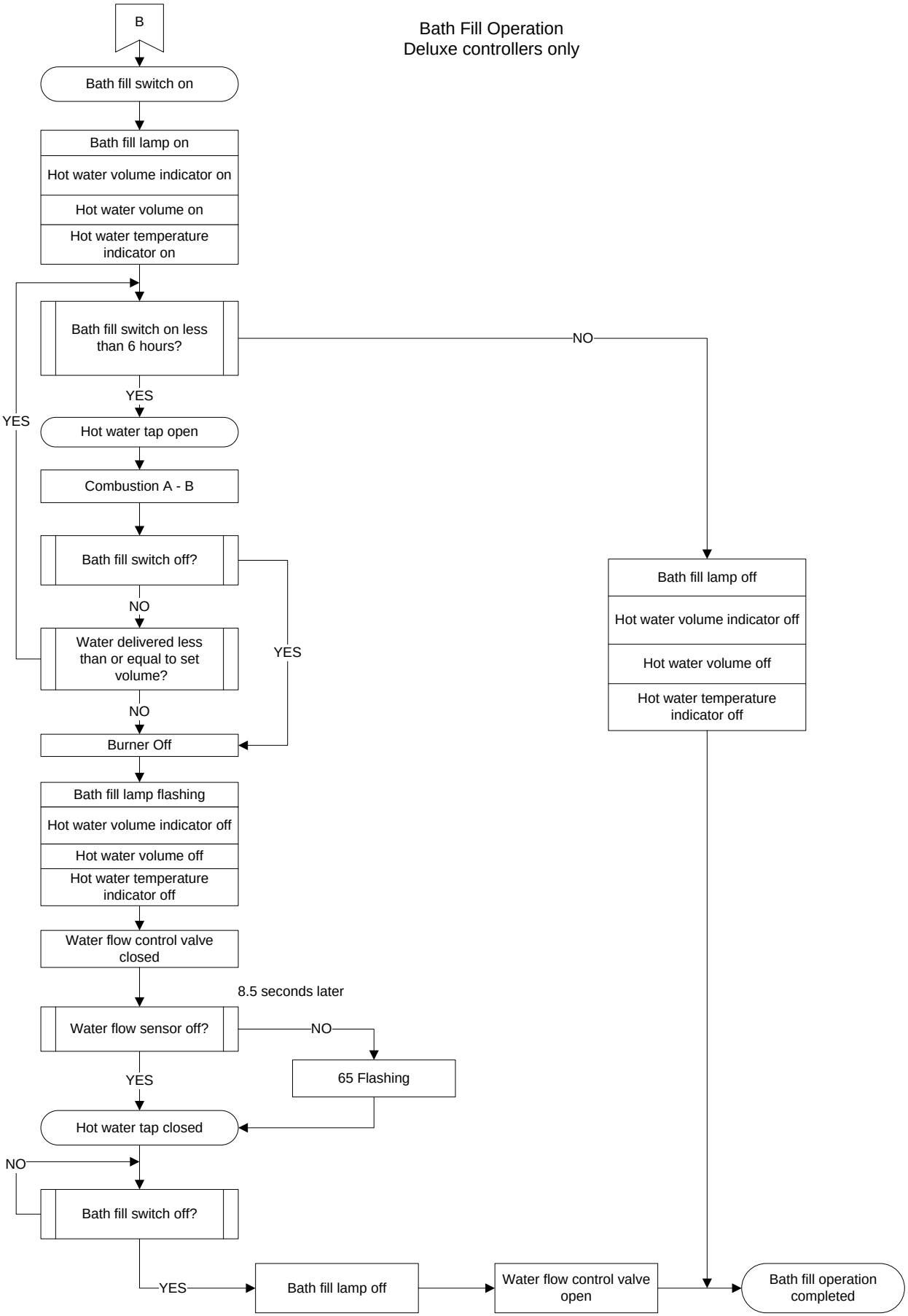
Deluxe Controller Functions

ON / OFF button	Press once to turn on the controller. The button will glow when the controller is on. A controller cannot be turned on if water is flowing from a hot tap. Press the button to turn off the controller. A controller can be turned off whilst water is flowing.
Bath-Fill button	Initiates Bath-Fill mode and once pressed will display the last used Bath-Fill water volume in litres and the last used Bath-Fill temperature in °C. The displayed Bath-Fill water volume and temperature can be adjusted by using the Bath-Fill water volume and temperature control buttons located beneath the hinged panel
Bath-Fill operating light	Illuminates whenever Bath-Fill mode is in operation.
▲ (up button)	Increases the Bath-Fill temperature setting.
▼ (down button)	Decreases the Bath-Fill temperature setting.
Bath Fill Water Volume ▲ (up button)	Increases the Bath-Fill water volume setting in increments of 10 litres up to 500 litres. A further setting of 990 litres can be selected

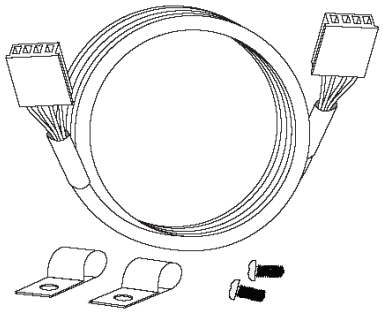
Deluxe Controller Functions (cont'd)

Bath Fill Water Volume ⮟ (down button)	Decreases the Bath-Fill water volume setting
Assistance Call button	When pressed sounds a message or alert tone on the Kitchen Controller indicating that assistance is required in the bathroom.
display	Displays the selected Bath-Fill water volume in litres. The quantity of water can be adjusted using the Bath-Fill Water Volume adjustment buttons located beneath the hinged panel
Heater Operating light	Illuminates on all controllers when hot water is flowing
Heater ACTIVE light	Illuminates when that controller is 'active'. The Bathroom controller when turned on, have priority over the Kitchen controller. Priority means that a controller has control of the water heater temperature setting. The water temperature setting can only be adjusted by the controller that is displaying the ACTIVE message.
Temperature Display	Displays the current temperature setting on all controllers in °C when any controller is on. If all controllers are off the display remains blank.
⮝ (up button)	Increases the general purpose temperature setting.
⮟ (down button)	Decreases the general purpose temperature setting.

Bath Fill Operation



EZ-LINK™ SYSTEM



The EZ-Link™ system is used to electronically control two identical water heaters and have them to operate as one.

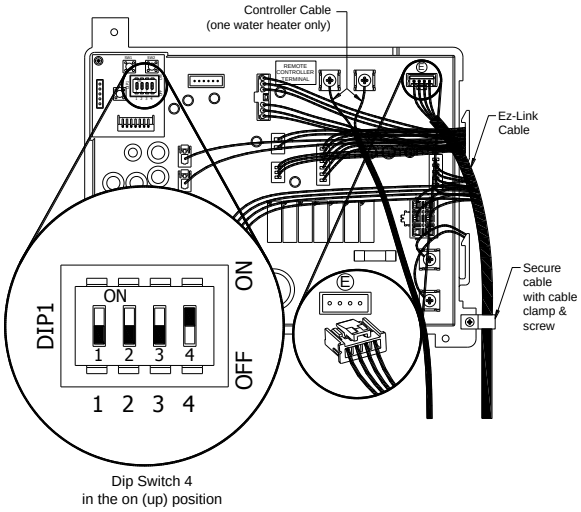
One or both water heaters may be in operation, depending upon the hot water demand. The second water heater will only operate when the hot water demand exceeds the capacity of the first water heater to supply.

The EZ-Link™ system consists of a cable that is connected between the PCB's.

The cable is connected into connector E on each PCB and dip switch 4 is turned to the 'on' position in each water heater (refer to diagram opposite).

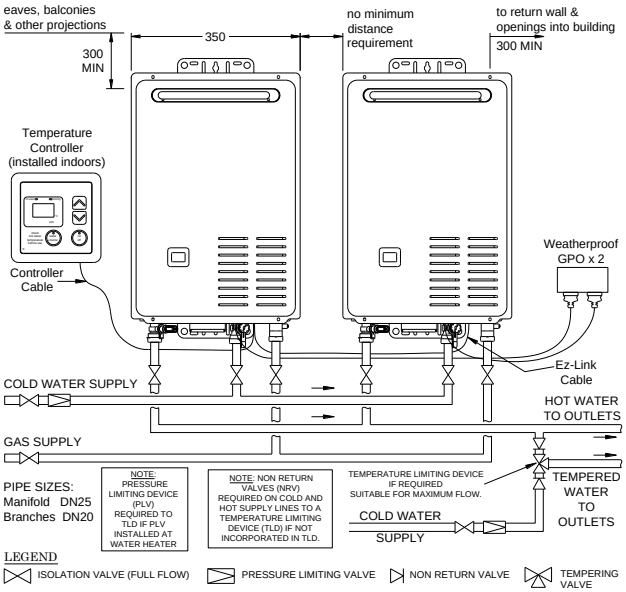
When a remote temperature controller is not used with an EZ-Link™ system one of the water heaters must be nominated as the master. Dip switch 3 is also to be switched 'ON' in one of the units to make it the master heater.

If a remote/s is to be fitted either the standard or deluxe temperature controller/s can be used. The unit that has the remote/s fitted will become the master unit.



The EZ-Link™ will vary the start up sequence of the two water heaters. These two continuous flow water heaters must be of the same model as the performance of two different models cannot be guaranteed.

If it becomes necessary to test the operation of both units, increase the hot water flow by opening multiple hot water outlets simultaneously until both units operate.



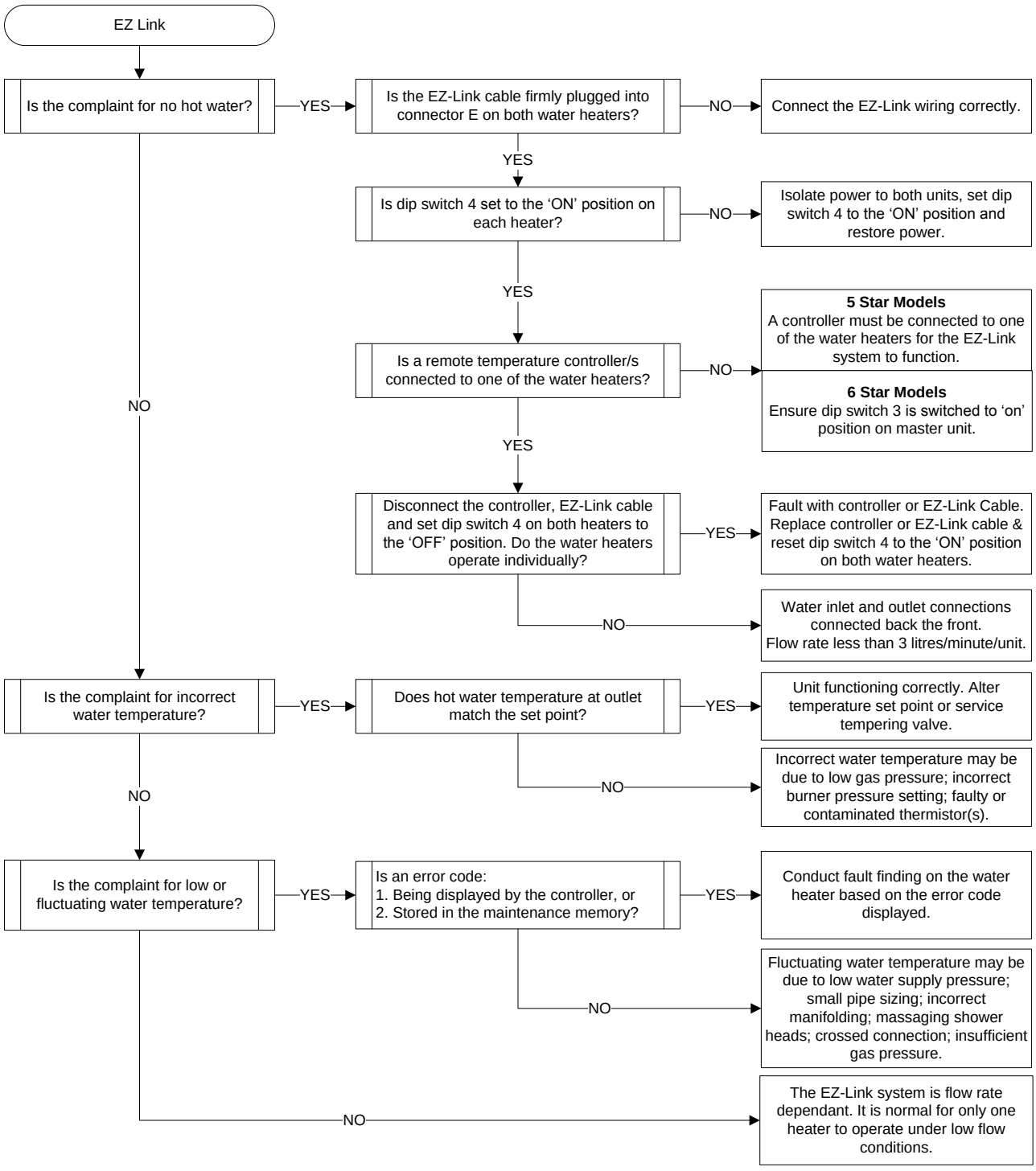
The diagram opposite details a typical installation utilising the EZ-Link™ system.

EZ-Link Error Code Display

If a fault is present with one of the water heaters connected via the EZ-Link system, in addition to displaying the normal error codes, the controller will also display a 1 or a 2 to indicate which unit is at fault.

1 indicates the master unit has the fault, 2 indicates the other unit has the fault.

EZ-Link Fault Finding



OPERATIONAL FLOW CHARTS

About the Operational Flow Charts

The Operational Flow Charts provide information on the start up sequence and, in the event a failure occurs at any point of the start up sequence, what error code will be displayed. Error codes are displayed via the red LED mounted on the PCB (refer to page 30 for details regarding interpretation of LED flashing pattern). If fitted, the controllers will also display the full range of error codes.

The Sequence Number Table below indicates the section of the operational sequence (boxed numbers on the operational flow chart) where the fault occurred.

Circled numbers, adjacent to the component or function, indicate the diagnostic test point required to diagnose the fault. Refer to the table on page 28.

By locating the error code in the diagnosis charts the component/s or fault can be quickly identified and tested using the diagnostic procedures outlined in this manual.

