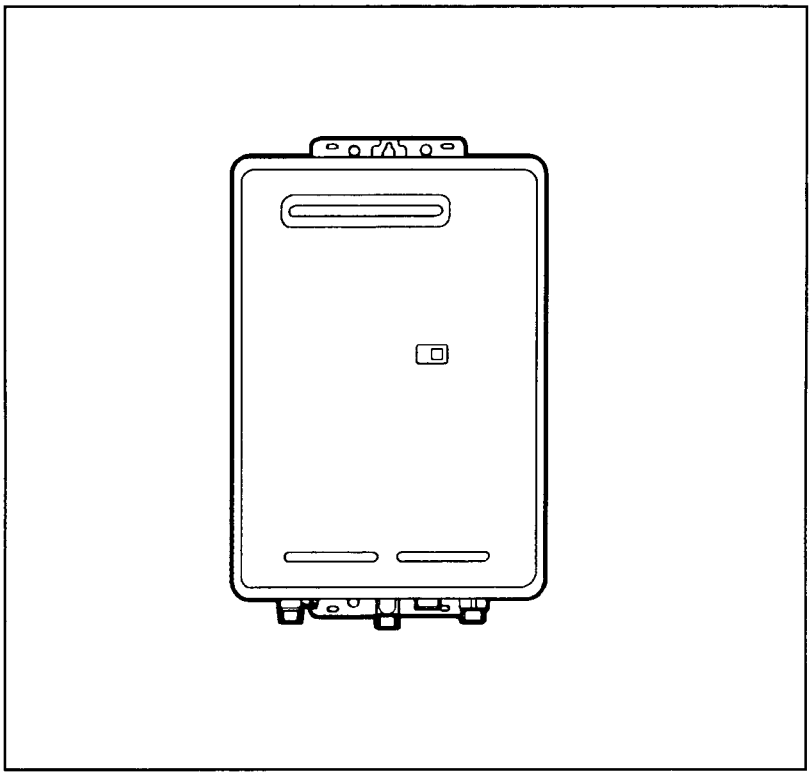
Rinnai

16 Litre Series

REU-1616W-A
REU-1616WE-A
REU-1616WT-A

SERVICE MANUAL



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The Australian Gas Association

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WARNING

ALL WIRING INSIDE THIS APPLIANCE MAY BE AT 240 VOLTS POTENTIAL.

ALL SERVICE WORK MUST BE CARRIED OUT BY AN AUTHORISED PERSON.

DO NOT TEST FOR GAS ESCAPES WITH AN OPEN FLAME.

This manual has been compiled by the Rinnai Australia Technical and Support Services Group. 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.

Please REGISTER your details with our Support Services Department on tel: (03) 9271 6604 or fax: (03) 9271 6605, and we will ensure you are kept up to date with changes to specifications as well as receiving new model information as it becomes available.

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Glossary of Terms

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

AC	-	alternating current
CPU	-	central processing unit
dB(A)	-	sound pressure level in decibels, "A" range
DC	-	direct current
Hz	-	Hertz
IC	-	integrated circuit
kcal/h	-	kilocalorie per hour
kPa	-	kilopascals
L/min	-	Litres per minute
LED	-	light emitting diode
mA	-	milliamps
MJ/h	-	megajoule per hour
mm	-	millimetres
mmH_2O	-	millimetres of water (Guage pressure)
No_x	-	oxides of nitrogen (NO & NO_2)
OHS	-	over heat switch
PCB	-	printed circuit board
POT	-	potentiometer
rpm	-	revolutions per minute
SV	-	solenoid valve
TE	-	thermal efficiency
T_{IN}	-	temperature of incoming water
T_{OUT}	-	temperature of outgoing water

§ 1 INTRODUCTION

The 16 Litre series was developed in response to the growing changes in lifestyle of the end user, and the increasing diversification and sophistication of demand in the marketplace. The 16 Litre series models offer reduced cost to the end-user, offering advanced safety features (see p.3), and an option to connect a remote temperature control.

The 16 Litre series models are delivered with the DIP switches (see p.7) set to ensure a maximum hot water temperature of 55°C with or without remote controls connected.

