SERVICE INSTRUCTIONS

18 & 20L Integrity

Electronic Gas Instantaneous Water Heater

TM002

Revision: E

Published: November 07

871018
875018

871020
875020

Contents

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 Rheem Instantaneous 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.

Certain diagnostic procedures outlined in these Service Instructions require "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.

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.

Introduction

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

Should you require further technical advice on a Rheem Integrity Water Heater, contact your nearest Rheem Service Department where genuine replacement parts are also available.

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.

8	7	1	018	N	F	-B

Model Number
8 - Rheem
2 - *Everhot

Location
7 - External

Ignition Type
1 - Electronic 60ºC Max temp
5 - Electronic 48ºC Max temp

Capacity
Nominal litres/minute @ 25 ºC rise

Gas Type
N - Natural
P - Propane

F - Frost protection fitted

Version
Internal Use Only

Specifications

Model		871018N0 871018NF 875018NF 871018NF-B 875018NF-B	871018PF 875018PF 871018PF-B 875018PF-B	871020N0 871020NF 875020NF 871020NF-B 875020NF-B	871020PF 875020PF 871020PF-B 875020PF-B
Specification	Gas Type	Natural	Propane	Natural	Propane
Max hourly gas consumption (MJ/Hr)		157	157	157	157
Min hourly gas consumption (MJ/Hr)		24	24	24	24
Min inlet water pressure (kPa)		140	140	140	140
Max inlet water pressure (kPa)		1000	1000	1000	1000
Min inlet gas pressure (kPa)		1.13	2.75	1.13	2.75
Max inlet gas pressure (kPa)		3.5	3.5	3.5	3.5
Max burner gas test pressure (kPa)		0.903	1.50	0.903	1.50
Min burner gas test pressure (kPa)		0.182	0.32	0.182	0.32
Ignition System		Continuous Spark			
Power (Watts) Consumption	Standard	66	66	66	66
	Anti-frost*	124	124	124	124
Gas connection diameter (mm)		R¾/20	R¾/20	R¾/20	R¾/20
Water connection diameter (mm)		R½/15	R½/15	R½/15	R½/15
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		N	N	N	N
Deluxe Bathroom 1 Controller		N	N	N	N
Deluxe Bathroom 2 Controller		N	N	N	N

* Maximum power consumption when anti-frost heaters are energised.

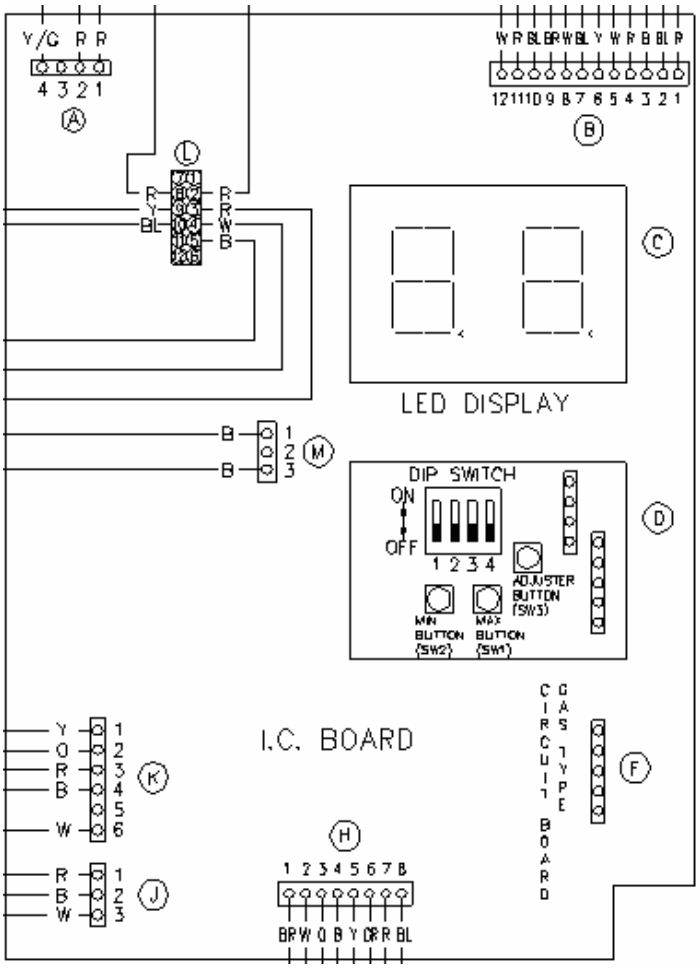
Preset Temperature Adjustment

It is possible to choose a preset outlet water temperature setting when remote controllers are not fitted. The water heater comes factory set at 50ºC on 871 series models or 48ºC on 875 series models.

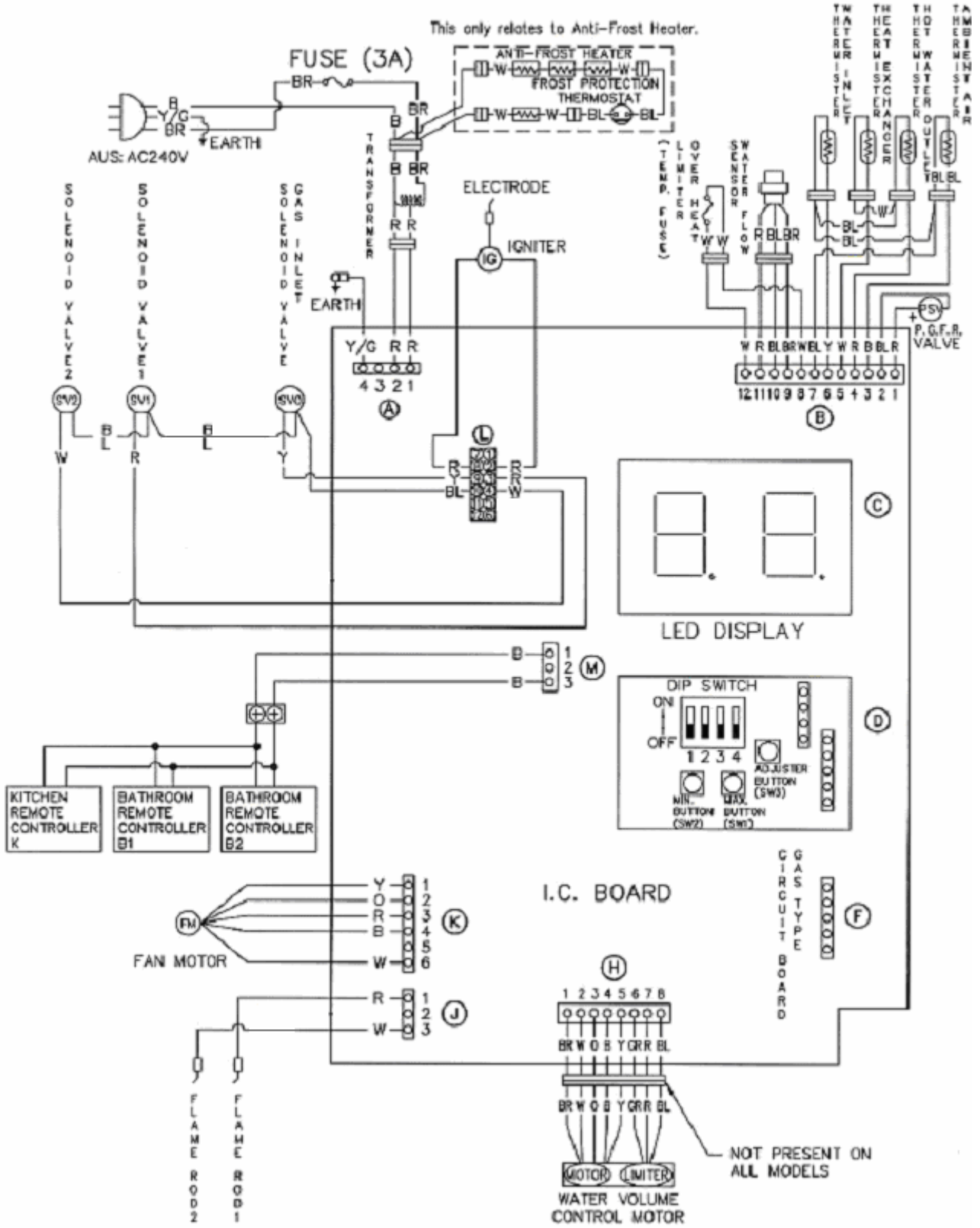
Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

To adjust the preset temperature:

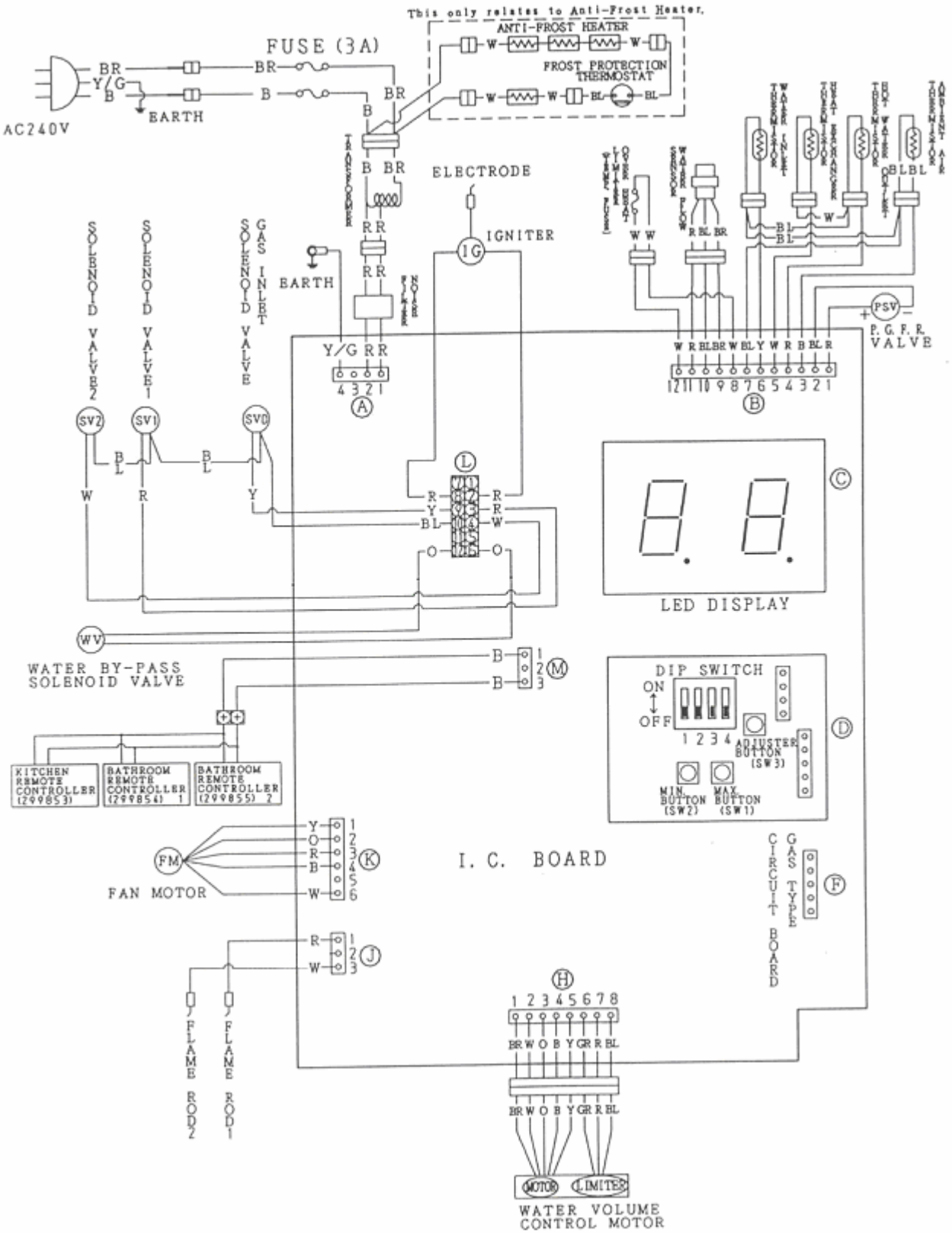
1. Remove the front cover from the water heater.
2. Turn DIP SWITCHES 3 and 4 on (up position) on the I.C. Board. The current preset temperature is displayed on the LED.
3. Press the MIN or MAX button, located under the DIP Switches, until the desired temperature is displayed. Available temperatures are:
   871 series models: 40ºC, 43ºC, 50ºC, 55ºC and 60ºC
   875 series models: 40ºC, 43ºC and 48ºC
4. Turn DIP SWITCHES 3 and 4 off (down position). The temperature display is now turned off.
5. Refit the front cover to the water heater.



Wiring Diagram - Models with Mechanical Bypass



Wiring Diagram - Models with Solenoid Operated Bypass

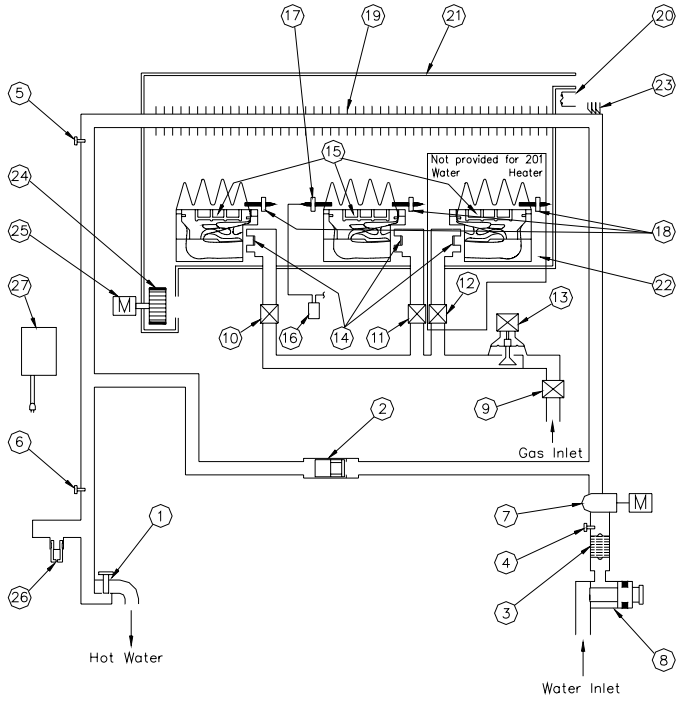


Sequence of Operation

Refer to 'Sequence of Operation Component Diagram' on page 9 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 preheater is installed) enters the water heater and passes through the Water Flow Sensor **(3)** and Heat Exchanger **(19)**. Note: For 871020 model heaters fitted with a comparator the inlet water temperature must be less than or equal to 57ºC and for 871020-B models 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 11).
2. The Water Flow Sensor **(3)** sends a pulse signal to the PCB **(27)**. Once the pulse signal reaches a pre designated frequency (at minimum flow rate) the PCB **(27)** activates the Fan Motor **(25)** and the Fan **(24)** starts rotating.
3. After the Fan **(24)** 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 **(13)** adjusts the gas flow rate to ensure adequate gas for ignition and gas is then supplied to the Burner **(15)**.
4. At the same time the Gas Solenoid Valves open the Igniter **(16)** starts sparking continuously and ignites the gas at the Burner **(15)**. After the flame sensor **(18)** detects burner flame, the Proportional Gas Valve **(13)** 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 remote controller (if fitted) the PCB **(27)** adjusts the hot water temperature by opening and closing the Gas Solenoid Valves 1 **(10)**, 2 **(11)** and 3 **(12)** and adjusting the Proportional Gas Flow Regulating Valve **(13)**. The water flow rate is also adjusted via the Water Flow Servo Motor **(7)** to ensure the selected temperature of hot water is delivered.
5. As the gas flow rate, controlled by the Proportional Gas Flow Regulating Valve **(13)** changes the PCB **(27)** varies the speed of the Fan Motor **(25)** 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)**, 3 **(12)** 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 **(25)** is cut and the Fan **(24)** stops.

Sequence of Operation Component Diagram



1 Hot Water Tap
2 Bypass Control Valve
3 Water Flow Sensor
4 Inlet Water Temperature Thermistor
5 Combustion Chamber Thermistor
6 Outlet Water Temperature Thermistor
7 Water Flow Servo Motor
8 Water Filter (Strainer)
9 Gas Inlet Solenoid Valve
10 Gas Solenoid Valve 1
11 Gas Solenoid Valve 2
12 Gas Solenoid Valve 3 (not fitted on 18 & 20L models)
13 PGFR Valve
14 Nozzle
15 Burner
16 Igniter
17 Igniter Electrode
18 Flame Sensor
19 Heat Exchanger
20 Over Temperature Limiter
21 Exhaust (Flue) Outlet
22 Combustion Chamber
23 Anti Frost Heater (Models with F in model number only e.g. 871020NF)
24 Fan
25 Fan Motor
26 Drain Plug With Relief Valve.
27 PCB

Bypass Operation

The bypass is a section of copper pipe work connected between the water body assembly (effectively the cold water inlet) 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 valve fitted to the water body assembly controls the bypass. Two types of bypass valve are utilised in 18 and 20 litre Integrity's.

Mechanical Bypass

Some models without a -B suffix in the model number utilise a mechanical bypass e.g. 871020NF and some models without a -B suffix utilise a solenoid operated bypass. To determine what kind of bypass is utilised in models without a -B suffix compare the appliance to the wiring diagrams on pages 6 & 7.

The mechanical bypass is a small spring loaded valve located in the water body assembly. The spring is temperature sensitive, as the cold water temperature decreases the spring tension increases reducing the amount of cold water flowing through the bypass. The bypass operates at all times when water is flowing.

Solenoid Operated Bypass

Models with a -B suffix in the model number utilise a solenoid operated bypass e.g. 871020NF-B. Some models without a -B suffix also utilise a solenoid operated bypass e.g. 871020NF. To determine what kind of bypass is utilised for models without a -B suffix compare the appliance to the wiring diagrams on pages 6 & 7.

The solenoid operated bypass comprises a valve (located in the water body assembly) that is controlled by a solenoid (mounted on the water body assembly). The PCB activates the solenoid at the following predetermined temperatures:

Without Touch Pads: When the unit is preset at 40 or 43 degrees.

With Touch Pads: When temperatures from 37 to 46 degrees are selected.

At all other times the bypass does not operate.

Anti-Frost Heater Circuit

Models with an 'F' in the model number have an anti frost heater circuit e.g. 871020N**F**-B. The anti-frost heaters are wired in series and operate independently from the water heater. 18 and 20 litre models have a 58-watt anti-frost system.

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 total heater circuit measures 993.2 ohms.

The circuit is split into two sections with 4 heaters in total. To determine which section has failed, isolate the power to the water heater and unplug the wiring connectors at the thermostat, cord set and the water body assembly heater block. The heat exchanger and hot water outlet heater's resistance (3 heater blocks) is 719.2 ohms. The resistance of the water body assembly heater is 274 ohms. Refer to Procedure 10 on page 51 for replacement procedure.

Product Changes

Software Changes

Models manufactured after July 2006 have a change to the software which controls the operation of the heater. When an inlet water temperature of more than 58ºC and more than the set point temperature minus 2ºC is detected by the inlet water temperature thermistor, the fan and burner will not operate.

This function has been introduced to enhance the operation of the water heater and remove the need for a Solar Bypass Valve when the Integrity 20 is connected as an in-series gas booster to a solar water heating system (for more information refer to 'In-series Gas Boosting' on page 11). Note: 875 series models and 18 Litre Integrity's are not suitable for use as in-series gas boosters.

Models with the revised software have a -B suffix added to the model number i.e. 871020NF-B.

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.

If a solar pre-heater has been installed to an existing Integrity water heater installation then a solar bypass valve or a comparator must be fitted at this water heater and any controllers, if fitted, must be disconnected and removed. Note: models ending with -B do not require a solar bypass valve or a comparator.

875 series models and 18 Litre Integrity's are not suitable for use as in-series gas boosters.

871020-B Models

Where an 871020-B model Integrity is installed to provide in-series gas boosting a solar bypass valve or a comparator is not required. 871020-B models have had a change made to the operating software which eliminates the need for either of these components.

The software now electronically mimics a bypass valve so that when the inlet water temperature is above 58°C 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 58°C the burner will fire and boost the outlet temperature to 60°C provided the flow rate is greater than 3 litres per minute. 20L models with modified software can be identified by a B suffix in the model number i.e. 871020NF-B.

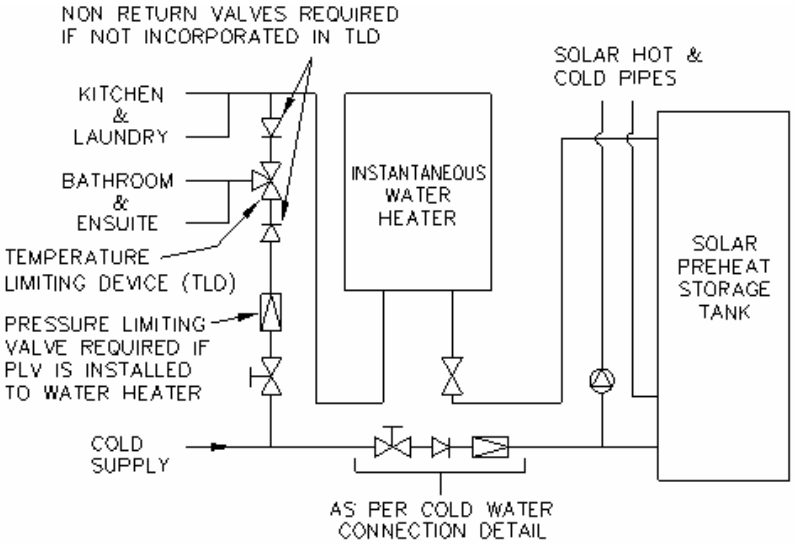
The preset outlet temperature of the Integrity, when installed as an in-series gas booster to a solar water heater, must be set at 60°C for the system to operate correctly.

The factory preset outlet temperature of all Integrity models is 50°C; during a new installation it will be necessary to reset the outlet temperature to 60°C. Refer to page 5 for details on checking and adjusting the outlet temperature.

Note: If an 871020 model heater is replaced with an 871020-B model heater and the existing 871020 heater is used as an in-line booster and has a solar bypass valve fitted, the solar bypass valve must be removed and the plumbing connections remade directly to the Integrity inlet and outlet water connections (refer to diagrams on pages 11 & 12).

