

Rinnai

INFINITY

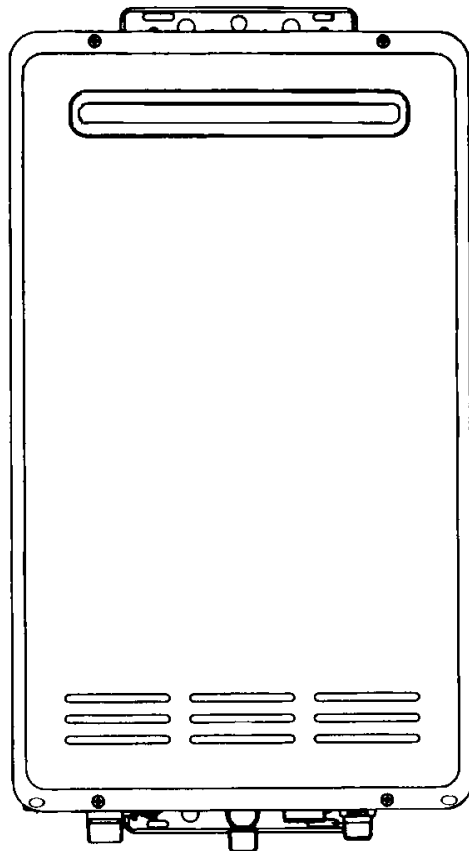
REU-2018W

REU-2020W

REU-2422W

REU-2425W

SERVICE MANUAL



Infinity Compact Continuous Flow Gas Hot Water System



The Australian
Gas Association

All Rinnai products are certified by the Australian Gas Association as compliant to relevant Australian Standards.



ISO 9001 Lic 4983
SAI Global

Head Office Certified

Distributed and serviced in Australia under a Quality System certified as complying with ISO 9001 by SAI Global

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Rinnai New Zealand has been certified to ISO 9001 Quality Assurance by Telarc.

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WaterMark

AS3498 Lic W208
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Key to Warning Symbols



Failure to comply with the following instructions may result in serious personal injury or damage to the appliance.



Be careful of possible electric shock. Wiring inside this appliance may potentially be at 240 Volts.



Remove the plug from the source when carrying out any of the following activities.



Read Fault Diagnosis and Wiring Diagram carefully to avoid incorrect wiring



Do not disassemble. Parts within cannot be exchanged or diagnosed faulty.

Please follow instructions carefully to ensure safe and appropriate service. After completing the service and confirming that there no gas leaks or incorrect wiring, test operation of unit according to the Customer Operating Instructions. After confirming normal operation, explain what was serviced to the customer and operation principles if necessary.

This manual has been compiled by Rinnai Australia Technical Services Department. While many individuals have contributed to this publication, it will be successful only if you - the reader and customer - find it useful. We would like to extend an invitation to users of this manual to make contact with us, as your feedback and suggestions are valuable resources for us to include as improvements. Rinnai are constantly working toward supplying improved appliances as well as information, and specifications may be subject to alteration at any time.

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Glossary of Terms and Symbols

This glossary of terms and symbols is provided to assist you in understanding some of the language used throughout this manual.

dB(A)	-	sound pressure level in decibels, "A" range
DC	-	direct current
AC	-	alternating current
WFCD	-	water flow control device
FB	-	feedback information
Hz	-	Hertz
IC	-	integrated circuit
kcal/h	-	kilocalorie per hour
kPa	-	kilopascals
LED	-	light emitting diode
L/min	-	Litres per minute
mA	-	milliamps
MJ/h	-	megajoule per hour
mm	-	millimetres
mmH ₂ O	-	millimetres of water (guage pressure)
NO _x	-	oxides of nitrogen (NO & NO ₂)
OHS	-	overheat switch
PCB	-	printed circuit board
CPU	-	central processing unit
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
∅	-	diameter
Δ °C	-	temperature rise above ambient
POV	-	modulating valve
TE	-	thermal efficiency
TH	-	thermistor
T _{IN}	-	temperature of incoming water
T _{OUT}	-	temperature of outgoing water

1. Introduction

The brand name Infinity refers to “Endless Hot Water”. The Infinity 24 has been developed in response to the growing changes in the lifestyle of consumers, and the increasing diversification and sophistication of demand in the marketplace.

The Infinity series offers reduced cost, advanced safety features, and an option to connect one, two, or three remote control pads.

The Infinity 24 is delivered with the maximum hot water temperature of 50°C, with or without remote controls connected.

About the Infinity

The front cover of each appliance in this series is formed from 0.6 mm coated steel, secured to the main box assembly by 4 screws. Seals around the front cover and flue outlet prevent water from entering the appliance.

Air inlets are situated in the front panel. The general layout of components is shown on the cutaway diagram on page 11. All components are supported within a box formed from 0.8 mm coated steel.

The heat exchanger occupies the top section of the box, and the burner is situated in a chamber formed from 0.8 mm aluminised steel attached to the bottom of the heat exchanger.

The air for combustion is supplied by a fan which is connected to the burner box by a duct at the left hand side of the appliance.

Gas and water controls are situated at the bottom right of the appliance, directly under the manifold. The products of combustion are expelled from the appliance through a flue outlet situated on the front of the appliance, at the top.

The burner assembly is made up of 18 identical stainless steel bunsen burners, secured by an aluminised steel framework. An aluminium manifold with 18 integrally moulded injectors supplies gas to the burners, and is attached to the lower front cover of the burner box.

There is one thermistor, it is located on the outgoing hot water supply tube, near the outlet of the heater.

2. Features

Installation

The light-weight, slim, and compact form enable easier, improved appearance installations. The remote controls (where fitted) are connected to the appliance by 2-core non-polar cable, ensuring easy wiring and eliminating misconnection problems.

Low Noise Level

Low noise level design enables these appliances to be installed in units, flats, townhouses, and other high density residential areas with little concern about noise disturbances.

Safety

Various safety devices controlled by a micro-computer ensure complete safety. Also, the anti-frost device (where fitted), automatically prevents the water inside the appliance from freezing by using small electrical ceramic heaters connected to the pipework at strategic locations.

Economy

Direct electronic ignition to the main burner eliminates wasteful pilot gas consumption. The combustion fan rpm is proportionally controlled with gas consumption. This maintains high energy efficiency as the gas consumption changes.

Water Supply Control

The water supply capacity varies proportionally from 2.7 L/min to 24 L/min. A suitable volume of hot water can be supplied throughout all seasons by the water flow control device and water flow servo mechanism. REU 2425W model will supply up to 24L/min, (maximum unmixed), controlled by an automatic electro-mechanical water flow device. See “Water Flows” on page 16 for precise details on water flow.

Water Temperature Control

With a remote control connected, the hot water control range is between 37°C and 50°C (in 12 steps). With or without a remote control connected the outgoing hot water temperature is fixed to 50°C maximum with no remote. This means that the Infinity Series can be set to comply with various State laws on temperature control in homes, child care centres, and elderly care centres. The maximum temperature selectable on the bath remote control is 50°C (this is a safety feature).

Over Temperature Protection

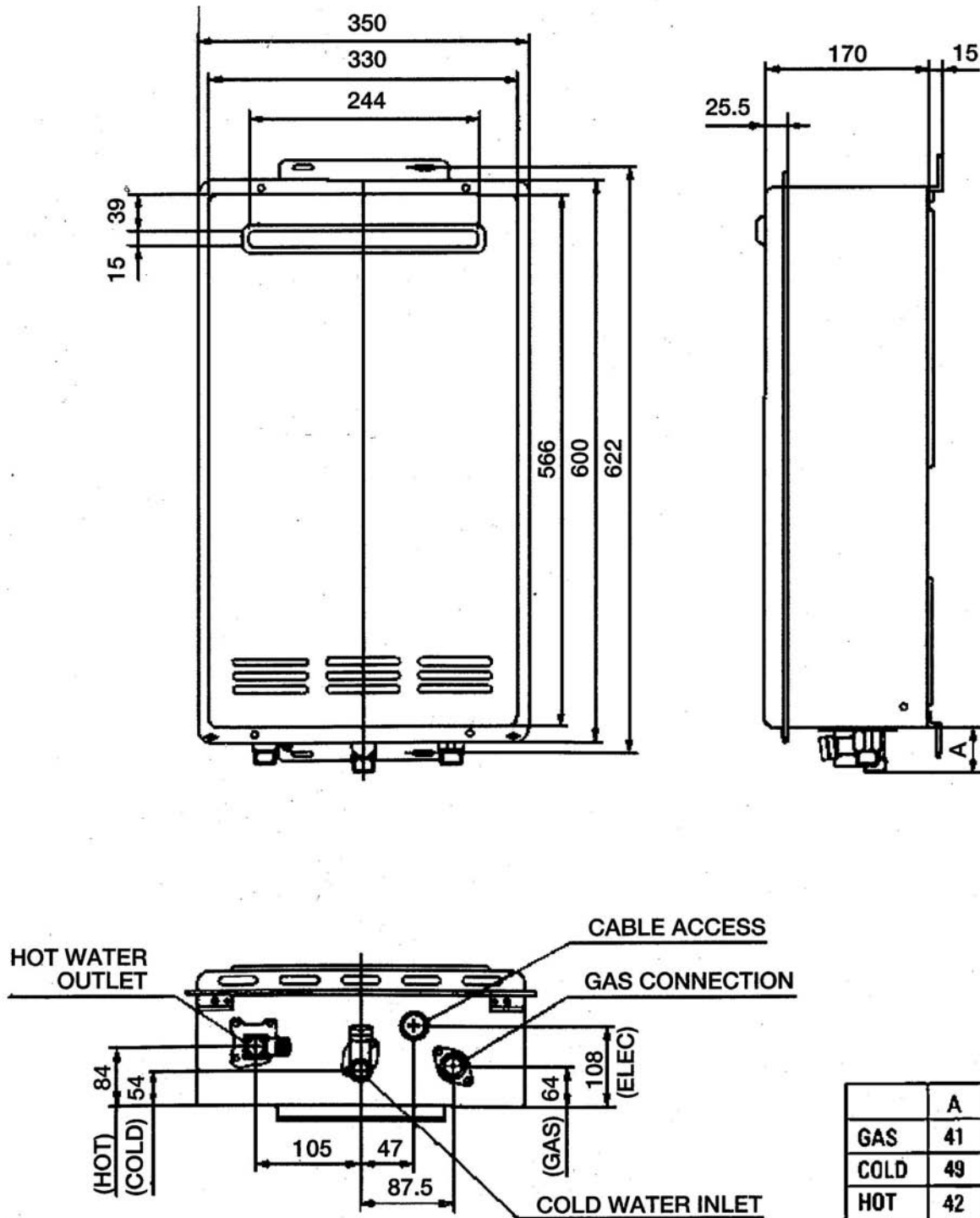
All Infinity models incorporate a device to prevent the hot water temperature exceeding the pre-set temperature by more than 3°C.

Temperature Locks

With the remote control(s) connected, the pre-set water temperature can only be altered between 37°C and 43°C while the hot water is flowing. This helps to avoid inadvertently increasing the temperature to a hazardous level whilst someone is in the shower. While the water is flowing, the remote control(s) can be turned off, but not on again.

3. Dimensions

Note: All dimensions are in mm.



4. Remote Controls

Remote Controls

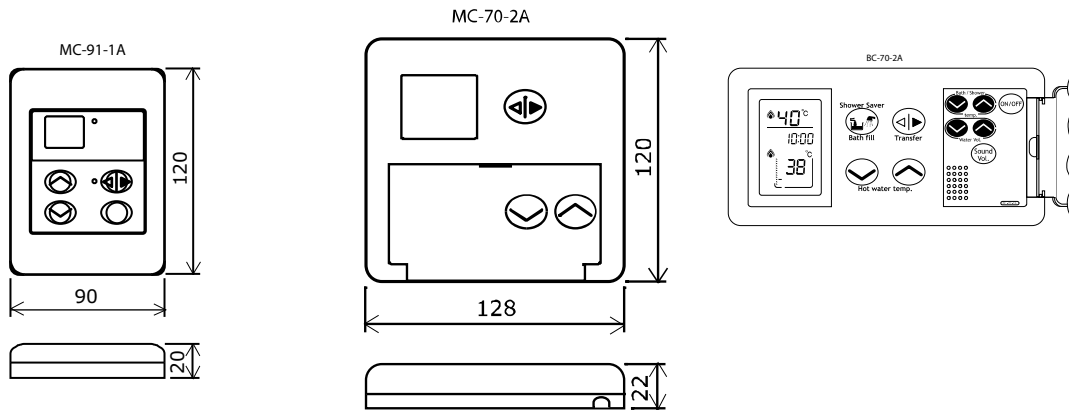
Remote Controllers are an optional extra. 'Universal' and 'Deluxe' Controllers can be fitted. Universal controllers allow temperature selection only. Deluxe controllers have temperature selection, bath-fill and voice prompting functions. For detailed information regarding controller operation refer to the 'How to use your water heater' booklet supplied with the appliance. Other manufacturers' controllers are NOT compatible with this appliance.

Universal Controller (Model: MC-91-1A)

Up to 3 Universal Controllers can be fitted to the appliance. They are normally installed in the areas where the majority of hot water is used, for example, the Kitchen, Bathroom, Ensuite and Laundry.

Deluxe Controllers (Models: MC-70-2A) and (BC-70-2A)

Deluxe Controllers have 'Kitchen' (MC-70-2A) and 'Bathroom' (BC-70-2A) versions. 'Kitchen' Controls are intended for the Kitchen or other convenient area where the majority of hot water is used. 'Bathroom' Controllers are intended to be fitted in the Bathroom or ensuite and allow the user to have a bath filled to the required level and temperature automatically.



Up to two 'Deluxe' controllers can be connected as follows:

Kitchen	Bathroom
MC-70-2A	
MC-70-2A	BC-70-2A

If a Third controller is required, a 'Unviersal' controller can be included as follows:

Kitchen	Bathroom	Laundry
MC-70-2A	BC-70-2A	MC-91-1A

Positioning of Controllers

Controllers must be installed in shaded and clean locations. They should be fitted out of reach of children (suggested height from floor at least 1500mm). Controllers are water resistant, however, durability is improved when positioned outside the shower recess or at least 400mm above the highest part of a sink, basin or bath.

DO NOT INSTALL THE CONTROLLERS

- NEAR A HEAT SOURCE, SUCH AS A COOK TOP, STOVE OR OVEN. HEAT, STEAM, SMOKE AND HOT OIL MAY CAUSE DAMAGE.
- IN DIRECT SUNLIGHT.
- OUTDOORS UNLESS AN ENCLOSURE IS PROVIDED WHICH PROTECTS THE CONTROLLER AGAINST SUNLIGHT AND DUST INGRESS.
- AGAINST A METAL WALL UNLESS THE WALL IS EARTHED IN ACCORDANCE WITH AS/NZ3000.

Remote Controller Connection

Remote controls operate at extra low voltage (12 Volts DC) which is supplied from the appliance. Controllers are supplied with 15 m of electrical cable. The cable wires for connection to the appliance are fitted with spade terminals.

Extension cables are available from Rinnai. Alternatively, a two core sheathed (double insulated) flex with minimum cross-sectional area of 0.5 mm² can be used. Maximum cable length is 50 m. For connection refer to the “CONNECTING REMOTE CONTROL CABLES” section.

Water Heater and Controller installation configurations

If there is a label on the appliance casing that contains the text “**This appliance delivers water not exceeding 50°C**”, local regulations may permit it’s installation without a Temperature Limiting Device. Installations without a Temperature Limiting Device are shown in Diagram 1. If you are unsure about your local regulations contact your regulating authority or Rinnai.

If the appliance does not have this label, or your local regulations require installation with a Temperature Limiting Device then install the appliance in accordance with Diagram 2.

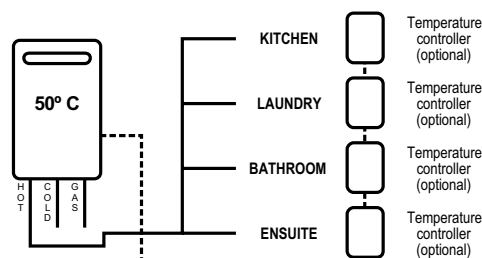


Diagram 1. 50° C Appliance

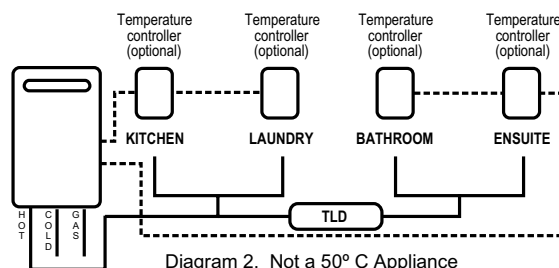


Diagram 2. Not a 50° C Appliance
Note: TLD = Temperature Limiting Device.

IMPORTANT: If the appliance is to deliver water primarily for the purposes of personal hygiene in an early childhood centre, primary or secondary school, nursing home or similar facility for young, aged, sick or disabled persons as defined in AS/NZ3500.4 a Temperature Limiting Device (TLD), such as a Tempering Valve, may be required even if the appliance is set to 50° C or less. For these types of applications contact Rinnai.

Connecting remote control cables



Do not attempt to connect the remote control cable terminals to the appliance with the power on.

RISK OF ELECTRICAL SHOCK

Connecting One or Two Controllers

1. Isolate the power supply.
2. Remove the front cover from the Appliance (4 screws) fig. 1.
3. Thread the cable(s) through the cable access hole at the base of the appliance.
4. Locate the terminals for controls, the position of which is marked on the Printed Circuit Board casing. Connect the space connectors to the terminals on the P.C.B. (Fig. 2). Polarity is not important. Either wire colour can be connected to either terminal.
5. Replace cover of the Appliance. Ensure that the special screw is placed at the bottom right hand corner for earthing purposes.

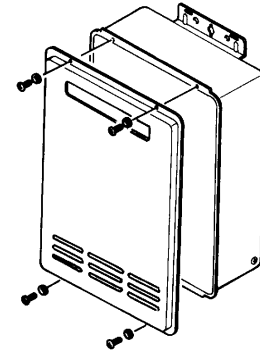
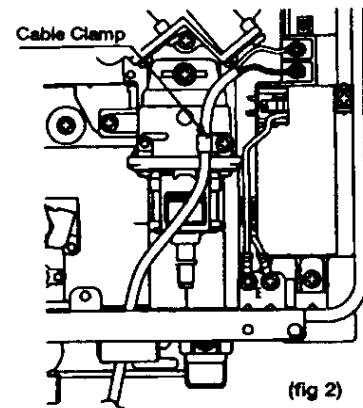


fig.1.

Connecting Three Controllers

1. Isolate the power supply.
2. Remove the front cover from the Appliance (4 screws) fig.1.
3. Cut the spade connectors from 2 of the controller cables to be connected to the appliance (4 spade connectors should be cut off) and discard. Connect the wires from these two cables and terminate into two new spade connectors as shown in fig.3. Spade connectors are available from your local electrical component retailer.
4. Located the terminals for controls, the position of which is marked on the Printed Circuit Board casing. Connect the 4 spade connectors to the terminals on the P.C.B. (Fig. 2). Polarity is not important. Either wire colour can be connected to either terminal.
5. Replace cover of the Appliance. Ensure that the special screw is placed at the bottom right hand corner for earthing purposes.



(fig 2)

MC-91A Controller Programming

Is there a label on the appliance casing that contains the text.

“THIS APPLIANCE DELIVERS WATER NOT EXCEEDING 50° C

IF YES: No further action required.

IF NO: You will need to program Kitchen controller to enable selection of temperatures higher than 50° C.

STEP 1:

For the controller in the KITCHEN only, press and hold the 'Transfer' and 'On/Off' buttons simultaneously (see Fig 7.) until a 'beep' is heard (approximately 5 seconds).

STEP 2:

When the controller fitted in the KITCHEN is switched on, it should be possible to select temperatures higher than 50° C. If not, repeat Step 1.

Note:

- If the kitchen controller is replaced, repeat STEP 1 above for the replacement controller.
- If the kitchen controller is swapped with another controller (for example, the controller fitted in a bathroom), repeat STEP 1 for the controller moved from the kitchen to the bathroom. Then perform STEP 1 for the controller moved from the bathroom to the kitchen.

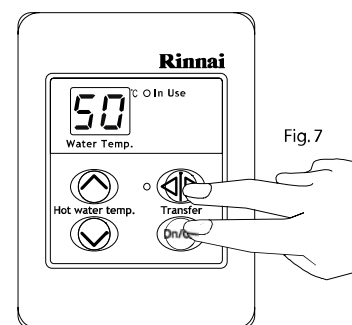


Fig. 7

5. Safety Devices

Flame Failure

Situated to the right of the burner at the front, the flame rod monitors combustion, preventing any discharge of gas to the burner if there is no flame, by sending a signal to the PCB which in turn isolates the gas.

Over Heat Protection Device

Also referred to as an Over Heat Switch. This device is fitted to a bend section at the inlet to the heat exchanger. If the flame remains on the burner after the tap is closed, and the water temperature inside the heat exchanger reaches 97°C, a DC 12 volt bi-metal cut-off switch isolates the gas to the solenoids.