Notes and Abbreviations used in the Operational Flow Charts

P.G.F.R Valve	Proportional Gas Flow Regulating Valve	**F.F**	Flame Failure
G.I.S.V.	Gas Inlet solenoid Valve	**I.C**	Integrated Circuit
O.H.L	Over Heat Limiter	**S.V. 1**	Solenoid Valve 1
I.U.I	In Use Indicator (Combustion Indicator)	**S.V. 2**	Solenoid Valve 2

Stepping gas rate change sequence by solenoid

Model	Step 1	Step 2	Step 3
12/16/18/20L	S.V. 1 ON	S.V. 2 ON	S.V. 1 & 2 ON

Burner Configuration (Burner Change-Over Assembly)

Model	Burner 1	Burner 2
12/16/18/20L	Right Solenoid (S.V. 1)	Left Solenoid (S.V. 2)

Sequence Number Table

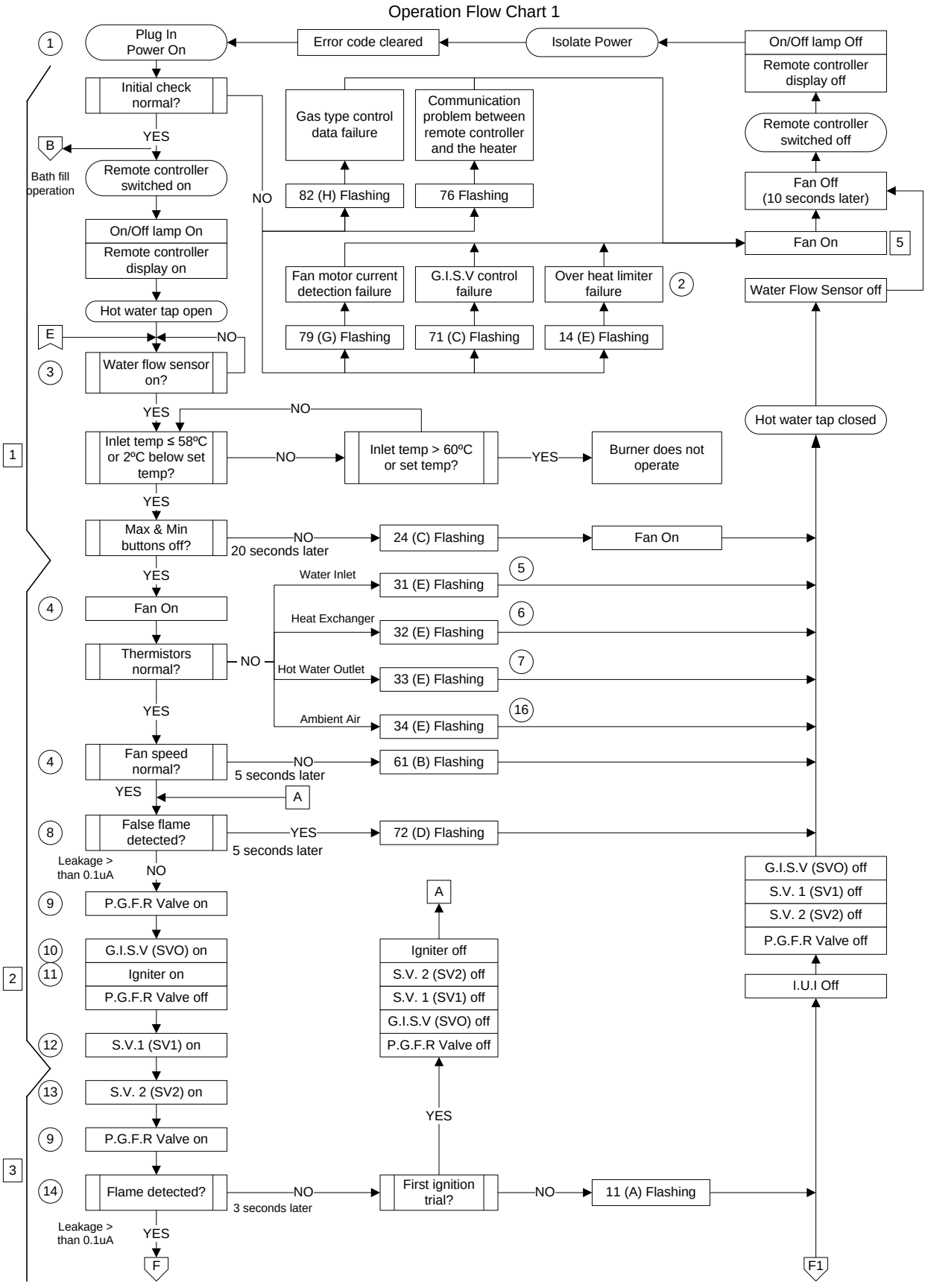
Sequence Number	- 0 to -9	A0 - A9 P0 - P9	C0 - C9	E0 - E9	H0 - H9 J0 - J9 L0 - L9
Operational Flow Chart Section	1	2	3	4	5

Test Equipment

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

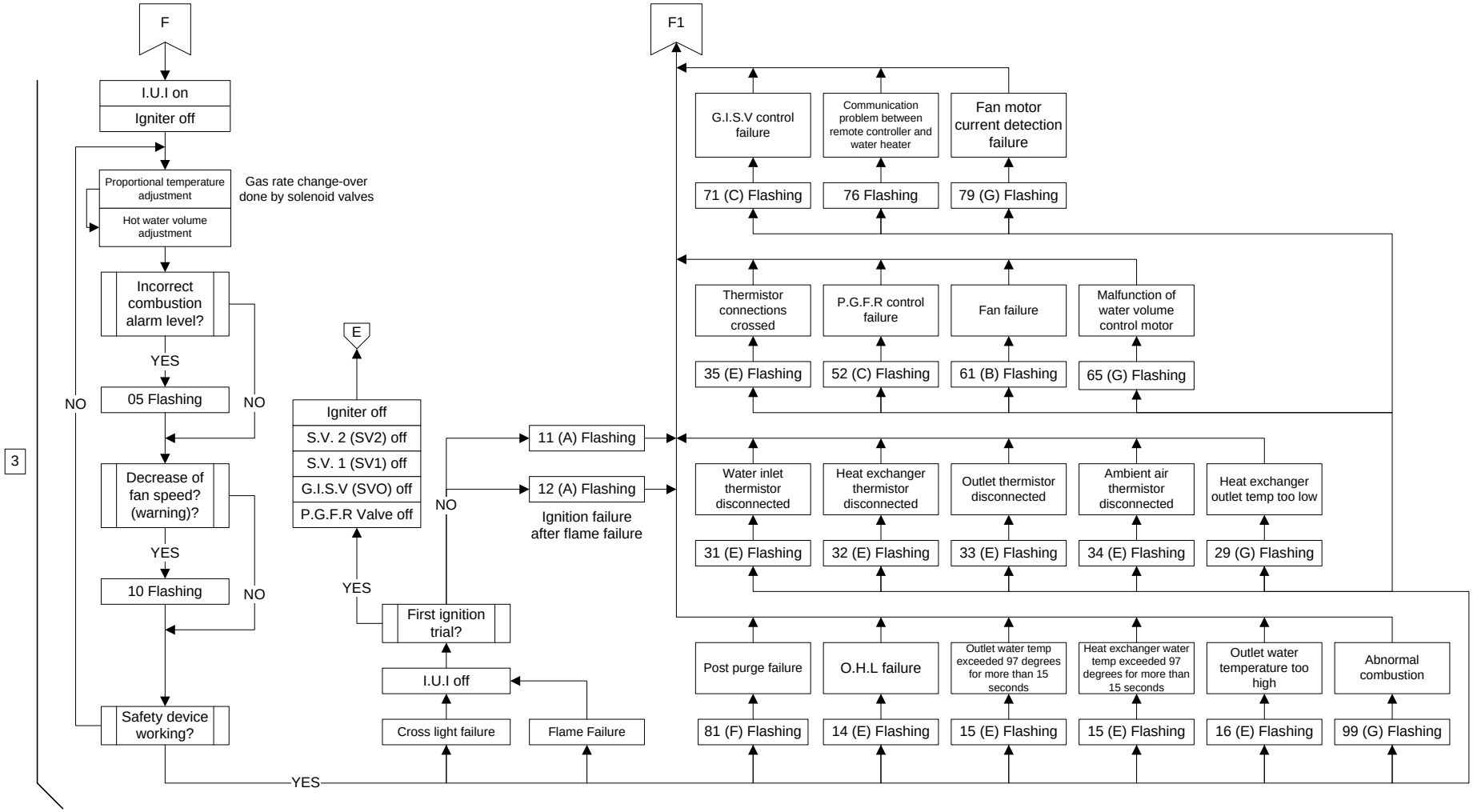
Flame detection simulator	WH0020080
Fine probe adapter kit	WH0020082
Heat exchanger fin brush	WH0020083
Probe to alligator clip kit	WH0020084

Operational Flow Chart



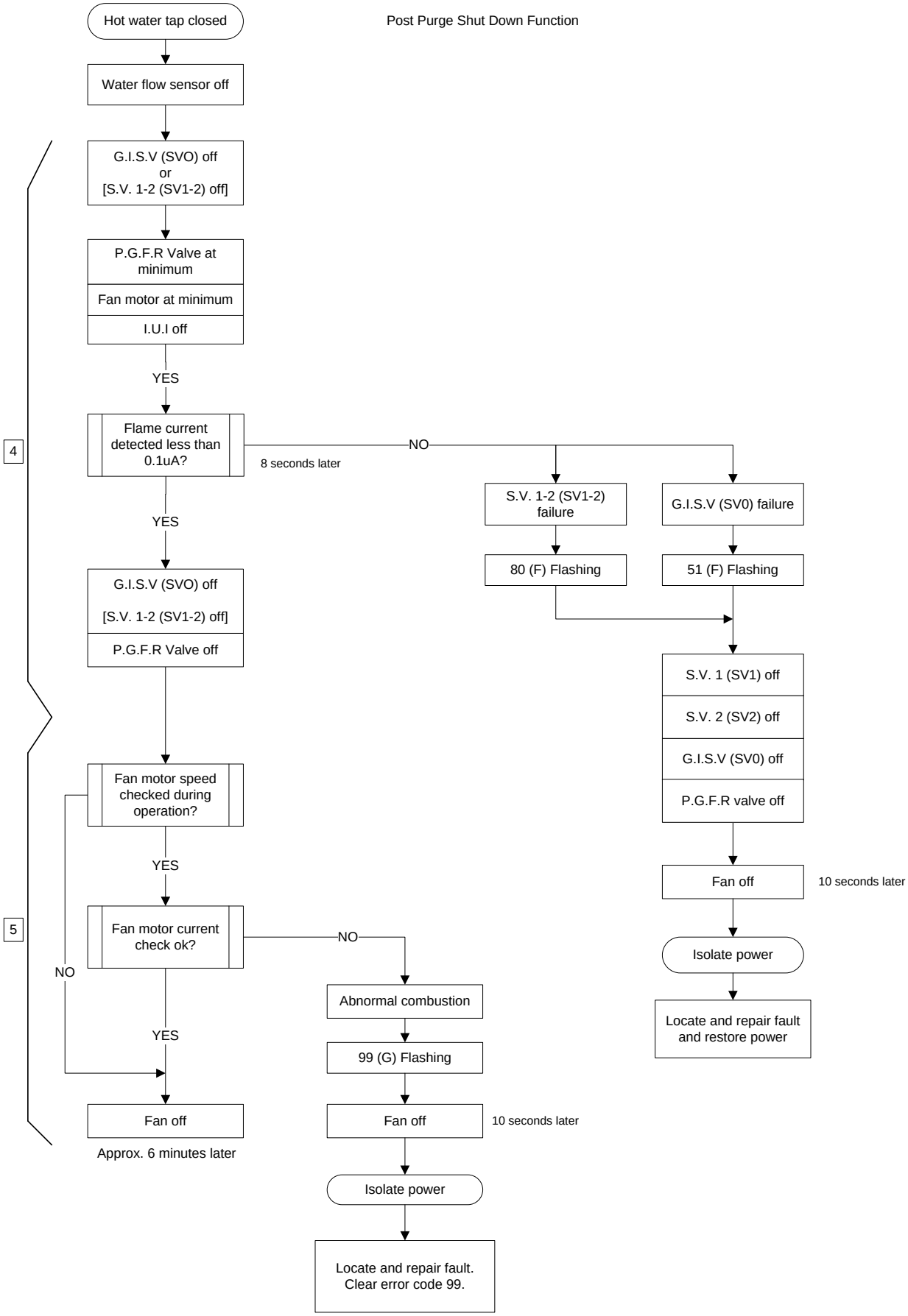
Note: Refer to page 23 for details on interpreting chart abbreviations. Refer to page 30 for details on interpreting LED flashing pattern.

Operational Flow Chart 2



Note: Refer to page 23 for details on interpreting chart abbreviations. Refer to page 30 for details on interpreting LED flashing pattern.

Operational Flow Chart 3



Note: Refer to page 23 for details on interpreting chart abbreviations. Refer to page 30 for details on interpreting LED flashing pattern.

ERROR CODES

The following table outlines the error codes, possible causes and diagnostic tests to conduct. More detailed diagnosis is outlined in the fault finding and operational flow charts.

Error Code LED pattern		Fault Condition	Items To Check
05	-	Heat Exchange outlet temp too low	Heat Exchanger, Air inlet.
10	-	Abnormal low rate combustion	Blockage in the h/exchanger, fan, air intake or flue
11	A	Ignition failure at start up Cross light failure	P.G.F.R Valve - diagnostic point 9 G.I.S Valve - diagnostic point 10 Igniter - diagnostic point 11 Solenoid valves 1 & 2 - diagnostic points 12 & 13, Flame sensors 1 & 2 - diagnostic point 14
12	A	Flame failure during operation	P.G.F.R Valve - diagnostic point 9 G.I.S Valve - diagnostic point 10 Solenoid valves 1 & 2 - diagnostic points 12 & 13, Flame sensors 1 & 2 - diagnostic point 14
14	E	Over heating	Over Heat Limiter - diagnostic point 2
15	E	Very high temperature	Heat exchanger thermistor - diagnostic point 6 Hot water outlet thermistor - diagnostic point 7 P.G.F.R Valve - diagnostic point 9
16	E	Outlet water temp too high	P.G.F.R Valve - diagnostic point 9
24	C	Operational switch faulty	MAX or MIN button on IC board
29	G	Heat Exchange outlet temperature too low	Heat Exchanger, Clean air inlet.
31	E	Inlet thermistor open circuit	Water inlet thermistor - diagnostic point 5
32	E	Heat exchanger thermistor open circuit	Heat exchanger thermistor - diagnostic point 6
33	E	Outlet thermistor open circuit	Hot water thermistor - diagnostic point 7
34	E	Ambient air thermistor open/short circuit	Ambient air thermistor - diagnostic point 16
35	E	Thermistor connections crossed	Connection points of thermistors
51	F	G.I.S Valve failure	G.I.S Valve - diagnostic point 10 Flame sensor 1 & 2 - diagnostic point 14
52	C	P.G.F.R control failure	P.G.F.R Valve – diagnostic point 9 IC Board
61	B	Abnormal fan speed	Fan motor – diagnostic point 4
65	G	Malfunction of water volume control motor	Water volume control motor - diagnostic point 15
71	C	G.I.S valve control failure	Gas Inlet Solenoid Valve - diagnostic point 10 IC Board (PCB)
72	D	Detected false flame	Flame sensors 1 & 2 - diagnostic point 8
76	-	Communication problem between controller and water heater	Controller, IC Board or cable
79	G	Fan motor current detection failure	Fan motor – diagnostic point 4, IC Board
80	F	Gas cut off defective	Solenoid valve 1 & 2 - diagnostic points 12 & 13 Flame sensor 1 & 2 - diagnostic point 14
81	F	Post purge malfunction (Solenoid valve 1 failure)	Solenoid valve 1 & 2 - diagnostic points 12 & 13 Flame sensor 1 & 2 - diagnostic point 14
82	H	Functional problem on GTC board	Gas type setting failure, IC board
99	G	Abnormal combustion	Blockage in the heat exchanger, fan, air intake or flue way

Note: Refer to page 23 for interpretation of abbreviations. Refer to page 30 for details on interpreting LED flashing pattern.

DIAGNOSTIC TEST POINTS

Refer to wiring diagram on page 6 for connector and wiring positions.

Test Point	Measuring Point		Normal Condition	Items Under Test
	Connector	Wire Nº & colour		
1	H & I	R – R	AC 90V – 110V	Main Power
2	T	W1 – W2	50 kilo-ohms – 500 kilo-ohms	Overheat Limiter
3	R	BR1 – BK2	DC 2V– 5V(Pulse) ***** More than 1310 pulse/min	Water Flow Sensor pulse signal
		R3 – BK2	DC 11V – 17V	Water Flow Sensor
4	F	B4 – W6	DC 120V – 160V	Fan Motor
		R3 – B4	DC 12V – 18V	
		Y1 – B4	DC 4V – 10V(Pulse) ***** More than 4800 pulse/min	Fan Motor pulse signal
5	Q	W6 – BK3	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Water Inlet Thermistor
6	Q	Y5 – BK3	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Heat Exchanger Thermistor
7	Q	R4 – BK3	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Hot Water Outlet Thermistor
8	L & J	W1 – Earth	AC 3V – 20V ******	Flame Sensor not detecting flame
	K & J	R1 – Earth	AC 3V – 20V ******	
9	Q	R1 – BK2	DC 1.5V – 14.0V 40 ohms – 80 ohms	Proportional Gas Flow R. V
10	J	Y1 – BK5	DC 75V – 100V 0.8 kilo-ohms – 2.2 kilo-ohms	Gas Inlet Solenoid Valve
11	G	GY2 – GY5	AC 90V – 110V	Igniter
12	J	W2 – BK5	DC 75V – 100V 0.8 kilo-ohms – 2.2 kilo-ohms	Solenoid Valve 1
13	J	R3 – BK5	DC 75V – 100V 0.8 kilo-ohms – 2.2 kilo-ohms	Solenoid Valve 2
14	L & J	W1 – Earth	AC 1V – 100V ******	Flame Sensor detecting flame.
	K & J	R1 – Earth	AC 1V – 100V ******	
15	B	W2 – BK8	DC 8V – 16V	Water Volume Control Motor position switch
		R7 – BK8	DC 8V – 16V	
		GR6 – BK8	Less than DC 1V (Limiter on) DC 4V – 6V (Limiter off)	
16	Q	B7 – BK3	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Ambient Air Thermistor

NOTES:

*** :** Approximate reading measured by digital multimeter on DC range.

**** :** Approximate reading measured by digital multimeter on AC range.

MAINTENANCE INFORMATION

Information relating to both the current and past operation of the water heater can be obtained from the memory; this information is referred to as the maintenance information.