About the 16 Litre Series Models

There are 2 basic specifications in the 16 Litre series range, and each is covered by the details contained in this manual. Any of the following model numbers may appear on the data plate: REU-1616W-A, REU-1616WE-A, REU1616WT-A. Three injectors are blanked off in the REU-1616WT-A. Information shown in brackets relates to the REU-1616WT-A.

The front cover of the appliance 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 cut-away diagram on page 9. 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 0.6 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 stainless steel nozzle situated on the front of the appliance, at the top.

The burner assembly is made up of 12 identical stainless steel Bunsen burners, secured by an aluminised steel framework. An aluminium manifold with 12 (9) injectors supplies gas to the burners, and is attached to the front lower cover of the burner box.

There is one thermistor, it is located on the outlet of the heat exchanger.

§ 2 FEATURES

Ease of Installation

1) Lighter, thinner, and more compact design allows for installation snugly against the wall, allowing for a greater variety of installation options.
2) The optional remote controls are installed using non-polar 2-core wiring which greatly simplifies electrical connection, eliminating any mis-wiring concerns.

Quiet Operation

1) A 49 dB(A) low-noise feature allows for installation in high-density housing situations.

Suits Individual Needs

1) The hot water capacity offers a wide range of supply from 3 L/min to 16 L/min (raised 25℃).
2) The remote controls (MC-33-1A/2A, Kitchen control), (BC-45-1A/2A, Bathroom control) further enhance temperature adjustability within the range 37℃ ~ 55℃.
3) The mechanical water flow control device detects the temperature of the cold water supply, and adjusts water flow.

Safety is Guaranteed

1) Featuring an array of safety devices (see p.3), the 16 Litre series models are controlled by a microprocessor, ensuring trouble-free operation in all situations.
2) Ceramic heaters (strategically positioned on the pipe work) automatically prevent freezing during icy conditions. (Available only on units with part number suffixed "AK".)

Economical Operation

1) The main burner employs a direct ignition system, eliminating the need for a pilot light, therefore saving gas.
2) The combustion system maintains high efficiency by controlling fan speed to match changes in gas consumption.

Hot Weather Areas

1) The REU-1616WT-A is suited to warm incoming water temperatures (refer to page 19).

Flame Failure

Situated on the right hand side of the burner at the front, the flame rod monitors normal 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.

Remaining Flame Safety Device

Also referred to as an Over Heat Switch. This device is fitted to a bend section of 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 90 Volt bi-metal cut-off switch isolates the gas to the solenoids.

Boiling Protection

The heat exchanger outlet water temperature thermistor continually monitors the temperature of the water flowing from the heat exchanger (2.5 second intervals). Should the temperature of the water at this point reach 105°C, a signal will be sent to the PCB to shut off the solenoids and isolate the gas.

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.

Fusible Link

Located in 5 positions covering the entire surface of the heat exchanger. If the heat exchanger burns out, or the temperature outside it reaches 129°C, the link melts, breaking the circuit. Current does not reach the gas solenoid valve circuit, and combustion stops, shutting down the unit completely.

Pressure Relief Valve

Located on the hot water outlet, this spring and valve seating type valve will, if the pressure inside the heat exchanger reaches the maximum kPa, release the built up pressure until the minimum kPa is maintained.
Max 2100 kPa (open), min 1500 kPa (close)

Combustion Fan Revolution Check

The combustion fan rpm are 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.