No Water

Should the incoming water flow become restricted or stop, then the water flow sensor will cease to send a magnetic pulse signal to the PCB, in turn isolating the flow of gas to the burner.

Thermal Fuse

Wrapped around the entire surface of the heat exchanger, if the heat exchanger burns out, or the temperature outside it reaches 129°C, the thermal fuse melts, breaking the electronic circuit. Current to the gas solenoid valve circuit is cut, and combustion stops, shutting down the unit.

Pressure Relief Valve

This spring and seat type valve located on the hot water outlet will release the built up pressure if the pressure inside the heat exchanger reaches 2100 kPa until 1500 kPa is maintained.

Combustion Fan Revolution Check

The combustion fan rpm is continually monitored by a magnetic pulse counter connected to the PCB. If the fan revolutions deviate from the speed required for complete combustion, a signal is sent to the PCB and the revolutions adjusted accordingly. (If not the unit shuts down)

Automatic Frost Protection

When the outdoor temperature drops and the temperature inside the appliance goes below 3.5°C, the frost sensing device is activated, and the anti-frost heaters prevent the water in the appliance from freezing. These anti-frost heaters remain ON until the temperature inside the appliance rises to 11.5°C. There are 5 x 16 Watt anti-frost heaters located at various points in the main water flow area of the appliance. The anti-frost protection device will prevent freezing down to -20°C in a no wind situation, and -15°C in a windy situation.

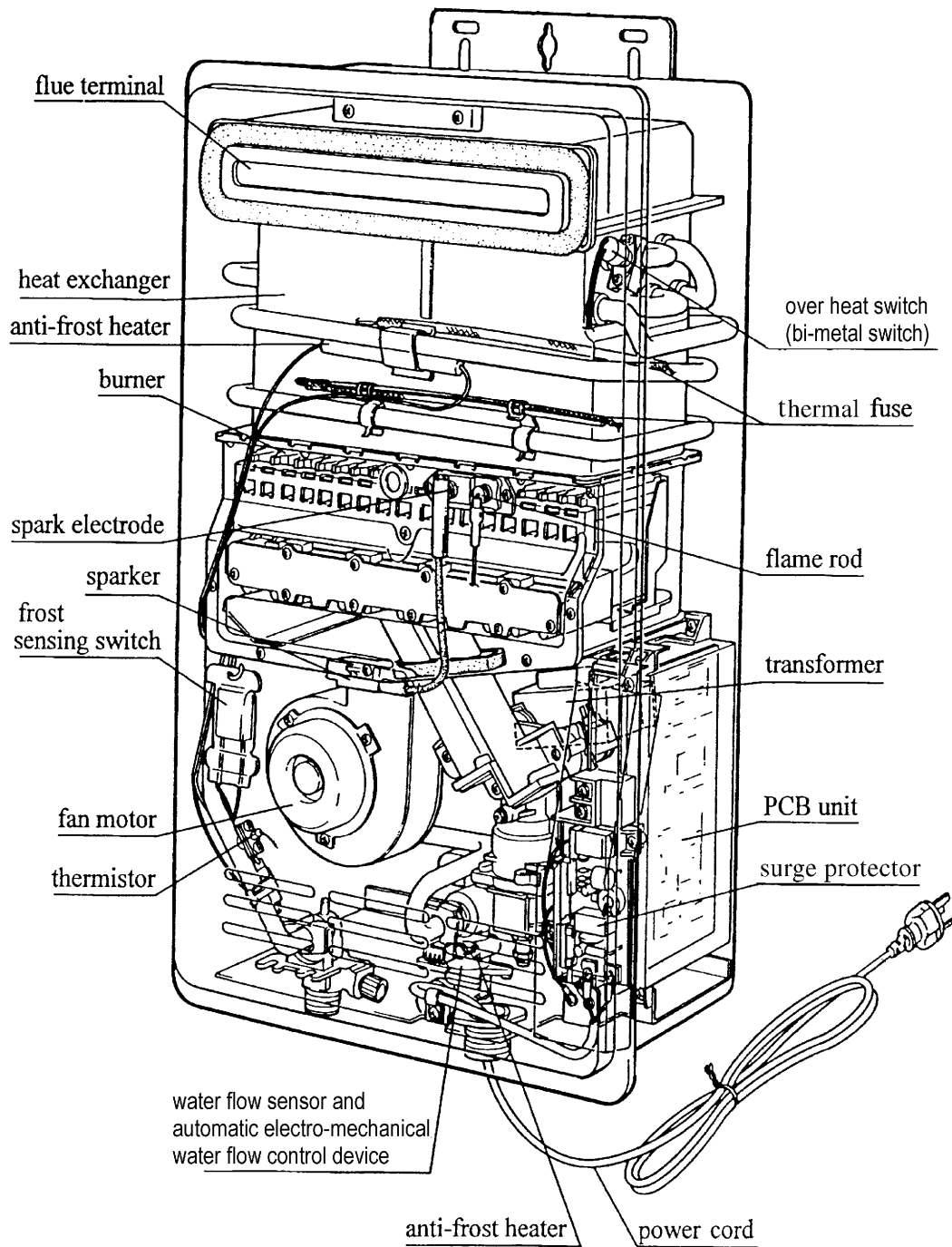
3°C Over Temperature Cut-Off

The temperature of the outgoing hot water is constantly monitored by the water temperature thermistor located near the outlet of the appliance. If the outgoing water temperature reaches 3°C above the preset temperature, the burner will automatically go out. The burner will only ignite again once the outgoing hot water temperature falls below the preset temperature.

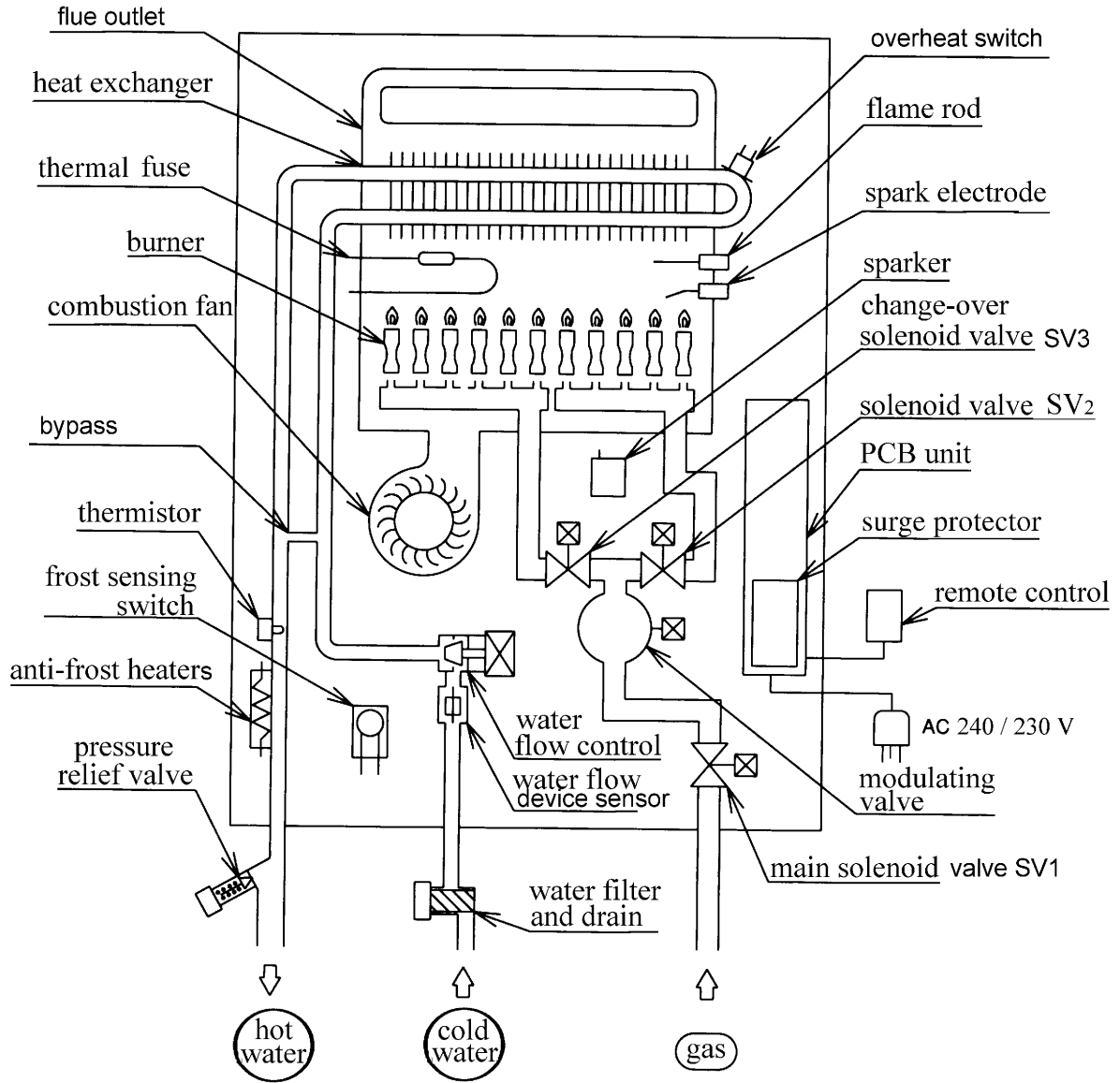
6. Specification

Rinnai Model No.	REU-2425W	
Type of appliance	Temperature controlled continuous flow gas hot water system.	
Operation	With or without remote controls, mounted in kitchen, bathroom, or ensuite.	
Exhaust system	Forced combustion	
Installation	Externally mounted	
Maximum gas rate	188 MJ/h	
Minimum gas rate	21 MJ/h	
Output (Kw)	41.7	
Efficiency rating	80%	
Hot water capacity, unmixed	2.7 to 24 L/min	
Hot water capacity, mixed (25°C rise)	2.7 to 24 L/min	
Default temperature (without remote) (Set using switches on PCB)	50°C (40,43,50,55,60,65,75°C)	
Maximum temperature ceilings (remote connected)	50°C (set by combination of switches on PCB) Other temp.settings than 50°C avail. from alternative PCB	
Temperature range (with remote)	37 to 50°C in 13 steps	
Approved gas types	Natural; Propane	
Dimensions	Width - 350 mm Height - 600 mm Depth- 170 mm	
Weight	18 kilograms.	
Noise level	49 dB(A)	
Connections	Gas supply- R: / 20mm Cold water inlet- R: / 20mm Hot water outlet- R: / 20mm	
Ignition system	Direct electronic ignition	
Electrical consumption (Watts)	Normal -	55
	Standby -	8
	Anti frost protection -	80
Water temperature control	Simulation feedforward and feedback	
Water flow control	Water flow sensor & automatic electro-mechanical water flow control device	
Minimum operating pressure	200 kPa	
Nominal operating pressure	200 ~ 1200 kPa	
Power supply	Appliance- AC240 Volts 50 Hz. Remote control- DC12 Volts (Digital)	
Safety devices	Flame failure- Flame rod.	
	Boiling protection- 105°C lockout thermistor (25 seconds)	
	Remaining flame [OHS]- 97°C bi-metal switch	
	Thermal fuse- 129°C	
	Pressure relief valve- Opens-2100kPa, closes-1500 kPa	
	Automatic frost protection- Bi-metal sensor & anti-frost heaters	
	Combustion fan rpm check- Integrated circuit system	
	Over current- Glass fuse (5 Amp).	
Remote control	MC-91-1A- Universal control	
	MC-70-2A- Kitchen control	
	BC-70-2A- Bathroom control	
Remote control cable	Non polarised two-core cable	

7. Cut-away Diagram



8. Schematic Diagram



9. Combustion Specification

REU-2425W				
Input	NG/Propane LPG #	HI	MJ/h	188
		LO		21
Gas Consumption	NG/Propane LPG #	HI	kW	52.3 (50)
		LO		5.93
Integral Injector size (18)	NG		mm	ø 1.7
	Propane/LPG #			ø 1.0
Damper (1 piece)	NG			NIL
	Propane/LPG #			A
Pressure	NG	HI	kPa	0.90
		LO		0.08
	Propane/LPG #	HI	kPA	2.26 (1.90)
		LO		0.17 (0.15)
Burner type				NG/ Propane Common
Dip Switch positions				Refer to page 14

Note: LPG values specified in brackets are for New Zealand.

10. Dip Switch Positions



Please do not adjust the DIP Switch Positions before reading this information. The dip switches are provided so that the water heater can be set to different operating configurations. In some instances such as nursing homes or even domestic situations, it may be necessary to limit the temperature of the hot water coming from the units. The set-up configuration for the water heater differs depending on:

- Gas type
- Maximum water flow select
- Temperature limiting requirements
- Alternate type

DIP Switches explained

Top switch settings 1 ~ 8

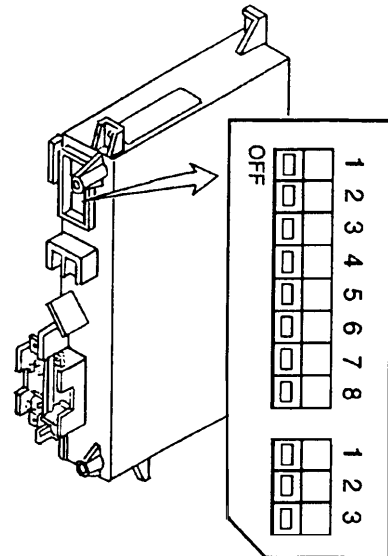
- 1: Gas type (used only during conversion)
- 2: To select maximum water flow volume

4 to 8: To select the temperature with or without remote connected.

Bottom switch settings 1 ~ 3

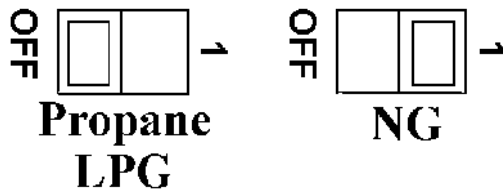
- 1: Factory use (To select the capacity of appliance)
- 2 & 3: Combustion control

The Infinity REU-2425W model delivers maximum hot water temperature limited to 50° C, however alternative PCB for the other maximum temperature of hot 40°C, 43°C, 50°C, 55°C, 60°C, 65°C, or 75°C available.

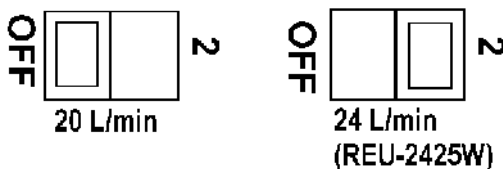


1. Gas Type

Only alter gas type positions when converting. For conversion instructions refer to page 43.



2. Maximum Water Flow Select

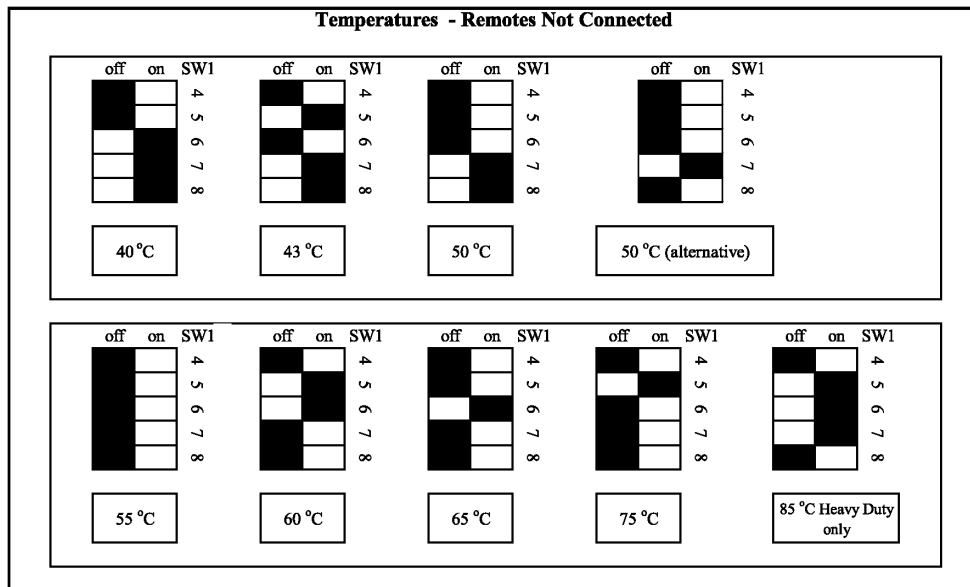
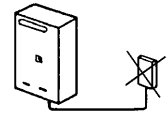


3. Temperature Limiting

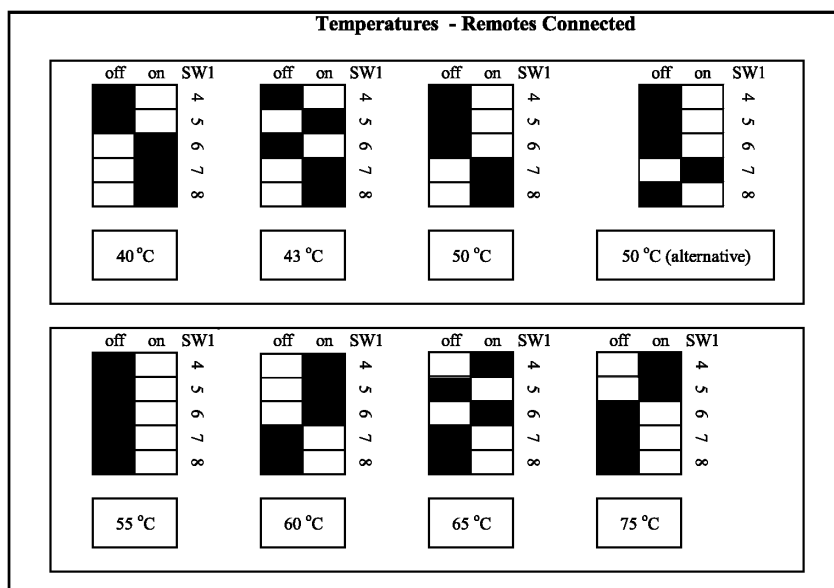
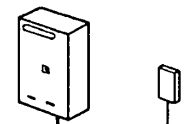
There are different positions, depending on the temperature limit required and whether the remote controls are connected or not.

Dip Switch Settings for Alternative PCB

a. Fixed hot water temperature “without” remote connected



Upper limit hot water temperature “with” remote connected



Note:

- a) The black squares indicate the position of switches.
- b) It will be noted that some dip switch configurations are the same for a given temperature whether controllers are connected or not. These similarities are not mistakes.

11. Water Flows

A simple calculation of the water flow rate, in litres per minute, can be made using the charts on the next page, or simply using the formula provided below. The charts on the following pages indicate the water flow from the Infinity at various combinations of incoming water temperatures, and the selected temperature at the remote control.

How to read the charts:

The vertical plane indicates the selected temperature at the remote, and the horizontal plane indicates the flow of water in litres per minute. Remote control range is between 50°C, therefore the water flow charts only show the temperatures in that range. The temperature rise is the difference between the temperature of the incoming water and the selected temperature at the remote controls.

Select the appropriate chart depending on the incoming water temperature. Draw a horizontal line across the graph from the selected temperature at the remote until it intersects the curve. At this point draw the line in the vertical direction. The water flow is indicated where the line intersects the bottom of the chart.

How to calculate water flows:

The following information is an outline of the formula required to measure accurately the flow rate in litres per minute, as well as being the base for the charts on the next page. The most useful way in which this formula can be utilised, is to calculate the water flow rate where there is maximum gas input of 188MJ/h.

$$\text{Formula: } IN \times TE = (T_{OUT} - T_{IN}) \times 60 \times Q$$

Where:	T_{IN}	=	Incoming water temperature.
	T_{OUT}	=	Outgoing water temperature as selected at the remote
	IN	=	Gas input [#] .
	TE	=	Thermal efficiency*.
	Q	=	Water flow in litres per minute.