The table below details the information that can be recalled from the memory i.e. to view the current temperature being measured by the outlet thermistor select 5Y, refer to page 30 for the procedure to display maintenance information.

Maintenance Table

Right digit in LED display (Alphabetical)	Left digit in LED display (Numerical) 0	1	2	3	4	5	6	7	8	9
E	Management Number	Error Code for the previous 8 faults								Management Number
F	Null	Sequence number of the previous 8 faults								Null
C	Total combustion starts X 10,000	Total combustion operations since last error X 10,000 hours								Null
D	Total combustion starts X 100	Total combustion operations since last error X 100 hours								Null
H	Total combustion period X 1000 hrs	Total combustion period since last error X 1,000 hours								Null
J	Total combustion period X 10 hrs	Total combustion period since last error X 10 hours								Null
Y	Flame sensor status (See table below)	Water Flow Sensor Litres / minute	Ambient Air Thermistor temp. ^{o}C	Water Inlet Thermistor temp. ^{o}C	Heat Exchanger Thermistor temp ^{o}C	Hot Water Outlet Thermistor temp ^{o}C	Fan speed X100 RPM	Power for P.G.F.R Valve	Null	Null
A	Null	Null	Fan detective value	Fan Motor Current	Fan Motor current curve - average	Fan Motor current curve - after tap closure	Fan Motor current curve -present combustion	Null	Null	Sequence number

Flame Sensor Status

Model	**All 12, 16, 18 & 20L Models**			
0y Information	**00**	**01**	**02**	**03**
Flame Sensor 1	X	O	X	O
Flame Sensor 2	X	X	O	O

X = Flame sensor is not detecting flame. **O** = Flame sensor is detecting flame

Displaying Maintenance Information

With Controller:

Isolate power whilst connecting a controller.

1. Fit controller if not already fitted.
2. Restore power supply and ensure the controller is turned OFF.
3. Press the temperature increase and decrease buttons simultaneously for 3 seconds.
4. Use the temperature decrease button to change the left digit (0→1etc.) in the controller display to the required maintenance code identified from the maintenance table on page 29.
5. Use the temperature increase button to change the right digit (E→F etc.) in the controller display to the required maintenance code identified from the maintenance table on page 29.
6. The maintenance code and the value of that code will alternate on the LED display of the Controller.
7. Press the on/off button twice on the controller to cancel maintenance information.

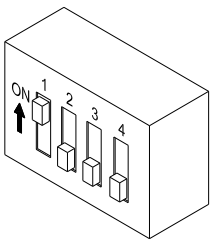
Without Controller:

Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

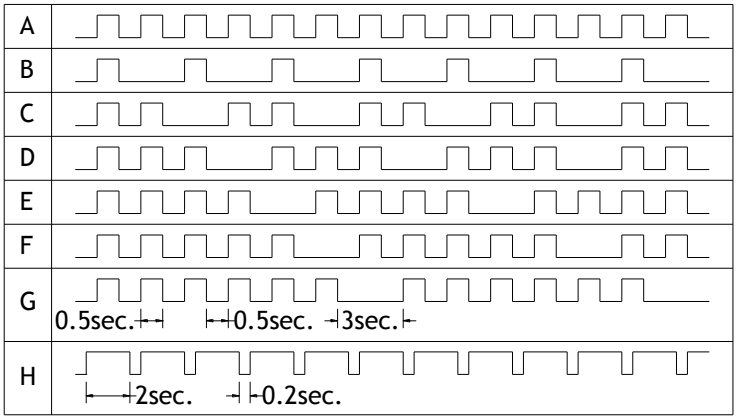
If a controller is not fitted, the red LED on the PCB can be used to show error code history. This method will only provide limited information regarding error codes. Specific maintenance information as listed on page 29 is not available unless a controller is fitted.

1. If the unit is in a fault condition, the red LED on PCB will be flashing. Previous error codes can be viewed by modifying the dip switch positions as below:

Dip Switch	1	2	3	4	State of Display
State of Switch	OFF	OFF	OFF	OFF	Normal Mode
	ON	OFF	OFF	OFF	Latest Error Code
	OFF	ON	OFF	OFF	2nd Error Code
	ON	ON	OFF	OFF	3rd Error Code



2. The red LED will flash in a specific pattern. Refer to adjacent chart in conjunction with error code information on page 27 to determine fault.



CLEARING ERROR CODE HISTORY

Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switches or MIN and MAX buttons.

After repairing the water heater the existing error code history should be cleared. This will allow fresh data to be stored and reduce the risk of confusion should it be necessary to service the water heater in the future.

To clear the error code history:

1. Ensure all controllers (if fitted) are turned off and all hot taps are closed.
2. Remove the front panel of the water heater.
3. Ensure all DIP SWITCHES are in the off position (down position).
4. Turn DIP SWITCH 1 on (up position) and then off (down position) again.
5. Within 5 seconds of turning DIP SWITCH 1 off, press and hold either the MIN or MAX button for more than 2 seconds.
6. Refit the water heater front panel.

RESETTING ERROR CODES

Most error codes can be reset by shutting off the hot water flow and turning the controllers (if fitted) off and then on again. It may also be necessary to isolate and restore the power. Where controllers are not fitted it may be necessary to turn the power off at the water heater to clear the error code.

To reset Error Code 99 it is necessary to:

1. Ensure all controllers (if fitted) are turned off and all hot taps are closed.
2. Ensure all DIP SWITCHES are in the off position (down position).
3. Turn DIP SWITCH 2 on (up position) and then off (down position).
4. Within 5 seconds of turning DIP SWITCH 2 off, press and hold both the MIN and MAX buttons for more than 2 seconds.
5. Refit the water heater front panel.

FAULT FINDING

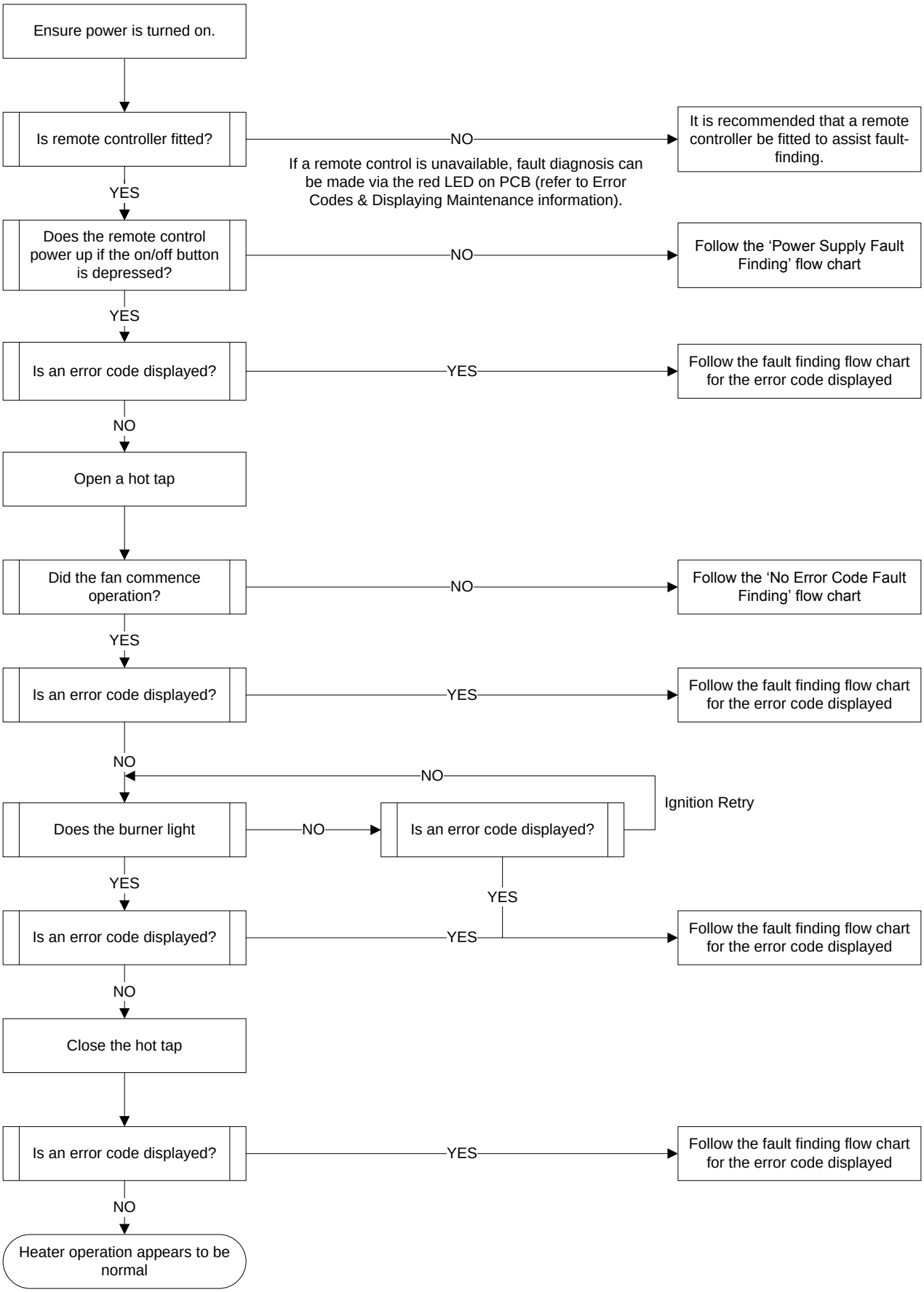
When measuring ***resistance*** of a part, turn off the electric power and be sure to disconnect the part completely before measuring (from connector or terminal). Resistance checks are performed on the part while it is disconnected from the control board.

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

All Molex connections only go to one location and fit one way. You do not need to force a connection. Connections are also colour coded to aid in reassembly.

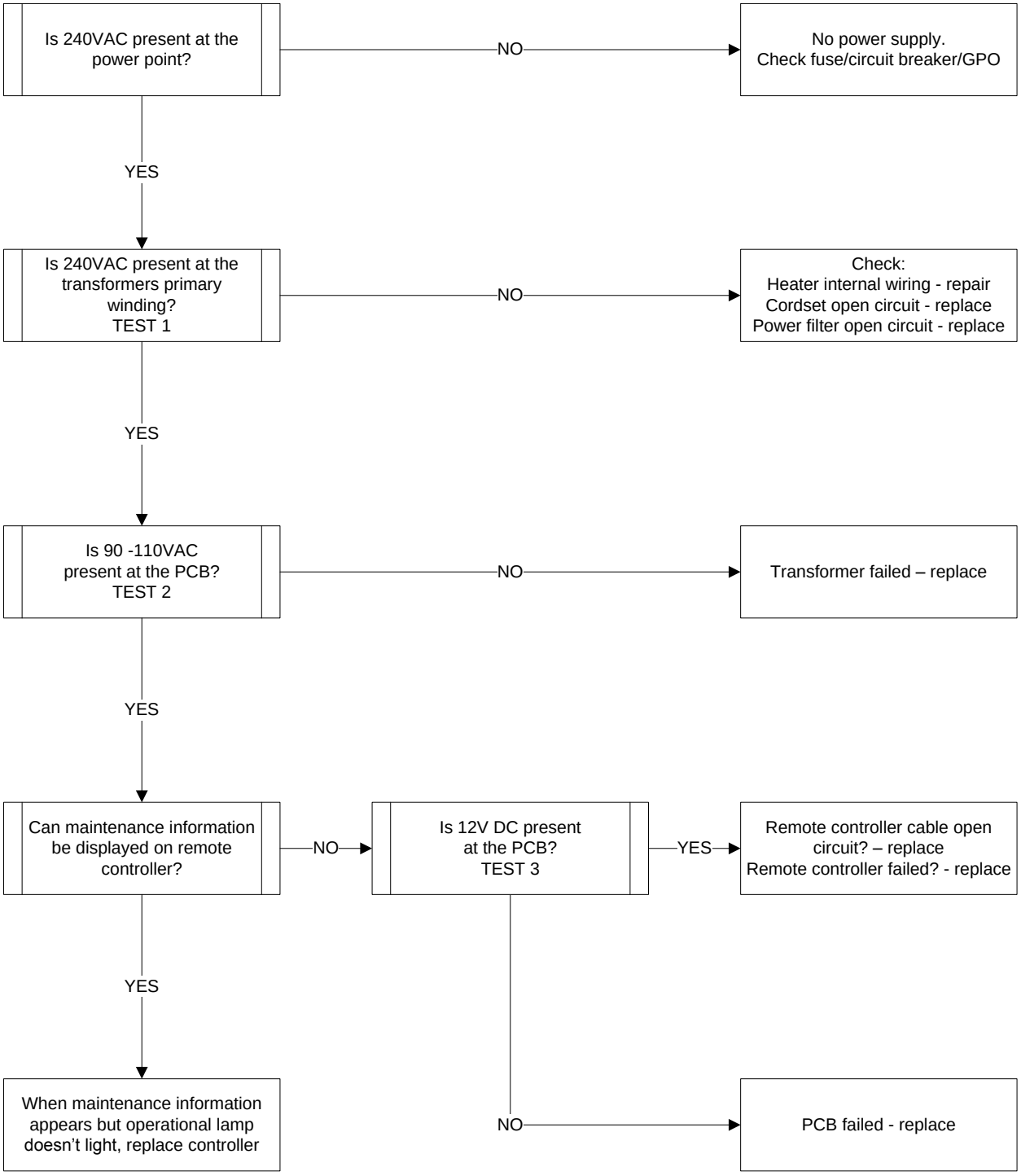
CAUTION: When performing maintenance and/or servicing the water heater, wait for the water heater to become cool. Be careful to avoid injury on the sharp edges.

Fault Diagnosis Sequence



The red LED on PCB can only supply limited information. For specific fault identification use a controller.

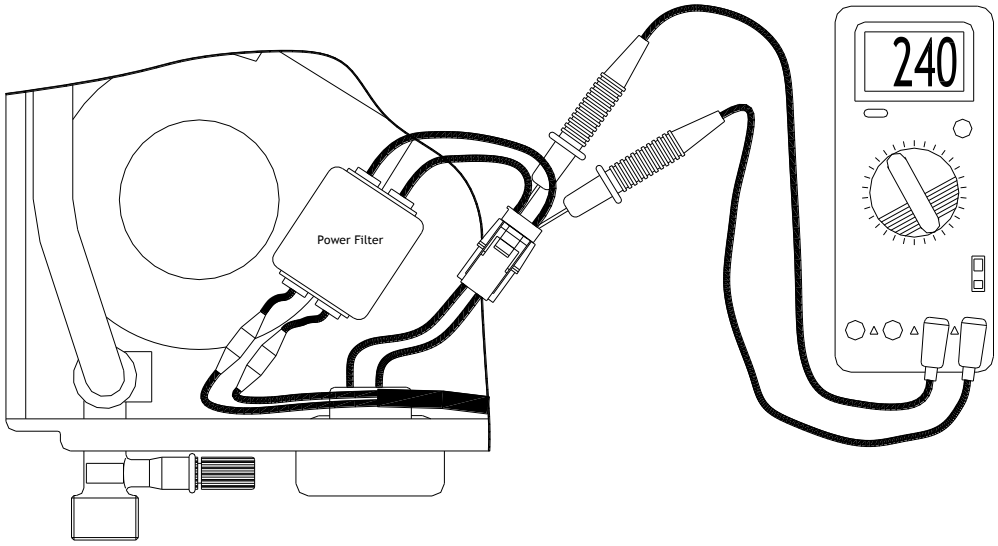
Power Supply Fault Finding



Fault Finding Tests 1 – 3

Components will be "Live" when conducting tests, exercise caution.