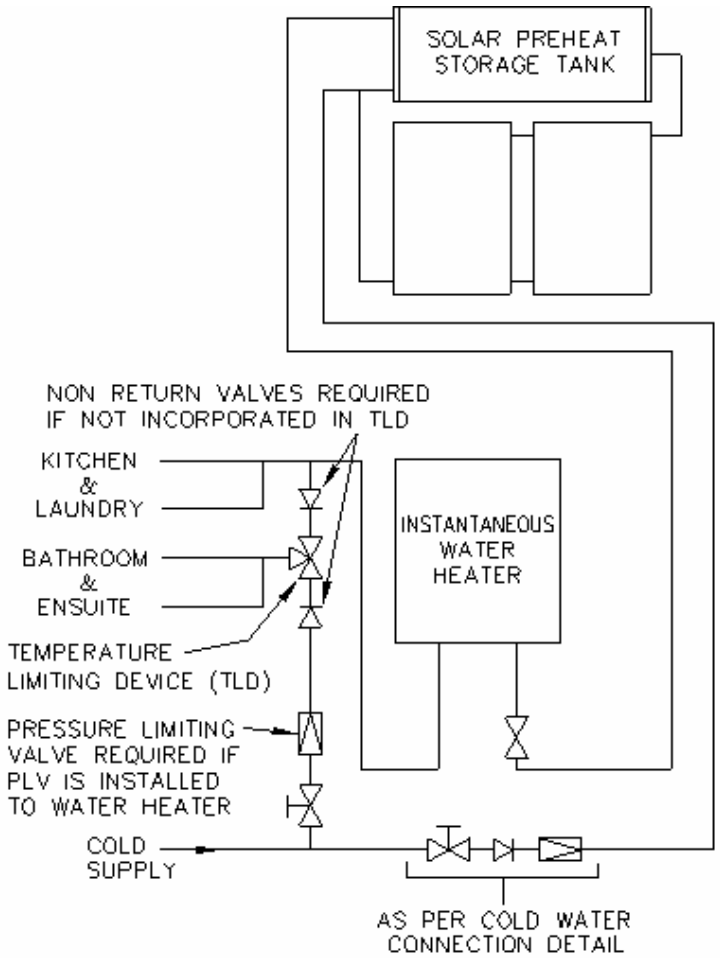
In-series Gas Boosting 871020-B Solar Loline Installation

Note: This plumbing diagram is also applicable to 871020 model heaters fitted with a comparator.
For more information on comparators refer to page 13.



In-series Gas Boosting 871020-B Solar Hiline Installation

Note: This plumbing diagram is also applicable to 871020 model heaters fitted with a comparator. For more information on comparators refer to page 13.



871020 Models

Where an 871020 model Integrity is installed to provide in-series gas boosting a solar bypass valve is fitted across the Integrity inlet and outlet water connections to prevent the water heater from operating when the outlet water temperature from the solar system is above 57°C (refer to diagrams on page 13). A disconnection union must always be provided at the solar preheated water inlet and hot water outlet on the solar bypass valve to allow for removal of the valve.

The solar bypass valve has been specifically designed to work with Rheem Integrity 871020 models heaters. Models ending with -B do not require a bypass valve. 875 series model water heaters and 18 Litre Integrity's are not suitable for use as in-series boosters.

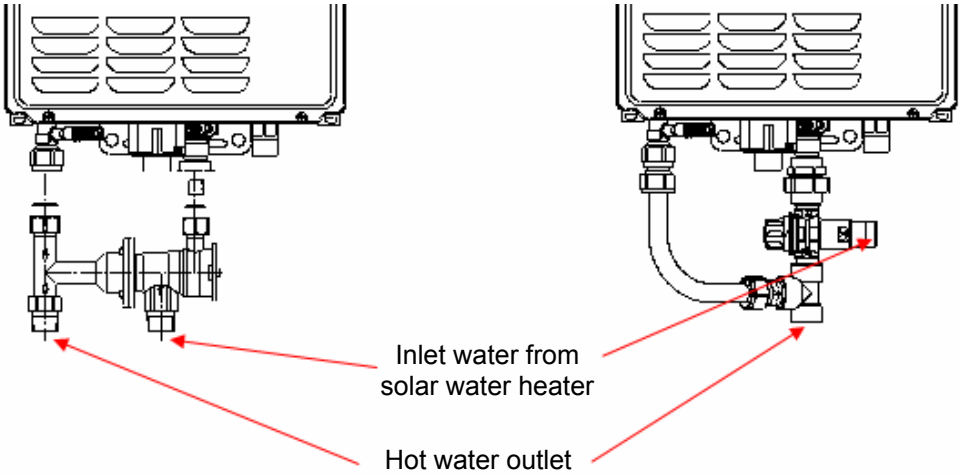
The preset outlet temperature of the Integrity, when installed as an in-series gas booster to a solar water heater, must be set at 60°C for the system to operate correctly.

The factory preset outlet temperature of all Integrity models is 50°C; during a new installation it will be necessary to reset the outlet temperature to 60°C. Refer to page 5 for details on checking and adjusting the outlet temperature.

There are two types of solar bypass valves currently in use (Paloma & RMC) and whilst both operate in the same manner the plumbing arrangement at the valve differs according to the type of solar bypass valve used (refer to diagrams on page 13). Solar bypass valves are no longer available and if faulty are to be removed and a Comparator installed. Refer to pages 13 & 14 for information on comparators.

Paloma Solar Bypass Valve

RMC Solar Bypass Valve



Note: If an 871020 model heater is replaced with an 871020-B model heater and the existing 871020 heater is used as an in-line booster and has a solar bypass valve fitted, the solar bypass valve must be removed and the plumbing connections remade directly to the Integrity inlet and outlet water connections (refer to diagrams on pages 11 & 12).

Solar Bypass Valve Operation

When the water temperature entering the solar bypass valve is above 57°C a temperature sensitive mechanism moves the valve spindle preventing water from entering the Integrity and allowing the water to flow through the solar bypass valve to the hot water outlet.

If the water temperature from the solar storage tank entering the solar bypass valve is below 57°C the temperature sensitive mechanism retracts the valve allowing water to enter the Integrity and preventing flow through the solar bypass valve. The Integrity will boost the water temperature to 60°C at the hot water outlet provided the flow rate is greater than 3 litres per minute.

Replacement of Solar Bypass Valve with a Comparator

An electronic device called a Comparator (part number 052127) is now available to replace the solar bypass valve and is suitable for use on Rheem 871020 models heaters. **NOTE:** 20L models with a -B suffix in the model number do not require either a solar bypass valve or a comparator.

Solar bypass valves are no longer available and if faulty are to be removed and a Comparator installed. Refer to page 14 for the procedure on installing a comparator.

The purpose of the comparator is to interrupt the operation of the burner when the inlet water temperature rises above 57°C.

The comparator is connected to the water flow sensor wiring and the inlet temperature sensor (cold sensor) wiring; both these components are mounted on the water body within the gas booster. The comparator monitors the inlet water temperature and when the temperature rises above 57°C the comparator interrupts the signal from the flow sensor to the PCB causing the burner to shut down.

Removing a Solar Bypass Valve and Installing a Comparator

1. Ensure power and water to the water heater is isolated.
2. Remove the front cover (refer to component procedure 1 on page 48).
3. Locate the 2 pin wiring plug in the wiring loom to the cold sensor mounted on the water body (refer to fig 1) and disconnect.

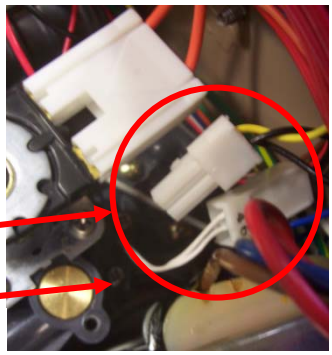


Fig 1

4. Plug the 2 pin male and female connectors from the comparator into the plugs attached to the cold sensor and the main wiring loom (refer to fig 2). **NOTE:** If the comparator connectors do not fit the cold sensor and main wiring loom plugs the model is an 871020-B model which does not require a comparator.

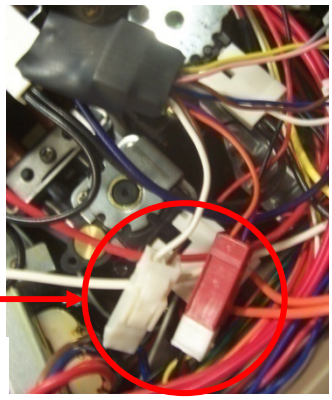


Fig 2

5. Locate the 3 pin wiring plug in the wiring loom to the flow sensor (refer to fig 3) and disconnect

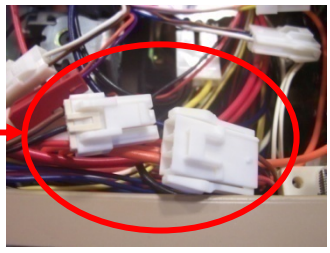


Fig 3

6. Plug the 3 pin male and female connectors from the comparator into the plugs attached to the flow sensor and the main wiring loom (refer to fig 4).

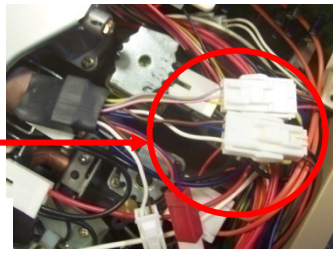


Fig 4

7. Position and secure the comparator in a safe position using the existing wiring ties securing the wiring loom (refer to fig 5).

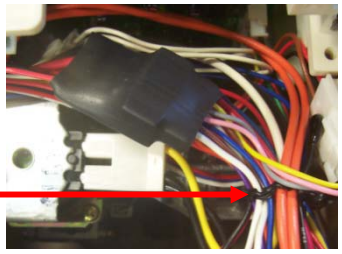
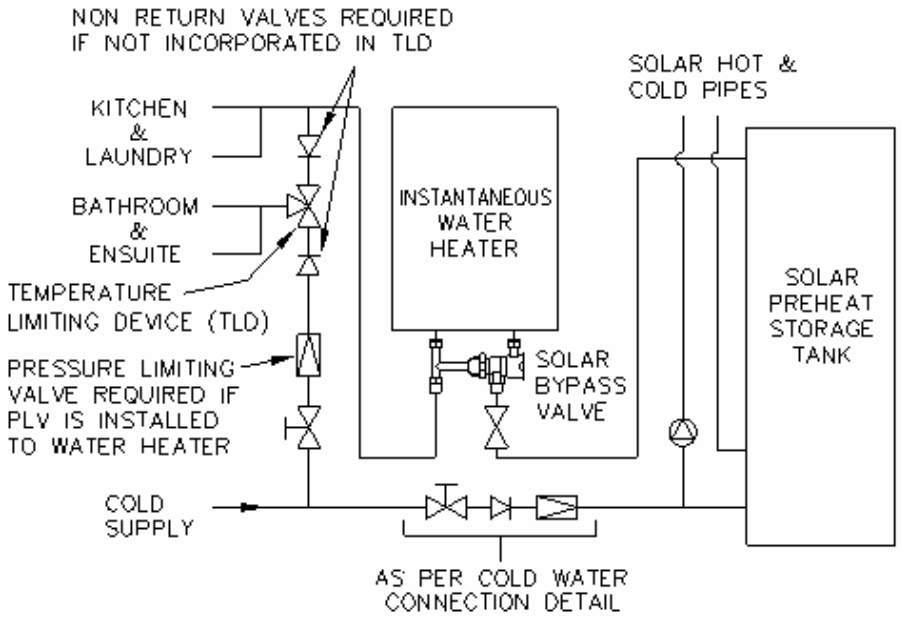


Fig 5

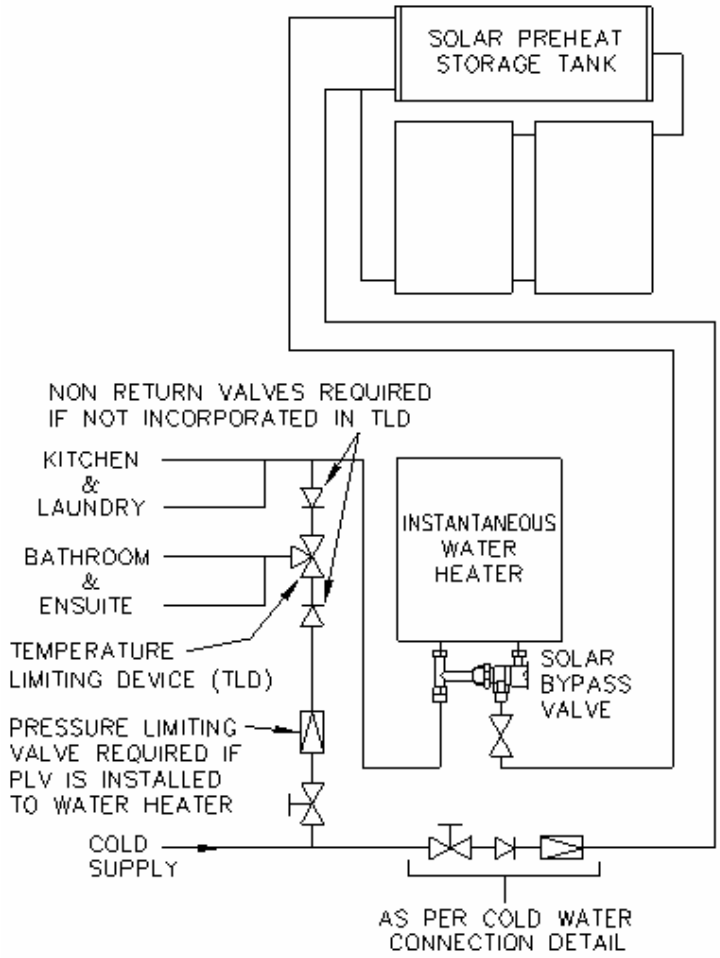
8. Refit the front cover.
9. Remove the bypass valve and associated fittings and connect the inlet and outlet pipe work directly to the gas booster. **NOTE:** This may require the pipe work to be extended; unions must be used at the inlet and outlet to enable removal of the gas booster for serving if required (refer to diagrams on pages 11 & 12).
10. Restore water and power supplies.

In-series Gas Boosting 871020 Solar Loline Installation



Note: For 871020 model heaters fitted with a comparator refer to diagram on page 11. For more information on comparators refer to page 13.

In-series Gas Boosting 871020 Solar Hiline Installation



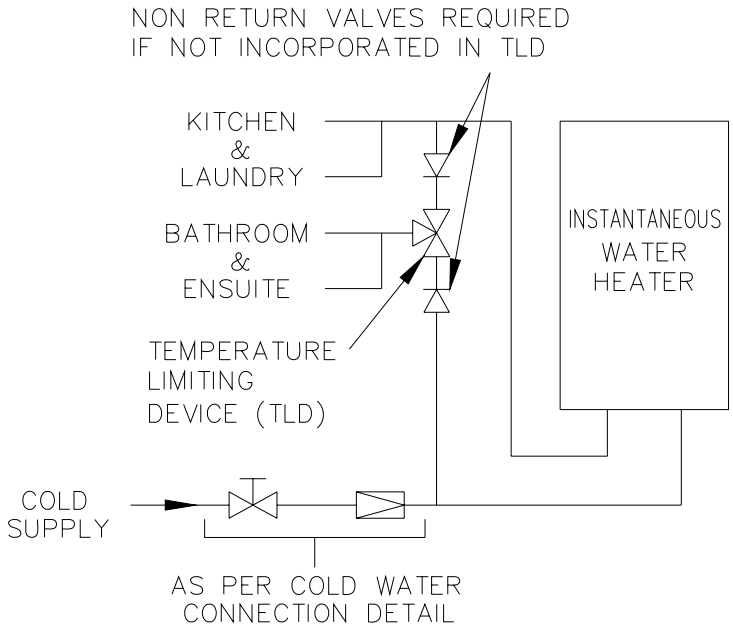
Note: For 871020 model heaters fitted with a comparator refer to diagram on page 11. For more information on comparators refer to page 13.

Tempering Valves

875 series models comply with AS/NZS 3498 and therefore do not require a tempering valve.

On 871 series models 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 below).



Remote Controllers

Integrity 18 and 20 Litre electronic instantaneous gas water heaters can be fitted with optional remote controllers.

There are 2 types of controller available, standard or deluxe; however only standard controllers can be used with an 18 or 20 litre Integrity.

Controller Type	Bathroom 1	Bathroom 2	Kitchen
Standard	299854	299855	299853

Standard and deluxe controllers **cannot** be mixed in a single installation; an individual water heater must have ALL standard type controllers fitted, other manufacturers' controllers cannot be used.

One, two or three 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 an 871 series model or 48°C when connected to an 875 series model.

875 series models are factory set and limited so that they cannot deliver water hotter than 48°C.

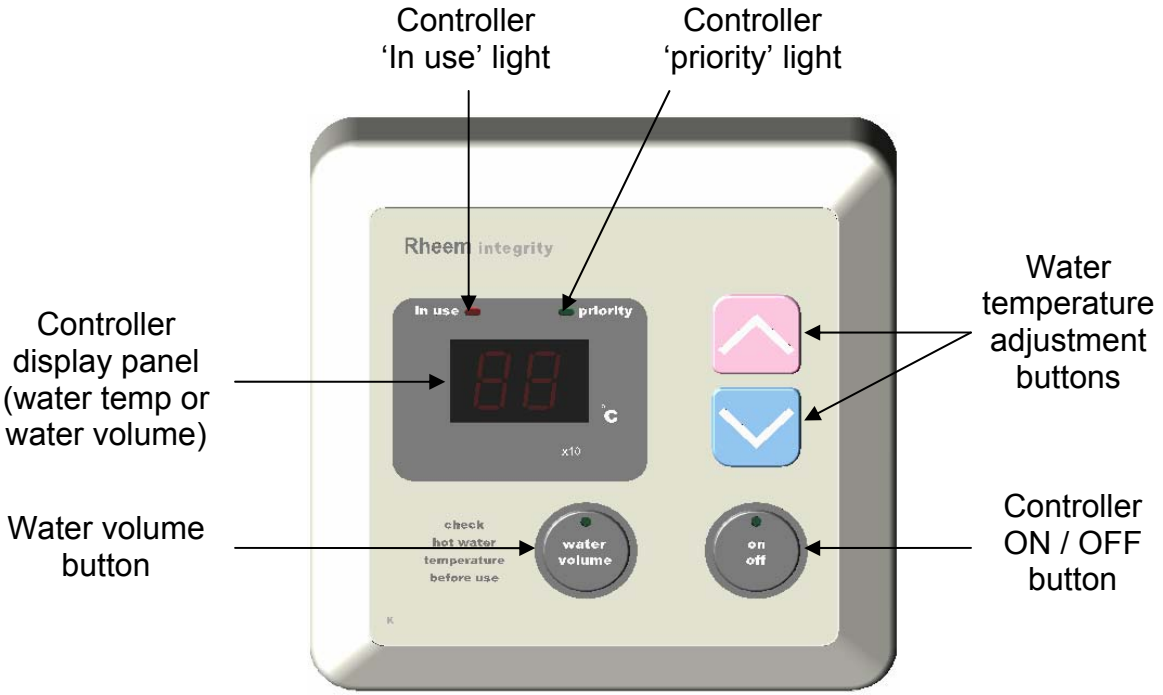
When no hot water is flowing, temperatures can be selected between 37°C and 43°C by pressing and holding the temperature control buttons, to select temperatures above 43°C press the temperature control button once for each selection.

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*, 55*, 60°C*

Bathroom Controllers:
37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 50°C*

* Temperatures above 48 degrees are not available on controllers fitted to 875 series models as these units have a maximum selectable temperature of 48°C at all locations.

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:

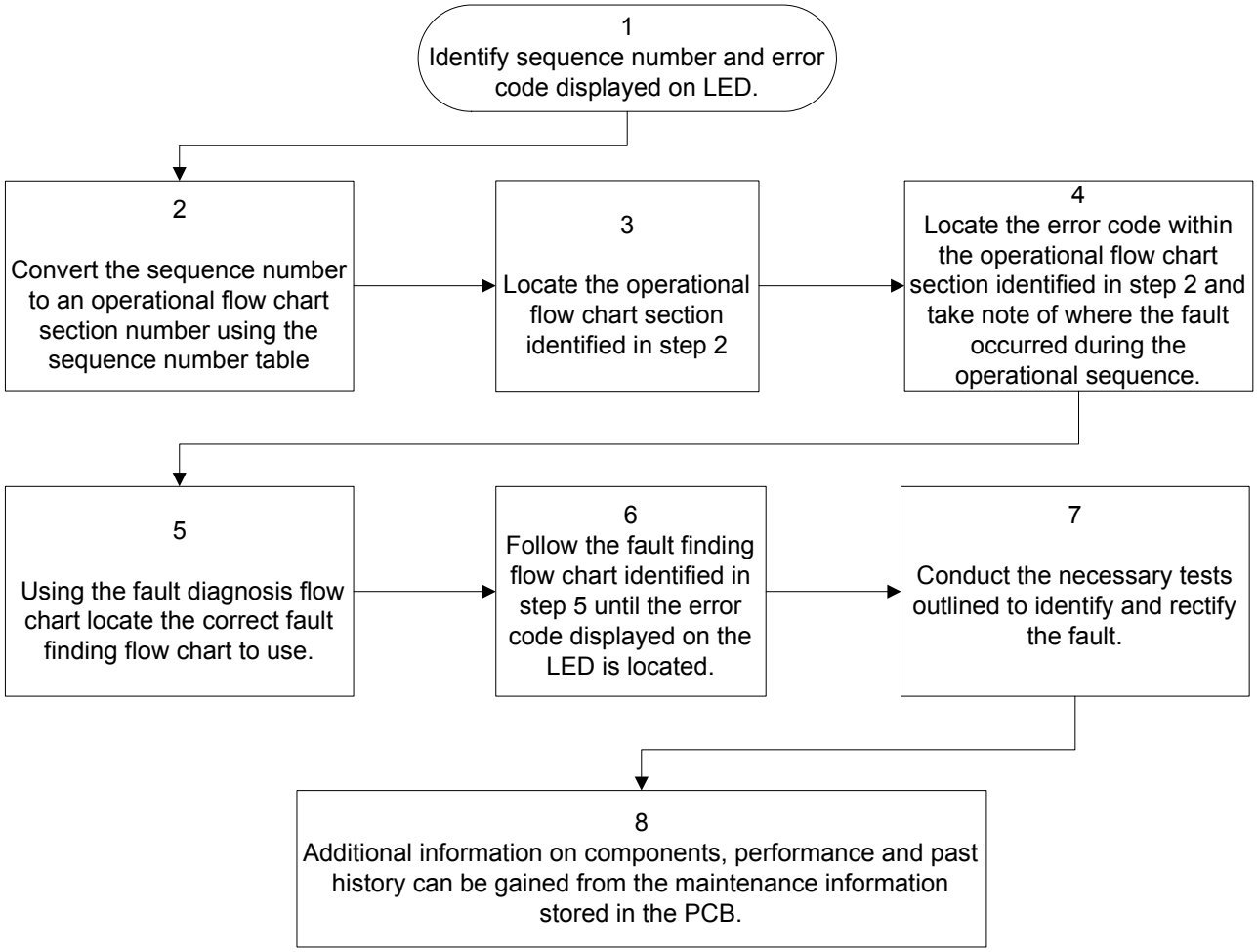
- The water volume function is designed to warn, by a beeping sound, that a certain volume of water has been delivered from the water heater. **It does not stop either the flow of or the heating of water.**
- The Kitchen controller does not require priority nor to be on in order to set the water volume 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.