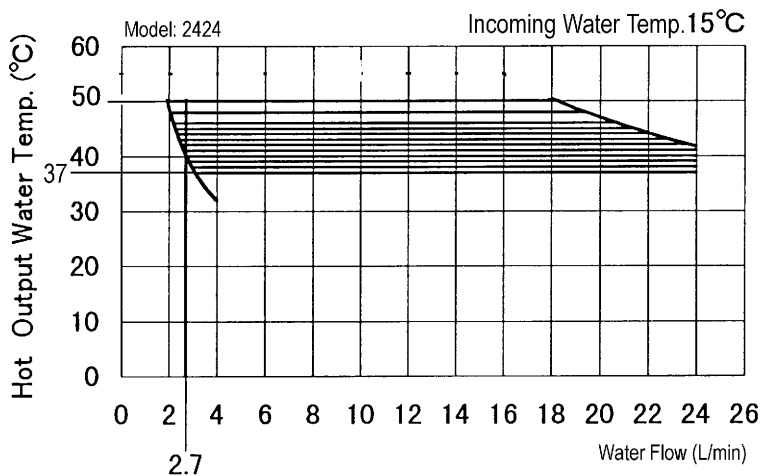
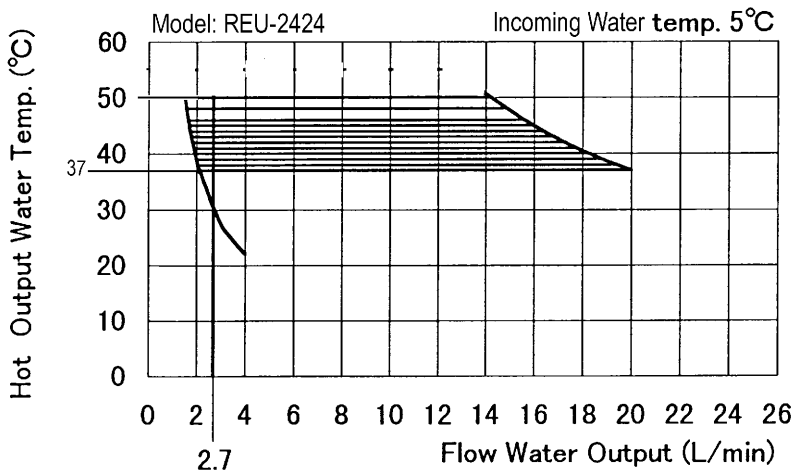
This is the maximum gas input converted from MJ/h into kilocalories. As 1 kilocalorie raises the temperature of 1 litre of water by 1 degree centigrade, the method of calculation is to multiply the input in MJ/h by 239.

* Thermal efficiency may be in the range of 78% to 90%, depending on the temperature rise and water flow. For the purpose of the following calculation we have assumed an efficiency of 80%.

Example Data	Calculation
$T_{IN} = 15^{\circ}\text{C}$ $T_{OUT} = 60^{\circ}\text{C}$ IN = 45000kcal/h TE = 80% Q = Water flow in Litres per minute	$IN \times TE = (T_{OUT} - T_{IN}) \times 60 \times Q$ $45000 \times 0.8 = (60 - 15) \times 60 \times Q$ $36000 = 45 \times 60 \times Q$ $\frac{36000}{45} = 60 \times Q$ $800 = 60 \times Q$ $\frac{800}{60} = Q$ 13.3 L/min

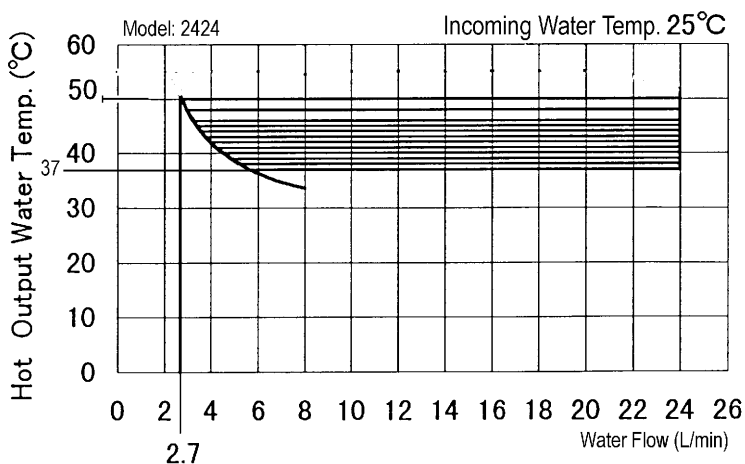
Unmixed Water Flows for the REU-2425W

The chart opposite indicates that the water flow rate of the REU-2425W will, at a preset temperature of 50°C and an *incoming water temperature* of 5°C, be 14 litres per minute.



The chart opposite indicates that the water flow rate of the REU-2425W will, at a preset temperature of 50°C and an *incoming water temperature* of 15°C, be 18 litres per minute.

The chart opposite indicates that the water flow rate of the REU-2425W will, at a preset temperature of 50°C and an *incoming water temperature* of 25°C, be 24 litres per minute.



Mixed Water Flows

Output water temp.	Incoming +15°C	Incoming +25°C	Incoming +30°C	Incoming +35°C	Incoming +45°C	Incoming +50°C
Output water vol.	with mixing 40 L/min	with mixing 24 L/min	with mixing 18 L/min	17.1 L/min	13.3 L/min	11.9 L/min

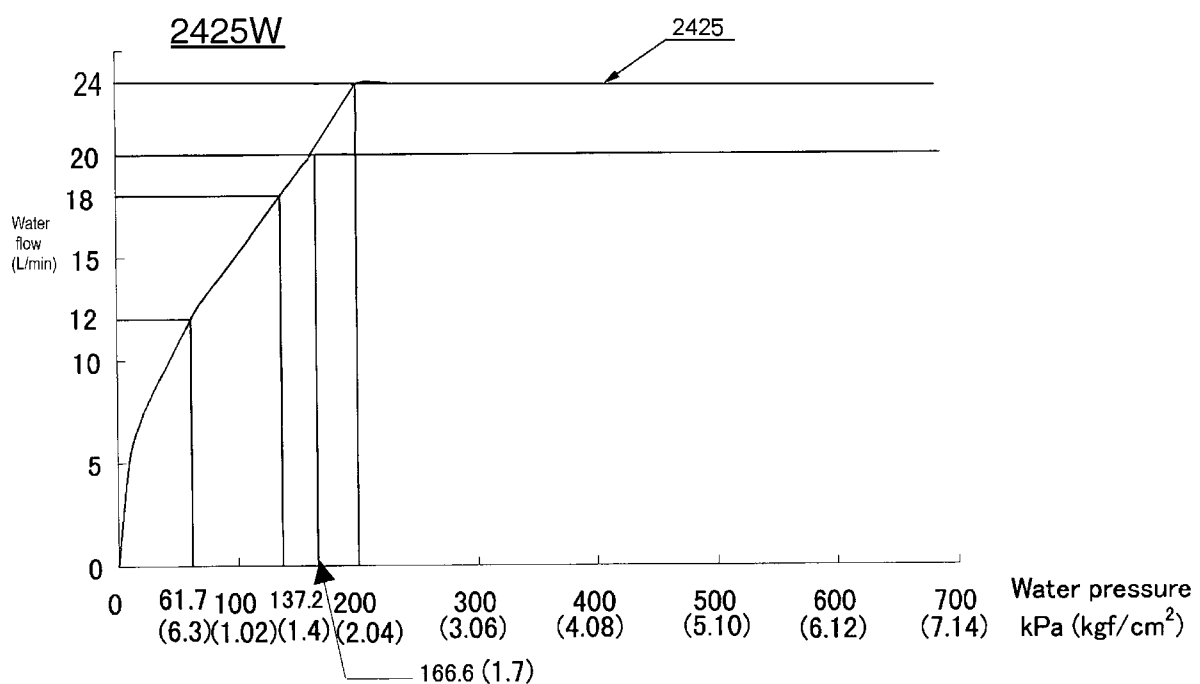
12. Main Components

1. Mechanical Water Regulator

Rinnai's unique water regulator mechanism ensures the hot water is maintained with no noticeable change to the desired temperature during use, even if water pressure drops due to another tap being turned on and increasing the demand.

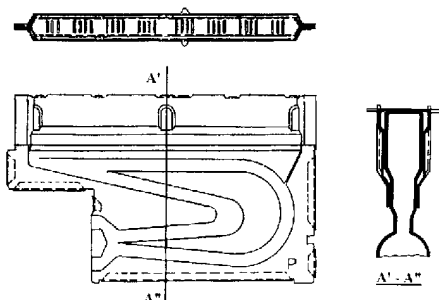
The following graphs show that the maximum flow is approximately 24 L/min for the 2425. This maximum flow is reached at 200 kPa inlet pressure respectively.

Note: Although the 2425W model operates at very low water pressures, maximum performance is not reached unless the incoming pressure is 200 kPa or more.



2. Preset Bypass

A preset volume of cold water is mixed with water heated in the heat exchanger.



3. Burner

The burner assembly is made up of 18 identical stainless steel bunsen burners, secured by an aluminised steel framework. An aluminium manifold with 18 integral injectors supplies gas to the burners, and is attached to the front lower cover of the burner box.

4. Changeover Solenoid Valve

The changeover solenoid increases the flexibility of the regulator/modulating valve by supplying gas to the right hand side of the burner only, [up to 40% input] or both sides of the burner, [40% input] + [40 - 100%] through the tandem manifold.

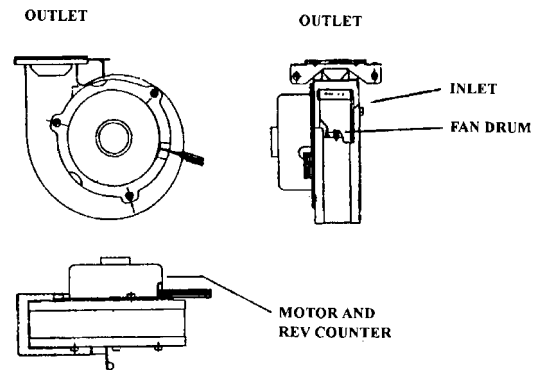
5. Combustion Fan

Air for combustion is supplied by a centrifugal fan driven by a DC motor. After a pre-purge period of 0.2 seconds, the fan speed is controlled by the PCB to provide the correct volume of air for combustion. The calculation for the fan speed is based upon incoming water temperature, water flow and the temperature selected on the remote controls.

The actual speed of the motor is continuously monitored by a magnetic pulse sensor.

This sensor emits 4 pulses per rotation of the fan.

This is the fan feedback or confirmation data processed by the PCB and used for 2 operations.



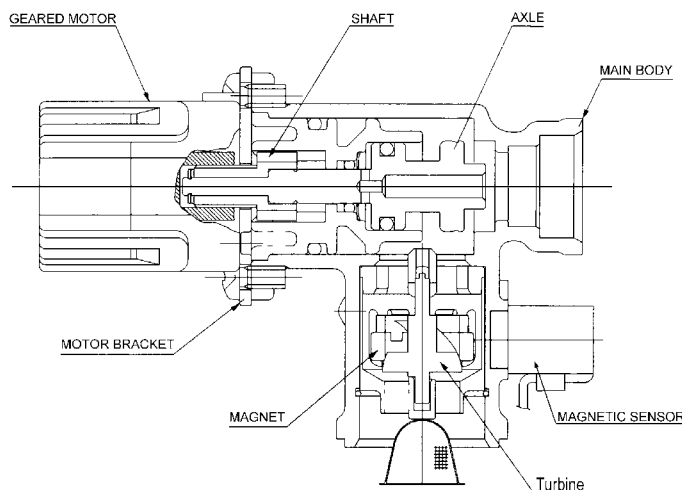
1. The fan speed is constantly corrected to provide optimum combustion conditions.
2. To determine the opening degree of the modulating gas valve, so that the gas rate always matches the volume of air for combustion, as well as the input required to heat the water. The reason for controlling the opening degree of the modulating gas valve based upon data from the combustion fan is that the gas valve is able to react much more quickly to a change in control signal than the combustion fan. Controlling the gas valve based upon data from the combustion fan means that combustion remains satisfactory, even if there are sudden changes in input conditions.

6. Water Flow Sensor and Water Flow Control device:

Water flow is detected by a turbine/magnetic pulse generating device. Water flows through the turbine/magnetic sensor providing information to the PCB by generating a pre-determined number of pulses in proportion to the water flow. These pulses are counted by the PCB - no pulse indicates no water flow. The frequency of the magnetic pulses increases as the water flow increases, this enables the PCB to calculate the exact water flow, and determine the water flow in litres/minute. As soon as the required water flow is detected, the PCB activates the combustion fan. The combustion fan speed is monitored by a magnetic pulse sensor. The output from this sensor is processed by the PCB which opens the gas modulating valve to a degree proportional to the fan speed. See above for further details on the combustion fan.

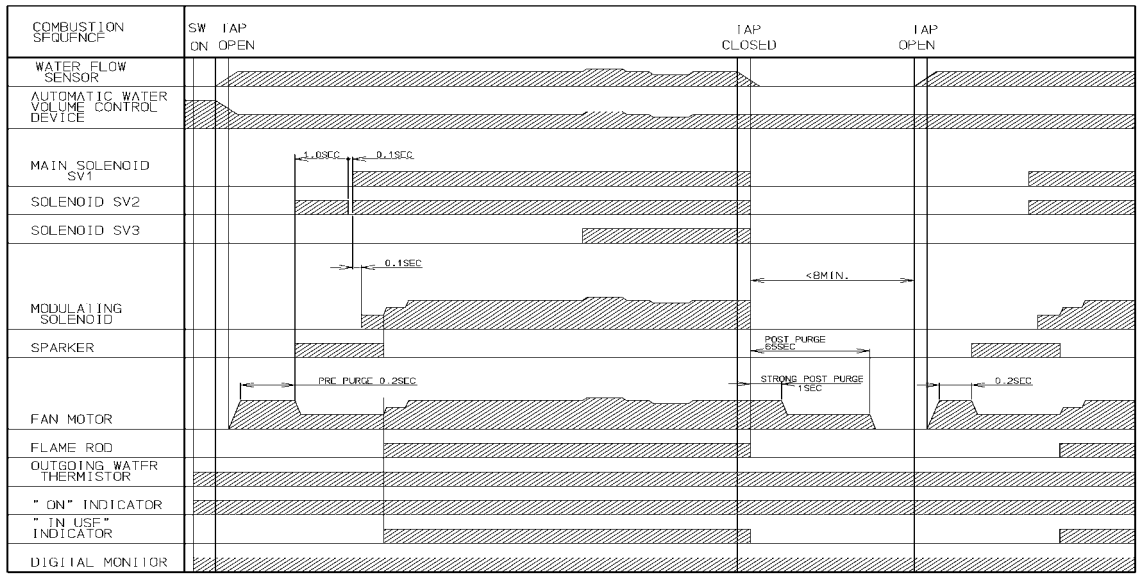
The water flow control consists of a plug and barrel valve which is rotated by a motor to increase or decrease the volume of water passing through the heat exchanger.

Water flow control device.

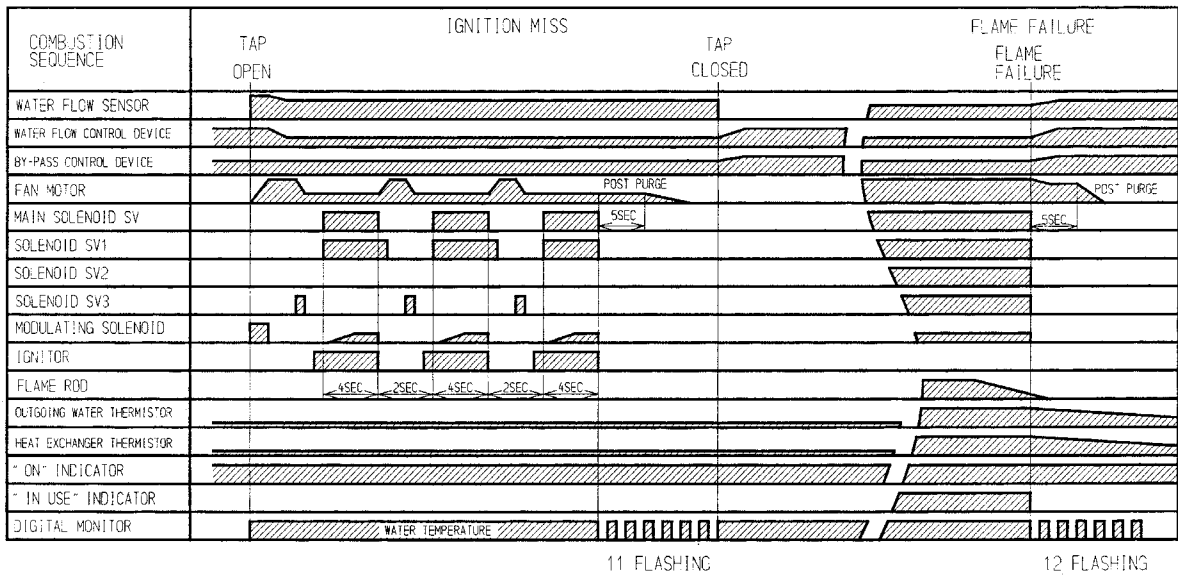


13. Time Charts

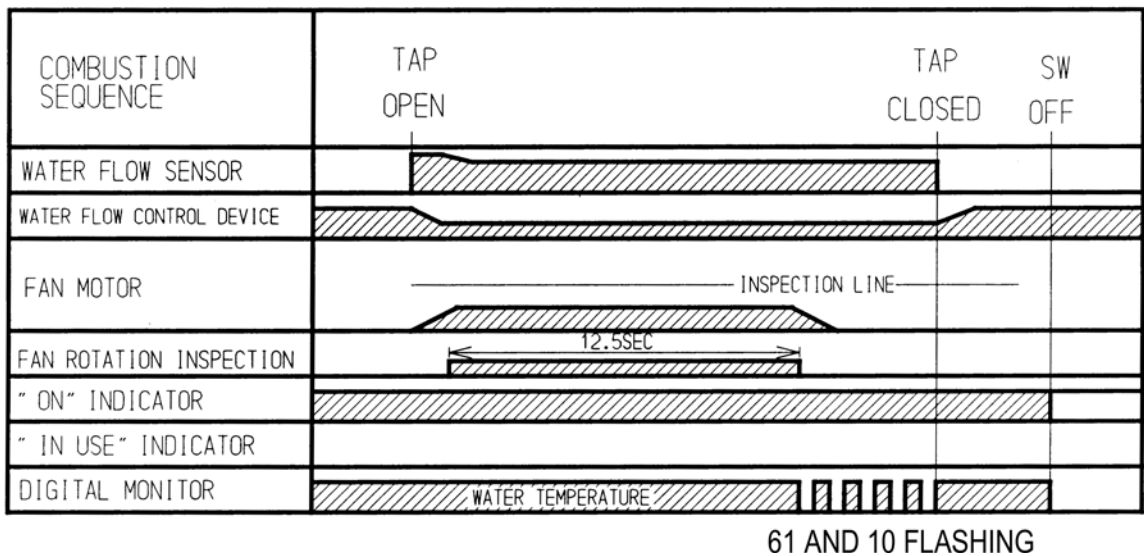
Normal Combustion Sequence



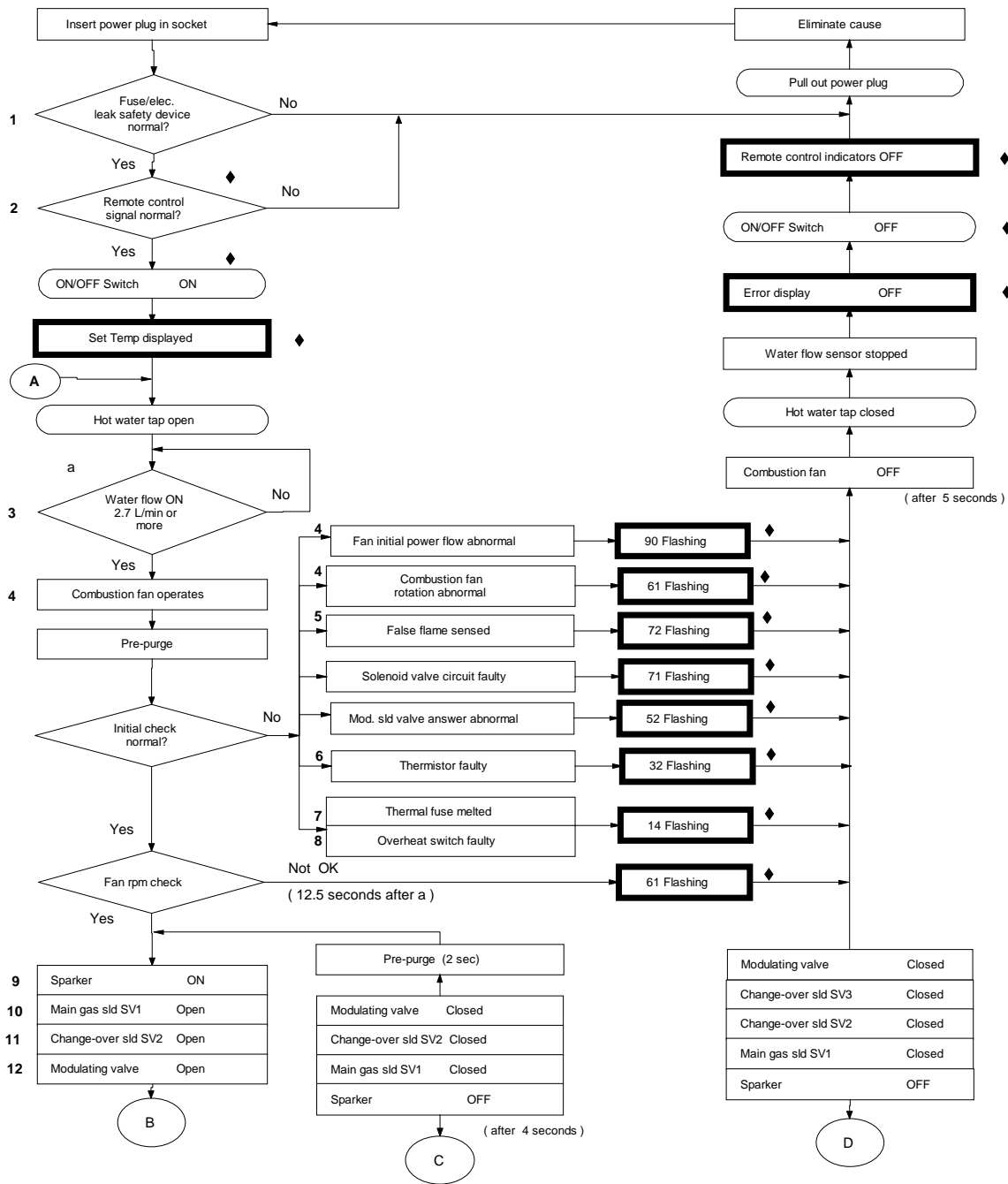
Error Sequence (Ignition / Flame Failure)