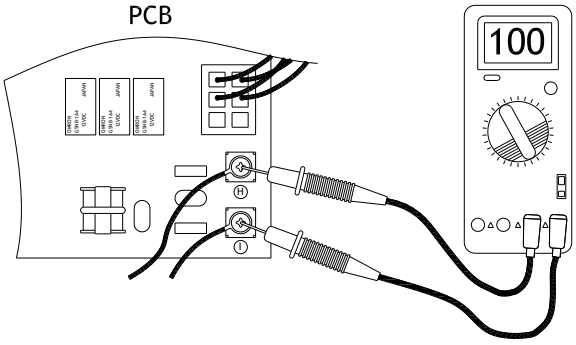
Test 1



Using a multimeter set on the AC volts scale, measure the voltage at the connector plug to the transformer primary winding.

Normal voltage is between 230V and 250V.

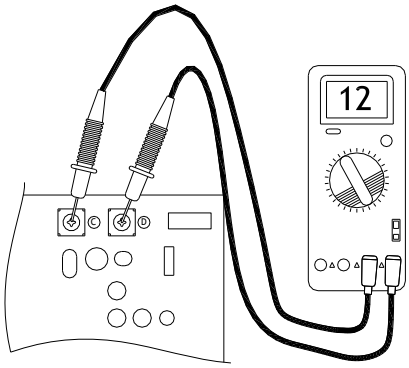
Test 2



Using a multimeter set on the AC volts scale, measure the voltage between red wires at terminals H & I on the PCB.

Normal voltage is between 90V and 110V.

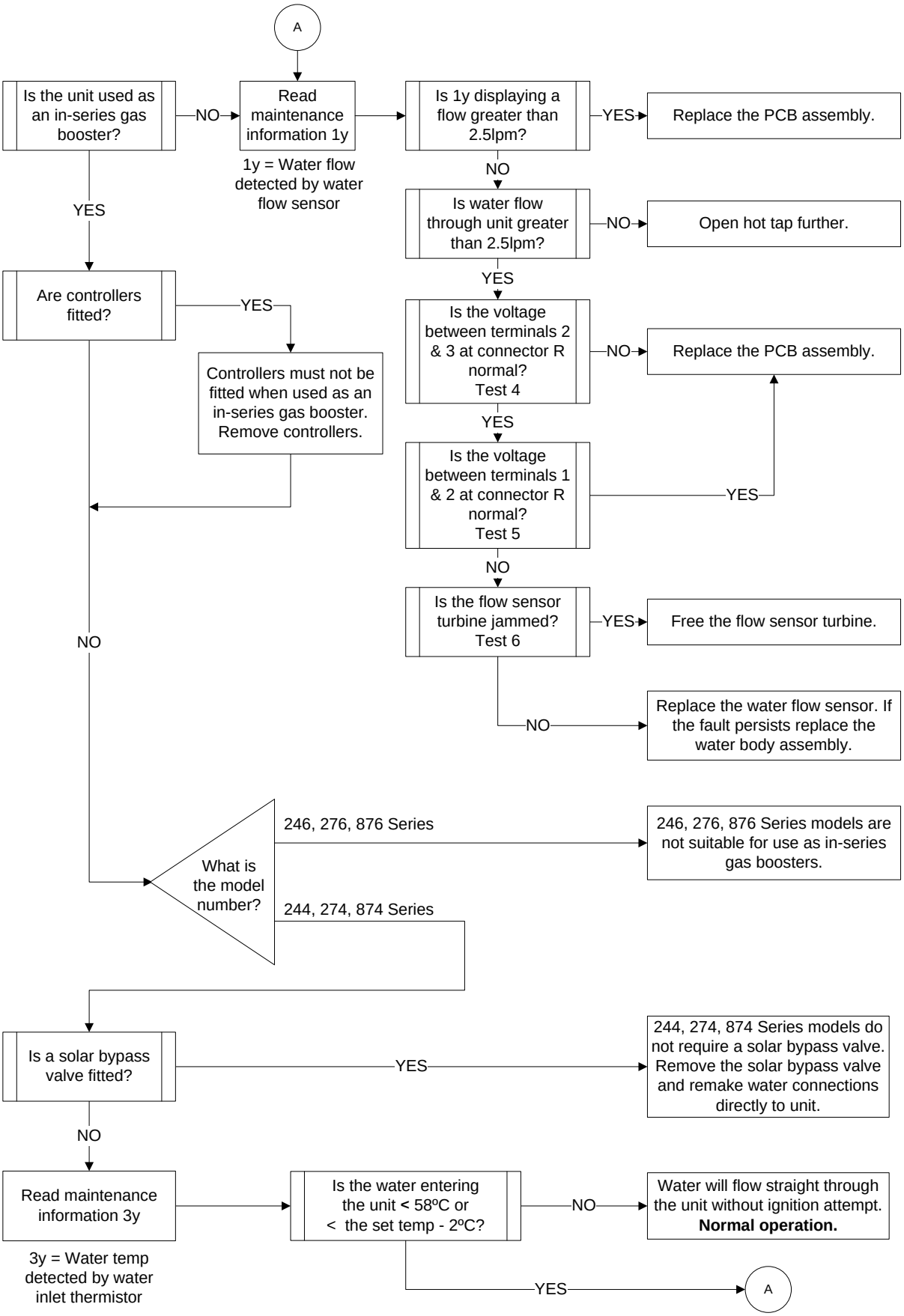
Test 3



Using a multimeter set on the DC volts scale, measure the voltage between terminals C & D on the PCB.

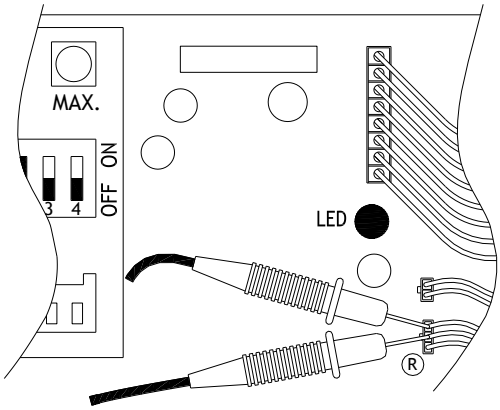
Normal voltage is 12V.

No Error Code Fault Finding



Fault Finding Tests 4 – 6

Test 4 - Diagnostic Point 3

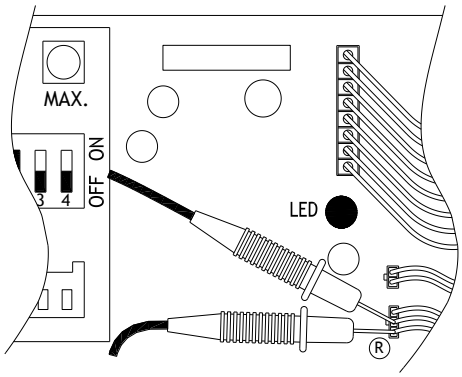


Conduct test with water flowing.

Using a multimeter set on the DC volts scale, measure the voltage between 3 Red and 2 Black on connector R.

Normal voltage should be between DC11 – 17V.

Test 5 - Diagnostic Point 3

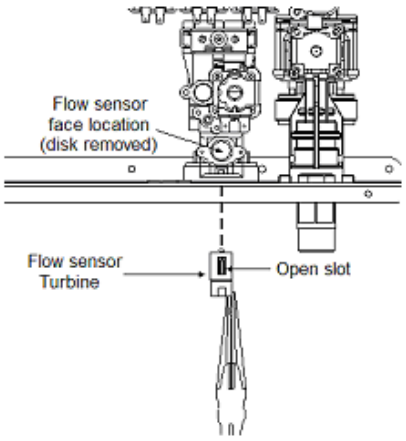


Conduct test with water flowing.

Using a multimeter set on the DC volts scale, measure the voltage between 1 Brown and 2 Black on connector R.

Normal voltage should be between DC2 – 5V.

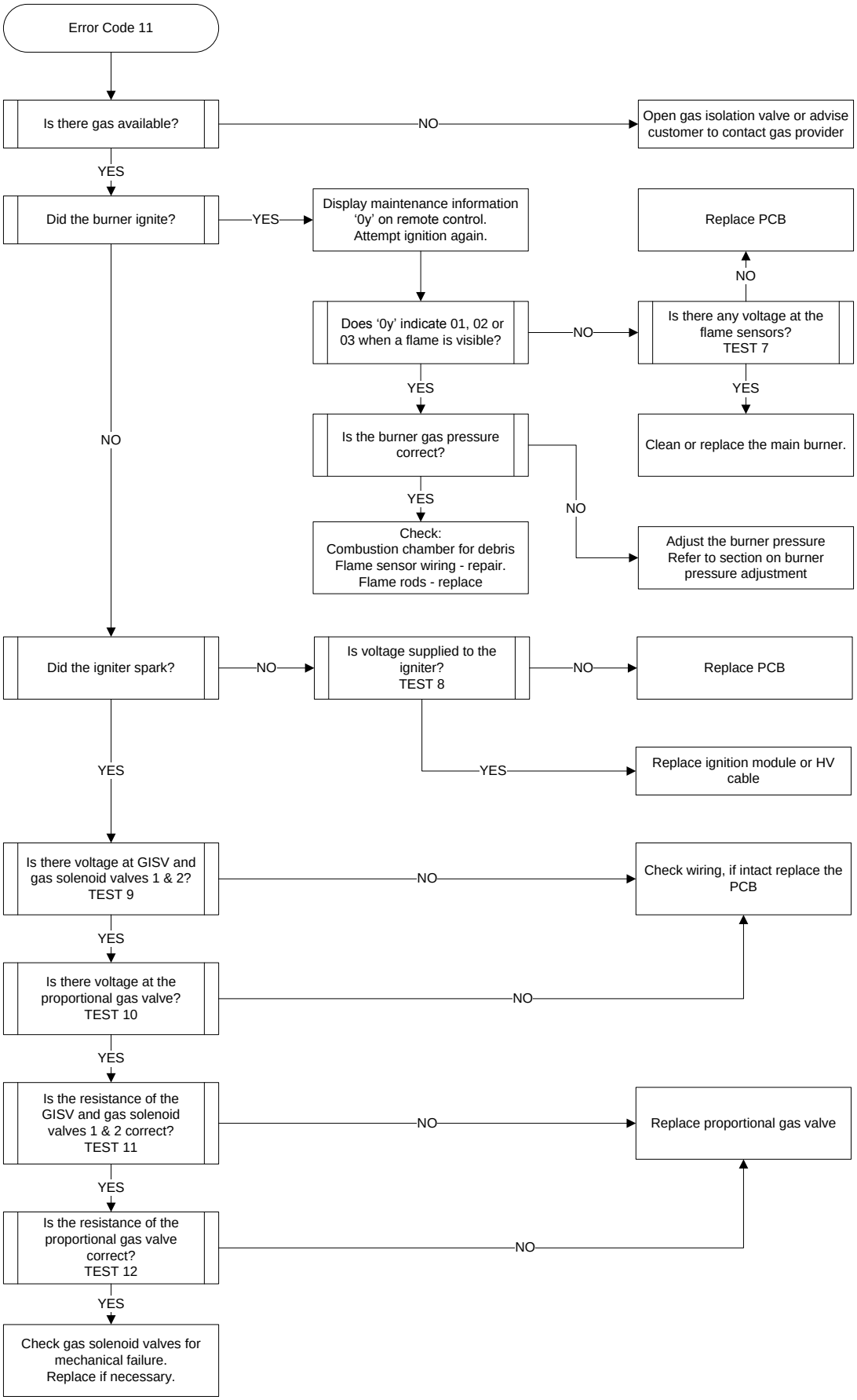
Test 6



Remove the flow sensor turbine. Refer to ‘Flow Sensor Turbine’ procedure on page 53.

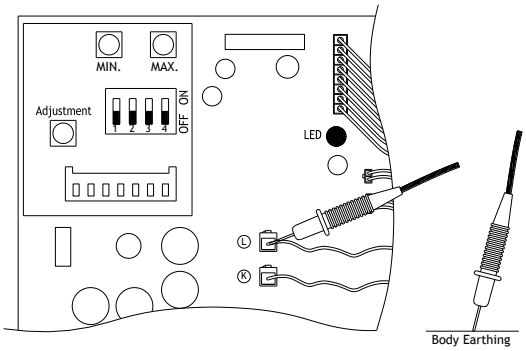
The flow sensor turbine should spin freely. Check for wear or blockage by foreign material such as thread tape. The power must be isolated during water flow sensor removal.

Error Code 11



Fault Finding Tests 7 – 9 & 11

Test 7 - Diagnostic Point 8

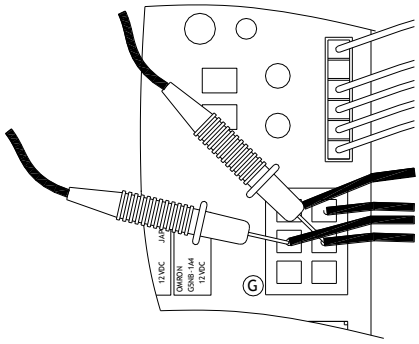


Conduct test with no water flow

Using a multimeter set on the AC volts scale, measure the voltage between terminals W1 on connector L and earth and between terminals R1 on connector K and earth.

Normal voltage should be between AC3 – 20V.

Test 8 - Diagnostic Point 11

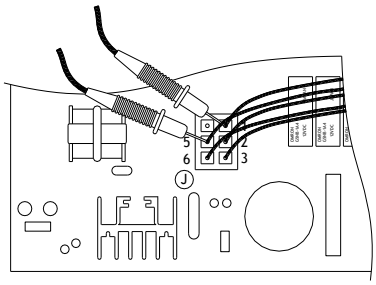


Conduct test with water flowing

Using a multimeter set on the AC volts scale, measure the voltage between the grey wires at connector G.

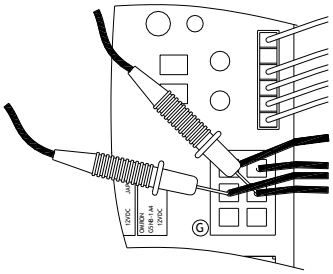
When ignition sequence commences, voltage should be between 90 - 110VAC until flame is detected. (Note: Duration is approx 3 seconds)

Test 9



Using a multimeter set on the DC volts scale, measure the voltage with connector J plugged into PCB.

Test 11



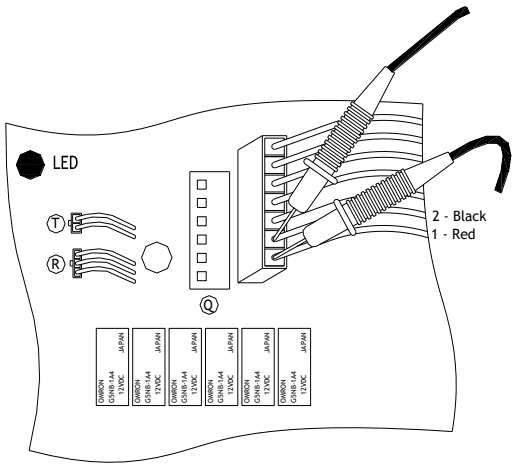
Using a multimeter set on the kilo-ohms scale, measure the resistance with connector J unplugged from the PCB.

Solenoid Valve	Normal Voltage	Test Point	Diagnostic Point
GISV	DC75 to DC120V	1 Yellow 5 Black	10
1		2 White 5 Black	12
2		3 Red 5 Black	13

Solenoid Valve	Normal Resistance	Test Point	Diagnostic Point
GISV	0.8Kohms to 2.2Kohms	1 Yellow 5 Black	10
1		2 White 5 Black	12
2		3 Red 5 Black	13

Fault Finding Tests 10 & 12

Tests 10 and 12 - Diagnostic Point 9



Test 10: Conduct test with water flowing.

Using a multimeter set on the DC volts scale, measure the voltage between 1 Red and 2 Black at connector Q whilst plugged into PCB.