How to Fault Find

When conducting fault finding techniques it is important to understand that the same error code with a different sequence number can be displayed at different points during the operational sequence of the water heater. It is important to determine where the fault occurred in relationship to the operational sequence of the water heater before commencing fault finding tests, as the tests may differ even though the same error code can be displayed.

If a fault occurs the LED display will alternate between the error code for the fault and a sequence number that indicates where in the operational sequence of the water heater the fault occurred. The operational flow charts are broken into 5 sections designated by boxed numbers. The table on page 20 converts the sequence number displayed on the LED to the appropriate operational flow chart section.

The flow diagram below outlines the recommended procedure to successfully diagnose, test and rectify faults on the Integrity range of water heaters.



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.

When a fault occurs, an error code and sequence number will alternate in the LED display. 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 25.

By locating the Error Code (displayed on the water heater or remote controller) 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 on 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
C.I	Combustion Indicator	**S.V. 2**	Solenoid Valve 2

Stepping gas rate change sequence by solenoid

Model	Step 1	Step 2	Step 3
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
18/20L	Right Solenoid (S.V. 1)	Left Solenoid (S.V. 2)

Sequence Number Table

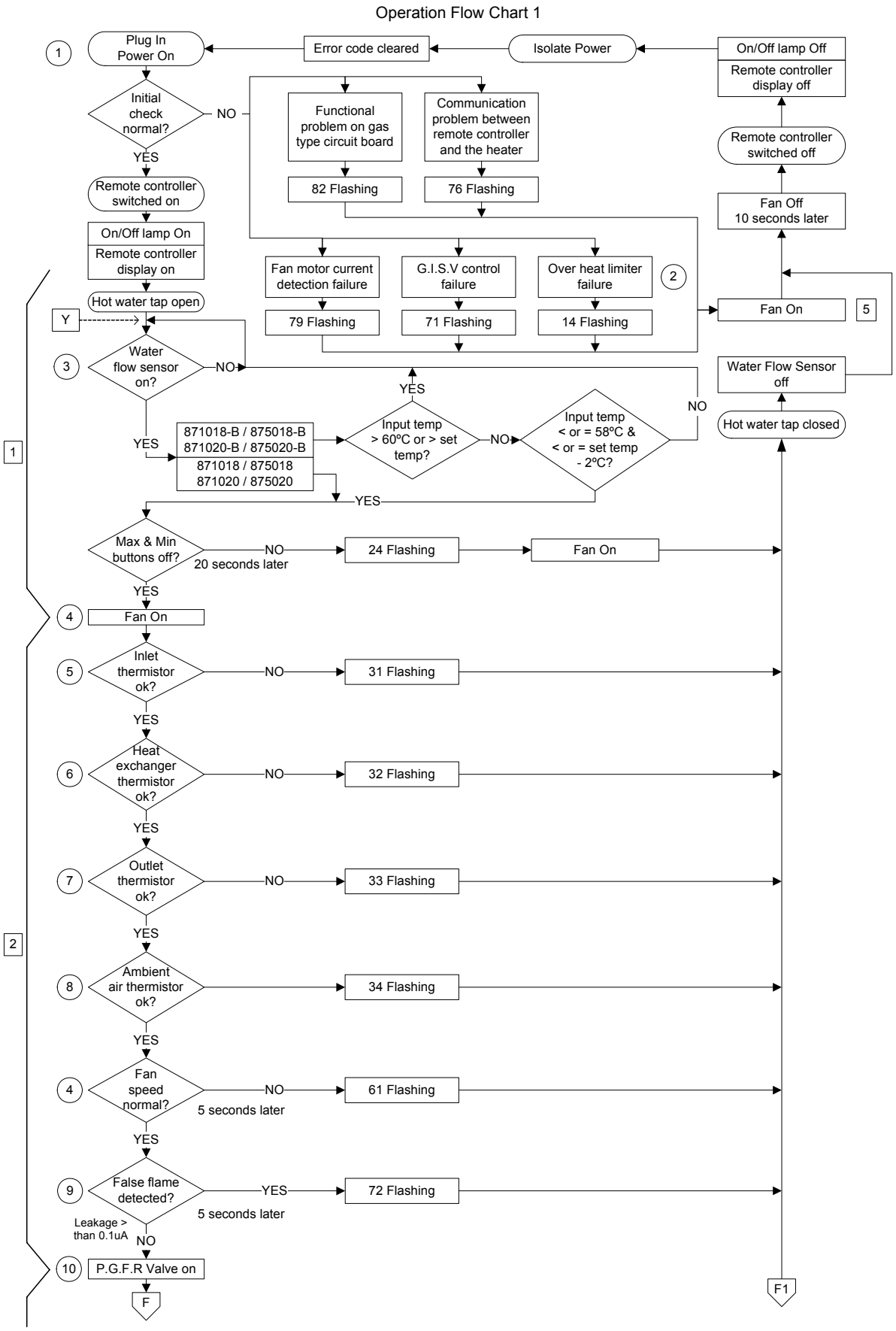
Sequence Number	- 0 to -9	A0 - A9 P0 - P9	C0 - C9	E0 - E9	H0 - H9 L0 - L9 J0 - J9 U0 - U9
Operational Flow Chart Section	1	2	3	4	5

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.

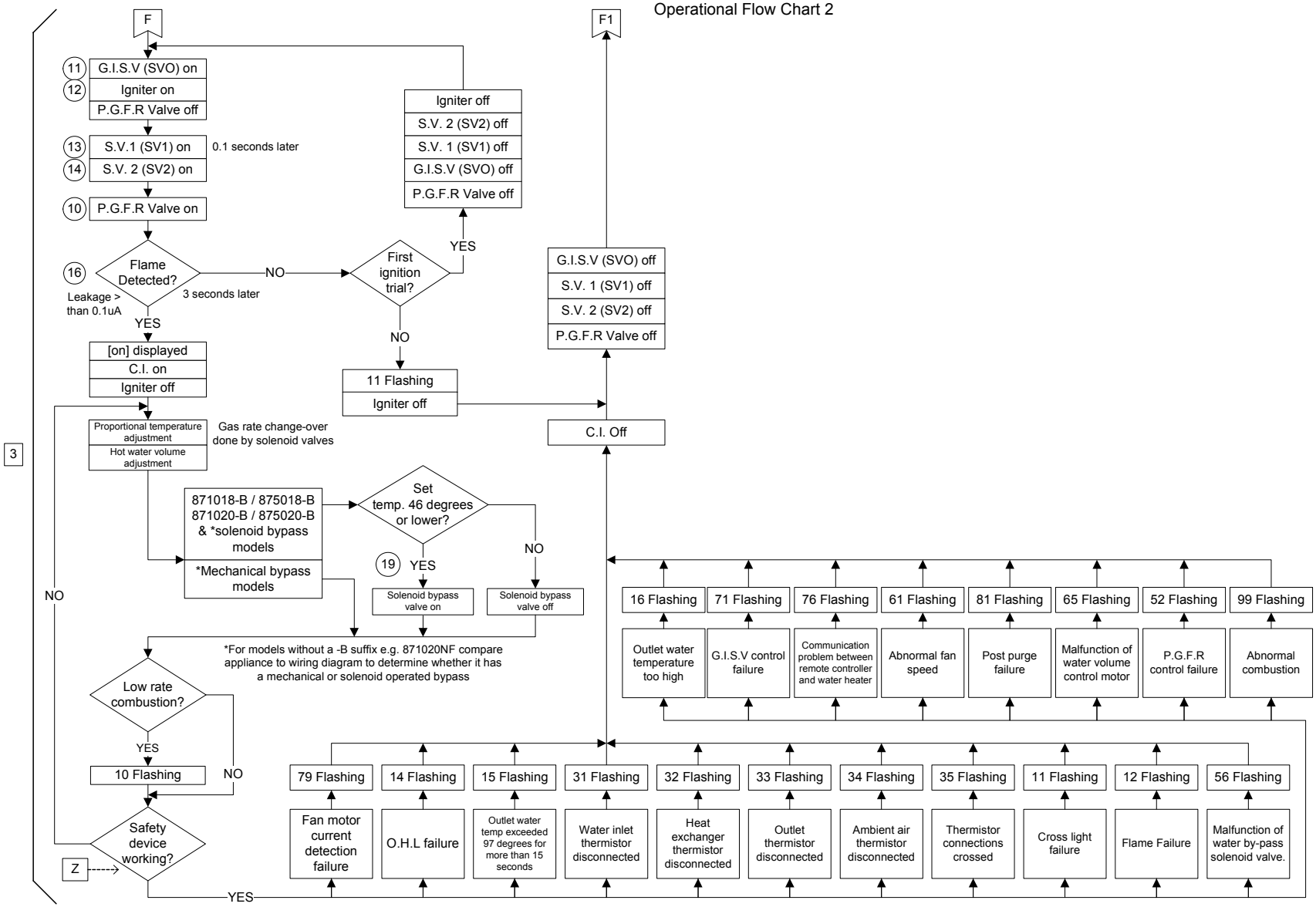
Flame detection simulator	WH0020080
Flame sensor current (uA) detection kit	WH0020081
Fine probe adapter kit	WH0020082
Heat exchanger fin brush	WH0020083
Probe to alligator clip kit	WH0020084

Operational Flow Charts



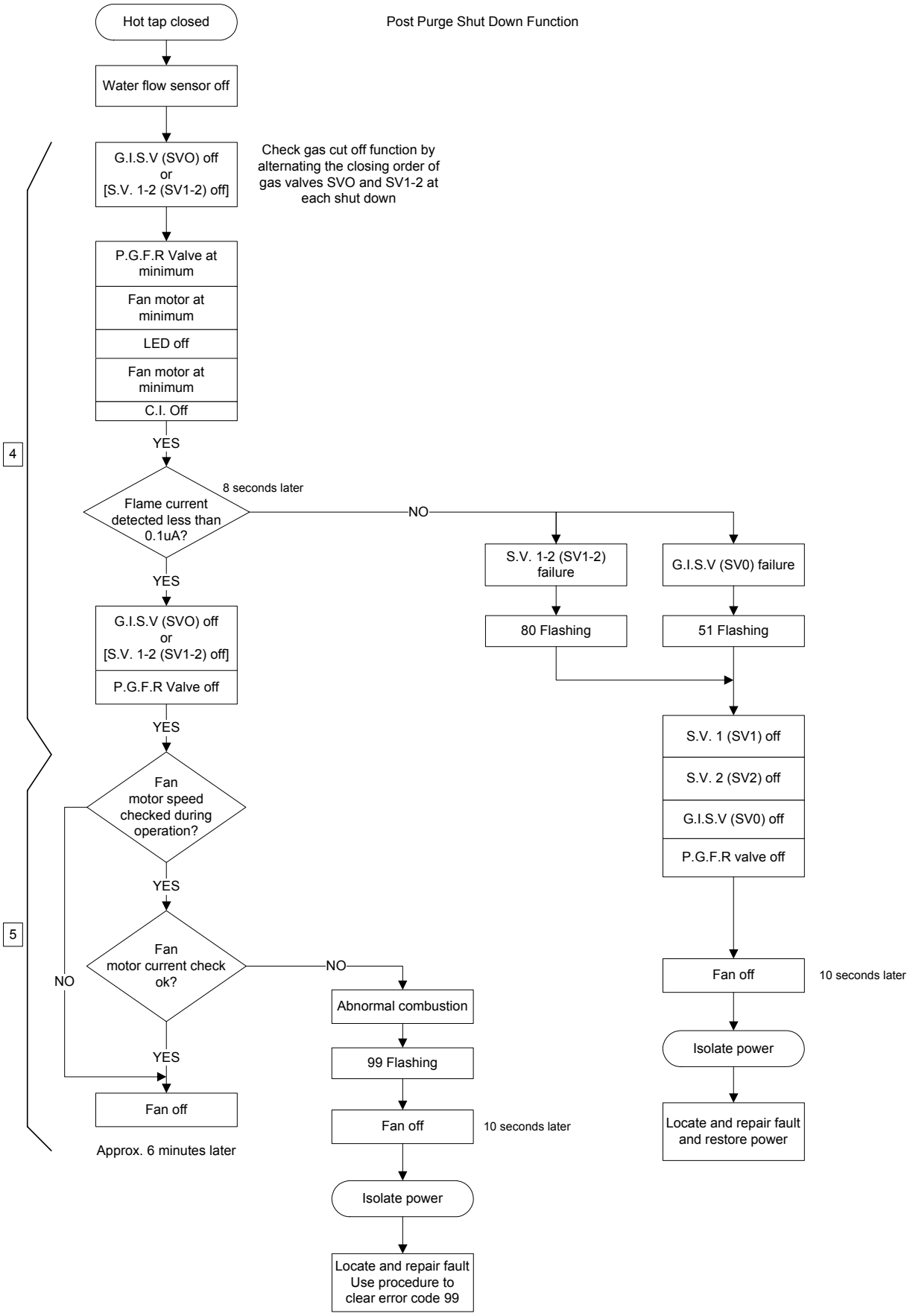
Note: see page 20 for details on interpreting chart abbreviations.

Operational Flow Chart 2



Note: see page 20 for details on interpreting chart abbreviations.

Operation Flow Chart 3



Note: see page 20 for details on interpreting chart abbreviations.

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	Fault Condition	Items To Check
10	Abnormal low rate combustion	Blockage in the heat exchanger, fan, air intake or flue
11	Ignition failure at start up Cross light failure	P.G.F.R Valve - diagnostic point 10 G.I.S Valve - diagnostic point 11 Igniter - diagnostic point 12 Solenoid valves 1 & 2 - diagnostic points 13 & 14 Flame sensors 1 & 2 - diagnostic point 16
12	Flame failure during operation	P.G.F.R Valve - diagnostic point 10 G.I.S Valve - diagnostic point 11 Solenoid valves 1 & 2 - diagnostic points 13 & 14 Flame sensors 1 & 2 - diagnostic point 16
14	Over heating	Over Heat Limiter - diagnostic point 2
15	Very high temperature	Heat exchanger thermistor - diagnostic point 6 Hot water outlet thermistor - diagnostic point 7 P.G.F.R Valve - diagnostic point 10
16	Outlet water temp too high	P.G.F.R Valve - diagnostic point 10
24	Operational switch faulty	MAX or MIN button on IC board
31	Inlet thermistor open circuit	Water inlet thermistor - diagnostic point 5
32	Heat exchanger thermistor open circuit	Heat exchanger thermistor - diagnostic point 6
33	Outlet thermistor open circuit	Hot water thermistor - diagnostic point 7
34	Ambient air thermistor open circuit	Ambient air thermistor - diagnostic point 8
35	Thermistor connections crossed	Connection points of thermistors
51	Gas cut off malfunction	G.I.S Valve - diagnostic point 11 Flame sensor 1 & 2 - diagnostic point 16
52	P.G.F.R control failure	P.G.F.R Valve – diagnostic point 10 Gas type circuit board IC Board
56	Bypass solenoid failure	Water Bypass solenoid – diagnostic point 19
61	Abnormal fan speed	Fan motor – diagnostic point 4
65	Malfunction of water volume control motor	Water volume control motor - diagnostic points 18 & 19
71	G.I.S valve control failure	Gas. Inlet Solenoid Valve IC Board (PCB) - diagnostic point 11
72	Detected false flame	Flame sensors 1 & 2 - diagnostic point 9
76	Communication problem between controller and water heater	Remote controller IC Board or cable
79	Fan motor current detection failure	Fan motor IC Board – diagnostic point 4
80	Gas cut off defective	Solenoid valve 1 & 2 - diagnostic points 13 & 14 Flame sensor 1 & 2 - diagnostic point 16
81	Post purge malfunction (Solenoid valve 1 failure)	Solenoid valve 1 & 2 - diagnostic points 13 & 14 Flame sensor 1 & 2 - diagnostic point 9
82	Functional problem on gas type circuit board	Gas type circuit board
99	Abnormal combustion	Blockage in the heat exchanger, fan, air intake or flue way

Note: see page 20 for interpretation of abbreviations.

Diagnostic Test Points

Refer to wiring diagram, page 7, for connector and wiring positions.

Test Point	Measuring Point		Normal Condition	Items Under Test
	Connector	Wire Nº & colour		
1	A	R1 – R2	AC 85V – 120V	Main Power
2	B	W8 – W12	50 kilo-ohms – 500 kilo-ohms	Overheat Limiter
3	B	BR9 – BL10	DC 2V– 5V(Pulse) ***1** More than 1310 pulse/min	Water Flow Sensor pulse signal
		R11 – BL10	DC 7V – 15V	Water Flow Sensor
4	K	B4 – W6	DC 120V – 170V	Fan Motor
		R3 – B4	DC 11V – 19V	
		Y1 – B4	DC 4V – 10V(Pulse) ***1** More than 4800 pulse/min	Fan Motor is pulse signal
5	B	Y6 – BL7	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Water Inlet Thermistor
6	B	W5 – BL7	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Heat Exchanger Thermistor
7	B	R4 – BL7	@ 20ºC – 10.3 kilo-ohms @ 40ºC – 4.9 kilo-ohms	Hot Water Outlet Thermistor
8	B	B3 – BL7	@ 25ºC – 5.0 kilo-ohms @ 5ºC – 12.7 kilo-ohms	Ambient Air Thermistor
9	J	R1 – Earth	AC 2V – 20V ***2**	Flame Sensor detecting flame
		W3 – Earth	AC 2V – 20V ***2**	
10	B	R1 – BL2	DC 1.5V – 8.0V 42 ohms – 97 ohms	Proportional Gas Flow Regulating
11	L	Y9 – BL10	DC 70V – 110V 0.8 kilo-ohms – 2.2 kilo-ohms	Gas Inlet Solenoid Valve
12	L	R2 – R8	AC 85V – 120V	Igniter
13	L	R3 – BL10	DC 70V – 110V 0.8 kilo-ohms – 2.2 kilo-ohms	Solenoid Valve 1
14	L	W4 – BL10	DC 70V – 110V 0.8 kilo-ohms – 2.2 kilo-ohms	Solenoid Valve 2
16	J	R1 – Earth	AC 2V – 20V ***2**	Flame Sensor not detecting flame.
		W3 - Earth	AC 2V – 20V ***2**	
18	H	W2 – BL8	DC 8V – 16V	Water Volume Control Motor position switch
		R7 – BL8	DC 8V – 16V	
		GR6 – BL8	Less than DC 1V (Limiter off) DC 4V – 6V (Limiter on)	
19	L	O6 – O12	DC 70 – 110V 0.6 kilo-ohms – 2.8 kilo-ohms	Water Bypass Solenoid (models with -B suffix in model number only e.g. 871020NF-B)

NOTES:

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

***2:** 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 27 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	Null	Error Code for the previous 8 faults								Null
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. °C	Water Inlet Thermistor temp. °C	Heat Exchanger Thermistor temp °C	Hot Water Outlet Thermistor temp °C	Fan speed X100 RPM	Power for P.G.F.R Valve	Null	Opening angle of Water Volume Control motor in degrees
A	Fan motor current curve (average)	Fan Motor current curve - after tap closure	Fan Motor current curve -present combustion	Fan Motor Current	Null	Null	Bath fill flow volume drawn Litres /minute X 10 (20L models with -B suffix in model number only e.g. 871020NF-B)	Null	Null	Sequence number

Flame Sensor Status

Model	**18 & 20L**			
R0y 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

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.

At the Water Heater

1. Remove the front panel from the water heater.
2. Using an insulated tool, turn DIP SWITCH 1 on (refer to figure 1).
3. Use the MIN button to change the left digit (0→1etc.) in the LED display to the required maintenance code identified from the maintenance table on page 26.
4. Use the MAX button to change the right digit (E→F etc.) in the LED display to the required maintenance code identified from the maintenance table on page 26.
5. The maintenance code and the value of that code will alternate on the LED display.
6. Turn DIP SWITCH 1 off (down position) when diagnosis is complete.
7. Refit the front panel to the water heater.

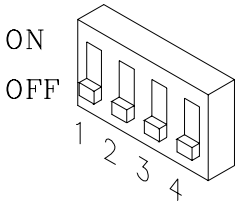


Fig 1

NOTE: Turning on DIP SWITCH 2 will lock the display if required.

From a Remote Controller

1. Ensure the Remote Controller is turned off.
2. Press the temperature increase and decrease buttons simultaneously for 3 seconds
3. Use Temperature decrease button to change the left digit (0→1etc.) in the LED display to the required maintenance code identified from the maintenance table on page 26.
4. Use the Temperature increase button to change the right digit (E→F etc.) in the LED display to the required maintenance code identified from the maintenance table on page 26.
5. The maintenance code and the value of that code will alternate on the LED display of the Remote Controller.
6. Press the on/off button twice on the Remote Controller to cancel maintenance information.

Clearing Error Code History

After successfully 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. Turn DIP SWITCH 1 on (up position) and then off (down position) again.
4. Within 5 seconds of turning DIP SWITCH 1 off, press and hold either the MIN or MAX button for more than 2 seconds. “CL” will flash in the LED display indicating the history is cleared.
5. 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.