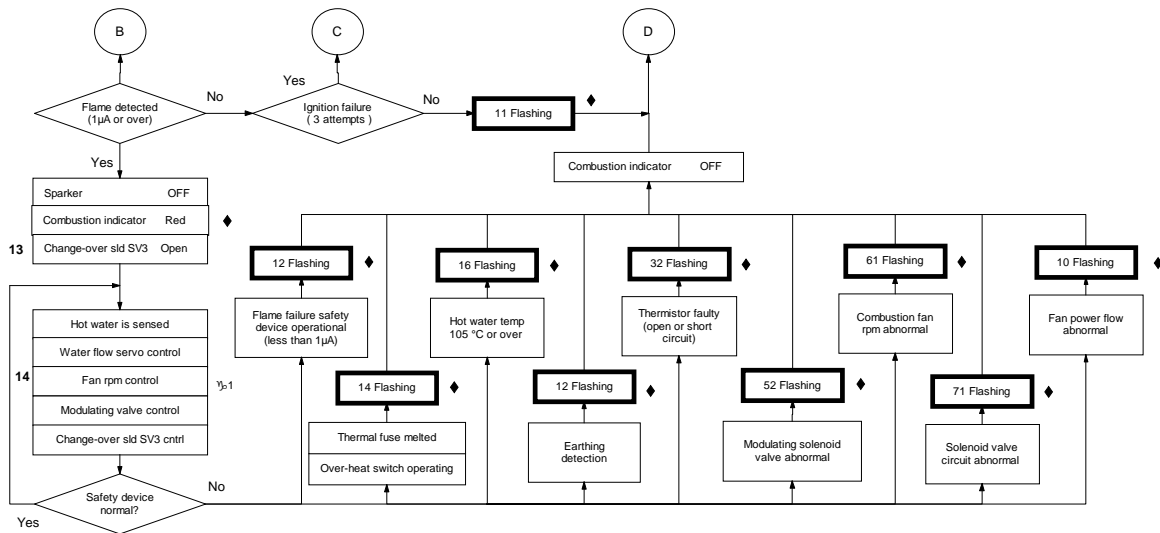
Pre-purge Defect Sequence



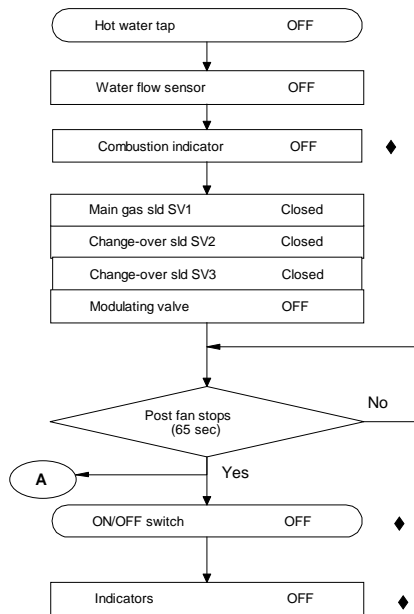
14. Operation Flow Principle



◆ Only applicable when remote control is connected



TURN OFF



15. Operation Principles

The preset temperature is selected at one of the remote controls (where fitted). Where no remote control is fitted, the default temperature (Heavy Duty only) depending on the position of dip switch numbers 4 to 8 (see page 14).

When the unit is first plugged into 240 Volts, the PCB assumes an incoming water temperature of 25°C, this prevents the appliance starting on HIGH, and producing very hot water the first time it is used.

The data used to determine the outgoing water temperature initially is incoming water flow, and the remote control pre-set temperature.

From the incoming water flow and remote control pre-set temperature data, the CPU is able to determine a suitable gas rate to kick the appliance off, once a hot water tap opens.

This calculation of temperature rise and water flow is called simulation feed-forward.

The water heater calculates incoming water temperature by subtracting the theoretical temperature rise from the outgoing hot water temperature, to establish the correct gas flow.

When a hot water tap is opened, water begins to flow through the appliance. The turbine in the water flow sensor begins to revolve. The revolution speed is proportional to the water flow. A sensor located inside the device relays information in the form of magnetic pulses to the main PCB to determine whether or not water is flowing, and also, the volume of water flowing. When a pre-determined water flow is sensed, the ignition sequence begins.

The combustion fan pre-purges the combustion chamber. A rev counter on the combustion fan indicates the fan rpm to the main PCB. Once the pre-purge cycle is completed, the PCB controls the fan rpm by varying the DC voltage to the fan motor. This maintains the correct air/gas ratio throughout the time the water heater is in use, to ensure good combustion.

The gas is ignited by direct electronic spark and the flame is sensed by the flame rod. The opening degree of the modulating valve is determined by the combustion fan speed.

The changeover valve directs gas to one side or both sides of the burner. At the point where the changeover valve opens or closes, the modulating valve is instantly re-adjusted by the PCB to compensate for the change in the number of burners in use. From the information provided by the water flow sensor and the water temperature thermistor, the PCB determines how much gas is required to heat the water to the temperature selected on the remote control.

The PCB is programmed to provide the maximum volume of water possible at a given temperature rise. As the water flow from the tap is increased, the PCB increases the gas and air flow to the burner.

Once the maximum gas rate is reached the PCB begins to control the water flow through the appliance in order to maintain the preset temperature. This is achieved by the PCB turning the valve within the water flow control device by means of a stepping motor.

The water flow control device operates at high water flows and/or high temperature rises. When the temperature rise is low, or the water flow is restricted by the hot water tap, then the device may not be required to operate. [See section on "Main Components" on page 18, for clarification].

There is no direct connection between the mechanical water flow control device with water flow sensor and the PCB, therefore, there could be occasions when the input required to heat the water exceeds the capacity of the appliance, and water at a temperature lower than that requested on the remote control is output. In this case, manually reducing the water flow at the tap will increase the temperature.

Once hot water is flowing the water temperature thermistor senses the outgoing water temperature.

The PCB is continually adjusting both the gas input and water flow to maintain a constant temperature. It also continually monitors the combustion fan rpm adjusting the gas rate to match.

When the hot water tap is turned off, the water flow sensor stops revolving, and the magnetic pulse ceases, indicating to the PCB that there is no water flowing, in turn the PCB closes the gas valves. The combustion fan continues to operate for 65 seconds. This is to provide quicker ignition when the tap is turned on and off in rapid succession, as it removes the need for a pre-purge cycle, and allows the burner to re-light immediately when a hot water tap is opened again.

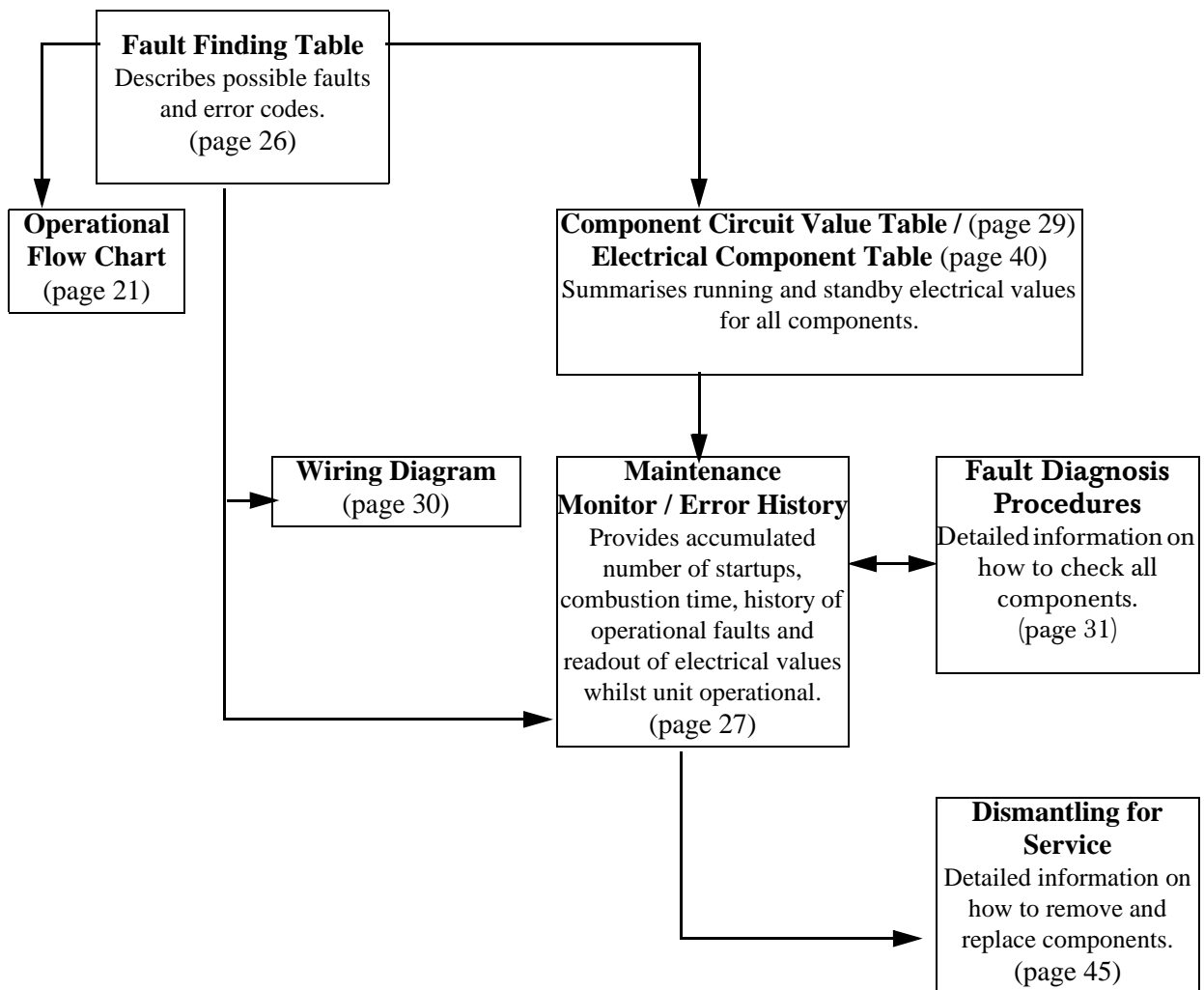
The PCB stores data on the calculated incoming water temperature, ready for when the hot water is turned on again. The data is used to calculate the initial gas flow.

16. Fault Finding



If there is a fault with the appliance, and controllers are installed, a numerical fault code may appear on the digital display controller. If controllers are not installed, one may be fitted to find out the fault code. Fault finding without controllers (and thus fault codes) is possible but more time consuming.

To diagnose and rectify faults, the **Fault Finding Table** is used as illustrated below:



17. Fault Finding Table

Code on Controller	Fault	Flow Chart No	Action
-	Changeover solenoid valve faulty. Incorrect water temperature.		
03	Power interruption during Bathfill. Water will not flow when power restored.		1. Turn off all hot water taps. 2. Press the ON/OFF button on a controller twice.
10	Fan current abnormal.	4	1. Check blockage of air intake/flue outlet. 2. Check combustion fan.
11	No ignition. Unit stops without flame igniting.		1. Check gas supply 2. Check sparker unit 3. Check gas valves
11	Sparker faulty. Stops without flame igniting.		
11	Solenoid valve faulty. Stops without flame igniting.		
11	Main solenoid valve faulty. Stops without flame igniting.		
12	Flame sensing device faulty. Stops second time burner has been extinguished.		1. Check gas supply 2. Check sparker unit 3. Check gas valves 4. Check flame rod 5. Check earth wire lead 6. Check remote control
12	Earthing faulty. Does not operate.		
14	Water flow control device faulty. Water flow is not controlled, water temperature incorrect.		
14	Water flow sensor faulty. Activated during OFF.		
14	Remaining flame safety device operating. Operates then stops.		
14	Thermal fuse faulty/blown. Operates, then stops.	8	1. Check thermal fuse 2. Check overheat switch
16	Outgoing water temperature abnormal. Operates, then stops.	6	1. Confirm "Gas Type" & "Combustion" dip switch settings (page 15) 2. Confirm test point pressure (page 45) 3. Check gas valves 4. Check water flow sensor 5. Check water flow servo 6. Check heat exchanger outlet temperature thermistor 7. Check hot water outlet temperature thermistor
32	Short or faulty wiring in water temperature thermistor - Does not operate.	6	Check hot water outlet thermistor
52	Modulating solenoid valve answer abnormal. Operates, then stops.	12	Check modulating solenoid valve
61	Combustion fan faulty. After 12.5 seconds operation.	4	Check combustion fan
65	Warning Code given - Tap left open at bath fill function.		Close tap
71	Solenoid valve circuit error. Unit does not operate.		Check gas valves
72	Flame rod circuit error. Unit does not operate.	5	Check flame rod
-	Appliance does not operate at all. No display on the remote controllers (if fitted).		1. Check power cord plugged in and supply turned on. 2. Check power supply voltage. 3. Check electrical fuse. 4. Check transformer. 5. Check gas valves. 6. Check sparker unit. 7. Check earth leads and connections. 8. Check for short circuits. 9. Check remote controller(s) - if fitted.
-	No combustion despite remote control indicating that combustion is occurring - if remote controller(s) fitted		1. Check water flow sensor. 2. Check flame rod. 3. Check heat exchanger outlet thermistor. 4. Check hot water outlet thermistor. 5. Check combustion fan. 6. Check the sparker unit. 7. Check gas valves. 8. Check thermal fuse. 9. Check overheat switch (OHS). IMPORTANT - If thermal fuse or OHS were faulty: a) check heater for damage; b) confirm "Gas Type" & "Combustion" dip switch settings; c) confirm test point pressure.
-	Combustion stops during operation.		1. Check gas supply 2. Check flame rod 3. Check earth leads and connections.
--	Cannot adjust the hot water temperature via the controller(s) - only if controller(s) fitted.		1. Check hot water outlet thermistor. 2. Check heat exchanger outlet thermistor. 3. Check gas valves 4. Check water flow servo.
-	Anti-frost heater does not operate.		1. Check anti-frost heater components. 2. Check frost sensing switch.

18. Maintenance Monitor / Error History

REU-2425W

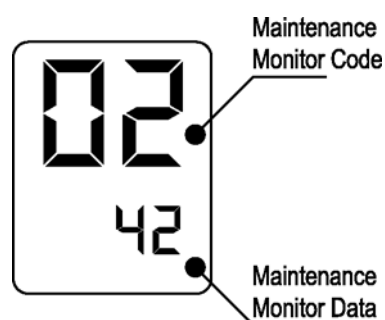
INFINITY 24

A deluxe controller (MC70-2A) should only be fitted to the above water heater models, for the purpose of enabling service personnel to locate the error history and fault find operational appliances.

NB. Use only one controller, when accessing the maintenance information, error history, as two or more remote controls may cause incorrect operation.

To display Maintenance Information

1. With the controller in the "OFF" position press the Water Temperature "DOWN" (Cooler) button while holding the "ON/OFF" button to activate the maintenance monitor. Press the "ON/OFF" button a second time to set the controller in the "ON" mode. This feature can now be used with the appliance in operation.
2. The maintenance number will be shown in the Water Temperature display.
3. Data will be shown in the Clock display.
4. To select the required maintenance number, press the Water Temperature "UP" and "DOWN" buttons.



Display Monitor Contents			
No.	Contents	Units	Data Range
01	Water flow sensor recognition flow (Example 123 = 12.3L/min).	0.1L/min	0~400
02	Hot water Outlet thermistor temperature (Example 20 = 20°C)	°C	0~999
03	Hot water combustion time (Example 6 = 600 hours)	100 hours	000~999
04	Hot water operation frequency (Example 6 = 600 Operations)	100	0~999
05	Hot water fan frequency	Hz pulses/ sec	0~999 *Note 1

***Note 1** Fan Frequency rpm Conversion
 $(rpm) = (Hz) \times 15$

06	Remote control connection	none	0 or 1 *Note 2
----	---------------------------	------	-----------------------

***Note 2** Remote Control Connections

Bathroom Remote		Kitchen remote	
Additional remote			
" 0			1 "
	1		

Controls connected	Display
No	"0"
Yes	"1"

07	Water flow servo present recognising positioning	None	0-2 *Note 3
----	--	------	--------------------

***Note 3 Water Flow Servo Positioning**

Servo Position	Open	Centre	Closed
Display	"1"	"0"	"2"

08	Inlet water temperature (PCB recognition value) (Example 25 = 25°C)	°C	0-999
09	Hot water fan current flow value (Example 6 x 10 = 60 mA)	10 mA	0-999
10	Bath fill amount (this counts the litres during bath fill operation).	Litres	0-999

To return to normal operation

- Press the ON/OFF button again while holding down the Water Temperature "DOWN" (Cooler) button.

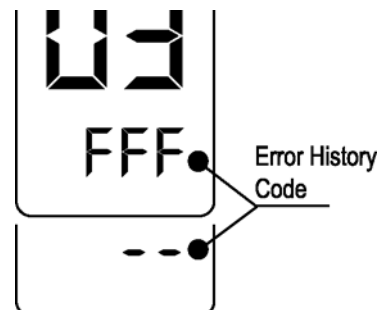
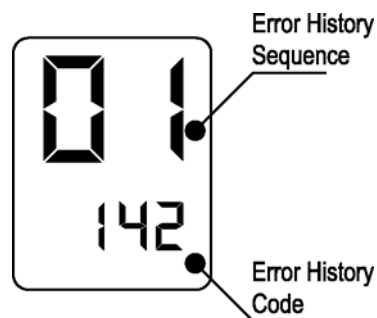
Error History

To Display Error Memory (History)

(This feature will show the last 10 faults in sequence)

1. Turn off at the ON/OFF button. (This can be done during operation)
2. Press the ON/OFF button while holding the Water Temperature "UP" (Hotter) button.

- The Sequence will be shown in the Water Temperature display.
- Error Code will be shown in the Clock display. (See service Manual for error codes).
- Where there are less than a total of 9 errors, "FFF" or "- -" will be displayed in the Clock display.



To return to normal operation

- Press the ON/OFF button again while holding the Water Temperature "UP" (Hotter) button.
- This feature will automatically shut down after 3 minutes.

19. Component Circuit Value Table

Flow chart is on page 21.

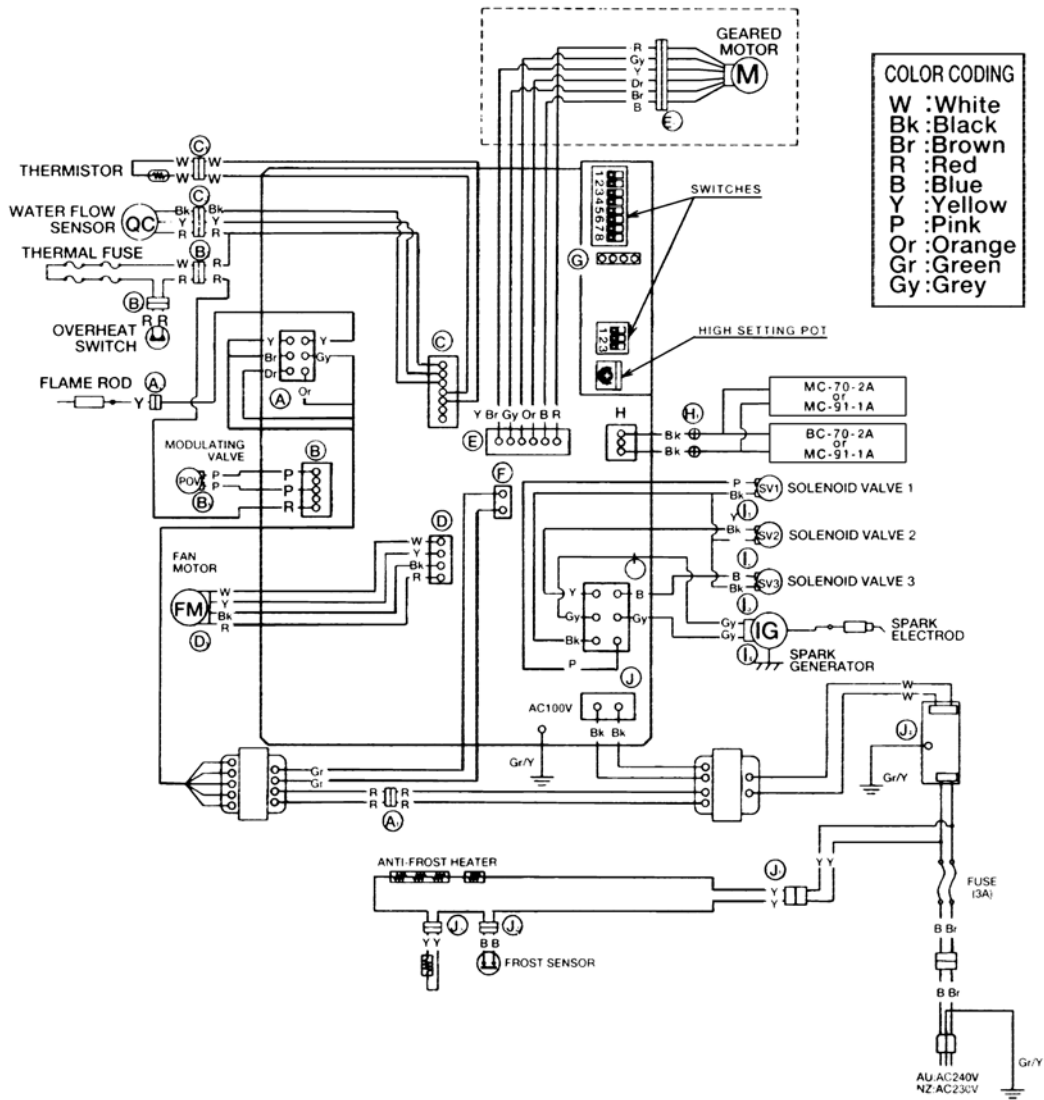
Wiring diagram is on page 30.