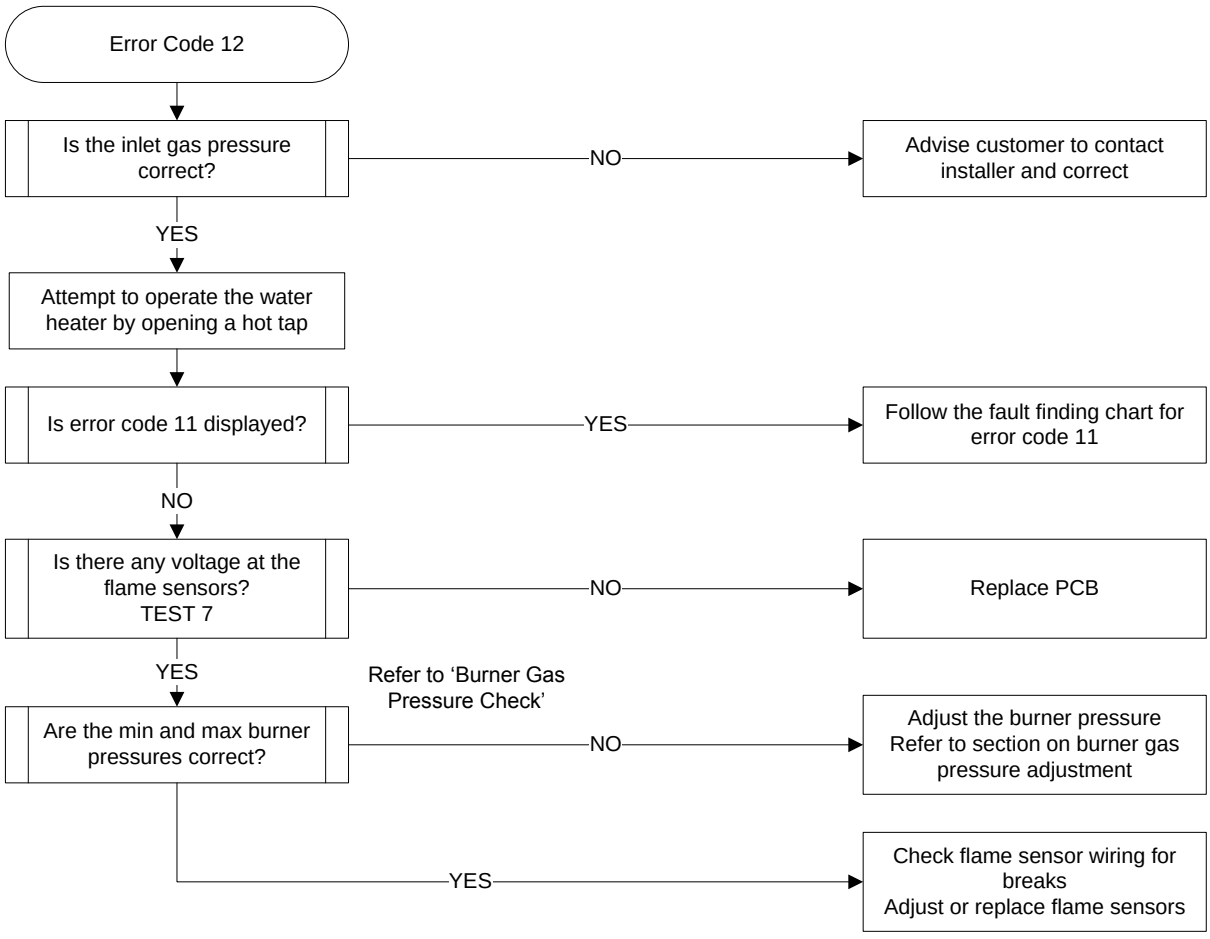
Normal voltage is between DC1.5 and 14.0V.

Test 12: Isolate power before conducting test.

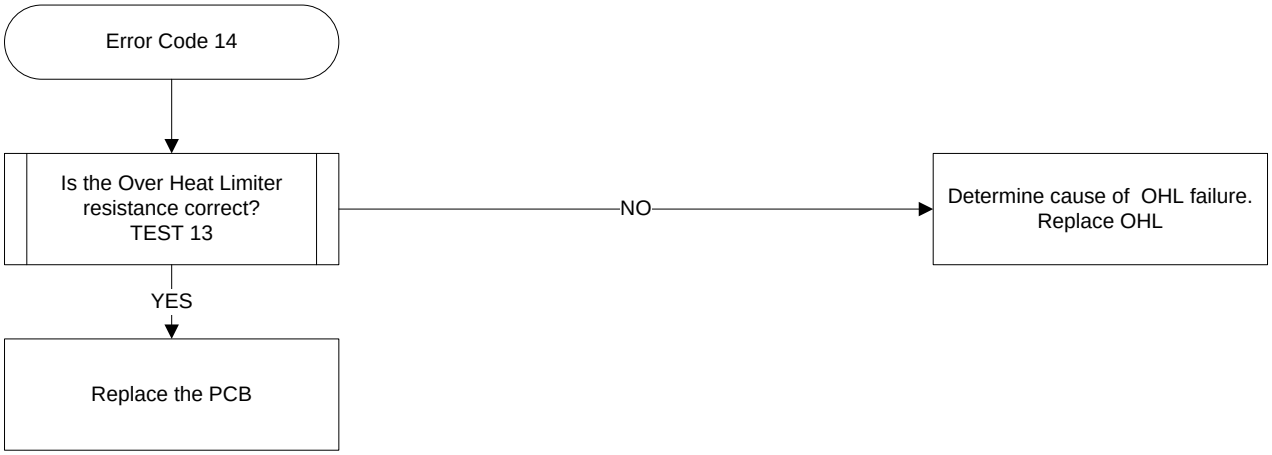
Using a multimeter set on the ohms scale, measure the resistance between 1 Red and 2 Black at connector Q whilst unplugged from the PCB.

Normal resistance is between 40 ohms and 80 ohms.

Error Code 12

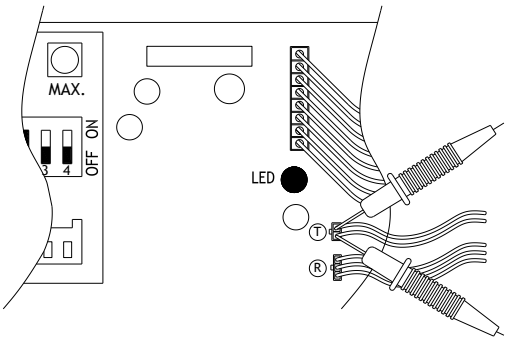


Error Code 14



Fault Finding Test 13

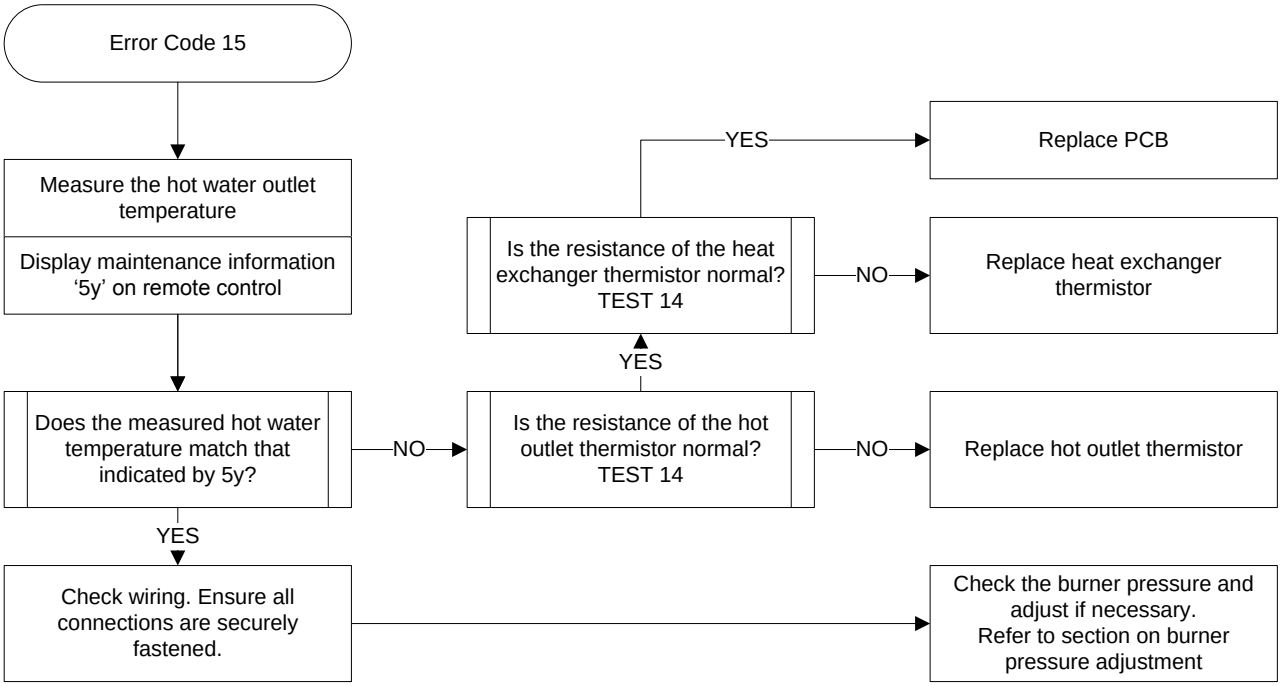
Test 13



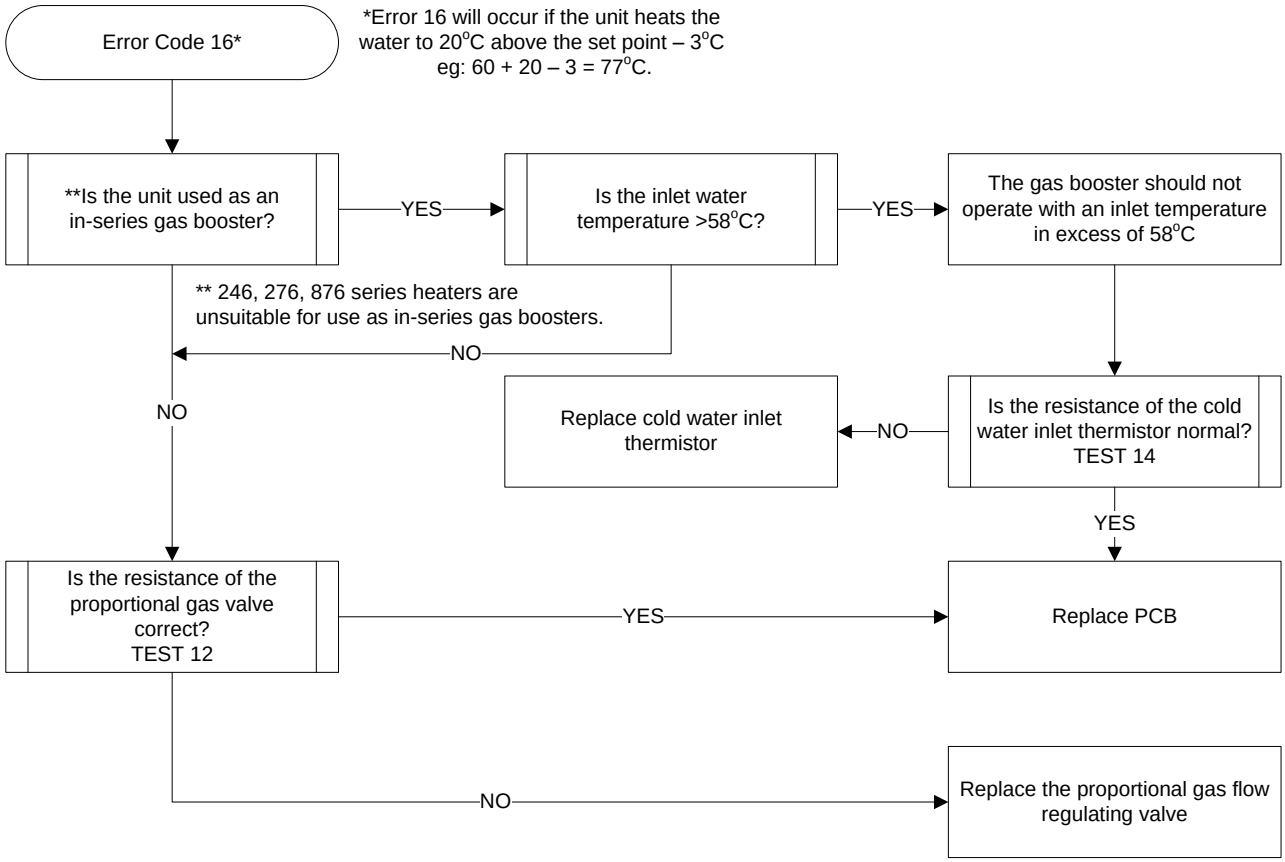
Unplug T connector from PCB and using a multimeter set on the kilo-ohms scale, measure the resistance of the Over Heat Limiter Assembly.

Normal resistance should be between 50 kilo-ohms - 500 kilo-ohms.

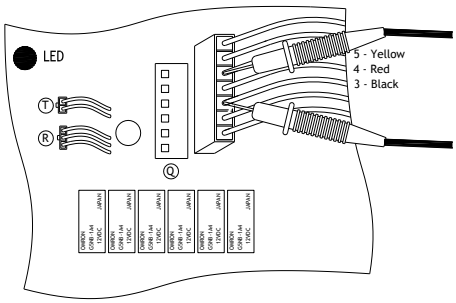
Error Code 15



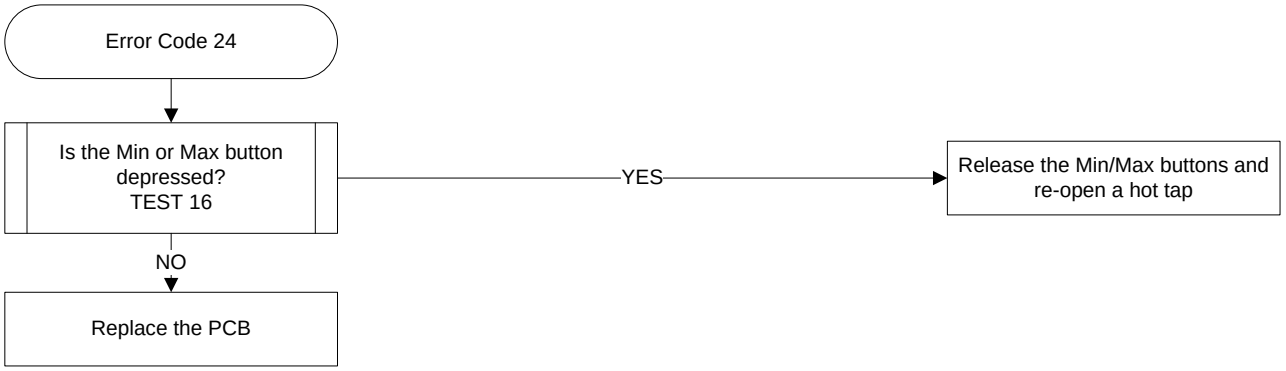
Error Code 16



Fault Finding Test 14

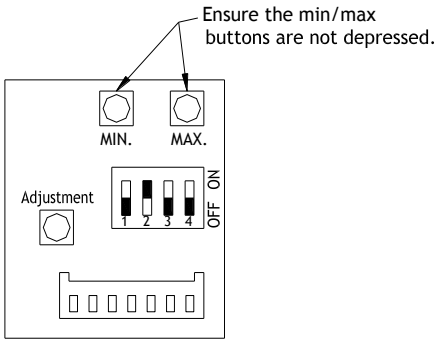
Test 14 – Diagnostic Points 5, 6, 7 & 16			
		 Isolate power before conducting test. Using a multimeter set on the ohms scale, measure the resistance at connector Q whilst unplugged from the PCB.	
Maintenance display code	**Diagnostic Point**	**Test Point**	**Measured Value**
2y: Ambient Air Thermistor	16	7 Blue 3 Black	@20ºC – 10.3 kilo-ohms @40ºC – 4.9 kilo-ohms
3y: Cold Inlet Thermistor	5	6 White 3 Black	
4y: Heat Exchanger Thermistor	6	5 Yellow 3 Black	
5y: Hot Water Outlet Thermistor	7	4 Red 3 Black	