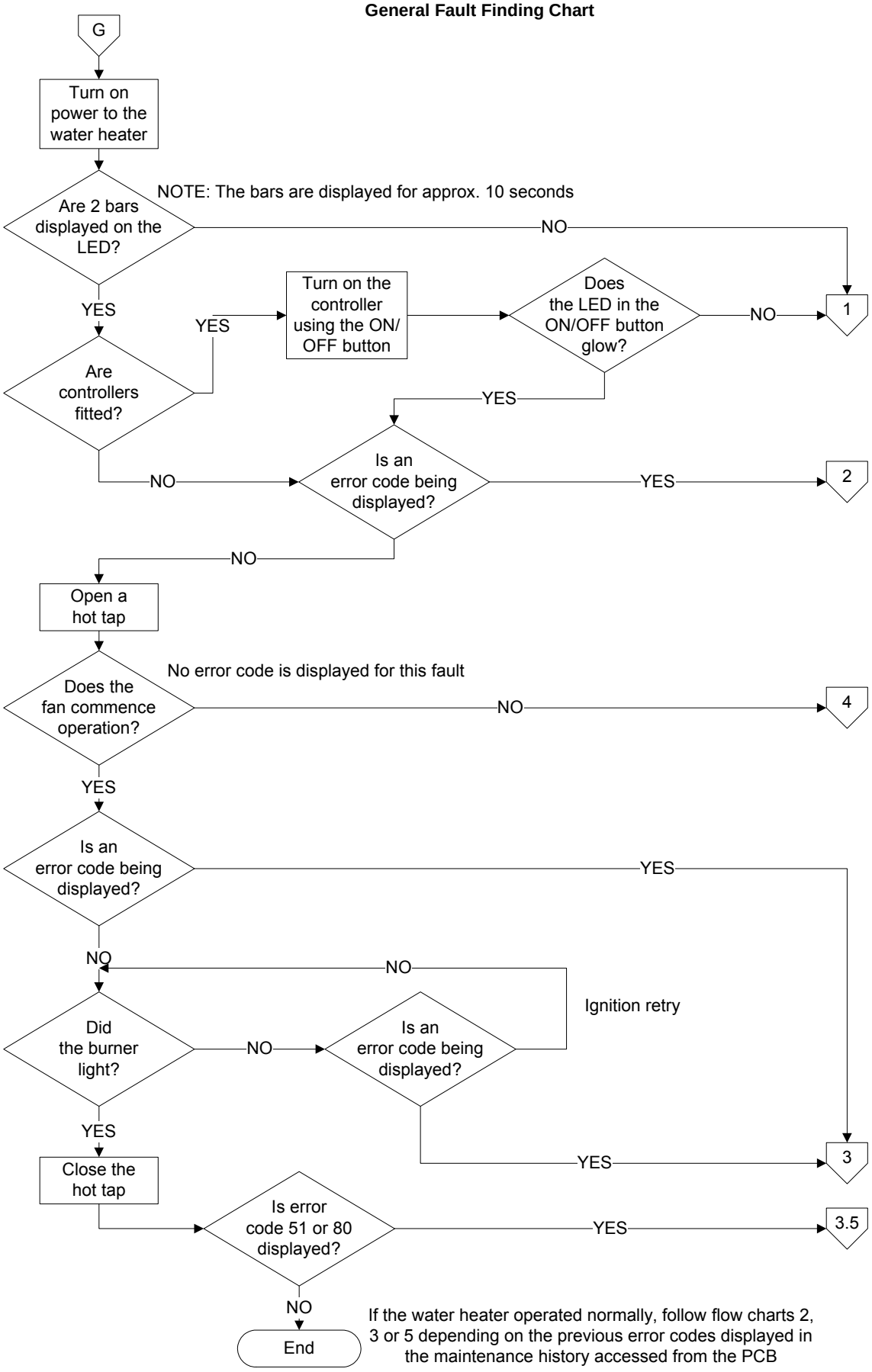
Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.

To reset Error Code 99 it is necessary to:

1. Ensure water is not flowing through the water heater.
2. Turn off remote controllers (if fitted).
3. Ensure all DIP SWITCHES are in the off position (down position).
4. Turn DIP SWITCH 2 on (up position) and then off (down position).
5. Within 5 seconds of turning DIP SWITCH 2 off, press and hold both the MIN and MAX buttons for more than 2 seconds.
6. “UL” will flash in the LED display and then become steady.
7. Turn on a controller (if fitted) then open and close a hot water tap to complete the procedure.

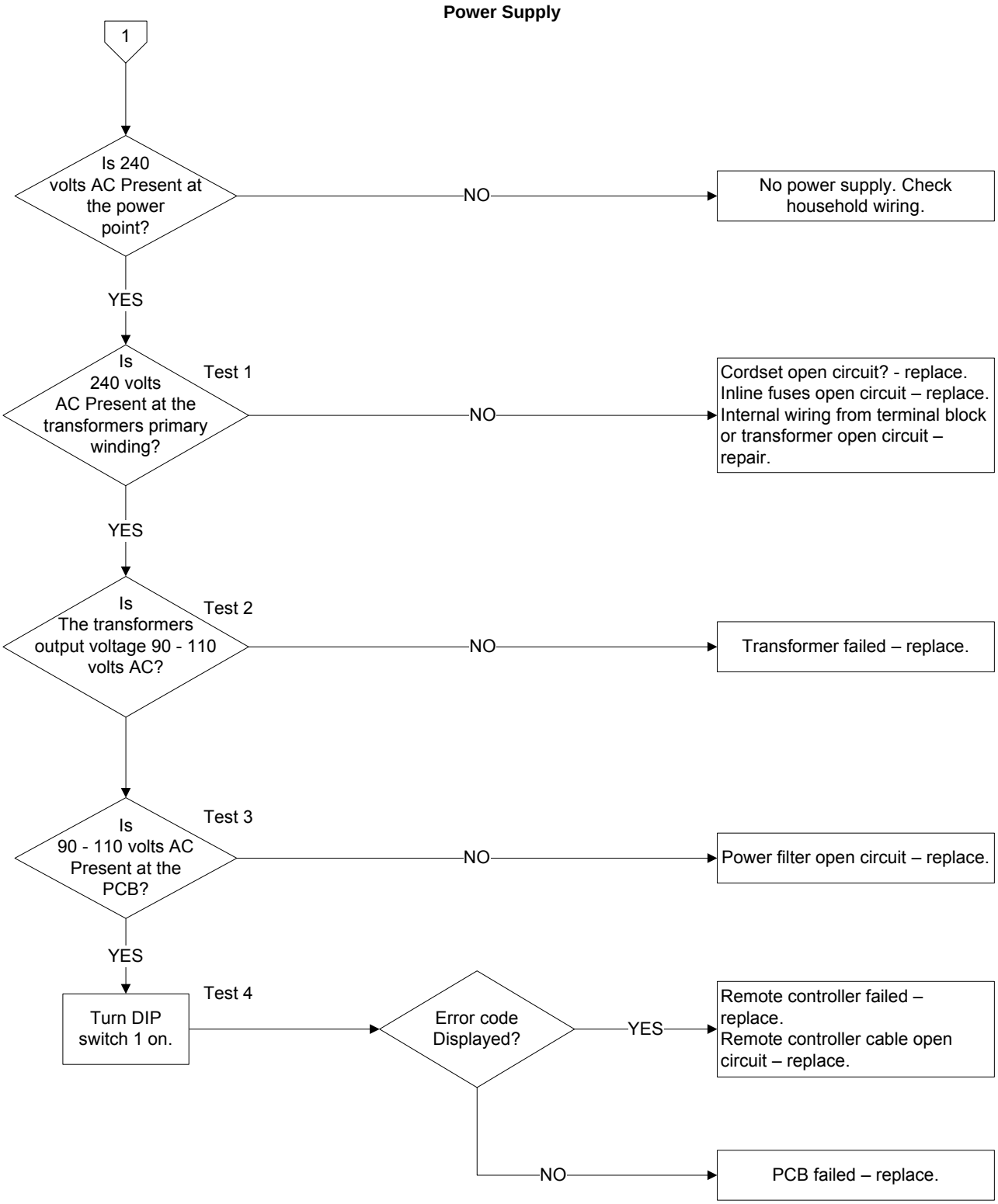
Fault Diagnosis Sequence (Fault Finding Chart G)

General Fault Finding Chart



Fault Finding Chart 1

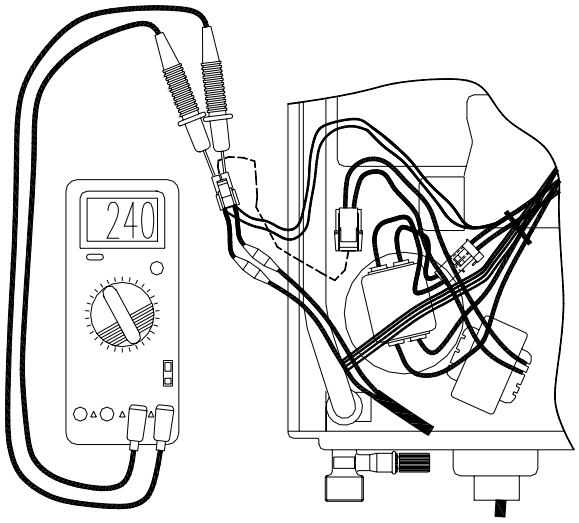
Voltages up to 240 volts will be present within the water heater, take care not to touch wiring terminals. Use an insulated tool when operating the DIP switch or MIN and MAX buttons.



Fault Finding Tests 1 – 4

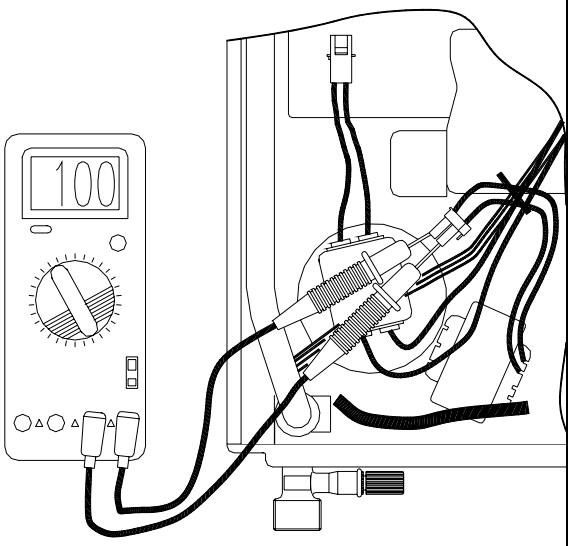
Components will be "Live" when conducting tests, exercise caution.

Test 1



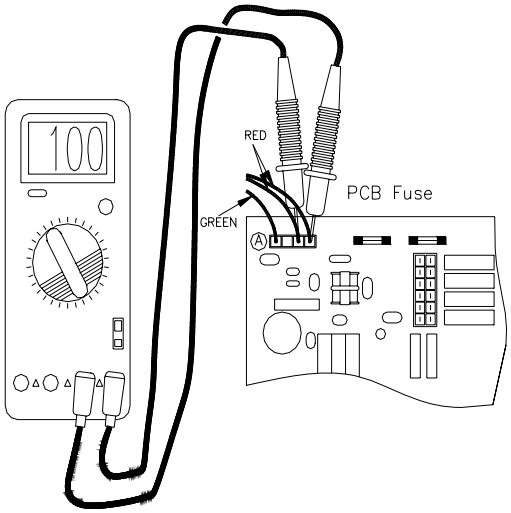
Measure the voltage at the connector plug to the transformer primary winding with a multimeter set on the AC voltage scale. If the voltage is between 230V and 250V the cord set and inline fuses are ok.

Test 2



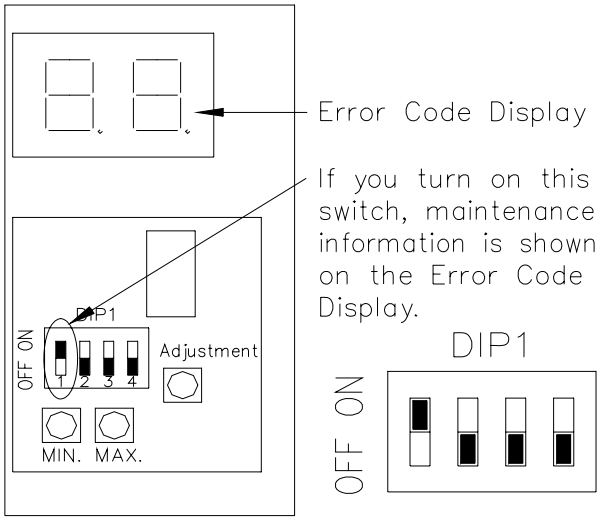
Measure the voltage at the connector plug from the transformer secondary winding with a multimeter set on the AC voltage scale. If the voltage is between 90V and 110V the transformer is ok.

Test 3



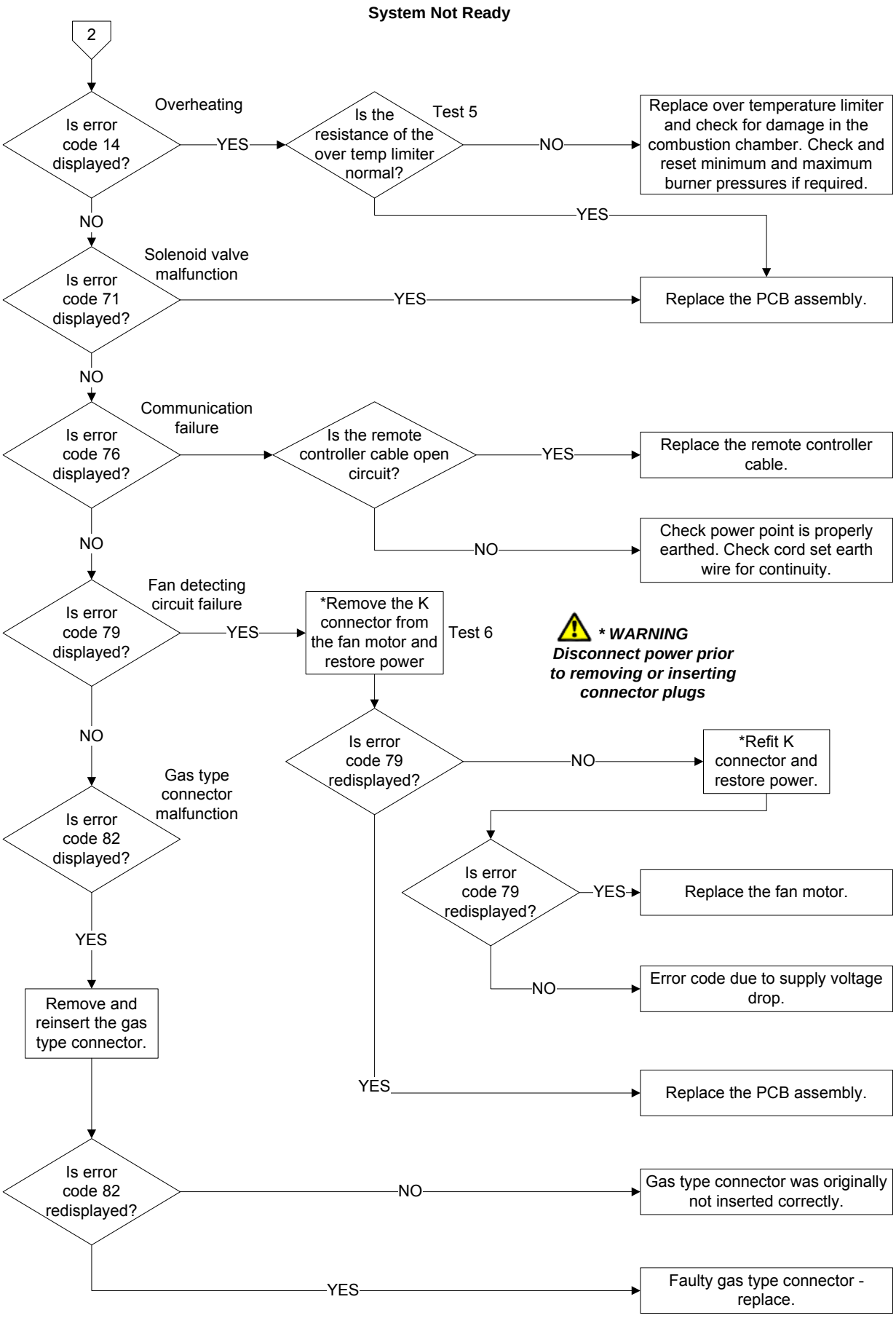
Measure the voltage at connector A between R1 and R2 on the PCB with a multimeter set on the AC voltage scale. If the voltage is between 90V and 110V the power filter is ok.

Test 4



Using an insulated tool, turn DIP switch 1 on

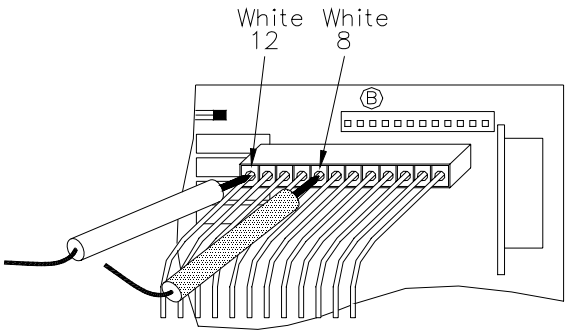
Fault Finding Chart 2



Fault Finding Tests 5 – 8

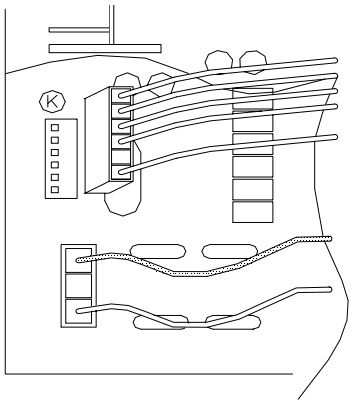
Isolate power before removing connector plugs

Test 5



Unplug connector B from the PCB and measure the resistance of the Over Heat Limiter Assembly. Resistance should be between 50kilo-ohms and 500 kilo-ohms.

Test 6

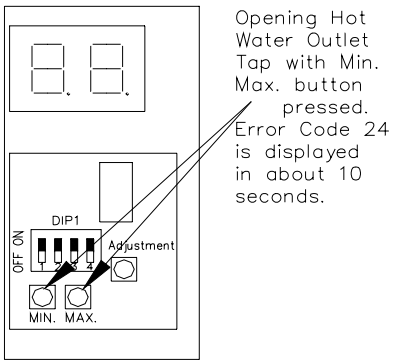


Unplug connector K from the PCB. Restore power and check if error code 79 is displayed within 30 seconds.

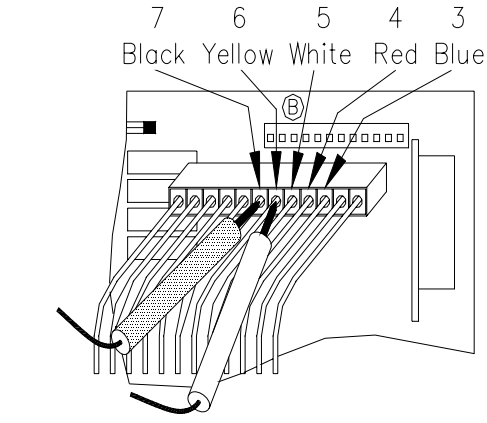
Isolate power when conducting resistance tests. "Live" components present during voltage tests, exercise caution

Test 7

Use an insulated tool when operating the DIP switch or MIN and MAX buttons



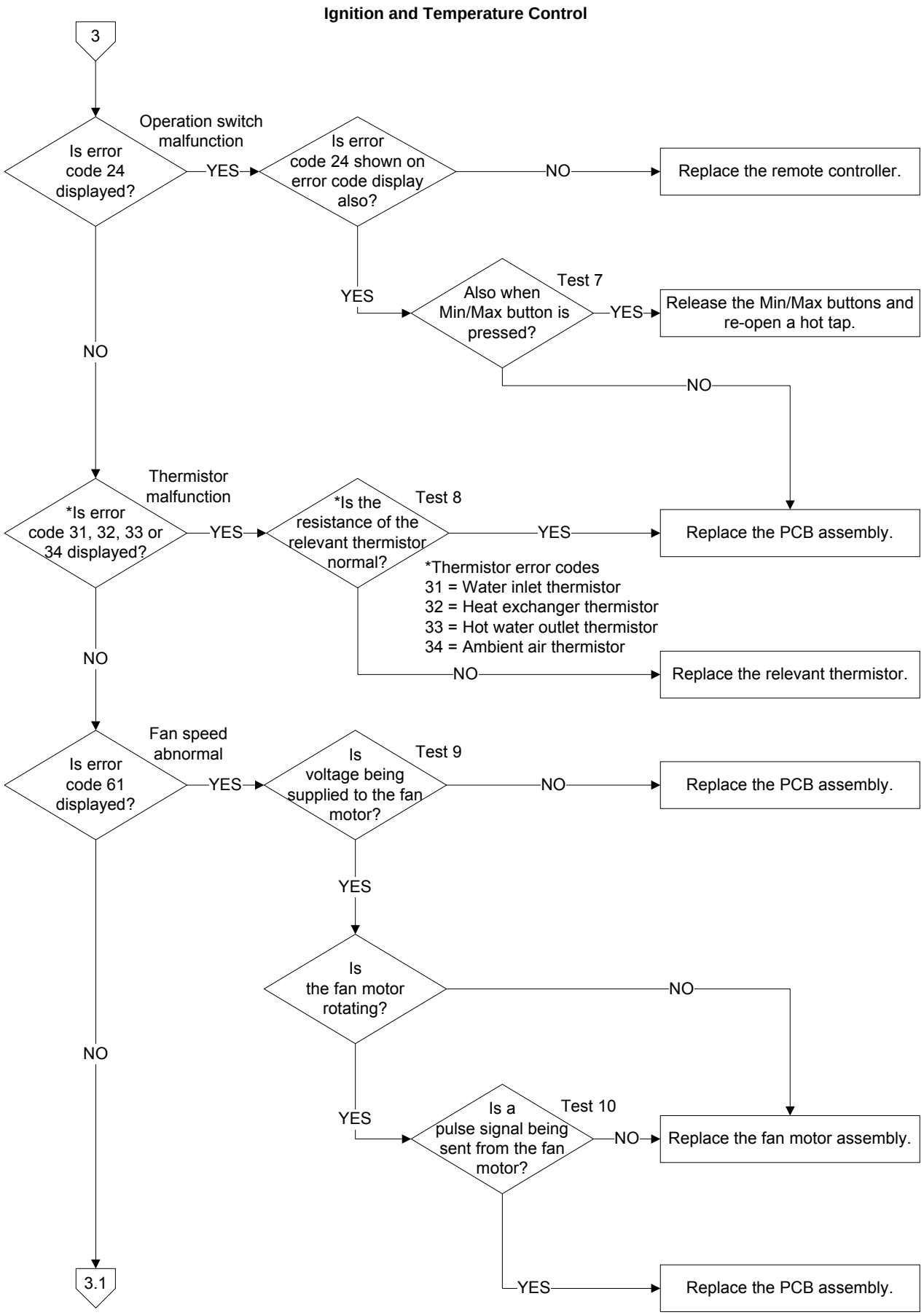
Test 8 – Diagnostic points 5, 6, 7 & 8



Remove the B connector and measure the resistance

Error code	Maintenance Display Code	Diag Point	Test Point	Measured Value
31	3y: Water Inlet Thermistor	5	6 Yellow 7 Black	20ºC – 10.3 kilo-ohms 40ºC – 4.9 kilo-ohms
32	4y: Combustion Chamber Thermistor	6	5 White 7 Black	
33	5y: Hot Water Outlet Thermistor	7	4 Red 7 Black	
34	2y: Ambient Air Thermistor	8	3 Blue 7 Black	25ºC – 5.0 kilo-ohms 5ºC – 12.7 kilo-ohms