Flow Chart No.	Component	Measurement Point		Normal Value
		CN	Wire Colour	
1	Surge Protector	J ₄	brown-blue	AC 207~264 V
2	Remote Controls	H ₁	black - white	DC 10~13 V
3	Water Flow Sensor	C ₂	red - black	DC 11~13 V
			yellow - black	DC 2~10 V
4	Combustion Fan Motor	D	white - black	DC 2~9 V
		G	red - yellow	60~350 Hz
5	Flame rod	A ₂	yellow - body earth	AC 100 ~ 160 V (over DC μ 1A)
6	Thermistor	C ₁	white - white	Thermistor resistance value Temp resistance 15° C 11.4~14 k Ω 30° C 6.4~7.8 k Ω
7	Thermal Fuse	B ₂	red - red	Below 1 Ω
8	Over Heat Switch	B ₃	red - red	Below 1 Ω
9	Sparker	I ₁	grey - grey	AC 90~110 V
10	Solenoid Valve (SV ₂)	I ₁	pink - black	DC 80~100 V 0.9~1.3 k Ω
11	Solenoid Valve (SV ₂)	I ₂	yellow - black	DC 80~100 V 1.3~1.9 k Ω
12	Modulating Valve	B ₁	pink - pink	DC 0.5~25 V 60~100 Ω
13	Solenoid Valve (SV ₃)	I	blue - black	DC 80~100 V 1.3~1.9 k Ω
14	Stepping motor	E ₁	red - blue	DC 11~13 V
			orange - grey	

Transformer Voltages and Resistances

CN	Wire Colour	Normal Value
A	red - red	AC 90~110 V
F	green - green	AC 16~20 V
A	orange - orange	AC 13~30 V
A	brown - grey	AC 30~50 V
A	yellow - grey	AC 180~220 V

20. Wiring Diagram

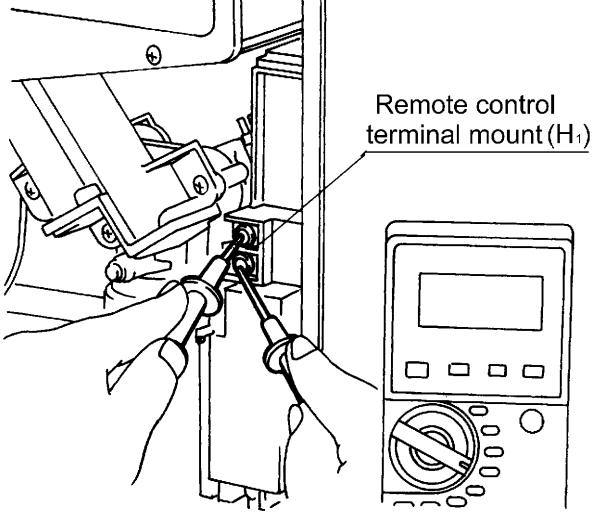
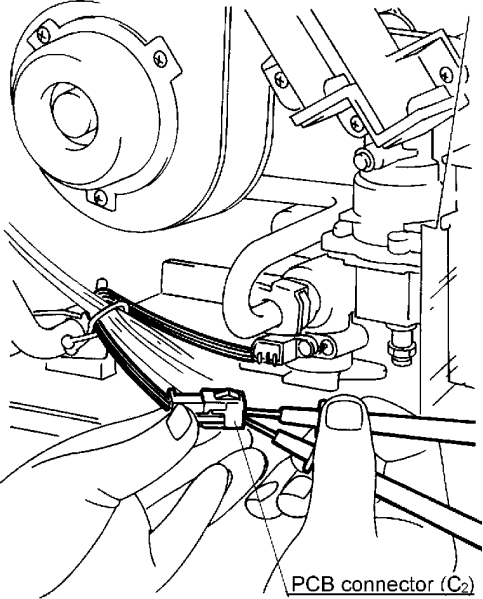


21. Fault Diagnosis

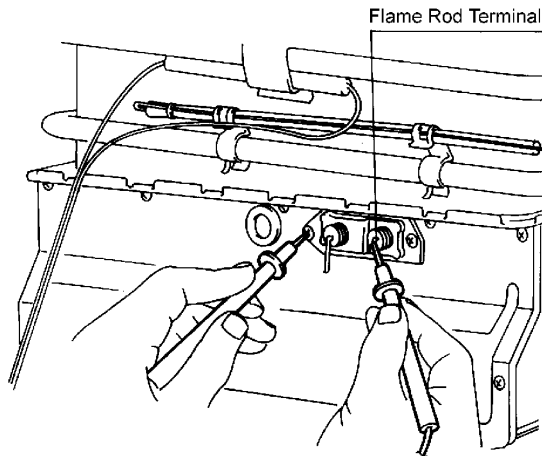


Before carrying out checks marked #, remove power cord from wall plug.
Wiring diagram is on page 30.

Appliance will to operate (even remote control fails to operate)	
1) Is the fuse blown?	
<p>Fuses are located in plastic holders in the main harness, on the lower right hand side of the appliance</p>	<p>Check fuse</p> <ol style="list-style-type: none"> a. Remove 240V plug from socket. b. # Measure resistance to check the electric fuse (3A). Normal: less than 1Ω If normal, proceed to check item 2) below. Faulty: Replace fuse (5A) If it blows again, investigate cause of short circuit.
2) Is the main transformer normal?	
<p style="text-align: center;">Connector (A₁)</p> <p style="text-align: center;">Connector (A)</p>	<p>Check the transformer</p> <ol style="list-style-type: none"> c. Measure the voltage in between the red wires of the relay connector (A₁). Normal: AC90 ~ 110 V / 15 ~ 21Ω If normal, check (d) below. Faulty: Check for AC 90 ~ 110 V on the PCB terminal J black ~ black d. Check voltages below at upper PCB connector A. Normal: orange -orange AC 13 ~ 30V / 1.4 ~ 1.8Ω brown - grey AC 30 ~ 50V / 6 ~10Ω yellow - grey AC 180 ~ 220V / 0.4 ~ 0.6Ω If normal, check 3 at top of next page. Faulty: Replace the transformer.

<p>Refer to diagram on bottom of previous page.</p>	<p>e. Check the voltage at centre PCB connector F, green~green.</p> <p>Normal: AC 16 ~ 20V If normal, check item 3) below. Faulty: Replace the transformer. Note: Transformer voltage above applies to the appliance in a standby, non-functioning state.</p>
<p>3) Is the remote control normal?</p>	
 <p>Remote control terminal mount (H₁)</p>	<p>Check voltage between the two remote control cable conductors.</p> <p>f. Check the voltage between terminals on the remote control terminal mount (H₁).</p> <p>Normal: DC 10 ~ 13V If normal, check for open circuit or shorts before replacing the remote control. Faulty: Replace PCB.</p>
<p style="text-align: center;">No combustion (despite remote control indication)</p>	
<p>4) Is the water flow sensor normal?</p>	
 <p>PCB connector (C₂)</p>	<p>g. Measure the voltage between red and black of the relay connector (a₂).</p> <p>Normal: DC 11 ~ 13V If normal, go to (h). Faulty: Replace water flow control.</p> <p>h. Measure the voltage between yellow and black of the relay connector (a₂)</p> <p>Normal: DC 2 ~ 10V If normal, go to 2). Faulty: Replace the water flow sensor.</p>

5) Is the flame rod normal? Error "72" is displayed



Checking the flame rod.

- i. # Detach the flame rod terminal A_2 , and re-attempt operation. ("72" is displayed)
Proceed to check item 3) below. ("72" is not displayed)
Inspect for electrical current leak from the flame rod.

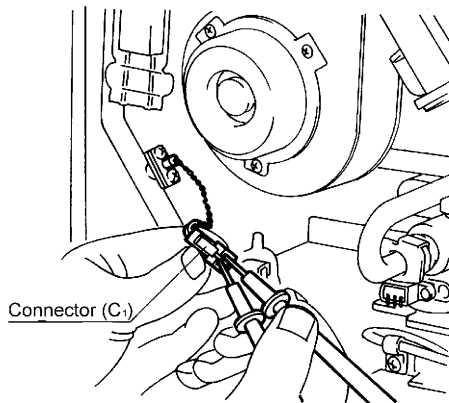
Measure resistance between flame rod terminal A_2 and the appliance earth.

Normal: 1 M Ω or more

If normal, replace the PCB unit.

Faulty: Replace the flame rod.

6) Is the water temperature thermistor normal?



If error "32" is displayed, check the water temperature thermistor.

- j. # Disconnect connector C_1 , and measure the resistance of white and white.

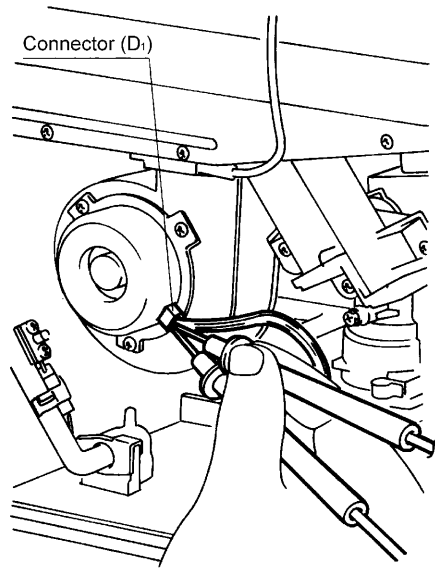
Resistance > 1M Ω = open circuit.

Resistance < below 1 Ω = short circuit.

Normal: proceed to check item 4) on next page.

Faulty: replace the water temperature thermistor.

7) Is the combustion fan normal?



Motor check

If error "61" is displayed, check combustion fan.

- k. Measure the voltage at the connector (D₁) black ~ red

Normal: DC 6~40V (fan on)

DC 0V (fan off)

If normal, go (1)

Faulty: Replace the PCB unit

Fan Revolution Sensor Check

- l. Measure the voltage at connector D₁, black ~ yellow

Normal: DC11~13V

If normal, go (m) below

Faulty: Replace the PCB unit

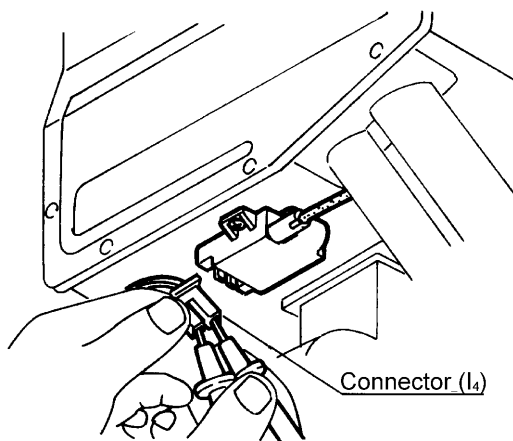
- m. Measure the voltage at connector D₁, black ~ white

Normal: DC2~9V

If normal, proceed to check item 5) below

Faulty: Replace the combustion fan.

8) Is the sparker operating normally?



Checking the motor

- n. Measure the voltage at connector I₄. grey ~ grey

Normal: DC 90 ~ 110 V

DC 0 V (when fan is OFF)

If normal, check (o) below.

Faulty: Replace the PCB unit

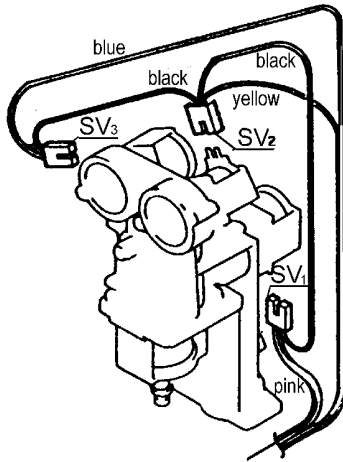
- o. # Disconnect I₄, and measure the resistance between sparker terminals

Normal: >1M Ω

If there is no spark, adjust or replace the electrode.

Faulty: Replace the sparker.

9) Is main gas solenoid valve (SV₁) normal?

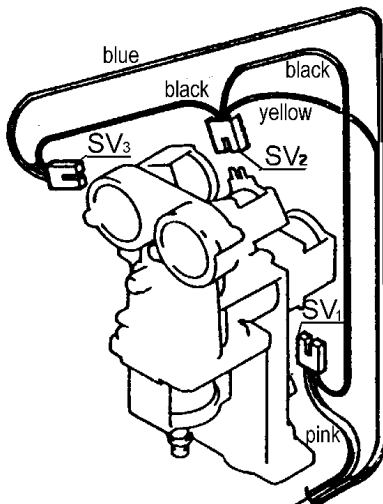


If error "11" is displayed, check the main gas solenoid valve.

p. # Disconnect the main gas solenoid valve (SV₁), connector and measure the resistance at the solenoid terminals. **Normal:** 0.9 ~ 1.3 k Ω
If normal, check (q) below.
Faulty: Replace the main gas solenoid valve.

q. Measure voltage main gas solenoid valve (SV₂) pink ~ black connector.
Normal: DC80~100V
If normal, proceed to check item 7) below.
Faulty: Replace the PCB unit.

10) Is the change over solenoid (SV₂) operating normally?



If error "11" is displayed, check the change over solenoid valve (SV₂).

r. # Disconnect the main gas solenoid valve (SV₂) connector, and measure the resistance at the solenoid terminals.

Normal: 1.3 ~ 1.9 k Ω .

If normal, check (s) below.

Faulty: Replace the change over solenoid valve (SV₂).

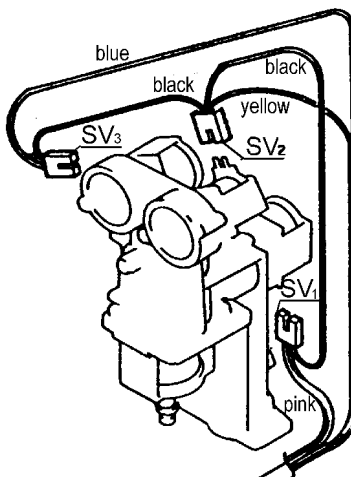
s. Measure voltage at change over solenoid valve (SV₃) blue ~ black connector.

Normal: DC 80 ~ 100V

If normal, check item 8) below.

Faulty: Replace the PCB unit

11) Is the change over solenoid valve (SV₃) normal?



t. # Disconnect the change over solenoid valve (SV₃) connector, and measure the resistance at the solenoid terminals.

Normal: 1.3 ~ 1.9 k Ω

If normal, check (u) below.

Faulty: Replace the change over solenoid valve (SV₃).

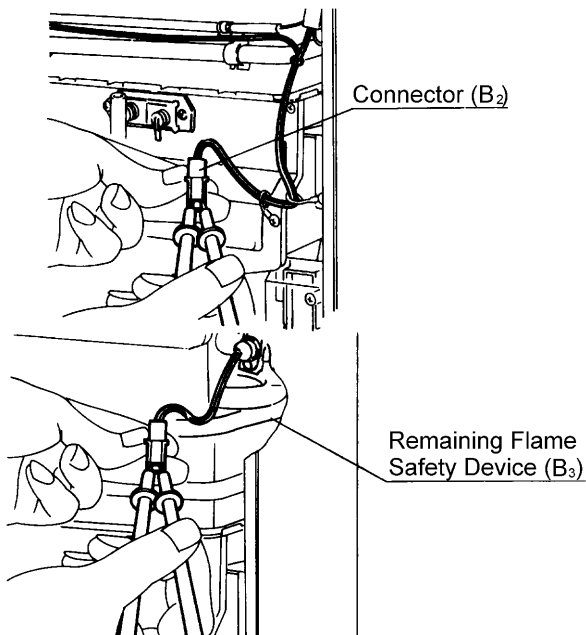
u. Measure the voltage at changeover solenoid valve (SV₃) blue ~ black connector.

Normal: DC 80 ~ 100V

If normal, check item 9).

Faulty: Replace the PCB unit.

12) Are the safety devices operating normally?



Check the thermal fuse.

- v. # Disconnect connector B₂ and measure the resistance between red ~ red.

Normal: less than 1 Ω.

If normal, replace the PCB unit.

Faulty: Check the appliance for damage. If there is nothing abnormal, replace the thermal fuse.

Check the remaining flame safety device.

- w. Measure resistance between the two terminals B₃.

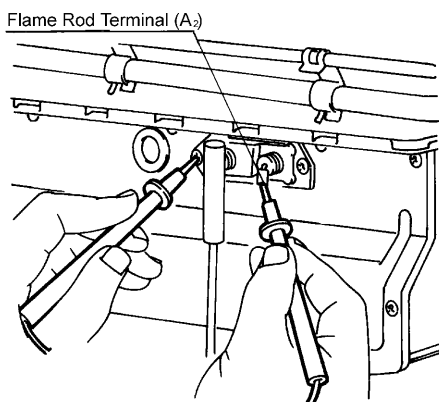
Normal: less than 1 Ω

If normal, replace the PCB unit.

Faulty: Replace the remaining flame safety device.

Combustion stops due to flame failure

13) Is the flame rod functioning normally?



- x. Measure the voltage between the flame rod terminal (A₂) and the appliance earth.

Normal: AC 100 ~ 160V

If normal, check (y) below.

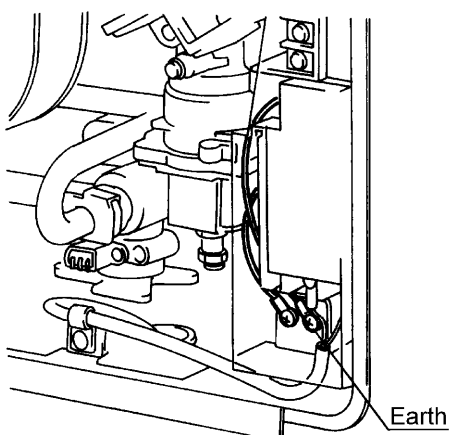
Faulty: Replace the PCB unit.

- y. Check that the flame rod attachment is not loose.

Normal: Replace the PCB unit

Faulty: Secure the flame rod brackets.

14) Is the earth lead wire normal?



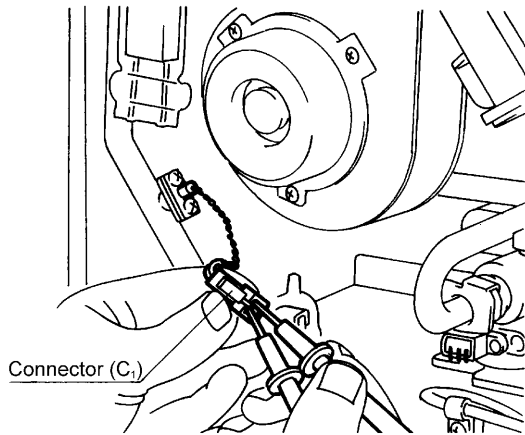
- z. Check whether the earth lead wire has come loose (disconnection from round terminal) or if any shorts have occurred.

If normal, check for any other causes for flame failure (eg. gas valve is open, blocked filter, etc)

Faulty: Secure the earth.

Unable to adjust hot water temperature

15) Is the water temperature thermistor normal?

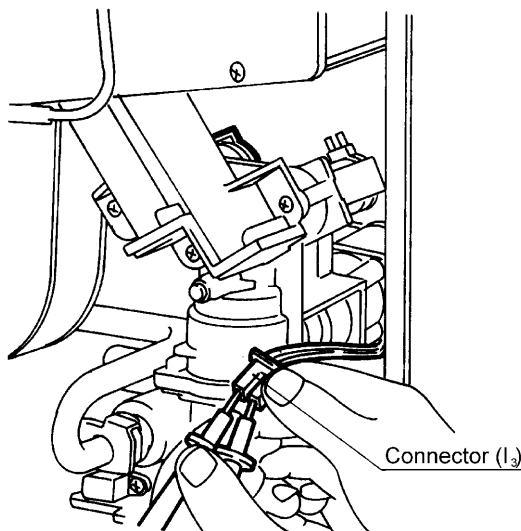


aa. Disconnect the connector (C₁) and measure the resistance between white wires.