Error Code 24



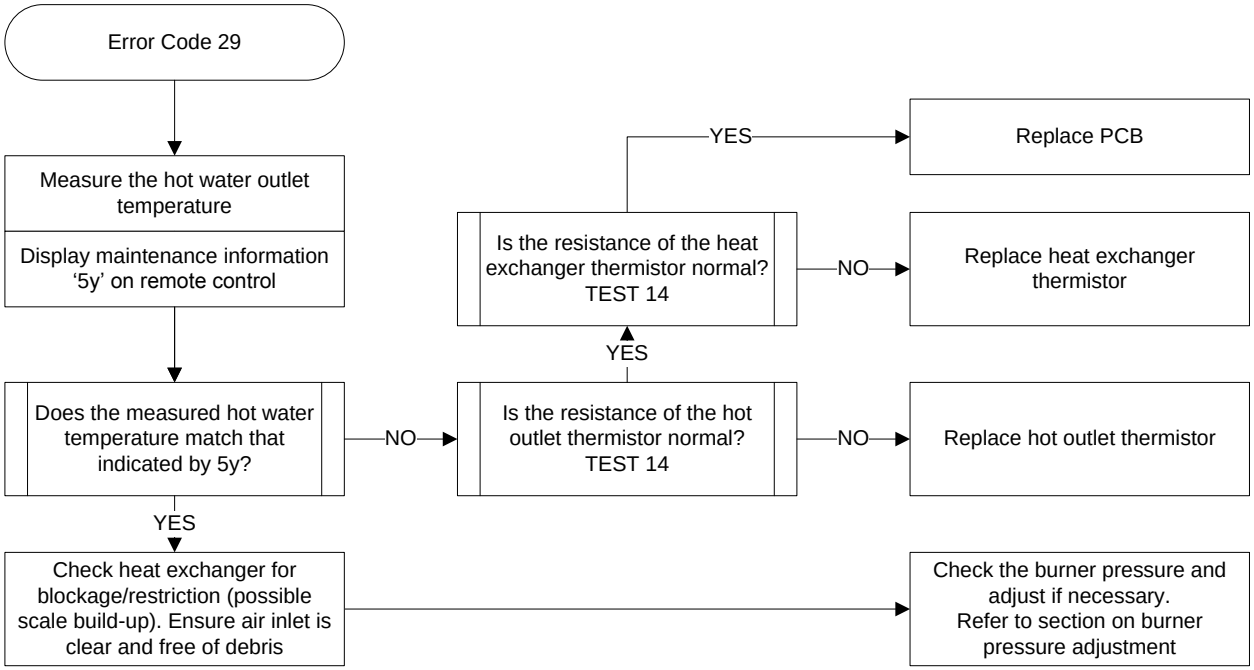
Fault Finding Test 16

Test 16

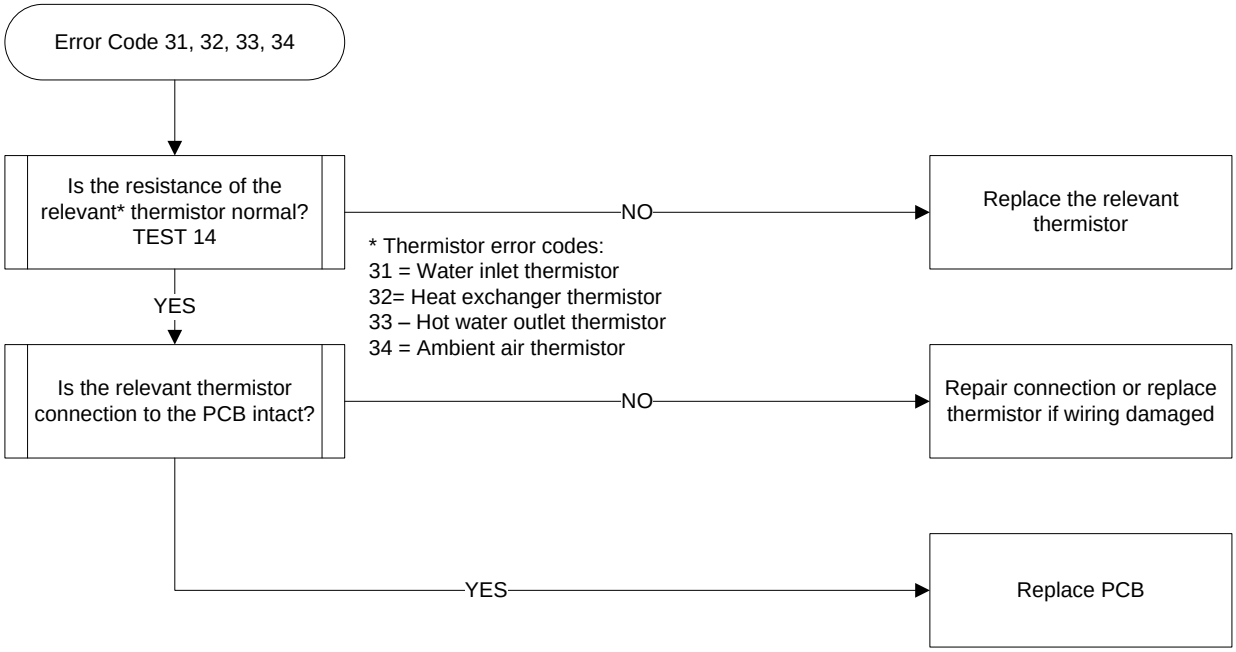


Are the controller cables or any other cables/components inadvertently depressing the Min or Max buttons on PCB?

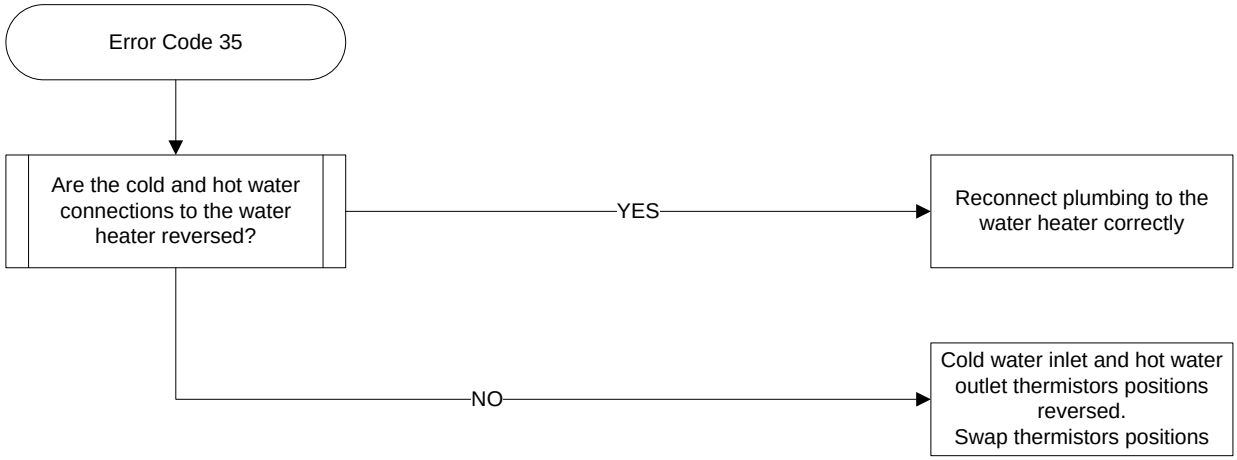
Error Code 29



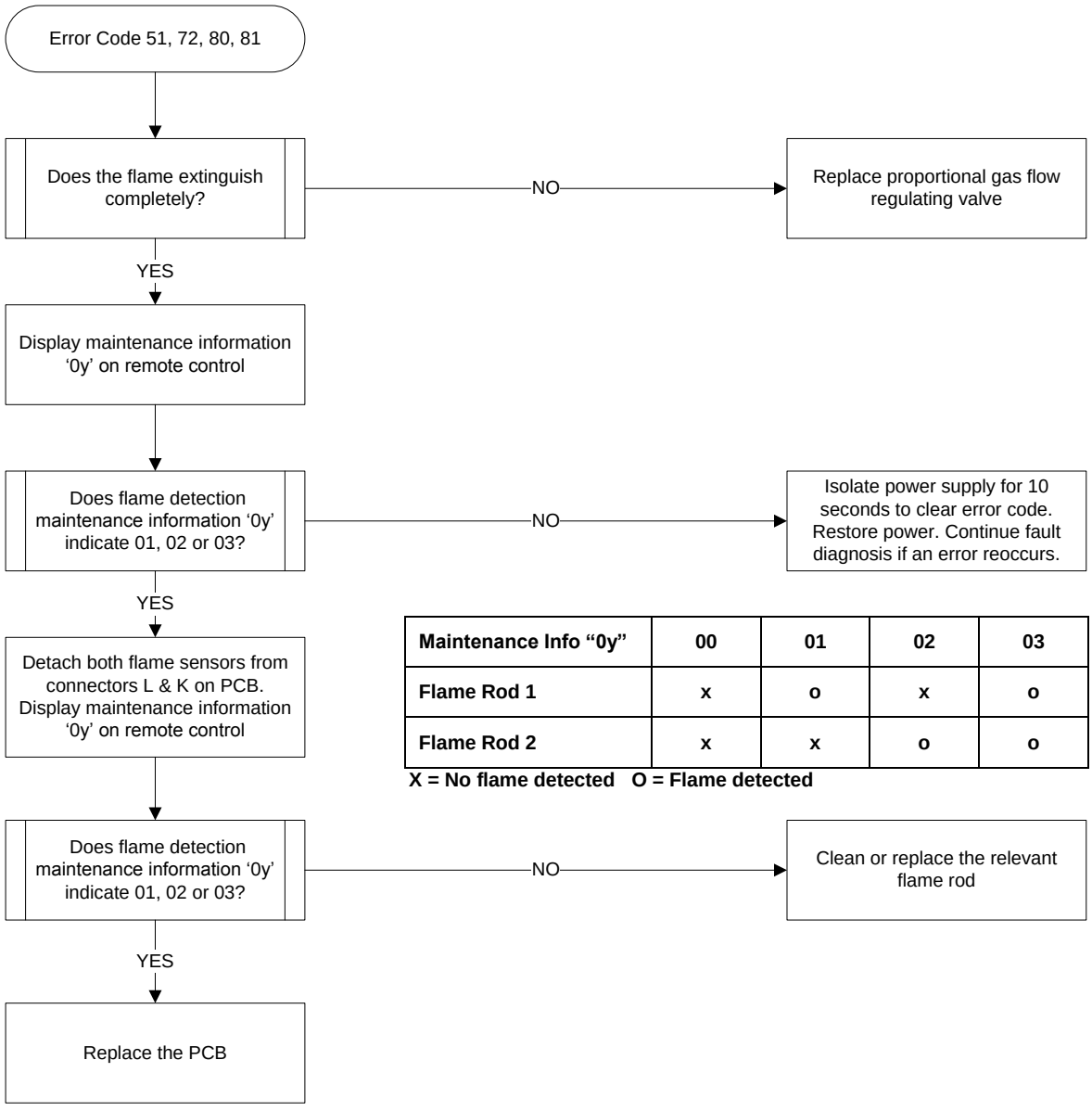
Error Code 31, 32, 33 & 34



Error Code 35



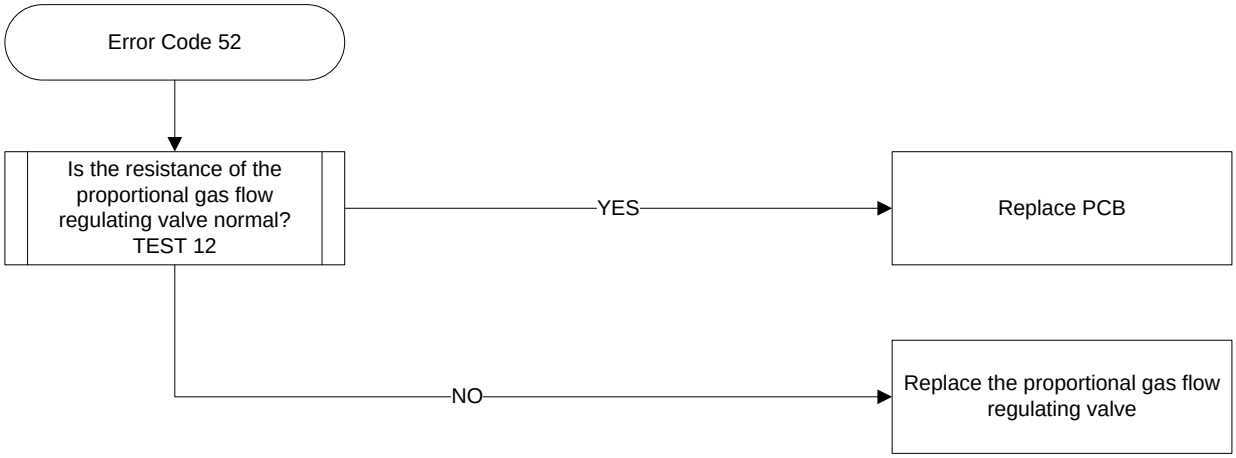
Error Code 51, 72, 80, 81



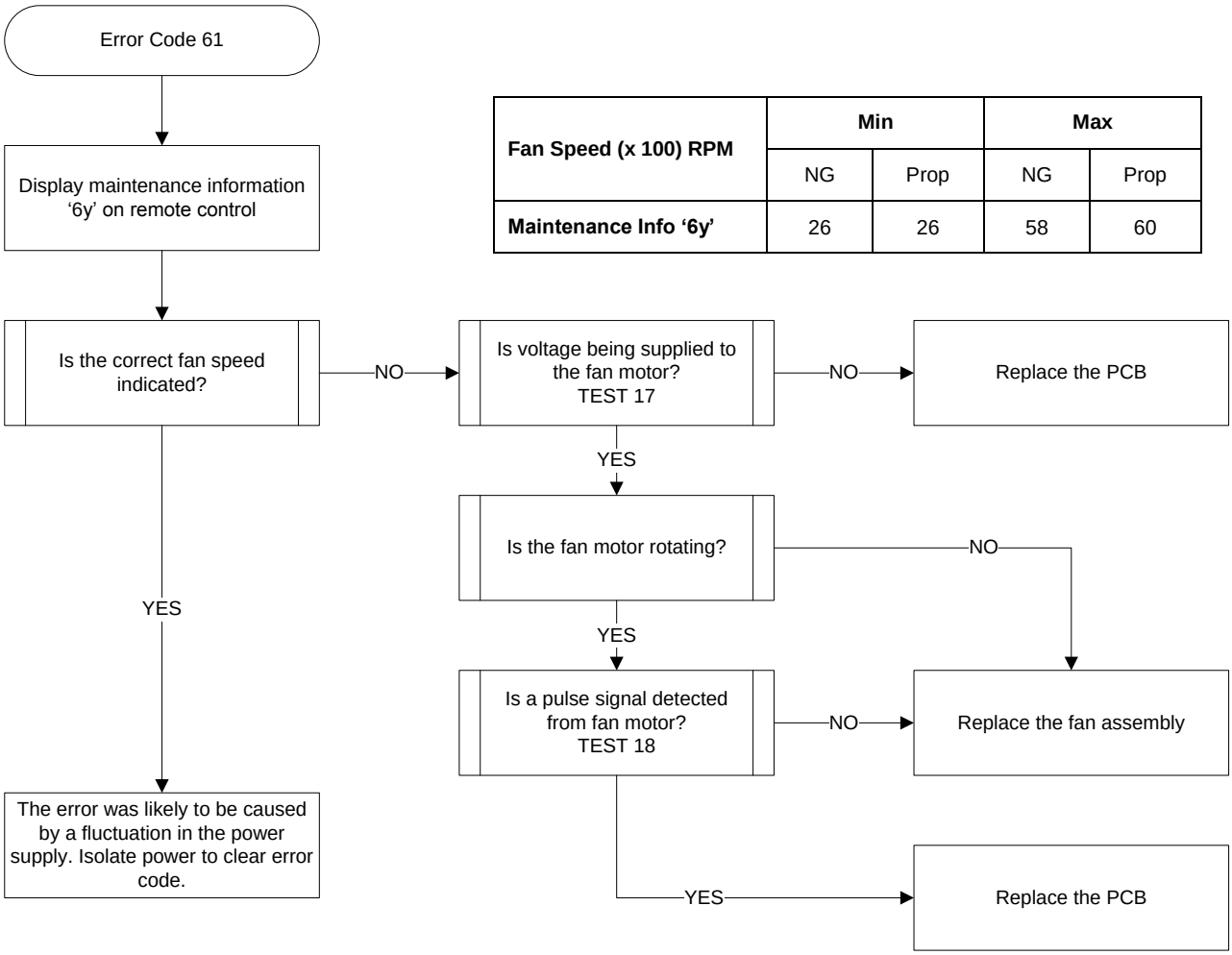
Maintenance Info "0y"	00	01	02	03
Flame Rod 1	x	o	x	o
Flame Rod 2	x	x	o	o