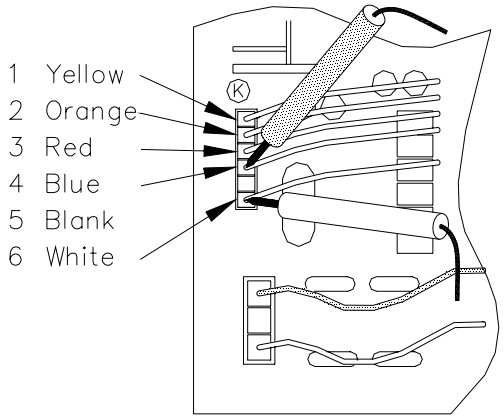
Fault Finding Chart 3



Fault Finding Tests 9 – 13

Isolate power when conducting resistance tests. "Live" components present during voltage tests, exercise caution

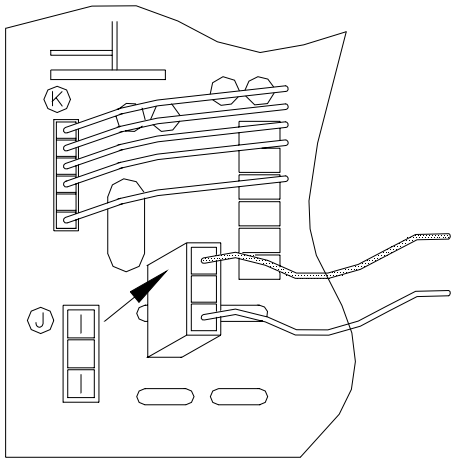
Tests 9 and 10 – Diagnostic Point 4



Diagnostic Point 4
Conduct test with water flowing

Test	Check Point	Measured Value
9	4 Blue – 6 White	DC120 -160V
	3 Red – 4 Blue	DC11 -19V
10	1 Yellow – 4 Blue	DC4 –10V (or measurement by pulse counter of not less than 4800 pulses per minute)

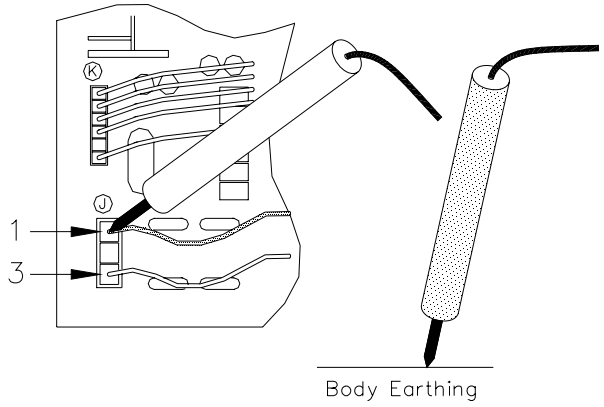
Test 11



Isolate power before removing connector plugs

Unplug connector J from the PCB and select maintenance information 0y on the L.E.D display.
If 01-07 is displayed the PCB has failed. If 00 is displayed there may be current leakage to earth

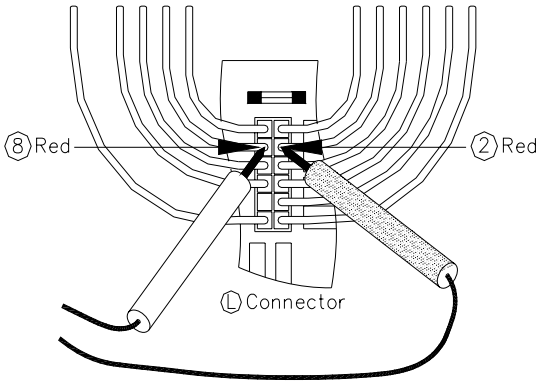
Test 12 - Diagnostic Point 9



Conduct test with no water flow

Measure the voltage between terminals 1 & 2 on connector J and earth. Voltage should be between AC2 – 20V

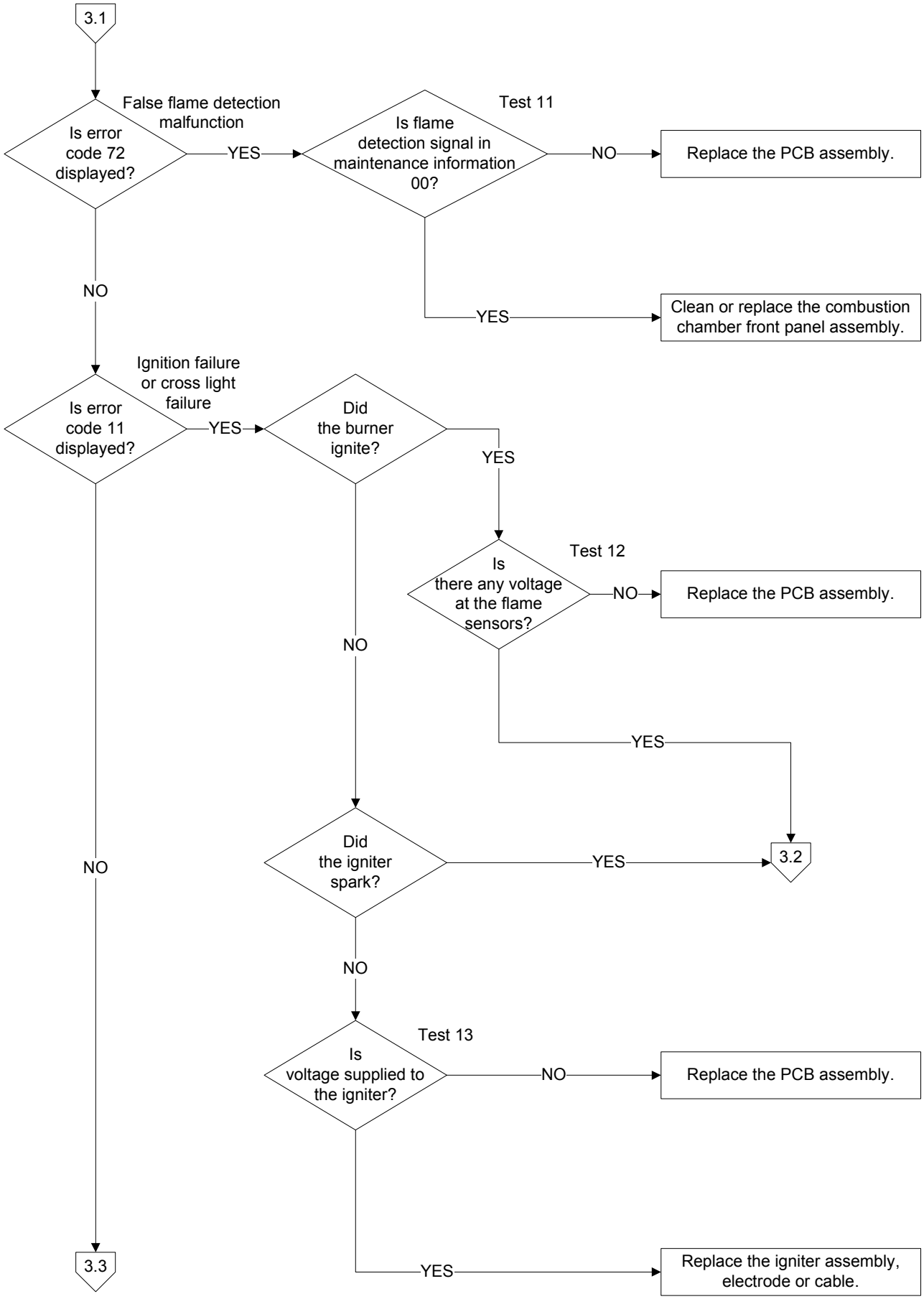
Test 13 - Diagnostic Point 12



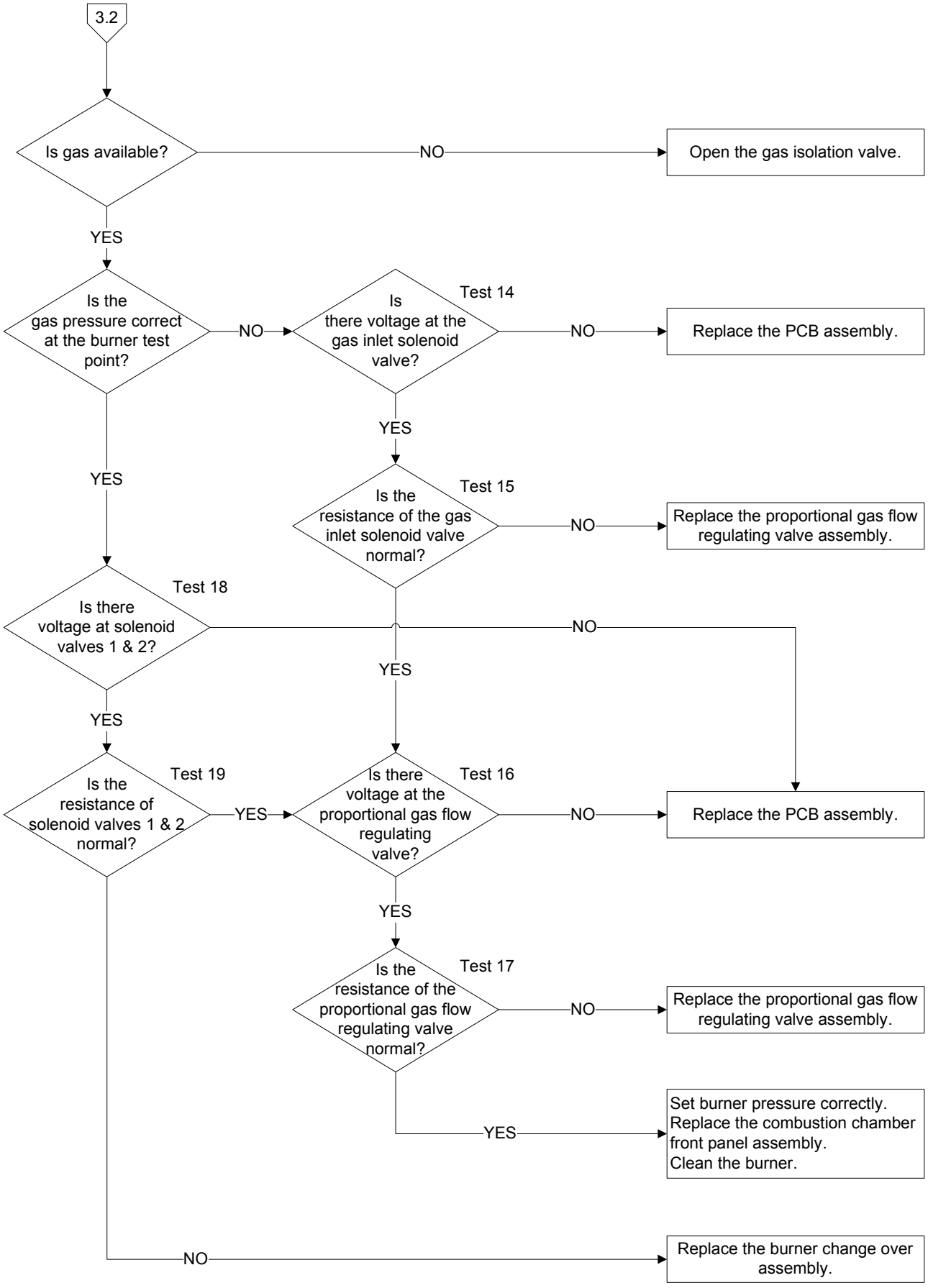
Conduct test with water flowing

When ignition sequence commences, normal voltage should be between AC 85 - 110V until flame is detected.
(Note: Duration is approximately 3 seconds)

Fault Finding Chart 3.1



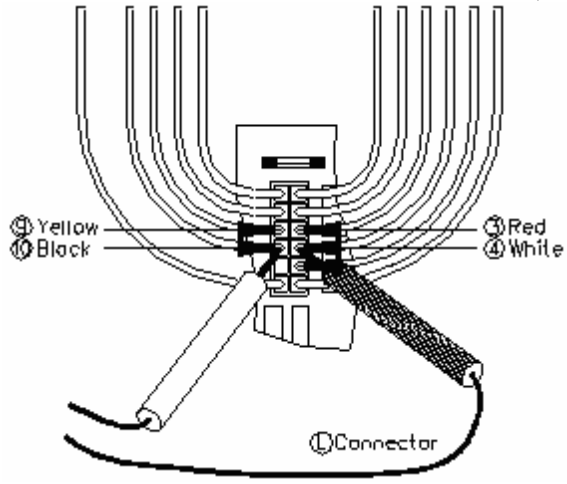
Fault Finding Chart 3.2



Fault Finding Tests 14 – 22

Isolate power when conducting resistance tests. "Live" components present during voltage tests, exercise caution.

Tests 14, 15, 18 and 19



NOTE:

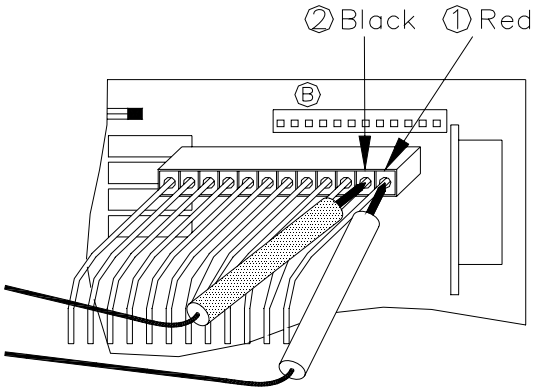
Measure the voltage with connector L plugged into PCB

Measure the resistance with connector L unplugged from the PCB

Test	Solenoid Valve	Normal Voltage	Test Point	Diagnostic Point
14	GISV	DC70 to DC100V	9 Yellow 10 Black	11
18	1		3 Red 10 Black	13
	2		4 White 10 Black	14

Test	Solenoid Valve	Normal Resistance	Test Point	Diagnostic Point
15	GISV	0.8kilo-ohms to 2.2kilo-ohms	9 Yellow 10 Black	11
19	1		3 Red 10 Black	13
	2		4 White 10 Black	14

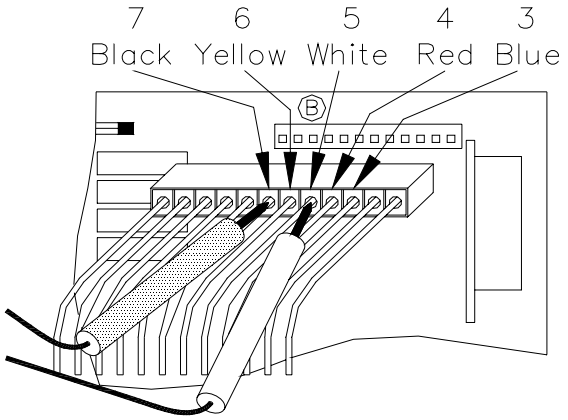
Tests 16 and 17 - Diagnostic Point 10



Test 16 – Conduct test with water flowing
Measure the voltage with connector B plugged into PCB. Normal voltage is between DC1.5 and 8.0V.

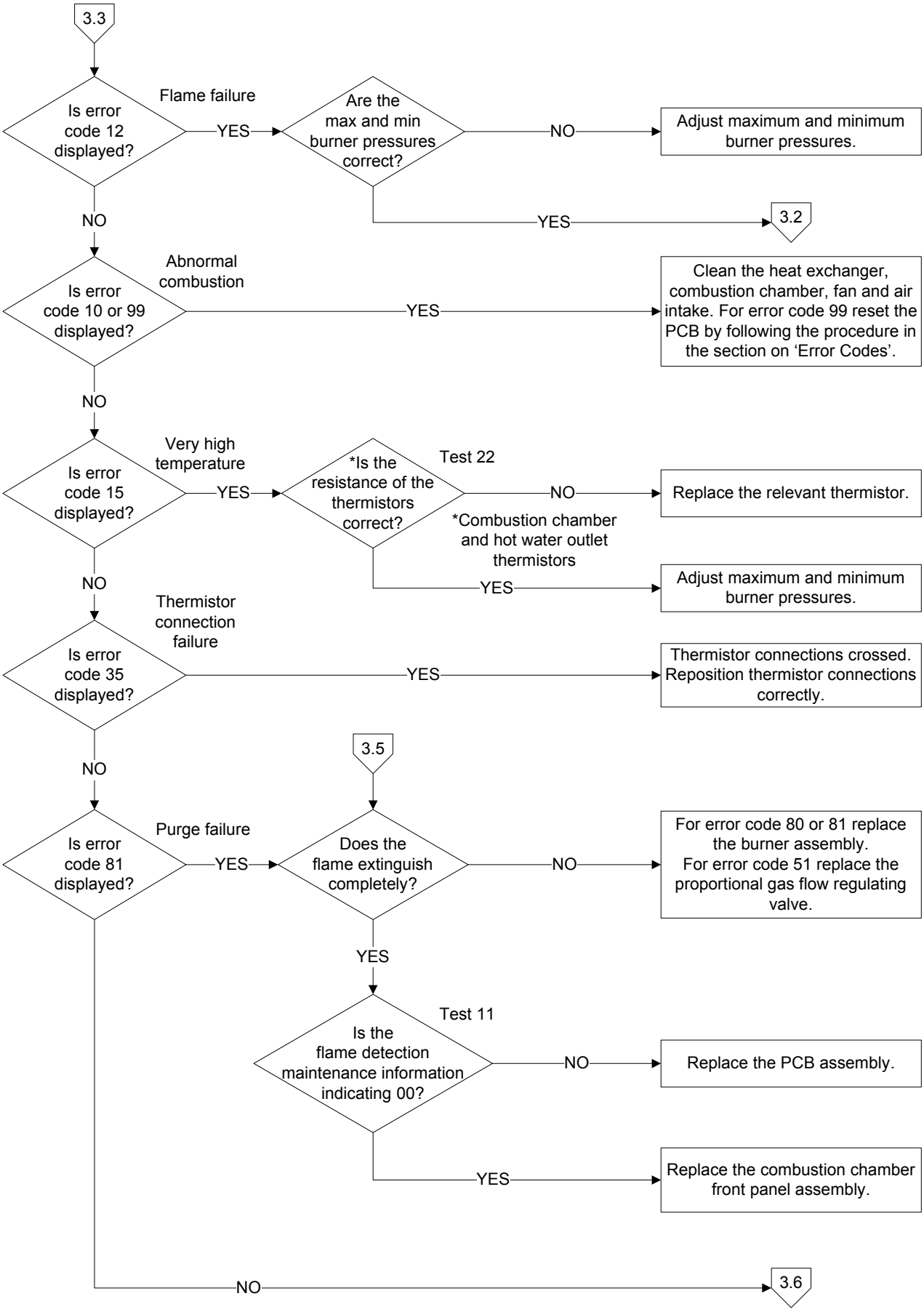
Test 17 – Isolate power before conducting test.
Measure the resistance with connector B unplugged from the PCB. Normal resistance is between 42 ohms and 97 ohms.

Test 22 – Diagnostic Points 6 and 7

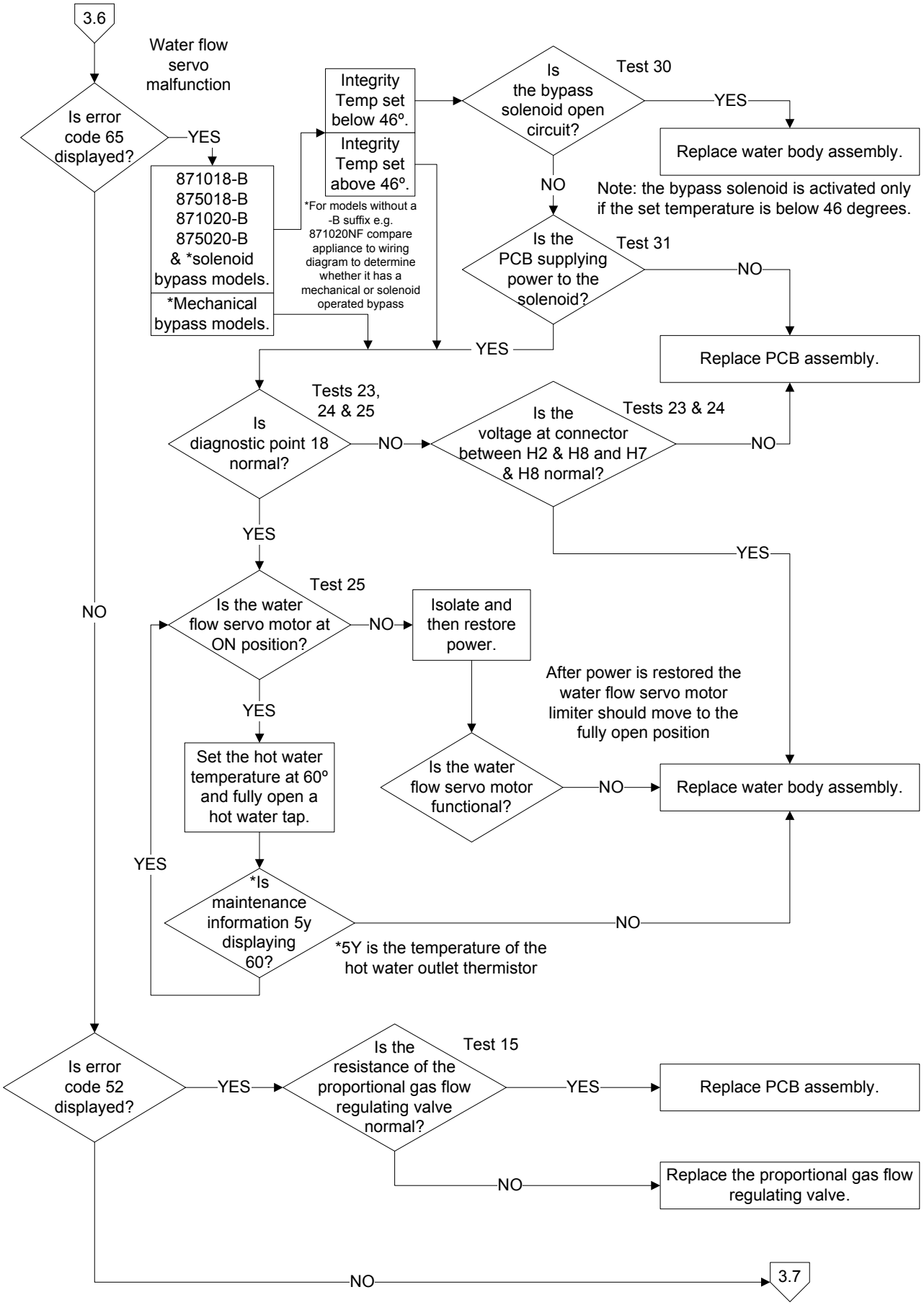


Error Code	Maintenance display code	Diagnostic Point	Test Point	Measured Value
32	4y: Combustion Chamber Thermistor	6	5 White 7 Black	@20ºC – 10.3 kilo-ohms @40ºC – 4.9 kilo-ohms
33	5y: Hot Water Outlet Thermistor	7	4 Red 7 Black	