See diagnostic points, for temperature at various resistance.

Normal: Proceed to check item 2) below
Faulty: Replace water temperature thermistor.

16) Is the changeover solenoid valve (SV₃) normal?



ab. # Disconnect the changeover solenoid valve (SV₃) connector, and measure the resistance between the solenoid terminals.

Normal: 1.3 ~ 1.9 k Ω .

If normal, go to (ac).

Faulty: Replace the changeover solenoid valve (SV₃).

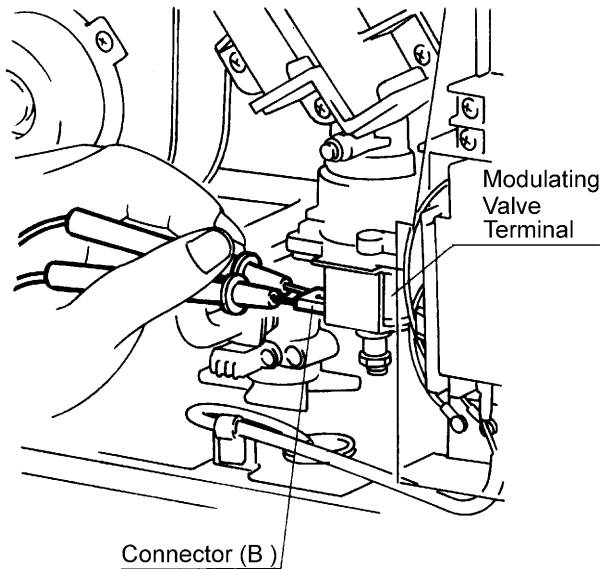
ac. Measure the voltage at the changeover solenoid (SV₃) blue ~ black connector.

Normal: DC 80 ~ 100V

If normal, go to item 3) on the next page.

Faulty: Replace the PCB unit.

17) Is the modulating valve operating normal?



ad. # Disconnect the modulating valve festoon terminals and measure the resistance at the terminals.

Normal: 60 ~ 100Ω

If normal, go to (ae).

Faulty: Replace the modulating valve.

ae. Re-connect terminal and measure the pink ~ pink voltage at the modulating valve festoon terminal.

Normal: DC 0.5 ~ 25 V

If normal, go to (af) below.

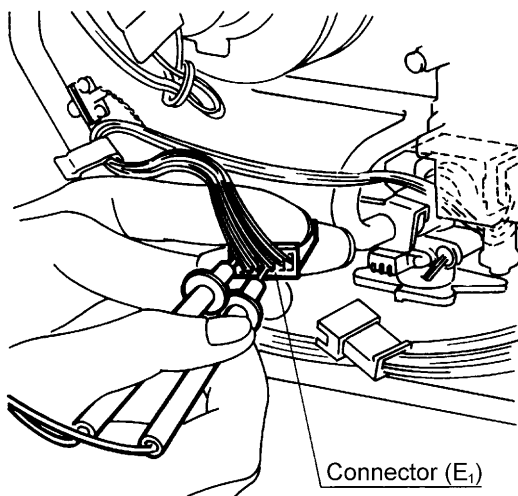
Faulty: Replace PCB unit.

af. Investigate the change in gas secondary pressure when the remote control preset temperature is altered from 37 to 75° C.

Normal: If the secondary pressure changes, proceed to check item 4) below.

Faulty: Replace the modulating valve.

18) Is the water flow servo normal? (2008/2408)



ag. # Disconnect connector and measure the red ~ blue resistance on the water flow servo side.

Normal: 10 ~ 30Ω

If normal, go to (ah).

Faulty: Replace the water flow servo with water flow sensor.

ah. Disconnect connector, and measure the voltage between orange (+) and grey(-) on the water flow control side.

Normal: DC 11 ~ 13 V

If normal, go to (ai).

Faulty: Replace the PCB unit.

ai. With connector (E₁) connected (do not turn water ON... wait for the water flow servo to return to fully open), measure the voltage between brown and grey.

Normal: DC 4 ~ 6V

Faulty: Change water flow servo with sensor.

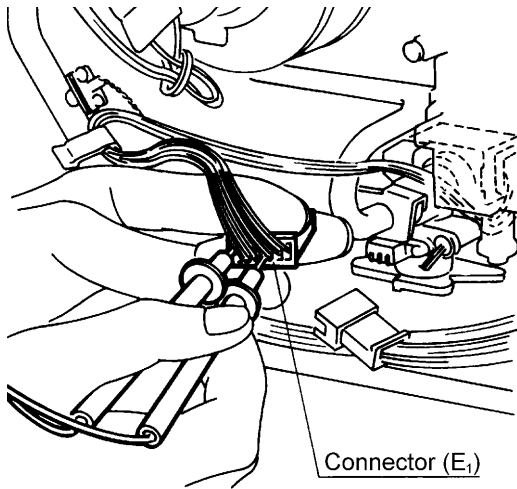
aj. Leaving the relay connector (E₁) connected (do not turn water ON... wait for the water flow servo to return to fully open), measure the voltage between yellow and grey.

Normal: Less than DC 0.5 V

Faulty: Change water flow servo with sensor.

Anti frost heater does not operate

19) Are the ceramic anti-frost heaters OK?

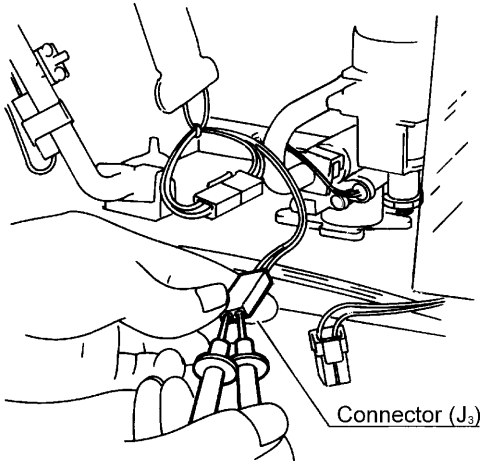


ak. # Disconnect connector (J₃) and measure the blue and blue resistance on the water control heater side.

Normal: 950~1050Ω

(If normal, go to (al)).

Faulty: Replace the water control heater.



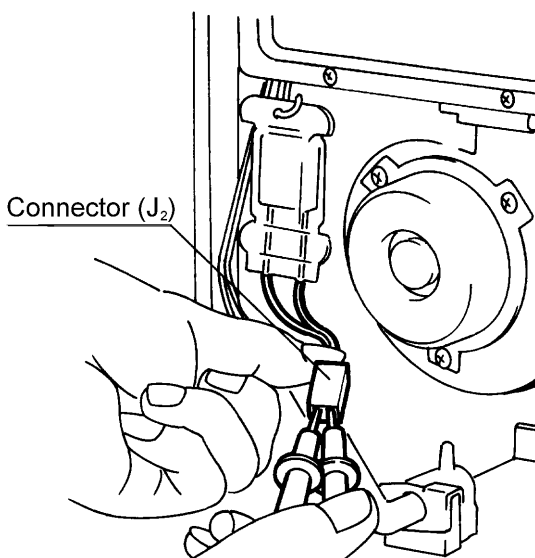
al. # Disconnect connector (J₃) and measure the resistance between blue and blue on the heater exchanger's heater side.

Normal: 135 ~ 175Ω

If normal, go to item 2) below.

Faulty: Replace anti-frost heater (assy)

20) Is the frost sensing switch normal?



am. # Detach connector (J₂) and measure the resistance between blue and blue.

*Measure at room temperature of 4±3° C.**

Normal: Less than 1Ω

if normal, check the wiring (AC100V circuit)

Faulty: Replace the frost sensing switch.

* *Where the low room temperature cannot be achieved, please cool with iced water or cold water below 4° C.*

22. Electrical Component Analysis

Before starting inspection, re-check wiring harnesses and double check that all connections are tight.
Before carrying out checks marked with *, remove power cord from wall plug.

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N ^o
A. The ON indicator does not light up after switching the unit on.	1. Is the power cord plugged in?	Inspect visually	Is it plugged in?	Yes	Go to A - 2.	
				No	Plug in cord	1
	2. Is supply voltage correct?	Measure voltage at power point.	AC 240 V (NZ 230 V)	Yes	Go to A - 3.	
				No	Check power supply circuit. Check fuses.	2
	3. Check 3 Amp electrical fuses.	*Inspect visually	Is the surge protector indicator lit up	Yes	Go to A - 5	
				No	Go to A - 6	
	4. Check 3 Amp electrical fuses.	* Disconnect and measure resistance to confirm if fuse is blown. Normal < 1 M Ω	Is fuse blown?	Yes	Go to A - 5 and replace fuse.	
				No	Go to A - 6.	
	5. Check for short circuits.	i) Measure the resistance of each solenoid valve. * Remove connector I from the PCB before measuring. Pink - Black 0.9 ~ 1.3 k Ω Yellow - Black 1.3 ~ 1.9 k Ω Blue - Black 1.5 ~ 1.9 k Ω	Are values within those specified at left? N.B. Measure after checking that there are no broken wires or shorts.	Yes	Go to A - 6 - 2)	
				No	Replace faulty solenoid valves.	
				ii) Measure the sparker resistance. * Disconnect the sparker connector I ₄ and measure the resistance between both terminals.	Is resistance > 1M Ω	Yes
	iii) Check wiring	Are there any shorts?	Yes	Rectify/Replace	5	
			No	Replace PCB	6	
	6. Check 240V-100V transformer.	i) Measure voltage between red-red A ₁ connector.	AC 90~ 110 V	Yes	Go to A - 6 - ii)	
No				Replace PCB.		
ii) Measure voltage at connectors A, F with appliance on "standby". A, Green-Green AC16 ~ 20 V F, Orange-Orange AC13 ~ 30 V F, Brown-Grey AC30 ~ 50 V F, Yellow (LH)-Grey AC180 ~ 220 V		Are values within those specified at left?	Yes	Go to A - 7.		
7. Check the remote control (where connected).	Measure voltage between the control terminals at H ₁ .	DC10 ~ 13 V.	Yes	Check cable for shorts/broken wires; replace remote control.	9	
			No	Replace PCB.	10	
B. Digital monitor lights up, but combustion does not commence. (When remotes are connected)	1. Check water flow sensor.	i) Measure voltage between red-black at connector C ₂	DC11 ~ 13 V.	Yes	Go to B - 1 - ii)	
			No	Replace PCB	11	
	ii) Measure voltage between yellow-black at connector C ₂	DC2 ~ 10 V	Yes	Go to B - 4 - ii).		
		No	Replace water flow sensor.	12		
Error code "72" displayed on digital monitor	2. Check flame rod.	* Measure resistance between flame rod terminal A ₂ and earth.	Resistance > 1M Ω	Yes	Replace PCB.	13
			No	Replace flame rod.	14	

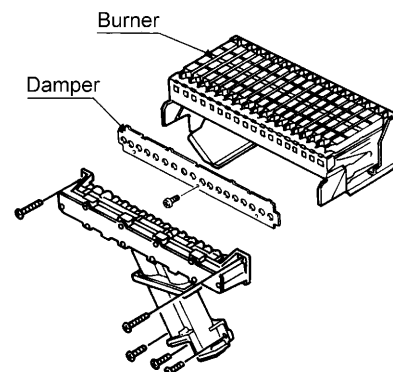
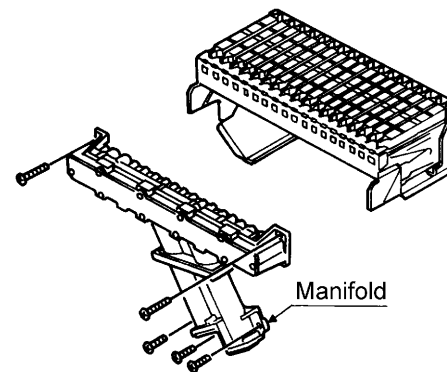
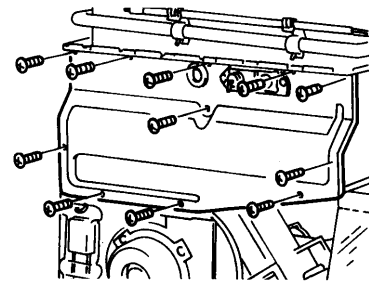
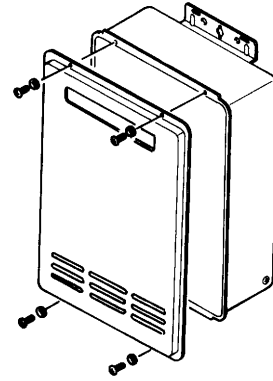
Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N ^o
Error code "32" displayed	3. Check outgoing water temperature thermostat.	* Disconnect connector C ₁ and measure resistance of resistance Open circuit: >1MΩ Short circuit: <1Ω	Are values as shown at left?	Yes	Replace water temp. thermistor.	15
				No	Go to B - 4.	
Error code "61" displayed on digital monitor	4. Check combustion fan.	i) Check motor. Measure voltage between black-red at connector D ₁ .	DC6 ~ 40 V (Fan ON) DC 0 V (Fan OFF)	Yes	Go to B - 4 - ii).	
				No	Replace PCB.	16
		ii) Check rotation sensor. Measure voltage between black-yellow at connector D ₁ .	DC11 ~ 13V	Yes	Go to B - 4 - iii).	
				No	Replace combustion fan.	18
		iii) Measure voltage between black-white of connector D ₁ .	DC2 ~ 9V.	Yes	Go to B - 5.	
				No	Replace PCB	19
Error code "11" displayed on digital monitor	5. Check sparker.	i) Measure voltage btwn grey-grey at connector I ₄ (sparker ON)	AC90 ~ 110 V.	Yes	Go to B - 5 - ii).	
				No	Replace PCB.	20
		ii) * Remove connector I ₄ ; measure resistance btwn sparker terminals.	Is resistance > 1MΩ	Yes	Go to B - 5 - iii).	
				No	Replace sparker.	21
		iii) Check if unit is sparking.	Is the sparker sparking?	Yes	Go to B - 6.	
				No	Adjust/replace electrode.	22
	6. Check main gas solenoid valve (SV ₁).	i) * Disconnect main sld connector I from PCB. Measure resistance btwn pink-blk.	0.9 ~ 1.3kΩ	Yes	Go to B - 6 - ii).	
				No	Replace main solenoid (SV ₁).	23
		ii) Measure voltage between pink-black of SV ₁ connector.	DC80 ~ 100V	Yes	Go to B - 7.	
				No	Replace PCB.	24
	7. Check solenoid valve (SV ₂).	i) * Disconnect connector I from PCB; measure resistance between yellow-black.	1.3 ~ 1.9kΩ	Yes	Go to B - 7 - ii).	
				No	Replace (SV ₂).	25
ii) Measure voltage between yellow-black of SV ₂ connector.		DC80 ~ 100V	Yes	Go to B - 8.		
			No	Replace PCB.	26	
Error code "11" displayed on digital monitor	8. Check changeover solenoid valve (SV ₃).	i) * Disconnect connector I from PCB; measure resistance between blue-black.	1.3 ~ 1.9kS	Yes	Go to B - 8 - ii).	
				No	Replace (SV ₃).	27
	ii) Measure the voltage between blue-black of SV ₃ connector.	DC80 ~ 100V	Yes	Go to B - 9.		
			No	Replace PCB.	28	
Error code "14" displayed	9. Check thermal fuse.	* Disconnect connector B ₂ ; measure resistance between red-red.	Resistance value < 1Ω	Yes	Go to B - 10.	
				No	Replace thermal fuse.	29
	10. Check overheat switch (remaining flame) switch (bi-metal)	* Disconnect OHS (remaining flame) sw. (Bi-metal sw.) festoon terminals; measure resistance btwn terminals.	Is Resistance < 1Ω	Yes	Go to B - 10.	30
				No	Replace remaining flame safety device (bi-metal SW).	31
C. Combustion occurs but flame fails. Error code "12" displayed	1. Check flame rod.	i) Measure voltage btwn flame rod terminal A ₂ and appliance earth	AC100 ~ 160V	Yes	Go to C - 1 - ii).	
				No	Replace PCB.	32
		ii) Check flame bracket is not loose.	Is it secure?	Yes	Go to C - 1 - 2.	
				No	Replace/Rectify.	33
	2. Check earth lead.	Check for faulty earth connections (to round terminals) for broken wires or short circuits	Are connections OK?	Yes	Check other causes for flame failure.	34
				No	Adjust/replace earth lead.	36

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N ^o
D. Can not adjust water temperature.	1. Check water temperature thermistor.	Disconnect connector C ₂ ; measure resistance between white-white. See page 29, for temp. at various resistance.	Resistance values match table on page 29?	Yes	Go to D - 2.	
				No	Replace water temperature thermistor.	36
	2. Check changeover solenoid valve (SV ₃)	i) * Disconnect sld connector I from PCB; measure resistance between blue-black.	1.3~1.9kΩ .	Yes	Go to D - 2 - ii).	
				No	Replace (SV ₃).	37
		ii) Measure voltage between blue-black wire of change over (SV ₃) at connector I ₃ .	DC80~100V	Yes	Go to D - 3.	
				No	Replace PCB.	39
	3. Check modulating valve.	i) * Disconnect modulating valve festoon terminal; measure resistance solenoid terminals.	60 ~ 100Ω	Yes	Go to D - 3 - ii).	
				No	Replace modulating valve	39
		ii) Measure the voltage between the two harness terminals (still disconnected)	DC0.5~25V	Yes	Go to D - 3 - iii).	
				No	Replace PCB.	40
iii) Check whether the secondary gas pressure alters when remote control temperature alters 37~75 ° C.	Does secondary voltage change?	Yes	Go to D - 4.			
		No	Replace modulating valve.	41		
D. Can not adjust water temperature.	4. Check water flow servo.	i) Measure resistance between red-blue water flow servo connector I ₁ .	10 ~ 30 Ω	Yes	Go to D - 4 - ii).	
				No	Replace water flow servo with sensor.	42
		ii) Measure voltage between orange (+) - grey (-) water flow servo connector I ₁ .	DC11~13V	Yes	Go to D - 4 - iii).	
				No	Replace PCB.	43
	iii) Measure voltage between brown-grey water flow servo connector I ₁ (don't turn water ON).	DC4 ~ 6V	Yes	Go to D - 4 - iv).		
			No	Replace water flow servo with sensor.	44	
	iv) Measure voltage between yellow-grey water flow servo connector I ₁ (don't turn water ON).	Is voltage < DC 0.5V	Yes	Normal		
			No	Replace water flow servo with sensor.	45	
E. Anti-frost heater does not work.	1. Check anti-frost heater.	i) * Disconnect connector J ₃ ; measure resistance between blue-blue (water valve)	950~1050Ω	Yes	Go to E - 1 - ii).	
				No	Replace anti-frost heater (assy).	46
		ii) * Disconnect connectors J ₃ ; measure resistance between blue-blue. (heat exchanger).	135~170Ω	Yes	Go to E - 2.	
				No	Replace anti-frost B (assy).	47
	2. Check frost sensing switch.	Disconnect connector f ₃ ; measure the resistance between blue-blue. Atmospheric temperature less than 4±3 ° C.	Is resistance < 1Ω	Yes	Check wiring.	
				No	Replace frost sensing switch.	48

23. Gas Conversion



1. Remove outer cover, 4 screws.
2. Delete "gas type marking" from the combustion chamber cover and replace with "new gas type". (Use a black marking pen).
3. Delete gas type from small paper sticker on bottom edge of inner casing.
4. Replace small gas label on gas inlet.
5. Replace large gas label on top of appliance.
6. Place "new" very small gas label (indicating new gas type) over existing one on data plate.
7. Complete details on conversion sticker, place sticker on the inside front cover.
8. Remove PCB protective plastic cover.
9. Disconnect flame sensor and sparker lead.
10. Remove combustion chamber cover, 11 screws.
11. Remove manifold, 5 screws.
12. Fit or remove damper assembly (3 screws) depending on gas type. Note: Damper is only used on LPG models.
13. Fit new manifold, ensuring no wires are trapped. Check "O" rings are correctly positioned.
14. Refit combustion chamber cover. Attach flame sensor and sparker lead.
15. Connect appliance to gas, water, and electricity.
16. Follow gas pressure setting procedure, (see next page).
17. Check for gas escapes with soapy water.
18. Disconnect appliance from services (if in workshop).
19. Replace front cover, star washer must be on bottom right hand screw.



24. Gas Pressure Setting Procedure

Position gas selection switches to the correct position.
(see diagram opposite).

Remove pressure point screw and attach pressure gauge.

Turn water ON.

Adjust pressure

1) Low

- a. Position No. 2 of the bottom set of dip switches to ON.
- b. Remove the plug in the base of the appliance for access to the regulator screw (modulating valve).