X = No flame detected O = Flame detected

Error Code 52



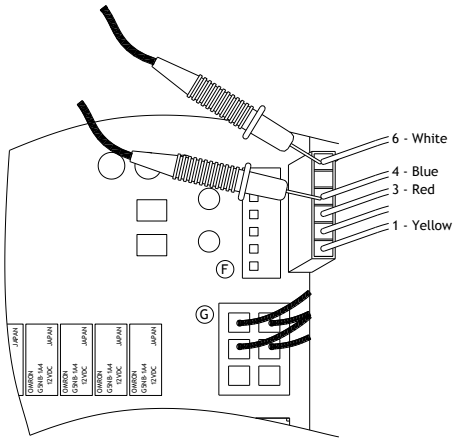
Error Code 61



Fan Speed (x 100) RPM	Min		Max	
	NG	Prop	NG	Prop
Maintenance Info '6y'	26	26	58	60

Fault Finding Tests 17 & 18

Tests 17 and 18 – Diagnostic Point 4

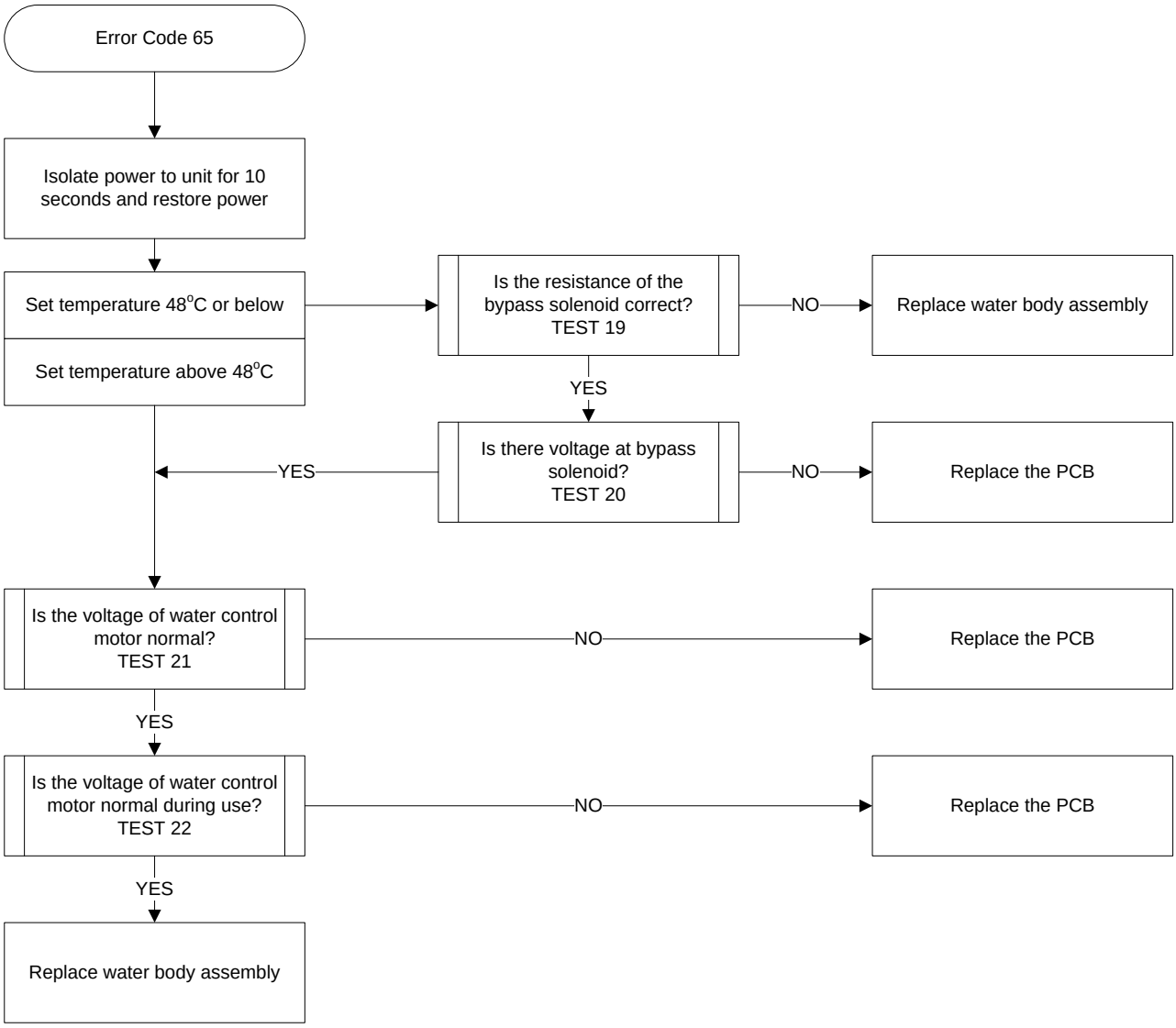


Conduct test with water flowing

Using a multimeter set on the DC volts scale, measure the voltage at connector F whilst plugged into PCB.

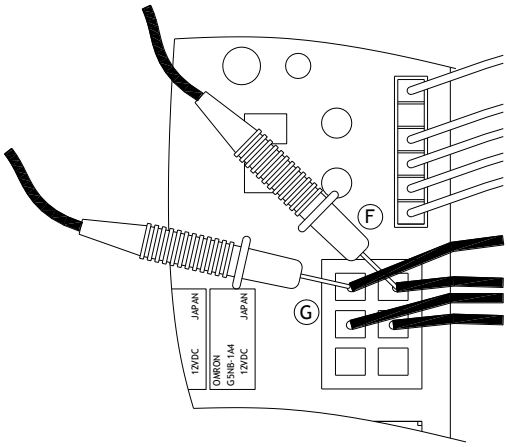
Test	Check Point	Measured Value
17	4 Blue – 6 White	DC120 - 160V
	3 Red – 4 Blue	DC12 - 18V
18	1 Yellow – 4 Blue	DC4 - 10V (or measurement by pulse counter of not less than 4800 pulses per minute)

Error Code 65



Fault Finding Tests 19 - 22

Test 19 and 20



TEST 19: Unplug connector G from the PCB and using a multimeter set on the kilo-ohms scale, measure the resistance between 3 Green and 6 Green.

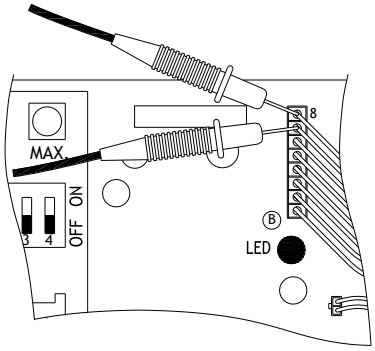
Normal resistance should be between 0.6kilo-ohms and 2.8kilo-ohms.

Conduct test with water flowing

TEST 20: Using a multimeter set on the DC volts scale, measure the voltage between 3 Green and 6 Green on connector G.

Normal voltage should be between DC70 – 110V.

Test 21 - Diagnostic Point 15

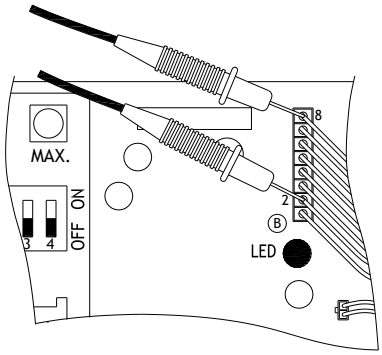


Conduct test with water flowing

Using a multimeter set on the DC volts scale, measure the voltage at connector B whilst plugged into PCB.

Check Point	Measured Value
7 Red - 8 Black	DC8 – 16V

Test 22 - Diagnostic Point 15

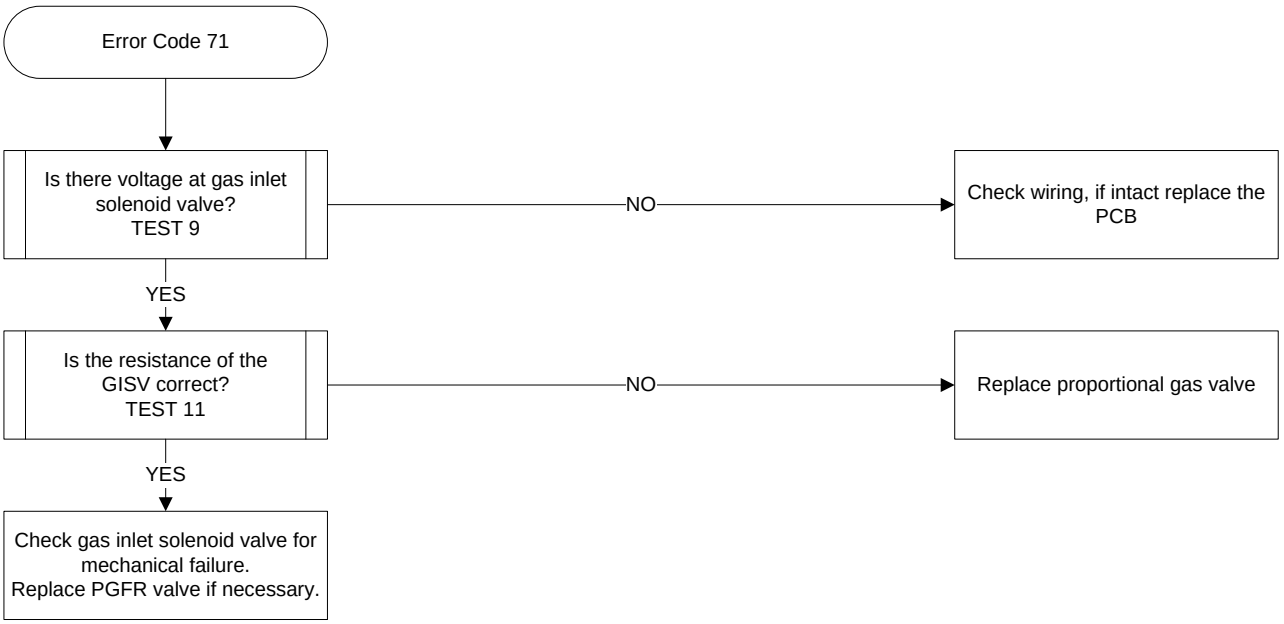


Conduct test with water flowing

Using a multimeter set on the DC volts scale, measure the voltage at connector B whilst plugged into PCB.

Check Point	Measured Value
2 White - 8 Black	DC8 – 16V

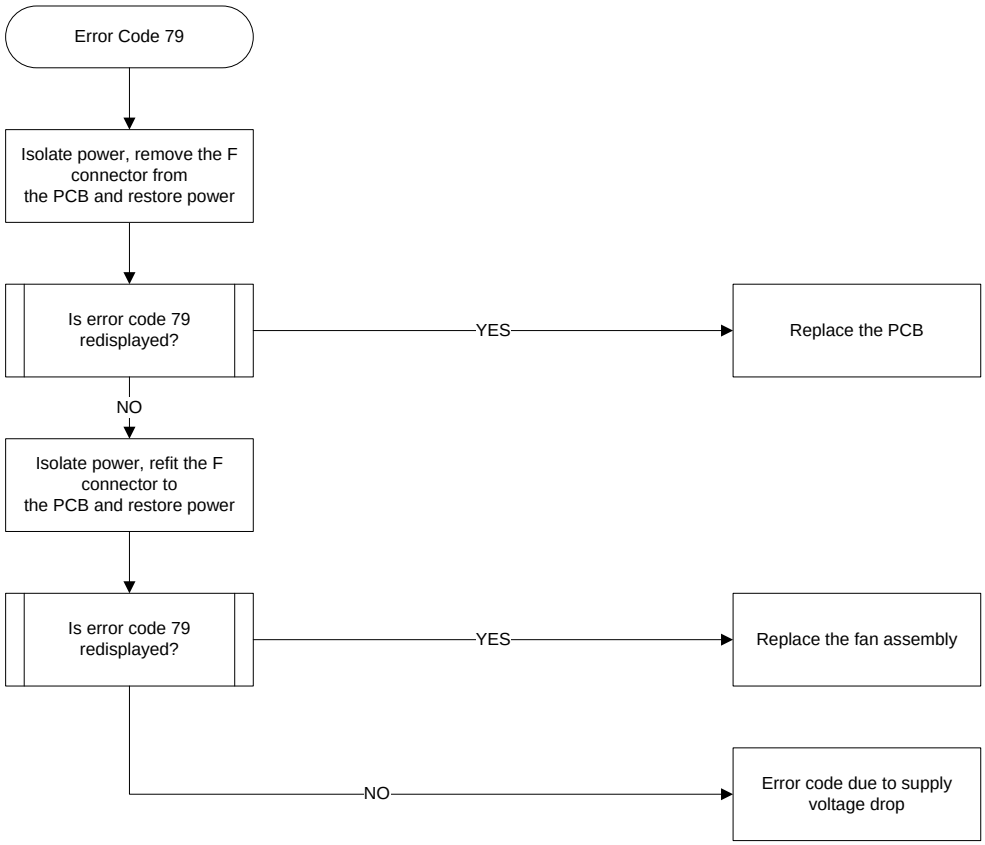
Error Code 71



Error Code 76

Ensure that there is no more than one of each controller type fitted and that they are all from the same family ie: All standard or all deluxe style. Any duplication of controllers or mismatching of the family type will result in this error. If no duplication or mismatching has occurred then check cables to all temperature controllers and replace as necessary.

Error Code 79



Error Code 82

If error code 82 appears a new PCB is required to be fitted.

Error Code 99 & 10

Isolate power supply; clean the heat exchanger, fan and air inlet opening. Restore power supply and attempt ignition. If the error code re-appears, replace the PCB.

BURNER GAS PRESSURE CHECK

Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

Minimum Burner Gas Pressure

1. Remove the front panel from the water heater.
2. Remove burner pressure test point screw and fit manometer.
3. Connect a controller (if one is not present) and turn on.
4. Open a hot tap slowly, to achieve the minimum flow rate at which the burners will ignite.
5. Press and hold the MIN button (“1L” is displayed on the controller) and observe the reading on the manometer.
6. Release the MIN button. If the reading observed in step 5 agrees with the rating label, no further adjustment is required.

Maximum Burner Gas Pressure

7. Open the hot tap fully to achieve maximum flow rate.
8. Press and hold the MAX button (“3H” is displayed on the display) and observe the reading on the manometer.
9. Release the MAX button. If the reading observed in step 8 agrees with the rating label, no further adjustment is required.
10. Turn the hot tap off.
11. Remove manometer and refit the burner test point screw ensuring the seal is gas tight.
12. Disconnect controller if connected in step 3.
13. Refit the front panel to the water heater.

Burner Gas Pressure Adjustment

Adjustment of the burner pressure will not overcome problems associated with poor supply pressure or incorrect gas supply pipe sizing.

Minimum Burner Gas Pressure

1. Remove the front panel from the water heater.
2. Remove burner test point screw and fit manometer.
3. Connect a controller (if one is not present) and turn on. NOTE: ***Isolate power while connecting the controller.***
4. Open a hot tap slowly, to achieve the minimum flow rate at which the burners will ignite.
5. Press and hold the adjuster button ("LH" is displayed on controller display)

   NOTE: The adjuster button must be held down continuously through steps 5 and 6.
6. Press the MIN button and observe the reading on the manometer.

   NOTE: While the MIN button is pressed, the gas pressure will at first increase then decrease, cycling between an upper gas pressure limit (39 on controller display) and a lower gas pressure limit (01 on controller display).
7. Release the MIN and adjuster buttons when the minimum test point pressure shown on the manometer agrees with the rating label.