Fault Finding Charts 3.3 and 3.5

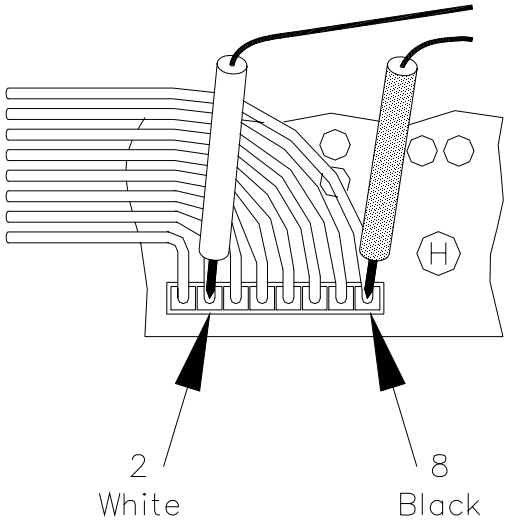


Fault Finding Chart 3.6



Fault Finding Tests 23 – 28

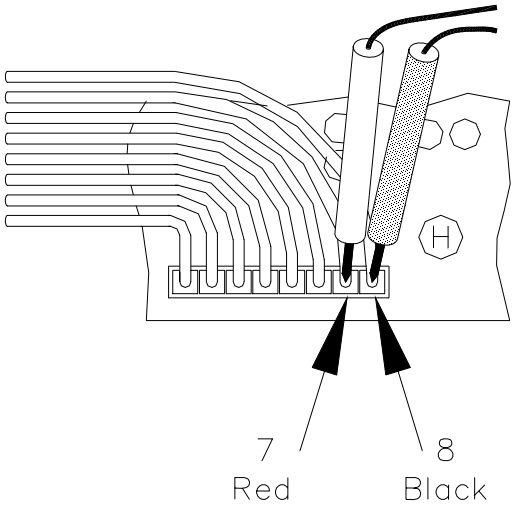
Test 23 - Diagnostic Point 18



Conduct test with water flowing

Test Point Connector H	Measured Value
2 White - 8 Black	DC8 – 16V

Test 24 - Diagnostic Point 18

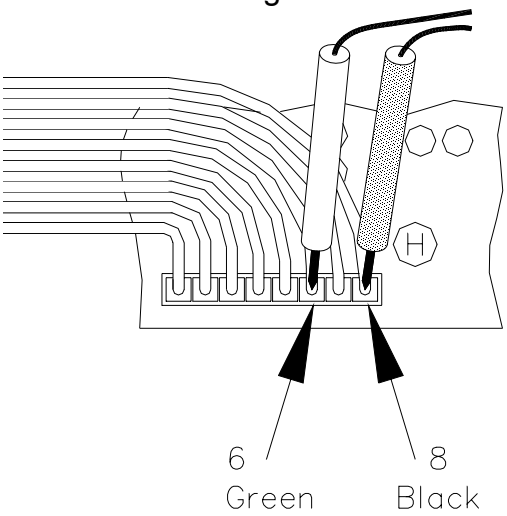


Conduct test with water flowing

Test Point Connector H	Measured Value
7 Red - 8 Black	DC8 – 16V

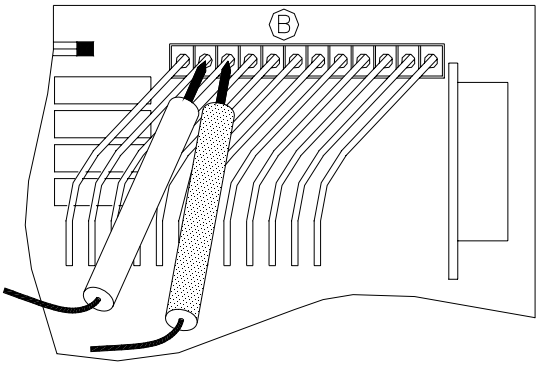
Components will be "Live" when conducting tests, exercise caution

Test 25 - Diagnostic Point 18



Test Point Connector H	Measured Value
6 Green - 8 Black	On position < DC1V Off position DC4 – 6V

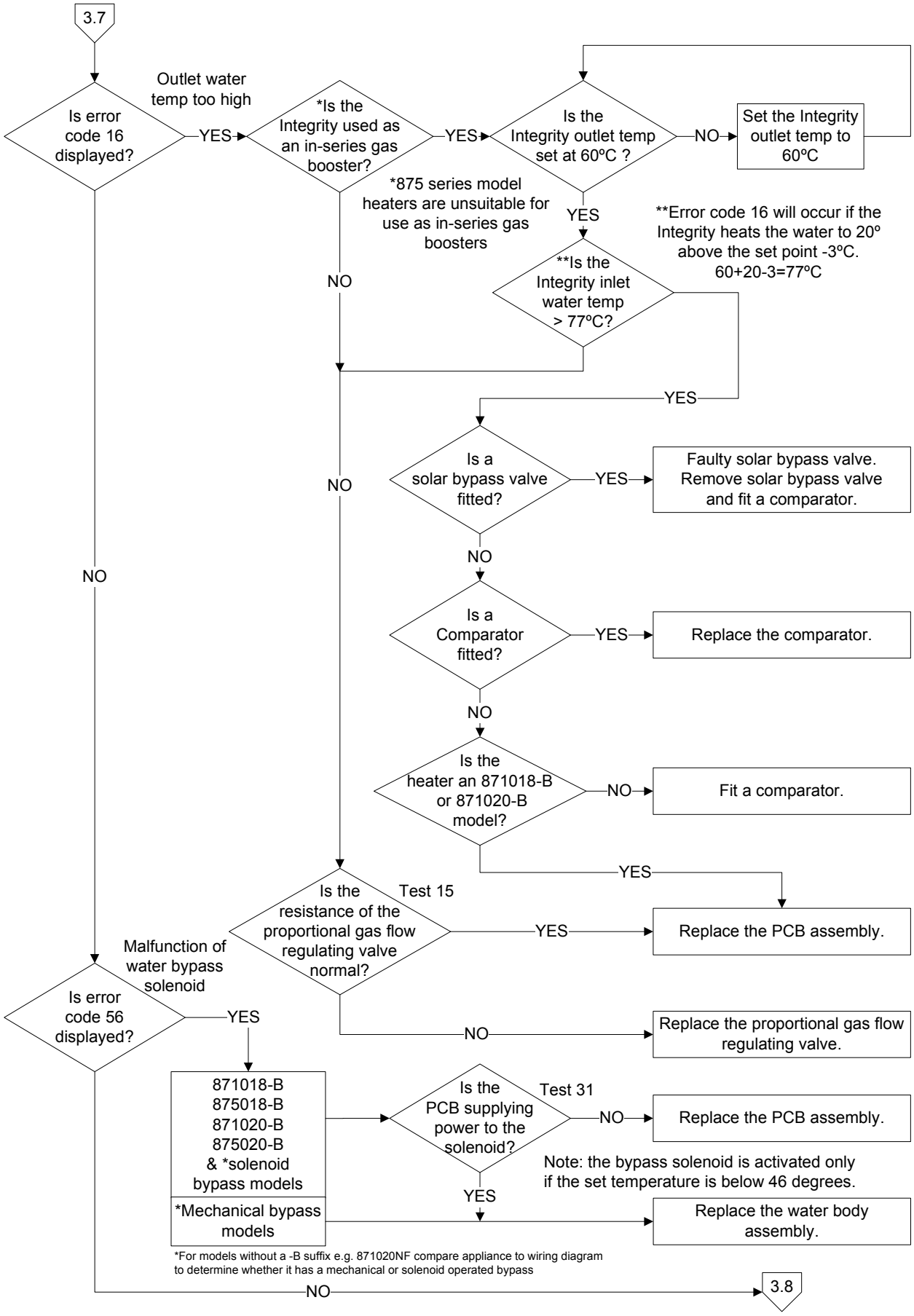
Test 28 - Diagnostic Point 3



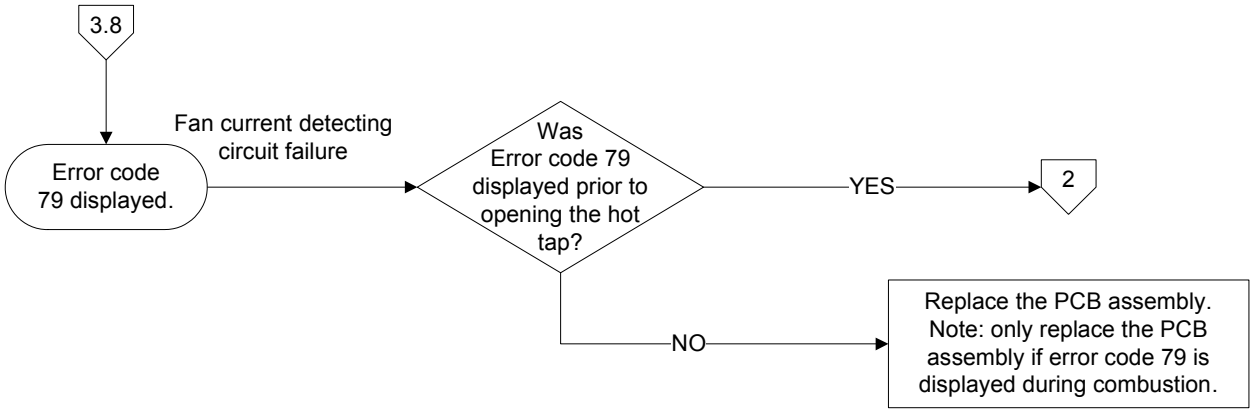
Conduct test with water flowing

Measure the voltage between 11 Red and 10 Black on connector B.
Voltage should be between DC7 – 15V

Fault Finding Chart 3.7

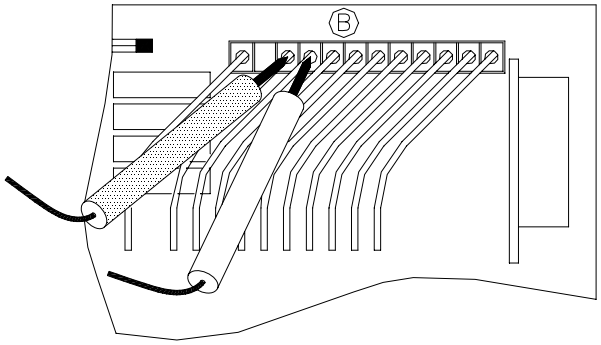


Fault Finding Chart 3.8



Fault Finding Tests 29 – 31

Test 29 - Diagnostic Point 3



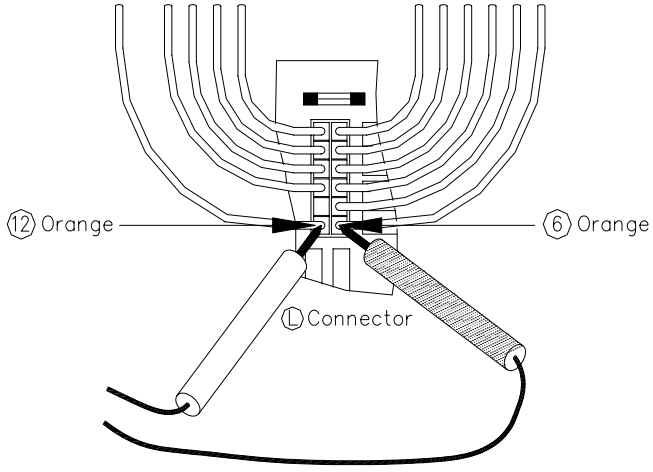
Components will be "Live" when conducting tests, exercise caution

Conduct test with water flowing

Measure the voltage between 9 Brown and 10 Black on connector B.

Voltage should be between DC2 – 5V

Test 30 and 31 - Diagnostic Point 19



Test 30

Isolate power when conducting resistance test

Unplug connector L from the PCB and measure the resistance between 6 Orange and 12 Orange.

Resistance should be between 0.6kilo-ohms and 2.8kilo-ohms.

Test 31

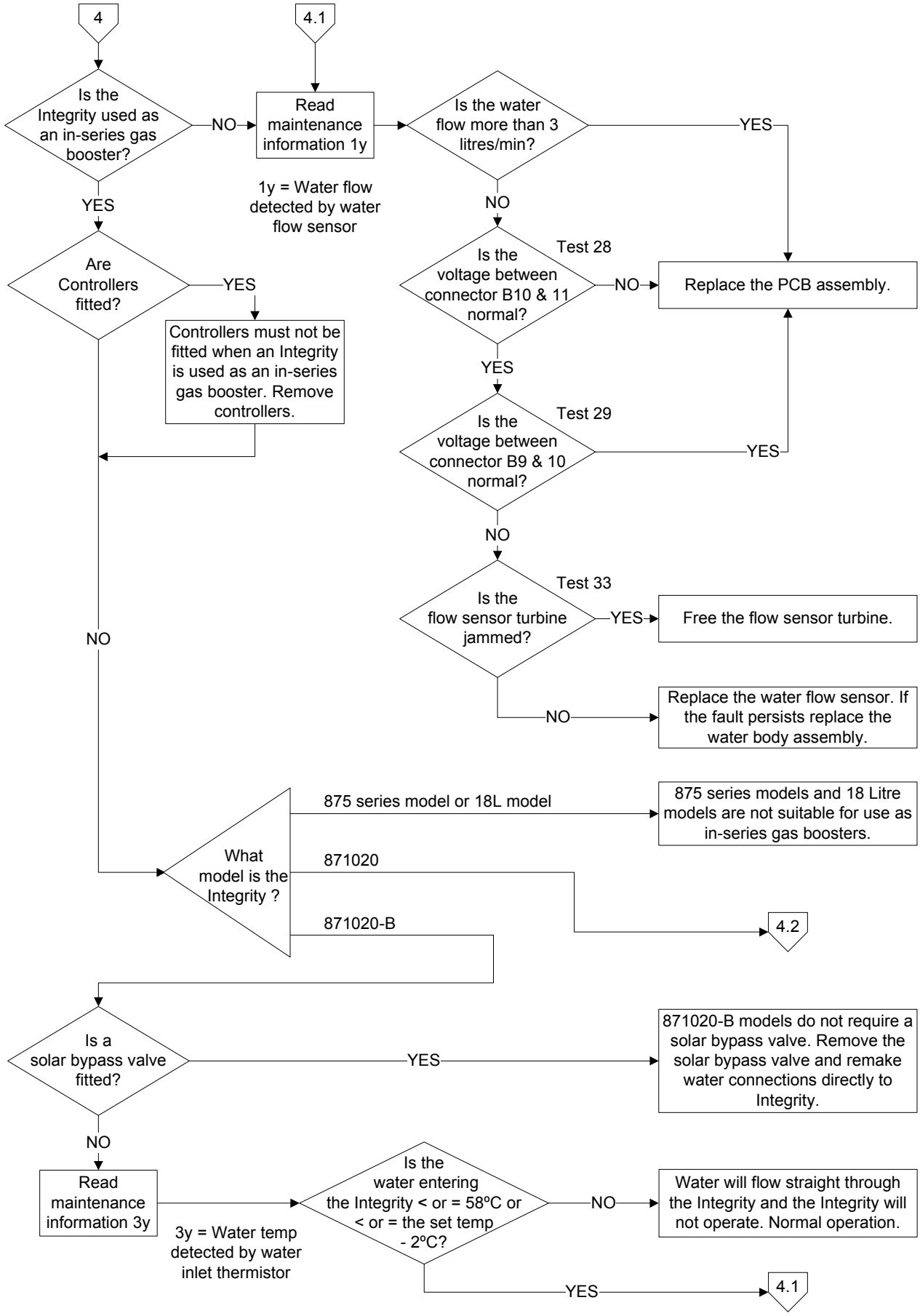
Components will be "Live" when conducting tests, exercise caution

Conduct test with water flowing

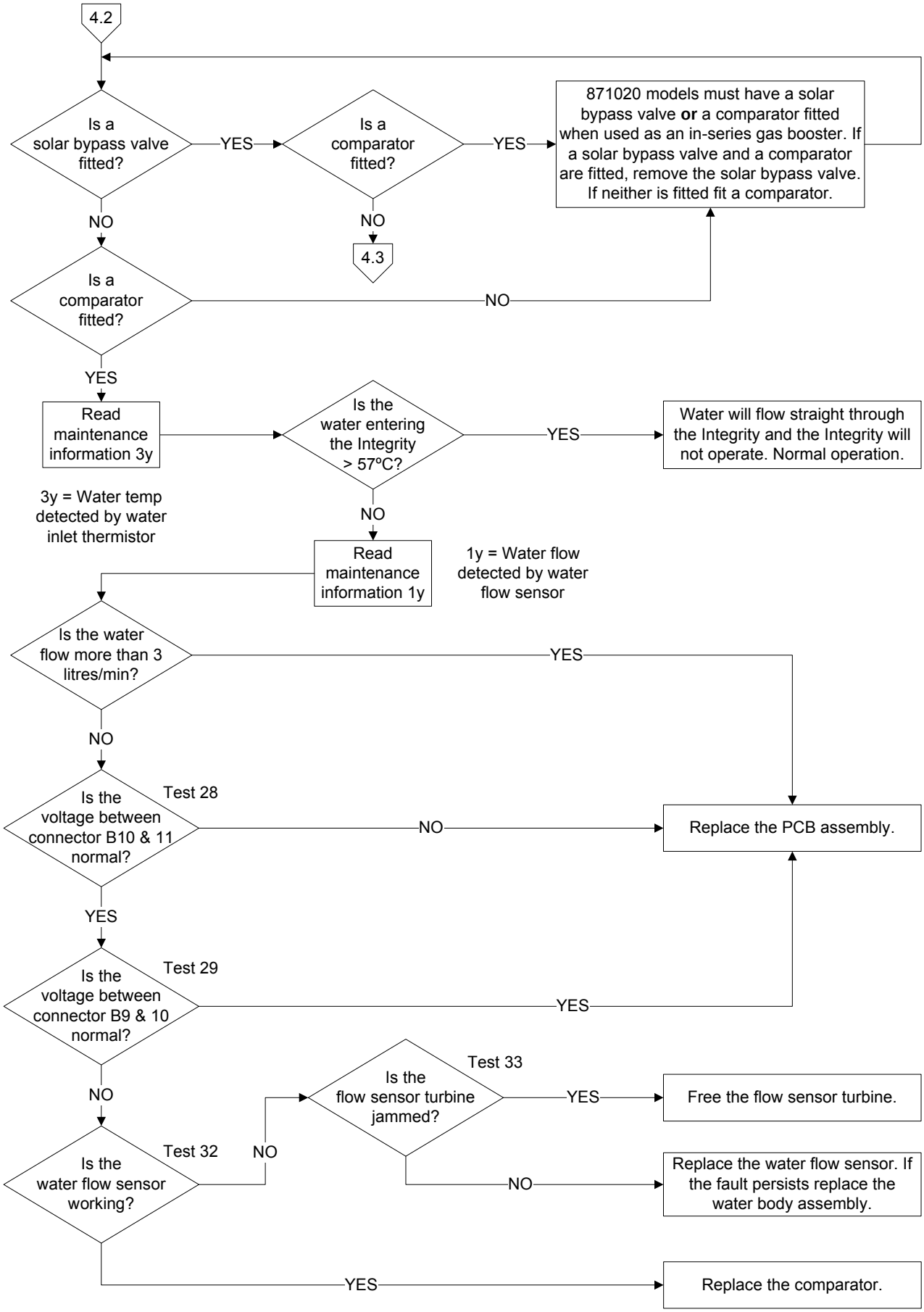
Measure the voltage between 6 Orange and 12 Orange on connector L.

Voltage should be between DC70 – 110V

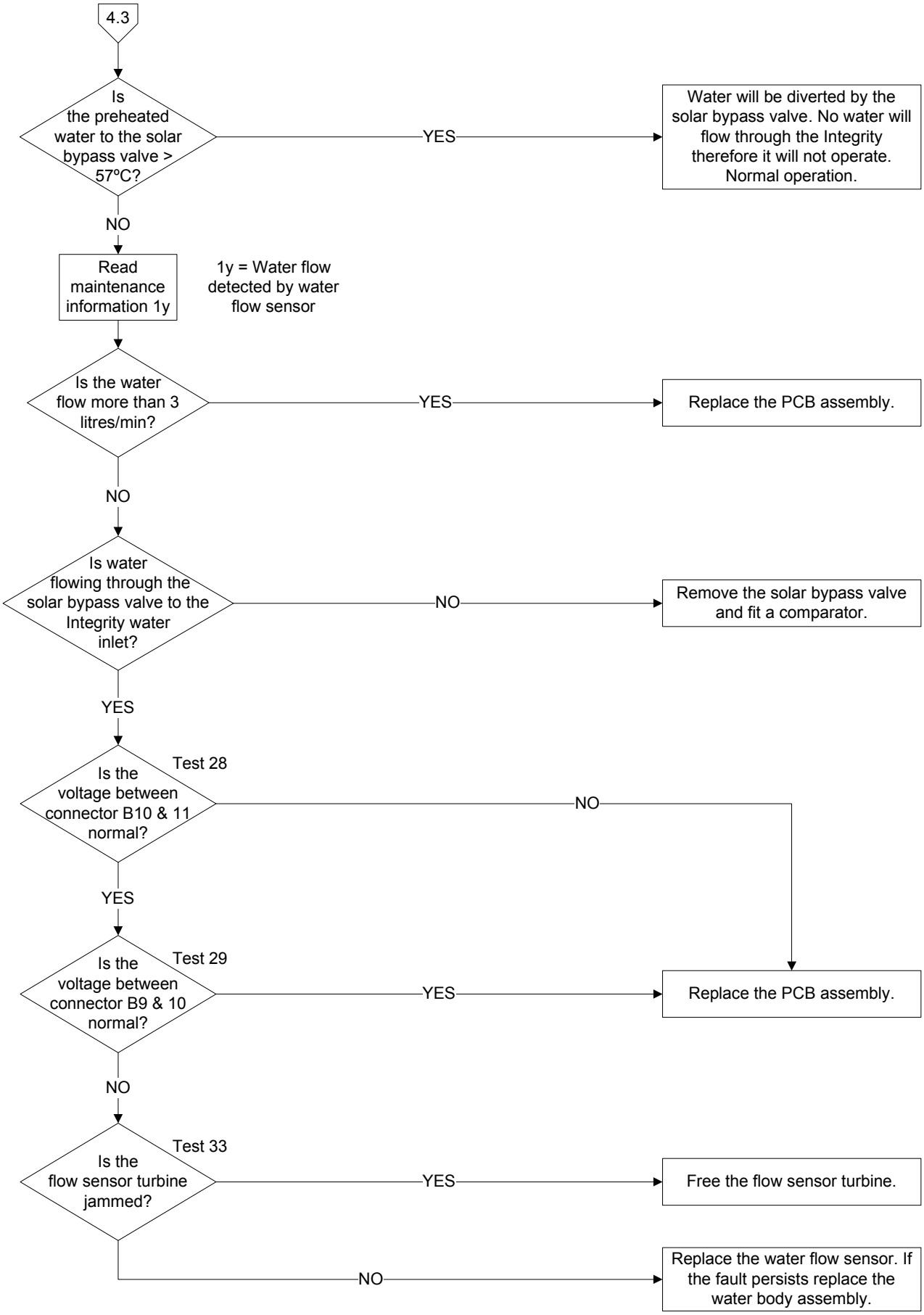
Fault Finding Charts 4 and 4.1



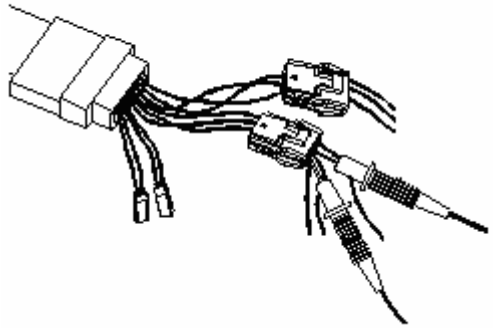
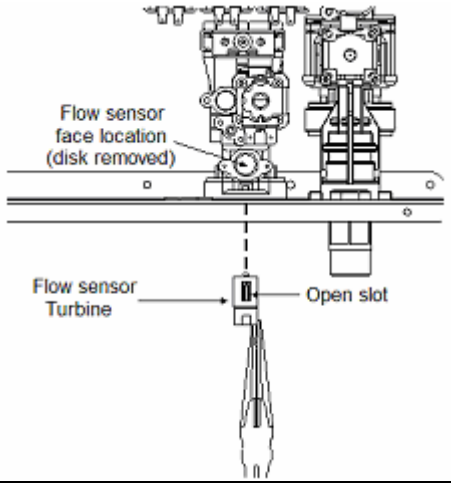
Fault Finding Chart 4.2



Fault Finding Chart 4.3



Fault Finding Tests 32 and 33

Test 32 	***Components will be "Live" when conducting test, exercise caution*** Conduct test with water flowing Measure the voltage at the 3 pin connector located between the water flow sensor and the comparator. Measure the voltage between the brown and black wires at this connector. Voltage should be between DC2 – 5V.
Test 33  	***Isolate power when removing flow turbine*** Remove flow sensor turbine by following component replacement procedure 21 on page 53. The flow sensor turbine should spin freely. Check for wear or blockage by foreign material such as thread tape.