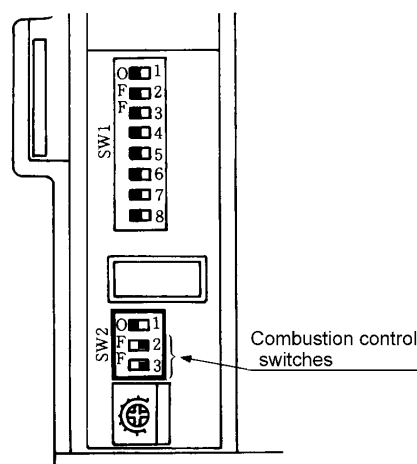
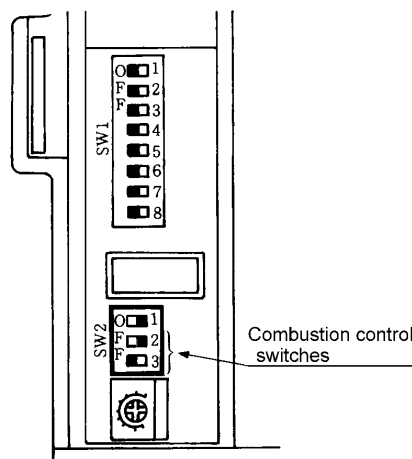
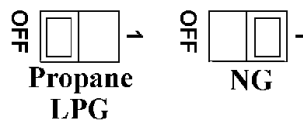
Unlock screw and adjust to:

- Natural - 0.8 kPa
- Propane - 0.17 kPa
- LPG (NZ) - 0.15 kPa

- c. Lock regulator screw (modulating valve).

2) High

- d. Position No. 3 of the bottom set of dip switches to the ON position (leaving No.2 ON).
- e. The HI potentiometer on the PCB, adjust the pressure to:
Natural - 0.90 kPa
Propane - 2.26 kPa
LPG (NZ) 1.90 kPa
- f. Position switch No.2 and No.3 of the bottom set of dip switches to the "OFF" position.
- g. Turn water OFF. Replace plug in base.
- h. Replace protective plastic cover over PCB.



25. Dismantling for service



NOTE: Before proceeding with dismantling, be sure to follow the **CAUTION** instructions before each explanation.

- e.g.
- Isolate gas supply.
 - Disconnect electrical supply from wall socket.
 - Isolate the water supply.
 - Drain All water from the appliance

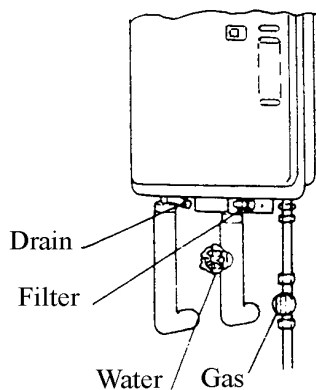
<i>Item</i>	<i>Page</i>
1. Removal of Front Panel.....	46
2. Removal of PCB.....	46
3. Removal of Water Flow Sensor with Water Flow Servo.....	46
4. Removal of Sparker.....	47
5. Removal of Combustion Fan.....	47
6. Removal of Water Temperature Thermistor.....	47
7. Removal of Transformer.....	48
8. Removal of Manifold and Burner.....	48
9. Removal of Gas Control.....	49
10. Removal of Heat Exchanger.....	49
11. Removal of Thermal Fuse.....	50

Unless otherwise stated, reassembly is the reverse of dismantling

IMPORTANT

For some areas of dismantling you may need to isolate any or all of the following:

- * Isolate gas supply.
 - * Disconnect electrical supply from wall socket.
 - * Isolate water supply.
 - * Drain **all** water from appliance.
- The following diagram may be of assistance.

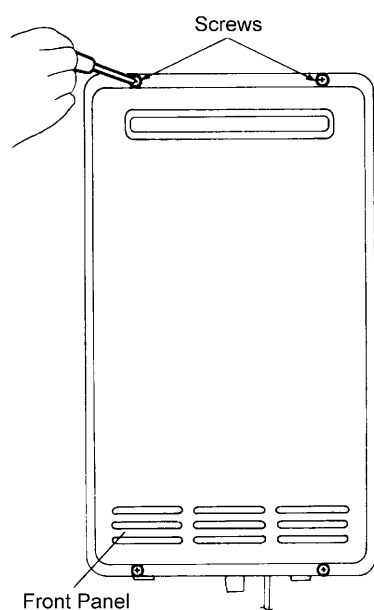


3) Removal of Front Panel

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove the four (4) screws holding the panel in place. (phillips driver)

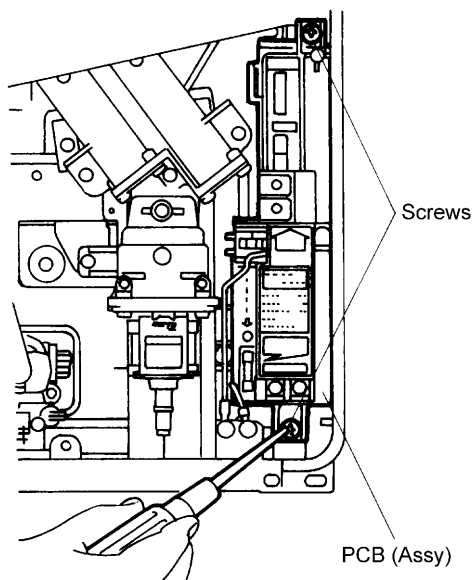


4) Removal of PCB

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove the 2 screws on the P.C.B. and pull out towards you. (phillips driver)

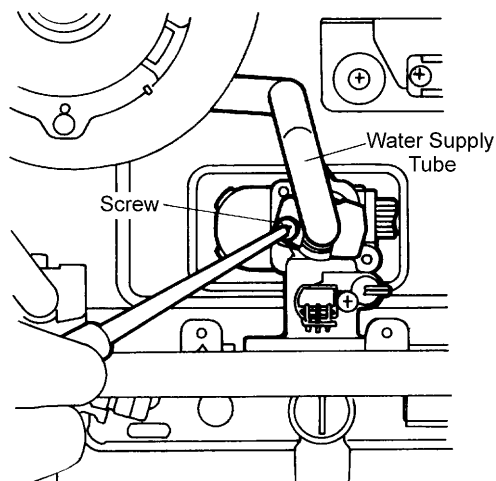


5) Removal of Water Flow Sensor with Water Flow Servo

CAUTION

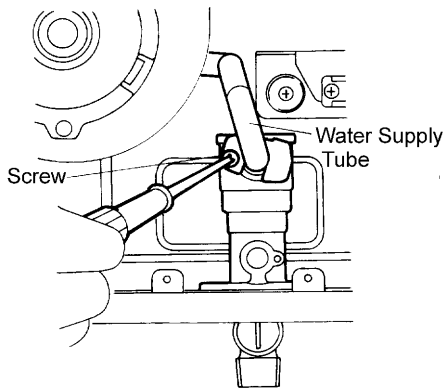
- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- Isolate Water Supply.
 - b. Remove one (1) screw from the heat exchanger water supply pipe to release the metal lock. Pull the pipe towards yourself to release. Handle O-ring carefully. (phillips driver)



- c. Remove four (4) screws from the water supply connection and remove connection.

Handle O-ring carefully. (Phillips driver)



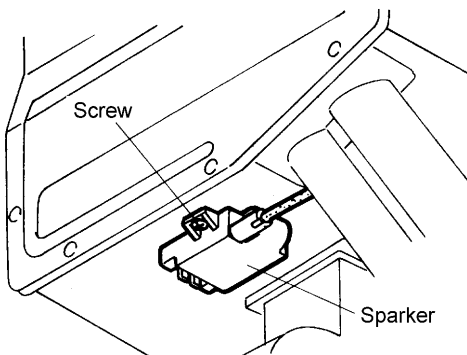
- d. Disconnect electrical connectors and remove water flow sensor from control assembly.

6) Removal of Sparker

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove one (1) screw that secures sparker to the attachment plate to remove sparker. (Phillips driver).
- b. Disconnect high tension lead connector.



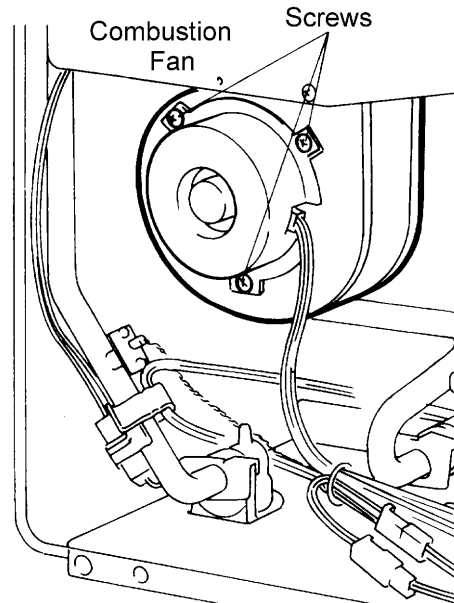
7) Removal of Combustion Fan

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Detach the sparker, refer to section 4.
- b. Remove the three (3) screws that secure the fan in place, disconnect connector and pull the fan towards yourself to remove it.

(Phillips driver).



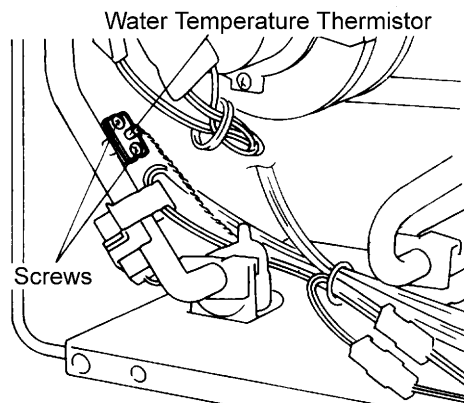
8) Removal of Water Temperature Thermistor

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- Isolate Water Supply.

- a. Remove the two (2) screws that secure the thermistor in place to remove the water temperature thermistor. (Phillips driver).

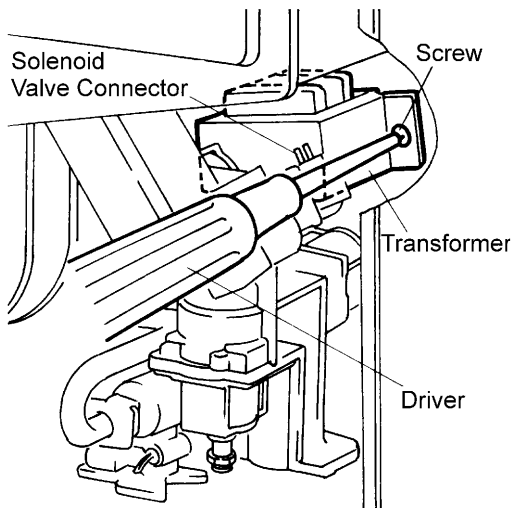


9) Removal of Transformer

CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove the PCB unit; refer to section 2.
- b. Remove the sparker; refer to section 4.
- c. Remove one solenoid valve connector.
- d. Remove two (2) fixing screws to release the transformer (Phillips driver)
- e. Disconnect connectors.



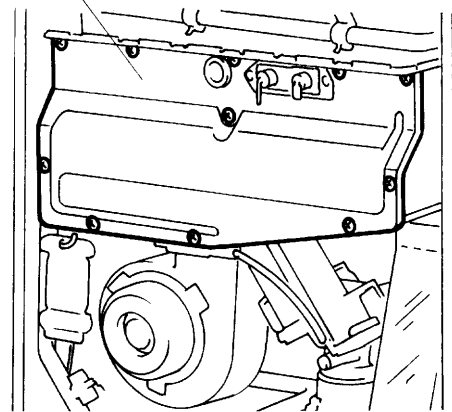
10) Removal of Manifold and Burner

CAUTION

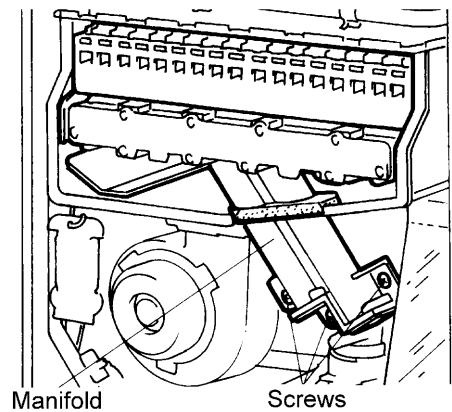
- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove the sparker, refer section 4. (1 screw)
- b. Remove eleven (11) screws that hold the combustion chamber front panel in place and remove the panel (Phillips driver)

Combustion Chamber Front Panel

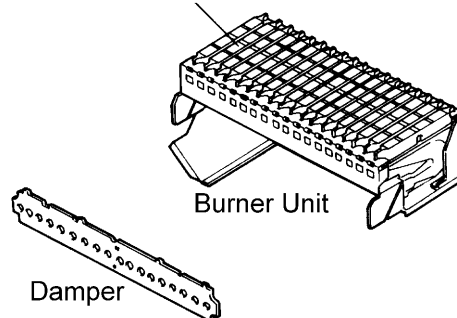


- c. Remove the five (5) screws that secure the manifold in place and pull out the manifold (Phillips driver).



- d. Pull burner unit forward to remove (hand)

Burner Assembly

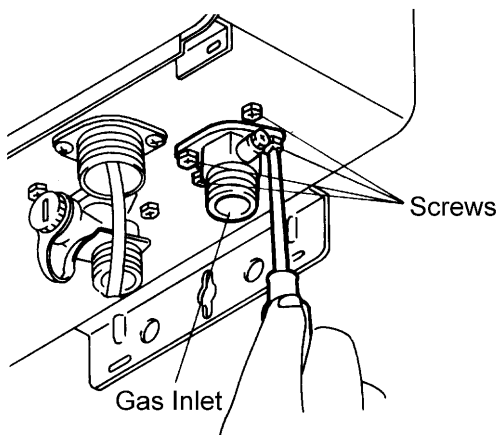


11) Removal of Gas Control

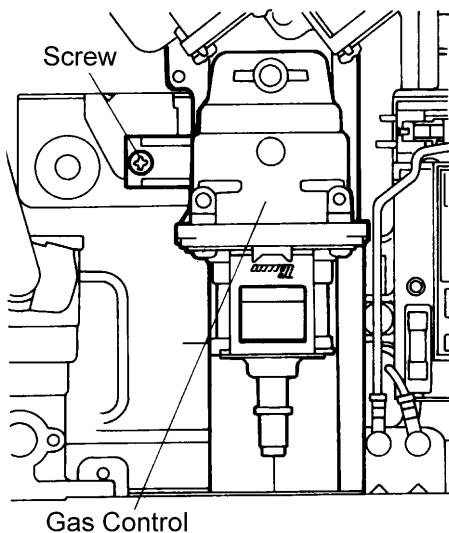
CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- a. Remove the manifold (5 screws), refer section 8a,b,c.
- b. Remove the four (4) screws that hold the gas connection and gas control in place. Remove the gas connection. Handle O-ring carefully. (Phillips driver)



- c. Remove one (1) screw that holds the gas control in place, disconnect connectors, pull out the gas control.

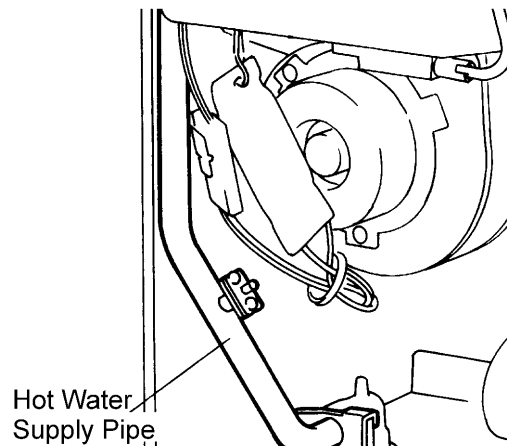


12) Removal of Heat Exchanger

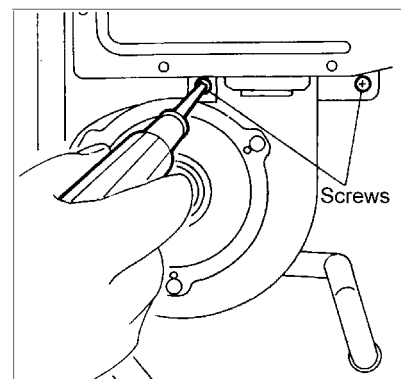
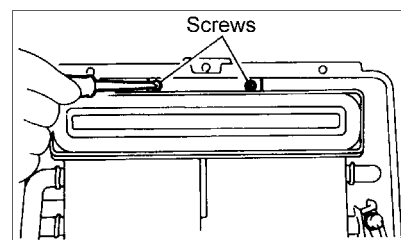
CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

- Isolate Water Supply.
- Drain All Water
- a. Remove PCB unit; refer to section 2-a.
- b. Remove the heat exchanger water connection pipe; refer to section 3-a.
- c. Remove one (1) screw from the outlet connection clip, to pull out the hot water supply connection pipe towards yourself. (Handle O-ring carefully)

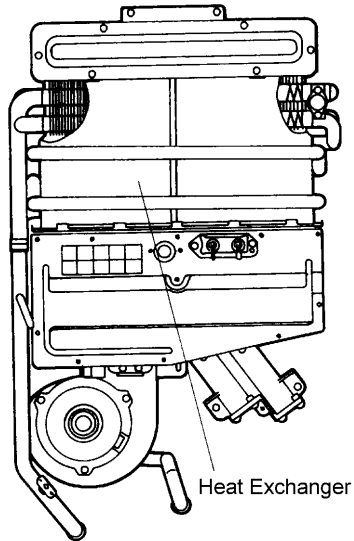


- d. Remove the three (3) screws securing the manifold to the gas control.
- e. Remove four (4) screws that secure the heat exchanger unit in place.



f. Remove all electrical connectors, including the thermistor.

g. Pull out the heat exchanger unit towards yourself.



13) Removal of Thermal Fuse

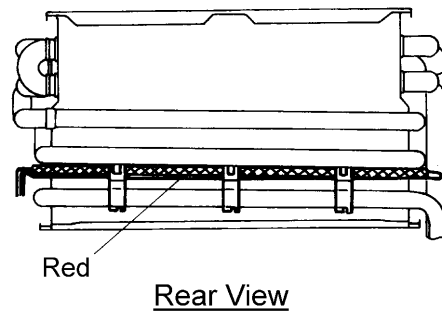
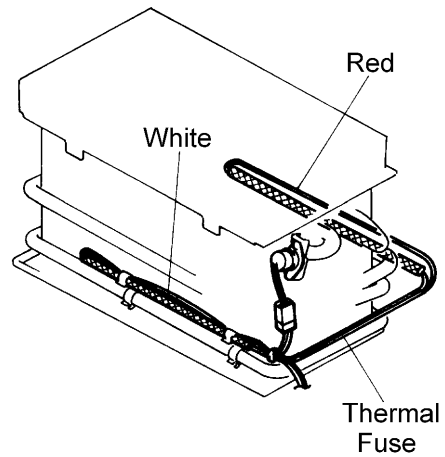
CAUTION

- 240 volt potential exposure. Isolate the appliance and reconfirm with a neon screwdriver or multimeter.

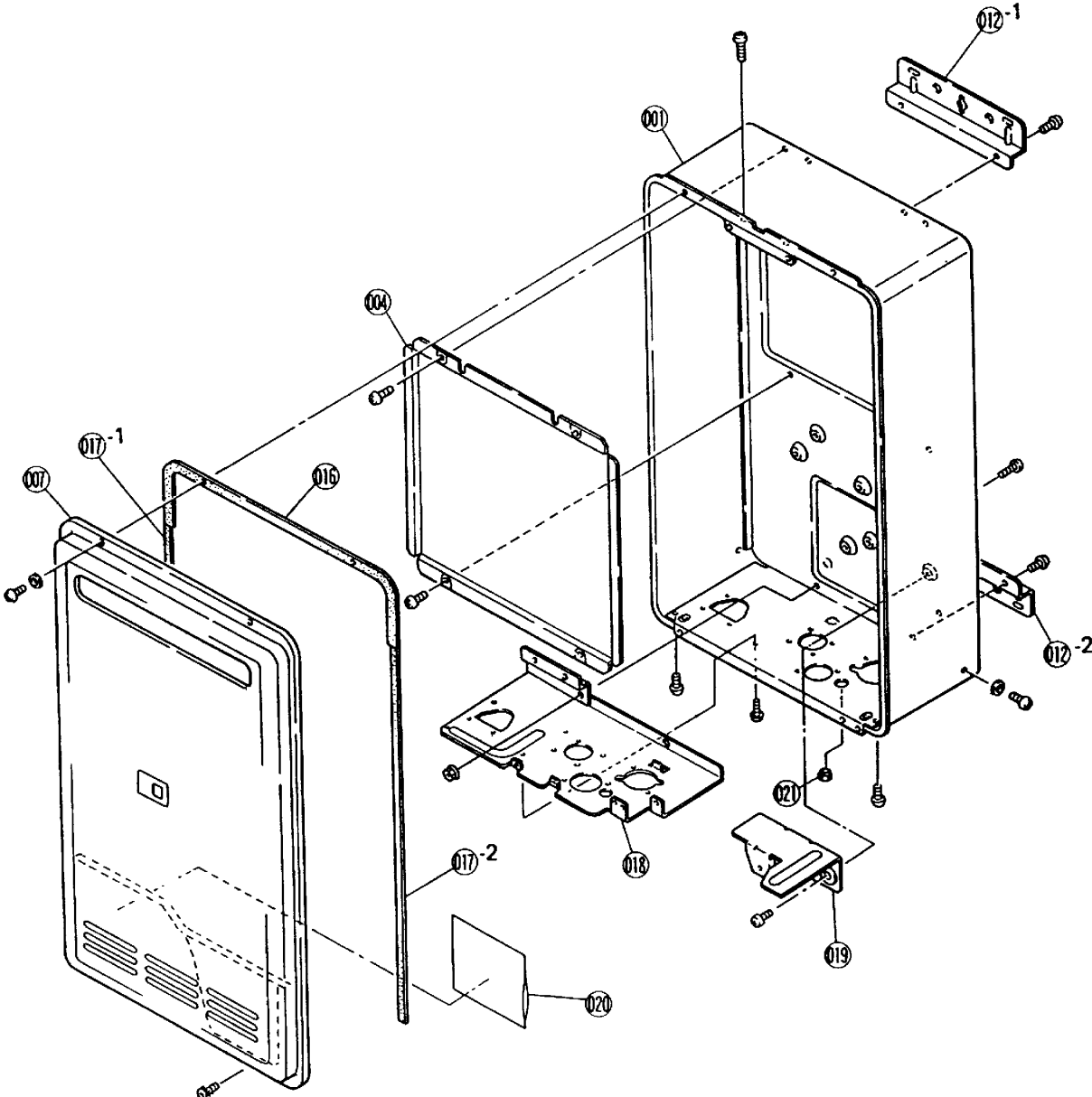
h. Remove the heat exchanger unit; refer to section 10.