NOTE: If the burners extinguish or an error code starts to flash on the controller display during this procedure, release the MIN and adjuster buttons, close the hot tap, clear the error code, turn on the water heater and recommence the procedure from step 3. To reset an error code, follow the procedure on page 31.

Maximum Burner Gas Pressure

8. Open the hot tap fully to achieve maximum flow rate.
9. Press and hold the adjuster button ("LH" is displayed on controller display).

   NOTE: The adjuster button must be held down continuously through steps 9 and 10.
10. Press the MAX button and observe the reading on the manometer.

    NOTE: While the MAX button is pressed, the gas pressure will at first increase then decrease, cycling between an upper gas pressure limit (39 on controller display) and a lower gas pressure limit (01 on controller display).
11. Release the MAX and adjuster buttons when the maximum test point pressure shown on the manometer agrees with the rating label.
12. Turn the hot tap off, remove manometer and refit the burner test point screw ensuring the seal is gas tight.
13. Disconnect the controller if connected in step 3. Note: ***Isolate power while disconnecting the controller***.
14. Refit the front panel to the water heater.

COMPONENT REPLACEMENT PROCEDURES

Front Panel

1. ***Isolate power, gas and water supplies.***
2. Remove four screws, two from the top and two from the bottom of the Front Panel.
3. Remove the Front Panel.

PCB Assembly

1. ***Isolate power supply.***
2. Remove the Front Panel. Refer to 'Front Panel' procedure above.
3. Remove the retaining screw at top left hand side of the PCB.
4. Disconnect the multi-pin connectors from the PCB Assembly.
5. Undo the two red wires from transformer at bottom right hand side of PCB.
6. Carefully remove the PCB assembly.
7. Reassembly in reverse order of above. **Note:** When replacing a faulty PCB it is important to ensure that the correct PCB is installed. Fitment of an incorrect PCB may result in unit malfunction or a breach of the approval of the unit. Eg: If an 876 series heater is installed and an 874 series PCB is incorrectly used to replace a faulty PCB then the maximum temperature setting may exceed the approved maximum temperature setting of 48ºC for an 876 series heater.
8. Restore power supply.

Lower Burner Assembly

1. Remove the Front Panel. Refer to 'Front Panel' procedure above.
2. Remove the fourteen screws retaining the Lower Burner Assembly. Includes three from the Proportional Gas Flow Regulating Valve and one retaining the Igniter.
3. Gently remove Lower Burner Assembly.
4. Reassemble in reverse order of above. Replace gaskets if required.
5. Test for gas leaks using soapy water solution.

Combustion Chamber Front Panel

1. Remove the Lower Burner Assembly. Refer to 'Lower Burner Assembly' procedure above.
2. Remove seven screws retaining the Combustion Chamber Front Panel.
3. Gently remove the Combustion Chamber Front Panel.
4. Reassemble in reverse order of above. Replace gaskets if required. NOTE: Ensure wiring to Igniter and Flame Sensors is not pinched during reassembly.
5. Test for gas leaks using soapy water solution.

Upper Burner Assembly

1. Remove the Combustion Chamber Front Panel. Refer to 'Combustion Chamber Front Panel' procedure on page 51.
2. Remove two retaining screws located on the underside of Upper Burner Assembly.
3. Remove the Upper Burner Assembly by sliding forward out of the Heat Exchanger.
4. Reassemble in reverse order of above being careful not to pinch or damage wiring. Replace gaskets if required.
5. Test for gas leaks using soapy water solution.

Flame Sensor

1. Remove the Upper Burner Assembly. Refer to 'Upper Burner Assembly' procedure above.
2. Remove the protective silicon tube and flame sensor lead from Flame Sensor A or B.
3. Loosen retaining screw from Flame Sensor Holder A or B and remove Flame Sensor.
4. Reassemble in reverse order of above. Replace gaskets if required.
5. Test for gas leaks with soapy water solution.

Igniter Electrode

1. Remove the Upper Burner Assembly. Refer to 'Upper Burner Assembly' procedure above.
2. Remove the protective silicon tube and spark lead from Igniter Electrode.
3. Loosen retaining screw from right hand flame sensor holder and remove the Igniter Electrode.
4. Reassemble in reverse order of above. Replace gaskets if required. NOTE: Ensure wiring to igniter and flame sensors is not pinched during reassembly.
5. Test for gas leaks with soapy water solution.

Proportional Gas Flow Regulating Valve

1. Remove the Lower Burner Assembly. Refer to 'Lower Burner Assembly' procedure on page 51.
2. Disconnect the gas supply pipe from the Gas Inlet Connection.
3. Remove the three silver screws from the Gas Inlet Connector on the outside of the water heater cabinet.
4. Carefully remove the Proportional Gas Flow Regulating Valve (PGFR) from the water heater.
5. Disconnect the multi-pin wiring plugs from the Gas Inlet Solenoid Valve (GISV), the Proportional Gas Flow Regulating Valve (PGFR) and Solenoid Valves 1 & 2.
6. Reassemble in reverse order of above. Replace gaskets if required.
7. Test for gas leaks with soapy water solution.

Water Body Assembly

Do not attempt to dismantle the servomotor, this is factory calibrated. Adjustments will render the water heater either inoperable or cause incorrect water temperature delivery.

1. Remove the Proportional Gas Flow Regulating Valve. Refer to 'Proportional Gas Flow Regulating Valve' procedure on page 52.
2. Disconnect the cold water supply pipe from the cold water Inlet Connection.
3. Unscrew the Water Drain Valve assembly (item 32) and Pressure Relief Valve (item 30) and drain the water heater.
4. Remove the screw from the Retaining Flange (item 26) and remove Flange.
5. Carefully disengage the two copper pipes from the Water Body Assembly.
6. Disconnect the wiring to the Bypass Solenoid.
7. Remove the four screws from the cold water Inlet Connector on the underside of the water heater cabinet and withdraw the Inlet Connector and o-ring from the base of the water heater.
8. Carefully remove the Water Body Assembly from the water heater.
9. Disconnect the multi-pin connectors from the servomotor, Water Flow Sensor and Cold Water Thermistor at the PCB. **Note:** Some wiring retainers will need to be released to allow wiring to be removed.
10. Remove the retaining screw from the Anti-Frost Heater and remove.
11. Reassemble in reverse order of above, replacing pipe o-rings (item 6) if required.
12. Test for gas and water leaks.

Flow Sensor Turbine

1. ***Isolate cold water supply.***
2. Remove the Front Panel. Refer to 'Front Panel' procedure on page 51.
3. Unscrew the Water Drain Valve assembly (item 32) and Pressure Relief Valve (item 30) and drain the water heater.
4. Disconnect the cold water supply pipe from the cold water Inlet Connection.
5. Disconnect the Bypass Solenoid wiring loom plug.
6. Remove two retaining screws holding the Flow Sensor to the Water Body Assembly and remove Flow Sensor.
7. Using a flat blade screwdriver lever the metal disc and o-ring from the Flow Sensor housing on the Water Body Assembly. Lever the disc out by placing the shaft of the screwdriver across the disc with the tip of the screwdriver on the far inside edge of the disc.
8. Remove the four screws from the cold water Inlet Connector and withdraw the Inlet Connector and o-ring from the base of the water heater.
9. Gently withdraw the Flow Sensor Turbine out through the water inlet of the water Body Assembly using a pair of long nose pliers.
10. Reassemble in reverse order of above ensuring open slot on turbine is centred and facing towards the face of the flow sensor.

Flow Sensor

1. Isolate cold water supply.
2. Remove the Front Panel. Refer to ‘Front Panel’ procedure on page 51.
3. Disconnect the Flow Sensor multi-pin wiring plug at the PCB.
4. Remove two screws retaining the Flow Sensor at the base of the Water Body Assembly.
5. Remove the Flow Sensor (Note: water may escape during this procedure).
6. Reassemble in reverse order of above.

Bypass Solenoid

The Bypass Solenoid is only available as part of the Water Body Assembly. Refer to ‘Water Body Assembly’ procedure on page 53.

Power cord

1. ***Switch off power at power point and unplug power cord from power point.***
2. Remove the Front Panel. Refer to ‘Front Panel’ procedure on page 51.
3. Undo cord clamp screw located on bottom right hand side of PCB and remove clamp.
4. Disconnect Earth connection at PCB holder.
5. Disconnect the power cable wiring loom plug and withdraw power cable through slot in the water heater jacket.
6. Reassemble in reverse order of above.

Combustion Fan Motor

1. Remove the PCB Assembly. Refer to ‘PCB Assembly’ procedure on page 51.
2. Remove the two screws retaining the Power Filter (item 9) to the Combustion Fan Motor.
3. Remove the remaining three screws retaining the Fan Motor and lift Fan Motor clear.
4. Disconnect the multi-pin wiring plug from the Fan Motor.
5. Reassemble in reverse order of above.

Igniter

1. Remove the Upper Burner Assembly. Refer to ‘Upper Burner Assembly’ procedure on page 52.
2. Disconnect black high voltage lead from Igniter Electrode on the right hand side of the Upper Burner Assembly.
3. Disconnect the multi pin connector from the Igniter.
4. Replace the Igniter.
5. Reassemble in reverse order of above. NOTE: Ensure wiring to Igniter Electrode and Flame Sensors is not pinched during reassembly.

Anti-Frost Heaters

1. Remove the PCB Assembly. Refer to 'PCB Assembly' procedure on page 51.
2. Disconnect connector plugs at the Anti-Frost Thermostat and Power Cord

Heat Exchanger and Hot Water Outlet Connection Heaters

3. Remove the two screws from the hot water Outlet Flange to release the hot water outlet Anti-Frost Heater.
4. Unclip the 2 Anti-Frost Heaters from the Heat Exchanger (Note the positions of both).
5. Remove the Anti-Frost Heaters and wiring (Some wiring retainers will need to be released to remove wiring).
6. Reassemble in reverse of above ensuring anti-frost heaters are fitted in correct positions.

Water Body Assembly Heater

2. Remove the Water Body Assembly (item 24 on exploded view). Refer to 'Water Body Assembly' procedure on page 53.
3. Remove the Anti-Frost Heater retaining clip.
4. Remove the Anti-Frost Heater and wiring (Some wiring retainers will need to be released to remove wiring).
5. Reassemble in reverse order of above.

Heat Exchanger Removal

1. Remove the Upper Burner Assembly. Refer to 'Upper Burner Assembly' procedure on page 52.
2. Remove the two Flame Sensor leads (items 12 and 13) and Ignition Lead from the rubber cable glands in the underside of the Heat Exchange Assembly.
3. Remove the two screws retaining the Power Filter (item 9) from the Fan Assembly and reposition Power Filter clear of Fan Assembly.
4. Remove the screw from the Water Body Assembly Flange (item 26) and remove Flange.
5. Carefully disengage the two pipes from the Water Body Assembly.
6. Remove the two screws from the hot water Outlet Flange retaining the hot water outlet pipe and carefully disengage the pipe.
7. Disconnect the multi-pin wiring connector from the Heat Exchanger Thermistor.
8. Disconnect the anti-frost wiring loom connector at the Anti-Frost Thermostat (item 15) and the hot water outlet Anti-Frost Heater (item 7). Remove Anti-Frost Heater from hot the Outlet Connector.
9. Open the Over Heat Limiter to gain access to Heat Exchanger Assembly. Remove wiring retainer that joins Anti-Frost Heater wiring to the Over Heat Limiter wiring.
10. Remove the four screws retaining the Heat Exchanger. One from each side of the Heat Exchanger and two from the top of the water heater cabinet above the flue outlet.
11. Remove Heat Exchanger by gently lifting the assembly up and clear of the water heater cabinet.
12. Disconnect the multi-pin wiring plug from the Fan Motor to completely free Heat Exchanger Assembly from the water heater.

Heat Exchanger Replacement

1. Remove the Heat Exchanger. Refer 'Heat Exchanger Removal' procedure on page 55.
2. Remove the Heat Exchanger Thermistor, Anti-Frost Heaters, Fan Assembly and Fan Cowling from the old Heat Exchanger and refit to the replacement Heat Exchanger.
3. Check the Over Heat Limiter. Replace if damaged or open circuit.
4. Reassemble in reverse order of above.
5. Test for gas leaks using soapy water solution
6. Check for water leaks.
7. ***Check and if necessary adjust the MIN and MAX burner gas pressures*.** Refer to 'Burner Gas Pressure Check' procedure on page 49 and 'Burner Gas Pressure Adjustment' procedure on page 50**.**

Over Heat Limiter

Replacement of the Over Heat Limiter requires removal and possible replacement of the Heat Exchanger.

1. Remove the Heat Exchanger. Refer 'Heat Exchanger Removal' procedure on page 55.
2. Remove the two white wires from the terminal block on the right hand side of the Over Heat Limiter.
3. Remove the two plastic rivets retaining the Over Heat Limiter to the back of the water heater cabinet and remove the Over Heat Limiter.
4. Inspect the Heat Exchanger for holes or combustion damage. (Replace Heat Exchanger if necessary)
5. Reassemble in reverse order of above (Note: Ensure all multi-pin plugs are reconnected and all wiring is neatly repositioned and retained to prevent damage during operation).
6. Test operation of water heater.
7. ***Check and if necessary adjust the MIN and MAX burner gas pressures*.** Refer to 'Burner Gas Pressure Check' procedure on page 49 and 'Burner Gas Pressure Adjustment' procedure on page 50.

Thermistors

1. Isolate cold water supply.
2. Remove the Front Panel. Refer to 'Front Panel' procedure on page 51.
3. Relieve water pressure through a hot tap.
4. Locate the Thermistor requiring replacement. **Note:** The PCB will need to be removed to gain access to the Hot Outlet Thermistor. Refer to PCB Assembly procedure on page 51.
5. Disconnect the relevant multi-pin plug from the PCB. **Note:** Some wiring retainers will need to be released to allow wiring to be removed.
6. Remove the retaining screws and withdraw the Thermistor taking care not to damage the o-ring (**Note:** with the exception of the Ambient Air Thermistor, water may escape during this procedure).
7. Reassemble in reverse order of above.

Transformer

1. Remove the Front Panel. Refer to ‘Front Panel’ procedure on page 51.
2. Disconnect the Transformer secondary windings from the bottom right hand side of the PCB (2 x red wires).
3. Disconnect the multi-pin plug to the Transformer.
4. Remove the four outside screws on the underside of the water heater retaining the Transformer base to the water heater cabinet.
5. Lower the Transformer and base plate from the base of the water heater.
6. Remove two screws retaining Transformer to the transformer base plate.
7. Reassemble in reverse order of above.

Power Filter

1. Remove the PCB Assembly. Refer to ‘PCB Assembly’ procedure on page 51.
2. Disconnect the incoming and outgoing Power Filter wiring loom plugs.

   Note: Some wiring retainers will need to be released to allow wiring to be removed.
3. Remove the two screws retaining the Power Filter to the mounting bracket on the Fan Assembly.
4. Remove the Power Filter. **Note:** An earth wire is connected to the power filter mounting bracket. Ensure it is reconnected when the Power Filter is refitted.
5. Reassemble in reverse order of above.

Controller

1. ***Isolate power at the water heater.***
2. Remove the small Phillips head screw from the bottom of the Controller.
3. Gently pivot the Controller up from the bottom and then lift up and off upper retaining lugs.
4. **Kitchen Controller:** Disconnect the wiring from the terminals on the back of the Controller (Note: The wiring is not polarity sensitive).

   Bathroom Controllers: Disconnect the multi-pin plug.
5. Reassemble in reverse order of above.

GAS CONVERSION PROCEDURE

The models covered in these service instructions are unsuitable for gas type conversion.

DOCUMENT REVISION HISTORY

Title: 12-20L Continuous Flow GWH Service Instructions	Document Nº: TM040

REV	Details of change	D.O.I.
A	Service instructions issued for 16-20L continuous flow gas water heater	06/09
B	Gas pressure specifications modified	06/09
C	Model number and PCB part numbers updated	11/09
D	Displaying Maintenance Information procedure on page 26 corrected	02/10
E	12L models added	04/10
F	Name badge part numbers added. Preset outlet temperatures modified	10/10
G	6 Star release. Solahart & AquaMAX models added. Exploded views and replacement parts lists removed – Now form part of Spare parts manual SPM-CFGWH	08/13
AH	18L models no longer in range, Flue diverter details added.	10/16

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