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 test point screw and fit manometer.
3. Turn on the remote controller (If fitted).
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 LED) 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 LED) 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. Refit the front panel to the water heater.

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. Turn on the remote controller (If fitted).
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 the LED)
   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 LED display) and a lower gas pressure limit (01 on LED 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 LED 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 28.

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 the LED).
   NOTE: The adjuster button must be held down continuously through steps 10 and 11.
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 LED display) and a lower gas pressure limit (01 on LED 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. Refit the front panel to the water heater.

Component Replacement Procedures

Front Panel Removal: (Procedure 1)

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.

Burner Change-Over Assembly: (Procedure 2)

1. Remove the front panel. Refer to Procedure 1.
2. Disconnect the wiring plug from each of the solenoid valves. (**Note which plug goes to each valve**)
3. Remove the screw retaining the ignition pack to the Burner Change Over Assembly.
4. Remove the six screws retaining the Burner Change Over Assembly. Four from the Combustion Chamber Front Panel and two from the Proportional Gas Flow Regulating Valve Assembly.
5. Remove the Burner Change Over Assembly.
6. Reassemble in reverse order of above. Replace gaskets (item numbers 105 and 108) if required.
7. Test for gas leaks using soapy water solution

Combustion Chamber Front Panel Assembly: (Procedure 3)

1. Remove the front panel and Burner Change Over Assembly. Refer to Procedures 1 and 2.
2. Disconnect wiring from the flame sensors and spark electrode (**Note which wire goes to each flame sensor**).
3. Remove screws (10 off) retaining the Combustion Chamber Front Panel.
4. Gently remove the Combustion Chamber Front Panel Assembly.
5. Reassemble in reverse order of above. Replace gaskets (item numbers 105 and 108) if required.
6. Test for gas leaks using soapy water solution.

Lower Burner Assembly: (Procedure 4)

1. Remove the front panel, Burner Change Over Assembly and Combustion Chamber Front Panel Assembly. Refer to Procedures 1, 2 and 3.
2. Remove the 2 screws retaining the Lower Burner Assembly and remove Lower Burner Assembly.
3. Reassemble in reverse order of above. Replace gaskets (item numbers 105 and 108) if required.
4. Test for gas leaks using soapy water solution.

Upper Burner Assembly: (Procedure 5)

1. Remove the front panel, Burner Change Over Assembly, Combustion Chamber Front Panel Assembly and Lower Burner Assembly. Refer to Procedures 1, 2, 3 and 4.
2. Remove the Upper Burner Assembly by sliding forward out of the heat exchanger assembly.
3. Reassemble in reverse order of above being careful not to pinch or damage wiring. Replace gaskets (item numbers 105 and 108) if required.
4. Test for gas leaks using soapy water solution.

PCB Assembly: (Procedure 6)

1. Remove the front panel. Refer to Procedure 1.
2. Remove the screw retaining the PCB Assembly in the water heater.
3. Carefully remove the PCB Assembly complete.
4. Disconnect the multi-pin connectors from the PCB Assembly.
5. Remove the Gas Type Connector IC board and fit to replacement PCB Assembly.
6. Reassemble in reverse order of above.

Proportional Gas Flow Regulating Valve: (Procedure 7)

1. Remove the front panel and Burner Change Over Assembly. Refer to Procedures 1 and 2.
2. Disconnect the gas supply pipe from the gas inlet connection.
3. Remove the three screws from the gas inlet connector and withdraw the connector and o-ring from the base of the water heater.
4. Carefully remove the Proportional Gas Flow Regulating Valve from the water heater.
5. Disconnect the multi-pin wiring plug from the Gas Inlet Solenoid Valve and the red and black wires from the proportioning valve. **Note: The proportional valve terminals are marked + for red and – for black.**
6. Reassemble in reverse order of above. Replace gaskets (item numbers 105 and 108) if required.
7. Test for gas leaks with soapy water solution.

Water Body Assembly: (Procedure 8)

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 front panel, Burner Change Over Assembly and Proportional Gas Flow Regulating Valve. Refer to Procedures 1, 2 and 6.
2. Disconnect the cold water supply pipe from the cold-water inlet connection.
3. Unscrew the water drain plug (item 405) and relief valve (item 431) and drain the water heater.
4. Remove the screw/s from the flange (item 419) and remove.
5. Carefully disengage the two 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 and withdraw the 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 motor, flow sensor and cold water thermistor.
10. Remove the retaining screw from the anti-frost heater and remove. (If fitted)
11. Reassemble in reverse order of above, replacing pipe o-rings (item 427) if required.
12. Test for gas and water leaks.

Combustion Fan Motor: (Procedure 9)

1. Remove the front panel. Refer to Procedure 1.
2. Remove the screw retaining the Cord Connector, item 008.
3. Remove the screw retaining the Terminal Block Assembly, item 768.
4. Remove the screws retaining the mounting bracket for the transformer and the power filter to the Fan Motor Assembly and reposition the transformer and power filter temporarily.
5. Remove the remaining screw retaining the Fan Motor Assembly and lift the Fan Motor clear.
6. Disconnect the multi-pin wiring plug from the Fan Motor.
7. Reassemble in reverse order of above.

Anti-Frost Heaters: (Procedure 10)

Note: Only models with an 'F' in the model number are fitted with anti-frost heaters e.g. 871020N**F**.

1. Remove the front panel. Refer to Procedure 1.

Heat Exchanger and Hot Water Outlet Connection Heaters

1. Disconnect connector plugs at the sensing thermostat and at the power cord.
2. Remove Flange (item 445) to release the Hot Water Outlet Anti-frost Heater.
3. Unclip the 2 anti-frost heaters from the heat exchanger (Note the positions of both).
4. Remove the Anti-frost Heaters and wiring (Some wiring retainers will need to be released to remove wiring).
5. Reassemble in reverse of above ensuring anti-frost heaters are fitted in correct positions.

Water Body Assembly Heater

1. Disconnect connector plugs at the cord set and at the sensing thermostat.
2. Remove the Water Body Assembly (item 410). Refer to Procedure 7.
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/Replacement: (Procedure 11)

1. Follow the steps in Procedure 5, Upper Burner Assembly.
2. Remove the screw/s from the Water Body Assembly flange (item 419) and remove.
3. Carefully disengage the two pipes from the Water Body Assembly.
4. Remove the two screws from the hot water outlet flange (item 445) retaining the hot water outlet pipe and carefully disengage the pipe.
5. Disconnect the multi-pin wiring connector from the top heat exchanger thermistor.
6. **Anti-Frost Models Only:** Disconnect the wiring loom connector at the thermostat (item 714) and the hot water outlet heater (item 705).
7. Remove 5 screws retaining the heat exchanger assembly. One from each side of the heat exchanger, two screws from the bracket above the flue outlet and one screw from the fan case assembly (item 729).
8. Remove two screws retaining the bracket (above the flue terminal) and remove the bracket. (Note: The bracket is glued in place, a small amount of force is required to remove it).
9. Remove Heat Exchanger Assembly by gently moving the top forward out of the water heater then lift the assembly up and clear.
10. Disconnect the multi-pin wiring plug from the Fan Motor to completely free Heat Exchanger Assembly from water heater.
11. Remove the top Thermistor, Anti-Frost Heaters (if fitted) and the Fan Motor and Cowling Assembly from the old Heat Exchanger and refit to the replacement Heat Exchanger Assembly.
12. Replace the Over Heat Limiter if damaged or open circuit.
13. Reassemble in reverse order of above.
14. Test for gas leaks using soapy water solution
15. Check for water leaks.
16. Check and if necessary adjust MIN and MAX burner gas pressures. Refer to Procedure on page 48.

Ignition Pack Replacement: (Procedure 12)

1. Remove the front panel. Refer to Procedure 1.
2. Disconnect high voltage lead from spark electrode.
3. Disconnect the multi pin connector from the Ignition Pack.
4. Remove the retaining screw.
5. Remove the Ignition Pack.
6. Reassemble in reverse order of above.

Flow Sensor: (Procedure 13)

1. Isolate cold water supply.
2. Remove the front panel. Refer to Procedure 1.
3. Disconnect the multi-pin plug to the flow sensor.
4. Remove 2 Philips head retaining screws.
5. Remove Flow Sensor (Note: Water may escape during this procedure).
6. Reassemble in reverse order of above.

Bypass Solenoid: (Procedure 14)

Note: Models with a -B suffix in the model number are fitted with a bypass solenoid e.g. 871020NF-B. For models without a -B suffix compare the appliance to the wiring diagrams located on pages 6 & 7 to determine whether it has a mechanical or solenoid bypass.

The bypass solenoid is only available as part of the water body assembly. Follow procedure 7.

Thermistors: (Procedure 15)

1. Remove the front Panel. Refer to Procedure 1.
2. Relieve water pressure through a hot tap.
3. Locate the Thermistor requiring replacement.
4. Disconnect the multi-pin plug from the Thermistor.
5. 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).
6. Reassemble in reverse order of above.

Over Heat Limiter Assembly: (Procedure 16)

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

1. Follow Procedure 11 to step 10.
2. Disconnect the multi-pin plug to the Over Heat Limiter Assembly.
3. Remove the screws retaining the Over Heat Limiter Assembly to the Jacket back and remove the Over Heat Limiter Assembly.
4. Inspect the heat exchanger for holes or combustion damage.
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 and ensure the MIN and MAX burner gas pressures are correct. Refer to Procedure on page 48.

Remote Controller: (Procedure 17)

1. ***Isolate power at the water heater.***
2. Remove the small Philips head screw from the bottom of the Remote Controller.
3. Gently pivot the Remote 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 Type Circuit Board: (Procedure 18)

1. Remove the front panel. Refer to Procedure 1.
2. Gently unplug the Gas Type Circuit Board from the PCB.
3. Reassemble in reverse order of above.
4. Restore power.
5. Press the MAX button. On all 18 & 20L Integrity models 3H should be displayed.
6. Test operation of water heater and ensure the MIN and MAX burner gas pressures are correct. Refer to Procedure on page 48.

Transformer: (Procedure 19)

1. Remove the front panel. Refer to Procedure 1.
2. Disconnect the primary and secondary winding multi-pin plugs to the Transformer.
3. Remove the 2 Philips head screws retaining the Transformer.
4. Reassemble in reverse order of above.

Power Filter: (Procedure 20)

1. Remove the front panel. Refer to Procedure 1.
2. Disconnect the incoming and outgoing wiring loom plugs.
3. Remove the 2 Philips head screws retaining the filter to the mounting bracket.
4. Remove the Power Filter.
5. Reassemble in reverse order of above.

Solar Bypass Valve: (Procedure 21)

Solar bypass valves are no longer available and if faulty are to be removed and a Comparator installed. Refer to page 14 for the procedure on installing a comparator. **NOTE:** 20L models with a -B suffix in the model number do not require either a bypass valve or a comparator.

Flow Sensor Turbine: (Procedure 21)

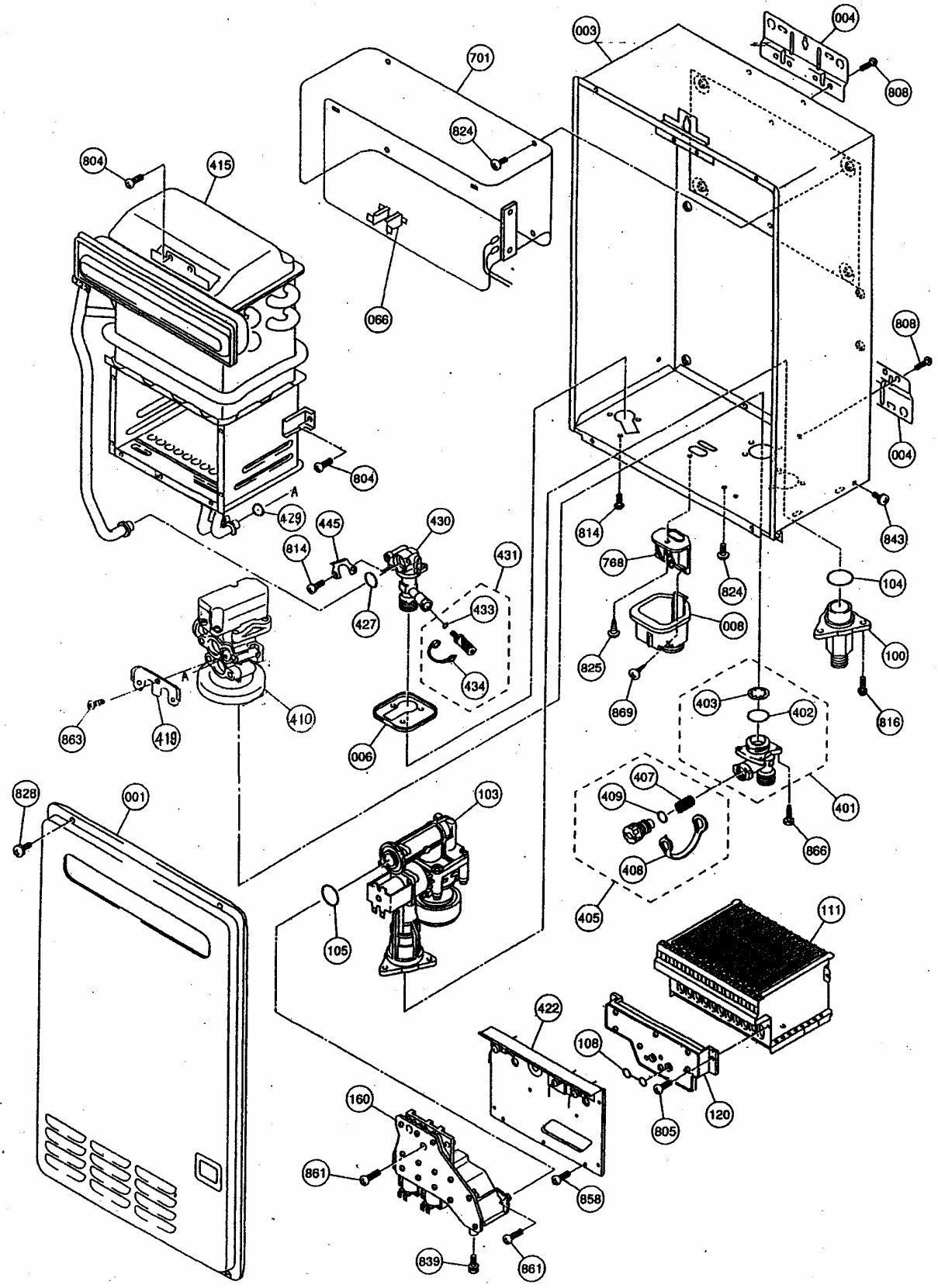
1. Isolate cold water supply.
2. Remove the front panel. Refer to Procedure 1.
3. Unscrew the water drain plug (item 405) and relief valve (item 431) and drain the water heater.
4. Disconnect the cold water supply pipe from the cold-water inlet connection.
5. Disconnect the bypass solenoid wiring loom plug.

6. Remove 2 Philips head retaining screws holding flow sensor to water body assembly and remove flow sensor.
7. Using a flat bladed screwdriver lever the metal disc and o-ring from flow sensor housing on 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 connector and o-ring from the base of the water heater.
9. Gently withdraw flow sensor turbine out from water inlet of 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.

Power cord: (Procedure 22)

1. Switch off power at power point and unplug power cord from power point.
2. Unscrew screw on power inlet cover and remove power inlet cover.
3. Undo cord clamp screw located next to power filter and remove clamp.
4. Disconnect the power cable wiring loom plug and withdraw power cable through slot in heater jacket.
5. Reassemble in reverse order of above.

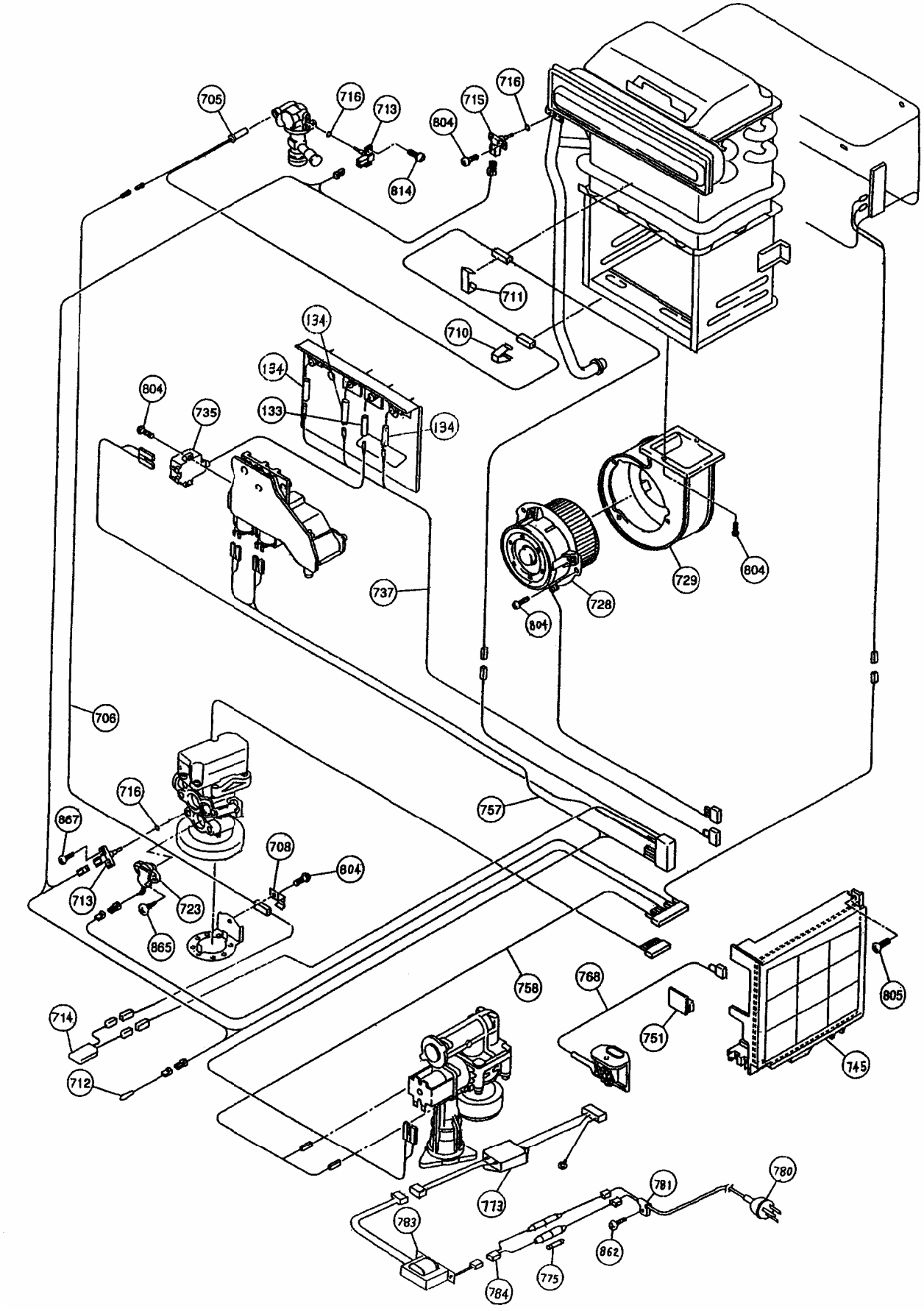
Exploded View 1 – 871018 & 871020 Models



Replacement Parts List Exploded View 1 – 871018 & 871020 Models

Ref. No.	Description	871018	871020
001	Front Panel Assembly (50 & 60ºC Models)	WH0020000	
003	Jacket Assembly	WH0020001	
004	Mounting Bracket	WH0020002	
006	Reinforcing Plate	WH0020003	
008	Cord Connector	WH0020004	
066	Fixing Plate B	WH0020005	
100	Gas Inlet Connector	WH0020006	
103	Proportional Gas Flow Regulating Valve	WH0020007	
104	O-ring	WH0020009	
105	Gasket	WH0020010	
108	Gasket	WH0020012	
111	Upper Burner Assembly	WH0020013	
120	Lower Burner Assembly - NG	WH0020015	
120	Lower Burner Assembly - LP	WH0020017	
123	Primary Air Adjuster	WH0020085	
160	Burner Change-Over Assembly	WH0020019	
401	Water Inlet Connector Assembly (¾)	Not fitted	WH0020021
	Water Inlet Connector Assembly (½)	WH0020086	Not fitted
402	O-ring	WH0020022	
403	CS Type Snap Ring	WH0020023	
405	Water Drain Valve Assembly (inc. water filter)	WH0020024	
407	Water Filter – use WH0020024	N/A	
408	Plug Band	WH0020026	
409	O-ring	WH0020027	
410	Water Body Assembly	WH0020028	
415	Heat Exchanger & Combustion Chamber Kit	WH0020029	
419	Flange	WH0020031	
422	Combustion Chamber Front Panel Assembly	WH0020032	
427	O-ring	WH0020034	
429	O-ring	WH0020035	
430	Hot water Outlet Connector (¾)	Not fitted	WH0020036
	Hot water Outlet Connector (½)	WH0020087	Not fitted
431	Relief Valve Assembly	WH0020037	
433	O-ring	WH0020038	
434	Safety Valve Band	WH0020039	
445	Flange	WH0020040	
701	Over Heat Limiter Assembly	WH0020042	
768	Terminal Block Assembly	WH0020043	
828	Truss Gasket Screw 4 x 10	WH0020044	