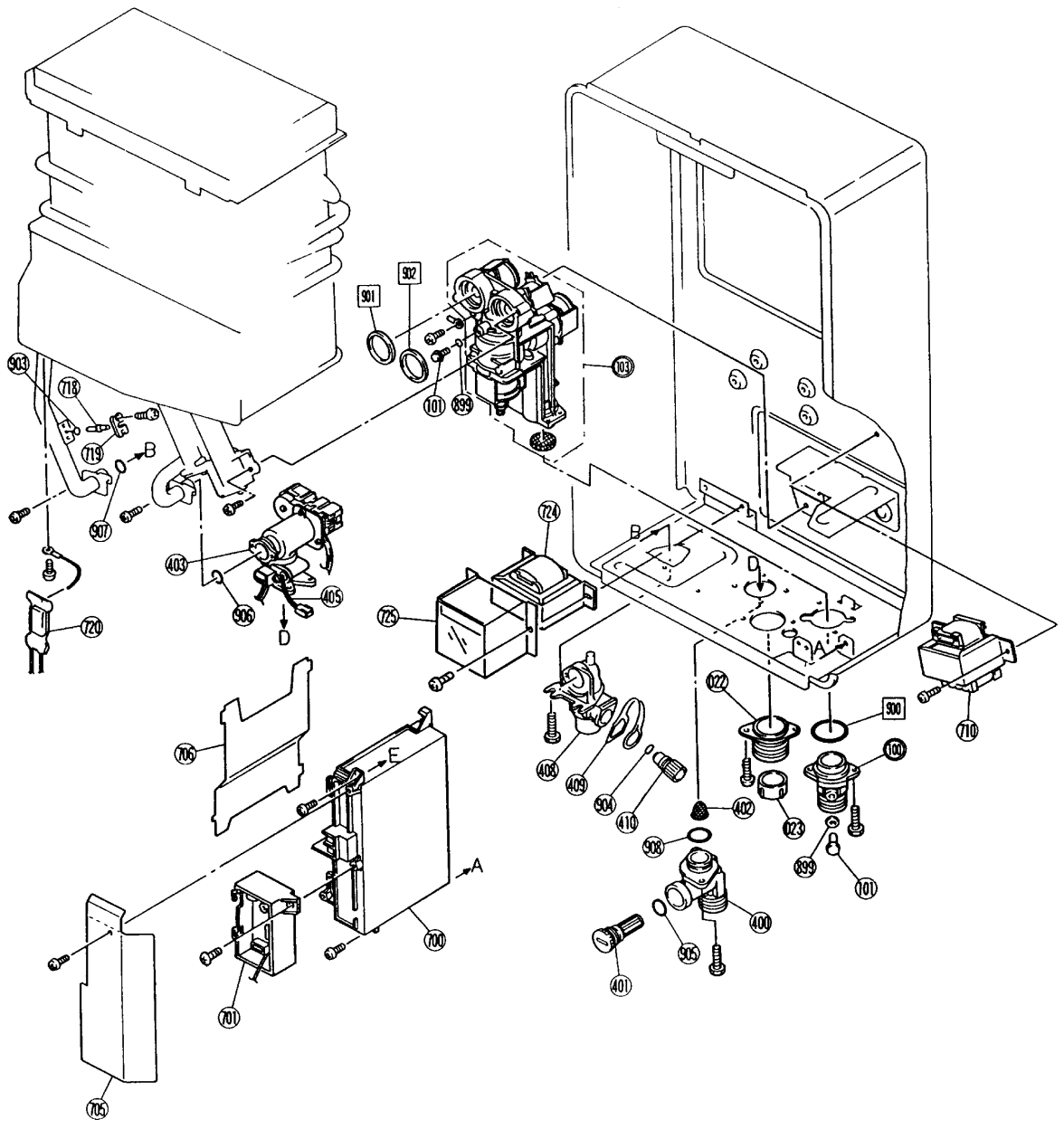
i. Disconnect and remove the thermal fuse (phillips head).

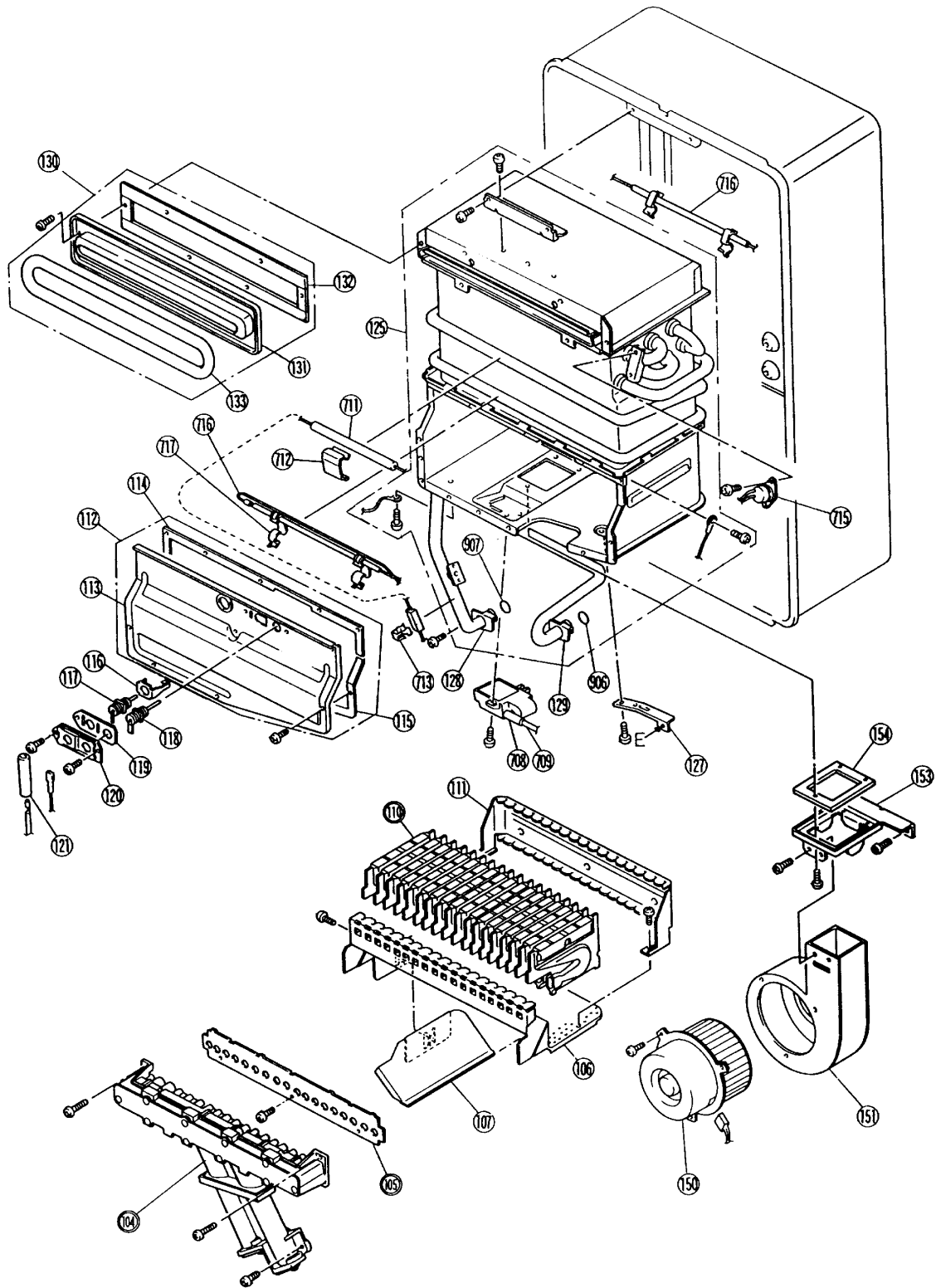
* Fit the fuse as shown below

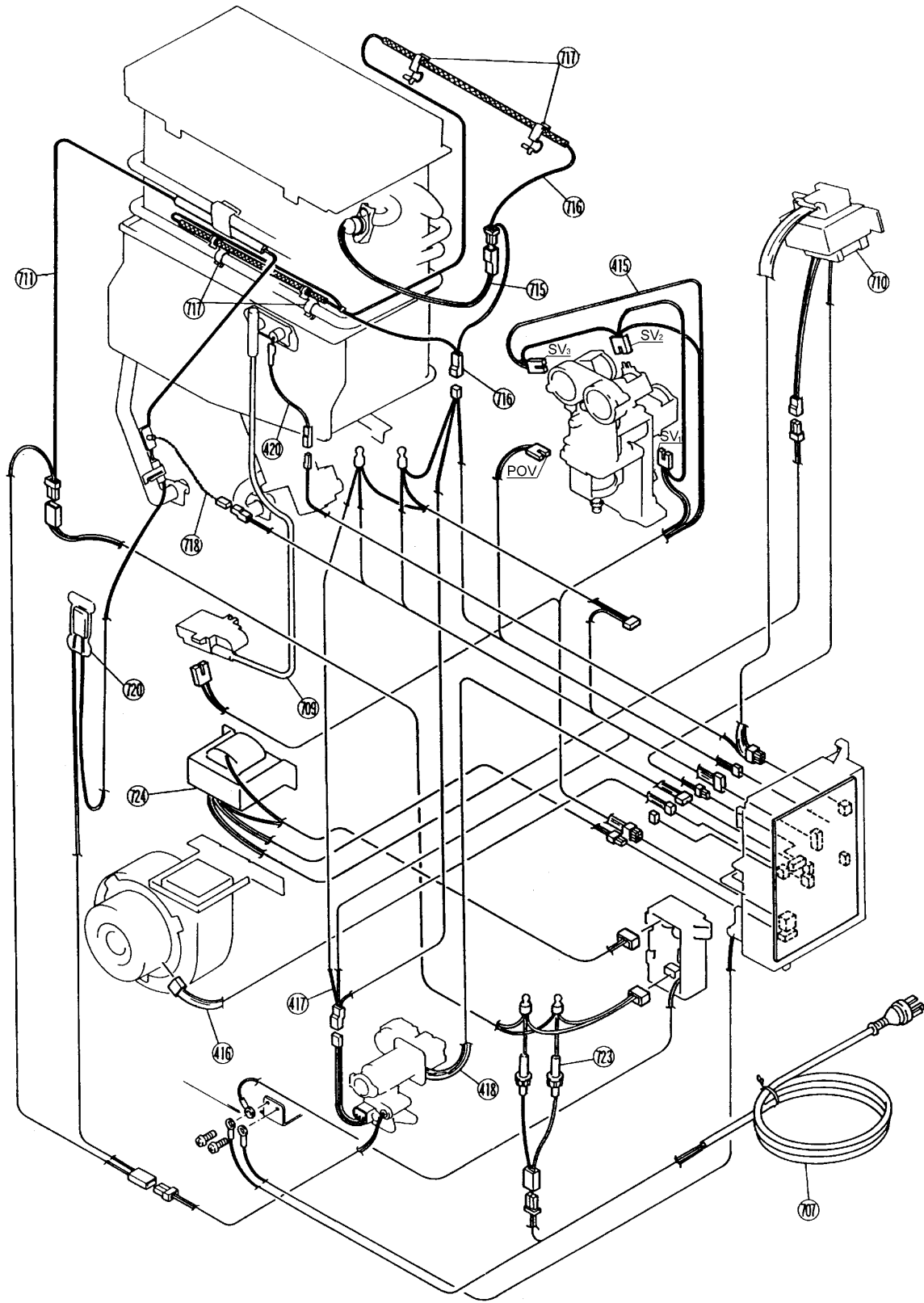


26. Exploded Diagram









21. Parts List

No.	Part Name	RJ Drawing No	11 Digit Code	RA Part No	Qty
001	BODY Assy, Main - Standard	DU195-100	014-312-000	92088616	1
001	BODY Assy, Main - Salt Resistant		030-521-000		1
004	SHIELD, Heat Insulation	BU155-110	030-521-000	92073329	1
007	PANEL Assy, Front - Standard	CU195-165-6-4	019-0953000	92088582	1
012	BRACKET, Wall Mounting	BU195-121	106-329-000		2
016	GASKET, Front Panel	BU195-167	580-453-000	92086909	1
017	GASKET - Side, Main Body	AU115-163	510-990-000	92063361	2
018	PANEL, Connection Reinforcement	BU169-1511	044-025-000		1
019	GASKET, Gas Control	BU169-125	537-737-000		1
021	GASKET, Blind	AU105-113	510-893-000		
022	PLUG, Rubber	BU56-602-N	106-104-000	92073352	1
023	SKIRT, Cable	AU169-126	580-306-000		1
100	CONNECTION, Gas R3/4	CU195-211	106-290-000	92081587	1
101	SCREW, Test Point	C10D-5	501-275-005		2
103	CONTROL Assy, Gas	C36E-16	120-051-000	92081595	1
104	MANIFOLD Assy - 1.70 NG	CU195-200-G	101-441-000	92074977	1
104	MANIFOLD Assy - NG	CU195-200-G	101-376-A00	92074970	1
105	DAMPER, Prop.G/LPG	BU195-258	140-563-A00	92071364	1
106	BURNER CASE, Front	DU195-255	098-439-000		1
107	PANEL, Sound Insulation	CU169-257	554-172-000		1
110	BURNER, Front	B3A1-4	157-060-LPG	92073451	1
111	BACK PANEL, Burner Case	CU169-256	004-518-000		1
112	FRONT PANEL, Comp.Assy, Comb.Chamber	DU195-311	019-991-000		1
114	GASKET, Comb. Chamber - Top	BU195-315	580-450-000	92081629	1
115	GASKET, Comb. Chamber - Bottom	BU195-316	580-451-000	92081637	1
116	TARGET, Ignition	AU168-325	202-128-000	92073469	1
117	ELECTRODE	AU168-321	202-129-000	92072917	1
118	ELECTRODE, Flame Rod Electrode	AU168-322	230-044-000	92072891	1
119	GASKET, Electrode	AU168-312	580-375-000	92095629	1
120	CLIP, Electrode retainer	AH43-262	506-153-000		1
121	SLEEVE, Electrode	AU102-681	518-031-000	90164856	1
125	HEAT EXCHANGER, Comp.Assy	DU195-906	314-383-000	92081660	1
127	BRACKET, PCB	AU195-330	537-728-000		1
128	O-RING, Heat Exchanger Outlet	AU195-321	537-502-000		1
129	O-RING, Heat Exchanger Inlet	AU195-322	537-501-000		1
130	FLUE Assy	BU169-470	055-426-000	92081678	1
131	TERMINAL, Flue	BU169-471	055-555-000		1
132	GASKET, Flue Front Terminal	BU169-472	580-452-000	92073485	1
133	PACKING, Flue Front Panel Seal	AU155-111	580-269-000	92073493	1
150	MOTOR Assy, Fan	BU195-565	222-340-000	92081686	1
151	CASING, Fan	BU169-552	035-866-000	92073519	1
153	CONNECTION, Fan	BU169-555	106-240-000	92073527	1
154	GASKET, Fan Connection	AU169-556	580-307-000	92073535	1
400	CONNECTION-B, R3/4 Water Inlet	H73-501	333-301-000	92089044	1
402	FILTER, Water Flow Valve	M8D1-11	017-193-000	92072701	1
403	SERVO Assy, Water Flow Sensing	M8E-4-3	301-043-000	92085406	1
403	HEATER, Water Valve	BU195-1635	235-268-000	92082437	1
408	RETAINER, Pressure Relief Valve Plug	BU132-362	333-256-000	92081744	1
409	PLUG, Rubber	AU129-526	553-043-000		1
410	VALVE, Pressure Relief	BU129-520-C	337-048-000	92081751	1
415	HARNESS - Wire, Modulating Solenoid Valve	BU129-520	290-228-000	92081769	1
416	HARNESS - Wire, Fan Motor	BU195-602	290-227-000		1
417	HARNESS - Wire, Sensor	BU195-603	290-011-000	92081777	18
418	HARNESS - Wire, Water Flow Servo	BU195-604	290-225-000	92081785	1
420	HARNESS - Wire, Flame Rod	AU195-605	290-748-000		1

No.	Part Name	RJ Drawing No	11 Digit Code	RA Part No	Qty
700	PCB Assy	CU195-1633	210-495-000	92088624	1
701	ARRESTOR, Surge	BU195-143	210-462-000	92081801	1
705	COVER, PCB Front	BU168-707	098-470-000		1
706	COVER, Control	BU195-507	098-442-000		
707	POWER CORD	CP904917		92089051	1
708	SPARKER	E1-144	261-015-000	92072776	1
709	LEAD HT	BH38-710	203-264-000	92063585	1
710	TRANSFORMER, Assy	ET150-1	224-195-000	92081835	1
711	HEATER-B Assy, Anti Frost (AK only)	BU195-1637	235-251-000	92081843	1
712	BRACKET, Heater (AK only)	AU195-675	537-433-000	92086123	1
713	BRACKET, Heater (AK only)	AU100-721	537-174-000	92076123	1
715	SWITCH, Overheat	BU129-821	234-507-000	92081850	1
716	FUSE, Thermal	CU195-610	290-240-000	92081868	1
717	HARNESS, Thermal Fuse	CP80531	553-055-000		1
718	THERMISTOR	BH45-650	233-108-000	92081876	1
719	CLIP-LARGE, Thermistor Retainer	CP90172	508-836-000	92086388	1
723	HARNESS - Wire, 3 Amp Fuse Harness	BU195-163	290-749-000	92081900	1
724	TRANSFORMER, Assy (240-100V)	ET160A-1	224-229-000	92081918	1
725	COVER, Transformer	BU168-1533	098-900-000		1
801	SCREW, FT	ZBA0410UK	501-408-000		1
802	SCREW	ZB10510UK	501-397-000		
803	SCREW, Tapping	ZFAB0408SZ	501-249-000		1
804	SCREW, FT	ZBA0408UK	501-398-000		1
805	SCREW, Truss Tapping	ZBD0408UK	501-329-000		1
806	SCREW	ZAD0408UK	501-399-000	92087535	1
807	SCREW	CP-21478-412	501-400-000		1
808	SCREW, Tapping	ZAA0408UK	501-261-000		1
809	SCREW	ZAA0408UK	501-262-000		1
810	SCREW, Truss FT	ZBA0412UK	501-402-000		1
811	SCREW, FT	ZQAA0512UK	501-395-000		1
812	SCREW, Truss FT	ZBA0512UK	501-403-000		1
816	SCREW	ZEDB0408SZ	501-404-000		1
818	SCREW	ZHDC0408TK	501-409-000		1
819	SCREW, Tapping	ZEAB0406UK	501-405-000		1
820	SCREW, FT	ZIAA0408SZ	501-406-000		1
821	SCREW, Hexagon Head	ZAG0514UK	501-265-000		1
822	WASHER, Nylon	CF83-41430	503-210-000		1
823	CLIP, Electrode	CP-90331	512-440-000		1
899	O-RING	12A03	520-300-010	90195165	2
900	O-RING	OR1AP24NP	520-401-000	92081926	1
901	MANIFOLD O-Ring Gas	C36F8-1	580-202-000	92075126	1
903	O-RING	M10B-2-4	520-209-010		1
904	O-RING	M10B-2-7	520-281-010	92043231	1
905	O-RING	M10B-2-12	520-213-010	92063551	1
906	O-RING	M10B-2-12.5	520-255-010	92071422	1
907	O-RING	M10B-2-14	520-193-010	92062207	1
908	O-RING	M10B-2-18	520-049-010	92071182	1

Notes

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