Exploded View 2 – 871018 & 871020 Models



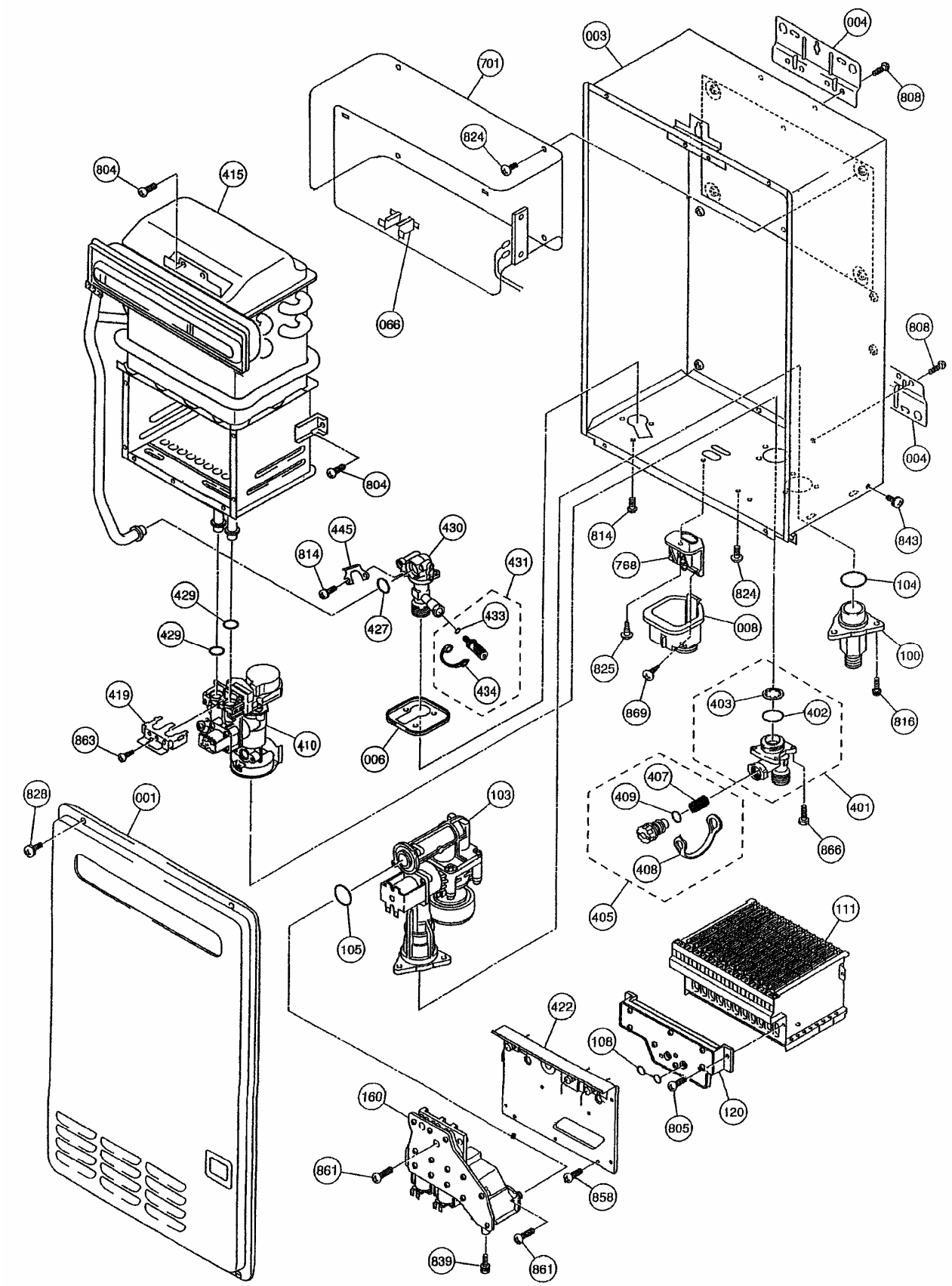
Replacement Parts List Exploded View 2 – 871018 & 871020

Ref. No.	Description	871018/020
133	Silicone Tube (Insulator)	WH0020045
134	Silicone Tube (Insulator)	WH0020046
705	Anti-Frost Heater	WH0020047
706	Anti-Frost Heater Assembly	WH0020088
708	Anti-Frost Heater Clamp	WH0020049
710	Anti-Frost Heater “C” Clamp	WH0020050
711	Anti-Frost Heater Clamp	WH0020051
712	Ambient Air Temp Thermistor Assy	WH0020052
713	Outlet Thermistor	WH0020181
714	Thermostat Assembly	WH0020054
715	Inlet and Heat exchanger Thermistor	WH0020053
716	O-ring – Thermistor	WH0020055
723	Hall Effect I.C. Assembly	WH0020056
728	Combustion Fan	WH0020057
729	Fan Case Assembly	WH0020058
735	Ignition Pack	WH0020059
737	Flame Sensor Loom	WH0020060
745	PCB Assembly	WH0020182
751	Gas Type Connector - NG	WH0020064
751	Gas Type Connector - LP	WH0020065
757	100 volt loom	WH0020089
758	Signal Loom	WH0020067
768	Terminal Block Assembly	WH0020068
771	Not Fitted (Australian Models)	N/F
773	Power Filter	WH0020079
775	Fuse - In line **Note:** PCB fuses not fitted	WH0020069
780	Power Cord With Clamp	WH0020071
781	Clamp – Power Cord	WH0020072
783	240-110 Volt Transformer Assembly	WH0020073
784	Not Fitted (Australian Models)	N/F

Not Shown	Gas Conversion Kit - LP to NG	WH0020074
Not Shown	Gas Conversion Kit - NG to LP	WH0020076

Note: For controller and controller cable part numbers refer to page 16

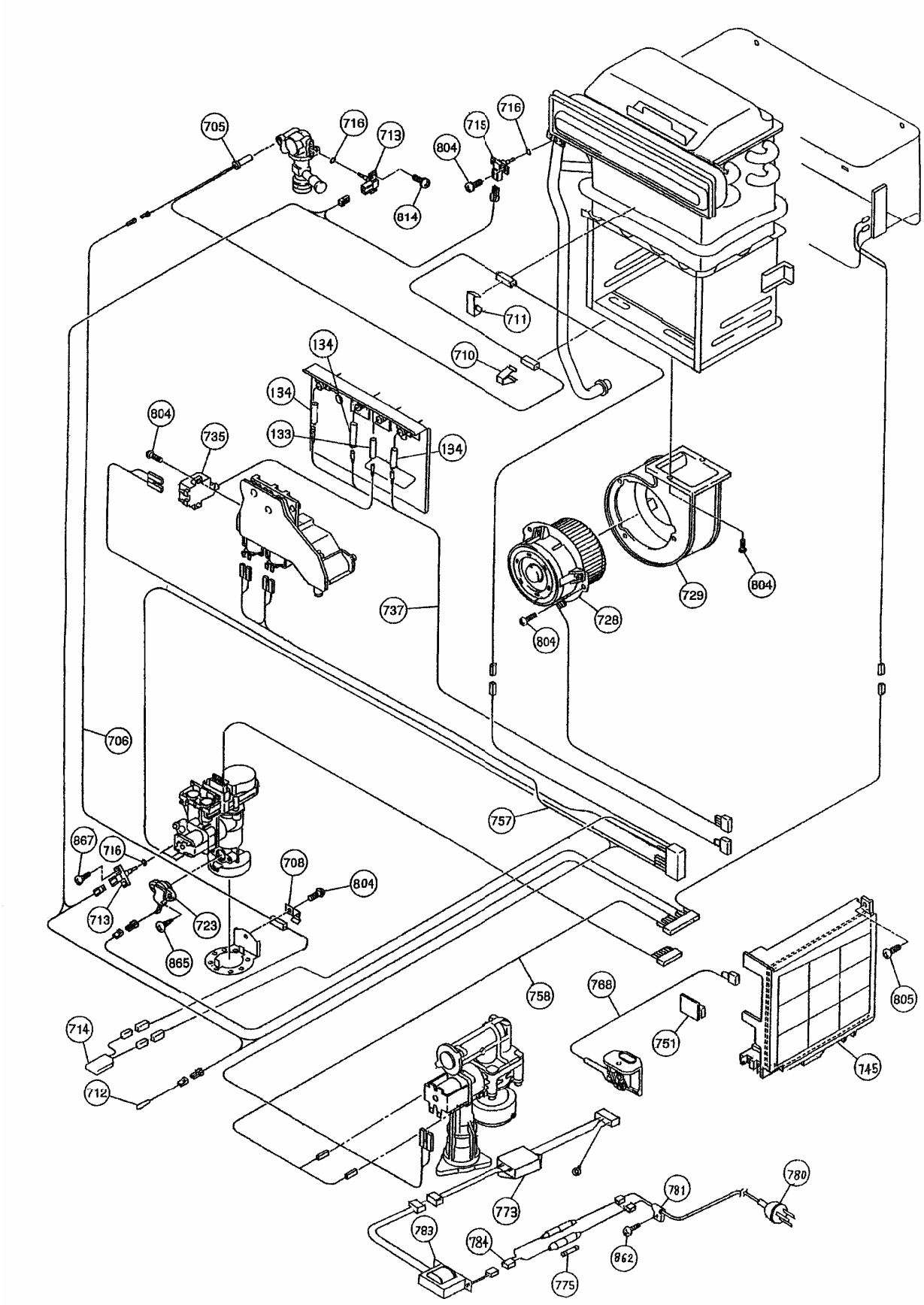
Exploded View 3 – 871/875018-B & 871/875020-B Models



Replacement Parts List Exploded View 3 – 871/875018-B & 871/875020-B Models

Ref. No.	Description	871018-B 875018-B	871020-B B875020-B
001	Front Panel Assembly (50 & 60ºC Models)	WH0020000	
003	Jacket Assembly	WH0020001	
004	Mounting Bracket	WH0020002	
006	Reinforcing Plate	WH0020003	
008	Cord Connector	WH0020004	
066	Fixing Plate B	WH0020005	
100	Gas Inlet Connector	WH0020006	
103	Proportional Gas Flow Regulating Valve	WH0020176	
104	O-ring	WH0020009	
105	Gasket	WH0020010	
108	Gasket	WH0020012	
111	Upper Burner Assembly	WH0020013	
120	Lower Burner Assembly - NG	WH0020015	
120	Lower Burner Assembly - LP	WH0020017	
123	Primary Air Adjuster	WH0020085	
160	Burner Change-Over Assy (Inc. solenoids)	WH0020019	
401	Water Inlet Connector Assembly (¾)	Not fitted	WH0020021
	Water Inlet Connector Assy (½)	WH0020086	Not fitted
402	O-ring	WH0020022	
403	CS Type Snap Ring	WH0020023	
405	Water Drain Valve Assy (includes water filter)	WH0020024	
407	Water Filter – use WH0020024	N/A	
408	Plug Band	WH0020026	
409	O-ring	WH0020027	
410	Water Body Assy including solenoid bypass	WH0020177	
415	Heat Exchanger and Combustion Chamber Kit	WH0020178	
419	Flange	WH0020031	
422	Combustion Chamber Front Panel Assembly	WH0020032	
427	O-ring	WH0020034	
429	O-ring	WH0020035	
430	Hot water Outlet Connector (¾)	Not fitted	WH0020036
	Hot water Outlet Connector (½) – 18 litre only	WH0020087	Not fitted
431	Relief Valve Assembly	WH0020037	
433	O-ring	WH0020038	
434	Safety Valve Band	WH0020039	
445	Flange	WH0020040	
701	Over Heat Limiter Assembly	WH0020042	
768	Terminal Block Assembly	WH0020043	
828	Truss Gasket Screw 4 x 10	WH0020044	

Exploded View 4 – 871/875018-B & 871/875020-B Models



Replacement Parts List Exploded View 4 – 871/875018-B & 871/875020-B Models

Fitted with solenoid operated bypass

Ref. No.	Description	871018-B 871020-B	875018-B 875020-B
133	Silicone Tube (Insulator)	WH0020045	
134	Silicone Tube (Insulator)	WH0020046	
705	Anti-Frost Heater	WH0020047	
706	Anti-Frost Heater Assembly	WH0020088	
708	Anti-Frost Heater Clamp	WH0020049	
710	Anti-Frost Heater “C” Clamp	WH0020050	
711	Anti-Frost Heater Clamp	WH0020051	
712	Ambient Air Temp Thermistor Assy	WH0020052	
713	Outlet Thermistor	WH0020181	
714	Thermostat Assembly	WH0020054	
715	Inlet and Heat exchanger Thermistor	WH0020180	
716	O-ring – Thermistor	WH0020055	
723	Hall Effect I.C. Assembly	WH0020056	
728	Combustion Fan	WH0020057	
729	Fan Case Assembly	WH0020058	
735	Ignition Pack	WH0020059	
737	Flame Sensor Loom	WH0020060	
745	PCB Assembly	WH0020182	WH0020195
751	Gas Type Connector - NG	WH0020184	WH0020196
751	Gas Type Connector - LP	WH0020183	31-23748-00
757	100 volt loom	WH0020089	
758	Signal Loom	WH0020067	
768	Terminal Block Assembly	WH0020068	
771	Not Fitted (Australian Models)	N/F	
773	Power Filter	WH0020079	
775	Fuse – In line **Note:** PCB fuses not fitted	WH0020069	
780	Power Cord With Clamp	WH0020071	
781	Clamp – Power Cord	WH0020072	
783	240 -110 Volt Transformer Assembly	WH0020073	
784	Not Fitted (Australian Models)	N/F	

Not Shown	Gas Conversion Kit - LP to NG	WH0020188	WH0020015 WH0020196
Not Shown	Gas Conversion Kit - NG to LP	WH0020190	WH0020017 31-23748-00

Note: For controller and controller cable part numbers refer to page 16.

Gas Type Conversion Procedure

1. ***Isolate the power and gas supply to the water heater.***
2. Remove the front panel. (Refer to Procedure 1)
3. Remove the Burner Change Over Assembly (Refer to Figure 1 and Procedure 2)
4. Remove the Combustion Chamber Front Panel Assembly. (Refer to Figure 2 and Procedure 3)
5. Remove the Lower Burner Assembly, (Refer to Figure 2 and Procedure 4) and refit replacement for required gas type and water heater capacity.
6. Refit the Combustion Chamber Front Panel Assembly.
7. Refit the Burner Change Over Assembly.
8. Remove the Gas Type Connector, (Refer to Figure 3 and Procedure 17) and refit replacement for required gas type and water heater capacity.
9. Restore the power and gas supply.
10. ***Using an insulated tool, adjust the minimum and maximum burner gas pressures (Figure 4) to that required for the size, model and gas type (refer to specifications table on page 4) following the Burner Gas Pressure Adjustment procedure on page 48.***
11. ***Fit the correct gas type label and alter the test point pressures on the rating label to reflect the new gas type.***

Figure 1

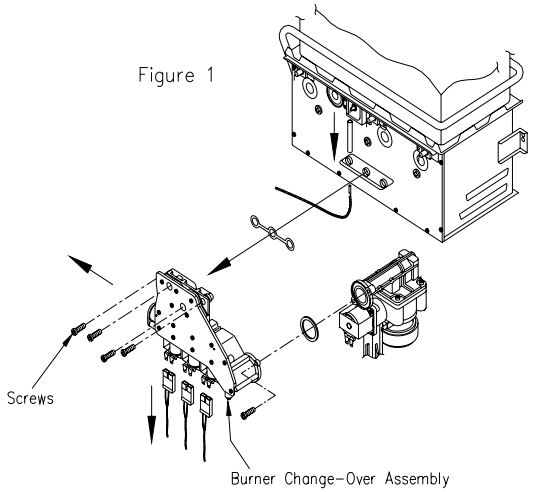


Figure 2

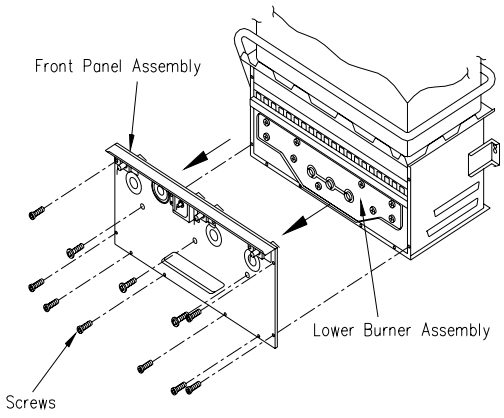


Figure 3

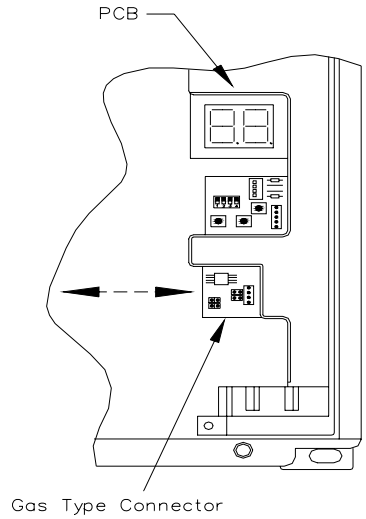
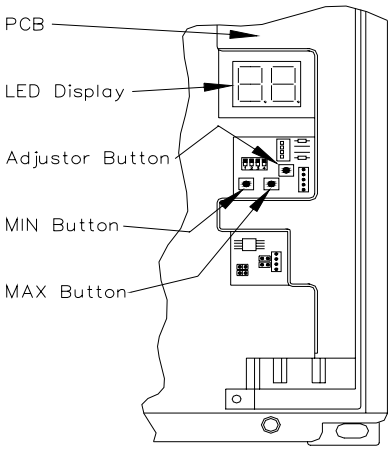


Figure 4



Electronic Instantaneous Gas Water Heater Warranty (Australia only)

Warranty conditions

1. This warranty is applicable only to water heaters manufactured from 1st January 2001.
2. The water heater must be installed in accordance with the Rheem water heater installation instructions, supplied with the water heater, and in accordance with all relevant statutory and local requirements of the State in which the water heater is to be installed.
3. Where a failed component or water heater is replaced under Warranty, the balance of the original warranty period will remain effective. The replaced part or water heater does not carry a new warranty.
4. Where the water heater is installed outside the boundaries of a metropolitan area as defined by Rheem or further than 25 km from a regional Rheem Service branch office, or an Accredited Service Agent, the cost of transport, insurance and travelling costs between the nearest Rheem Service Accredited Service Agent's premises and the installed site shall be the owner's responsibility.
5. The warranty only applies to the water heater and original or genuine company component replacement parts and therefore does not cover any plumbing or electrical parts supplied by the installer and not an integral part of the water heater, eg. pressure limiting valve; isolation valves, non-return valve, electrical switches, pumps, or fuse.
6. The water heater must be sized to supply the hot water demand in accordance with the guidelines in Rheem water heater literature

Warranty Exclusions

1. REPAIR AND REPLACEMENT WORK WILL BE CARRIED OUT AS SET OUT IN THE RHEEM ELECTRONIC INSTANTANEOUS WATER HEATER WARRANTY ABOVE, BUT THE FOLLOWING EXCLUSIONS MAY CAUSE THE WATER HEATER WARRANTY TO BECOME VOID, AND MAY INCUR A SERVICE CHARGE AND COST OF PARTS.

a) Accidental damage: Acts of God, failure due to misuse; incorrect installation; attempts to repair the water heater other than by a Rheem Accredited Service Agent or the Rheem Service Department.

b) Where it is found there is nothing wrong with the water heater, where the complaint is related to excessive discharge from the temperature and pressure relief valve due to high water pressure; where there is no flow of hot water due to faulty plumbing; where water leaks are related to plumbing and not the water heater components; where there is a failure of gas, electricity or water supplies; where the supply of gas, electricity or water does not comply with relevant codes or acts.

c) Where the water heater or water heater component failed directly or indirectly as a result of: excessive water pressure; excessive temperature and/or thermal input; corrosive atmosphere; ice formation in the pipework to or from the water heater; ice formation in the water ways of a water heater without a frost protection system; ice formation in the waterways of a water heater with a frost protection system where the electricity supply has been switched off or has failed and the water heater has not been drained in accordance with the instructions; ice formation in the waterways of a water heater with a frost protection system due to an ambient temperature below -20ºC (including wind chill factor)

d) Where the water heater is located in a position that does not comply with the Rheem water heater installation instructions or relevant statutory requirements, causing the need for major dismantling or removal of cupboards, doors or walls, or use of special equipment to bring the water heater to floor level, or to a serviceable position.

e) Repairs to the water heater due to scale formation in the waterways when the water heater has been connected to a harmful water supply as outlined in the Owner's Guide and Installation Instruction booklet.

2. SUBJECT TO ANY STATUTORY PROVISIONS TO THE CONTRARY, THIS WARRANTY EXCLUDES ANY AND ALL CLAIMS FOR DAMAGE TO FURNITURE, WALLS, FOUNDATIONS OR ANY OTHER CONSEQUENTIAL LOSS EITHER DIRECTLY OR INDIRECTLY DUE TO LEAKAGE FROM THE WATER HEATER.

In addition to this warranty, the Trade Practices Act 1974 and similar laws in each state and territory provide the owner under certain circumstances with certain minimum statutory rights in relation to your Rheem water heater. This warranty must be read subject to that legislation and nothing in this warranty has the effect of excluding, restricting those rights.

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.

Rheem Australia Pty Ltd ABN 21 098 823 511

Document Revision History

Title:	Integrity 18 & 20L Service Instructions	Document Number:	TM002

Revision	Details of change	D.O.I.
A	Service Instructions issued for 871018, 871020, 871024 Rheem Integrity	05/01
B	References to Southcorp Water Heaters replaced with Rheem Australia	03/02
C	Models with Solenoid bypass added	11/02
D	Diagnostics for Error Code 56 added	01/04
E	Update of font, ABN number, contents page, title page and standardisation of layout. Addition of version -B models. Removal of 24L models (refer TM031 for 24L models).	11/07