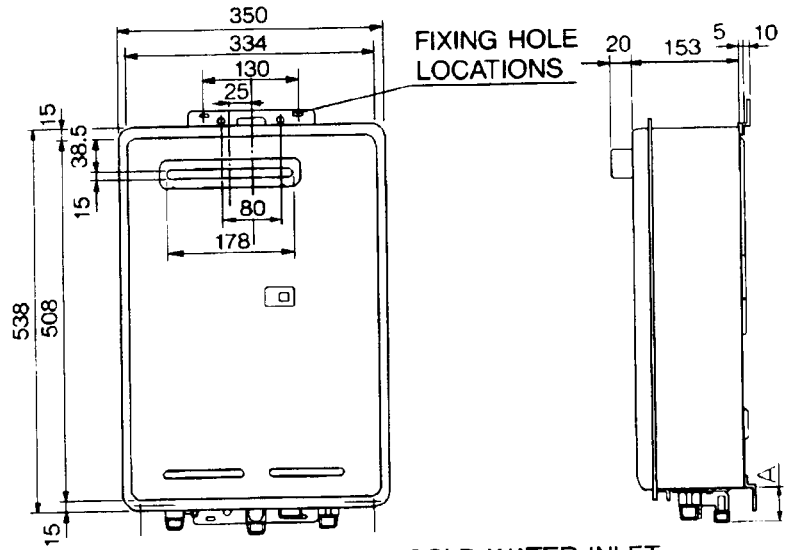
Automatic Frost Protection (AK units only)

When the outdoor temperature drops below 3.5°C, the frost sensing device is activated, and the anti-frost heaters (ceramic resistors) prevent the water in the appliance from freezing. These anti-frost heaters remain ON until the outdoor temperature rises to 11.5°C. There are 5 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

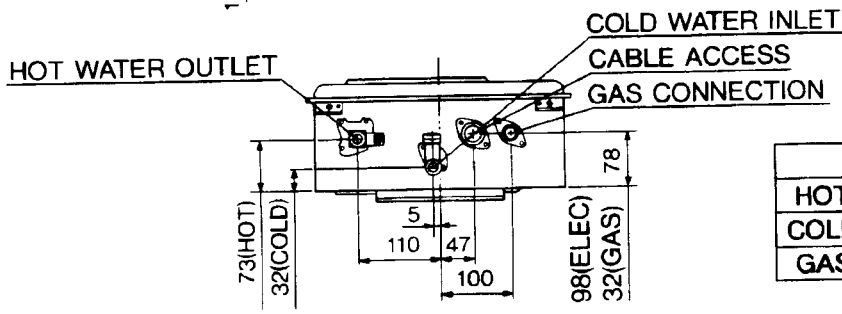
The temperature of the outgoing hot water is constantly monitored by the outgoing water temperature thermistor. If the outgoing water temperature rises to >3°C above the preset temperature, the burner will automatically go out. The burner will ignite again once the outgoing hot water temperature falls below the preset temperature.

DIMENSIONS



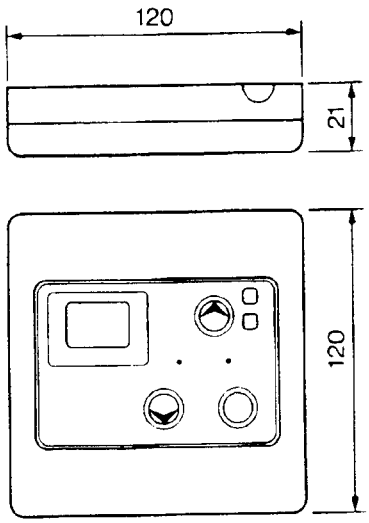
Connection sizes

Gas supply	R3/4 / 20A
Cold inlet	R1/2 / 15A
Hot outlet	R1/2 / 15A

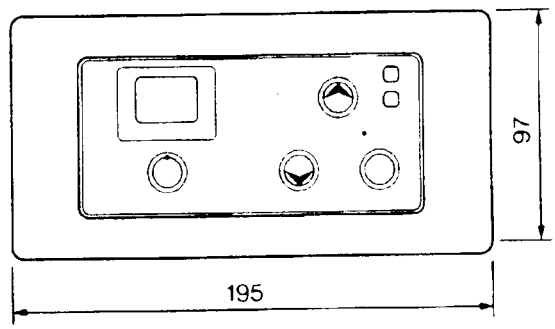


	A DIMENSION
HOT	40
COLD	49
GAS	41

All dimensions are in millimetres



Kitchen Control
MC-33-2A



Bath Control
BC-45-2A

§ 5 SPECIFICATION

✳ Information in brackets is for REU-1616WT-A

Type of appliance	Temperature controlled continuous gas hot water system.		
Exhaust system	Forced combustion.		
Installation	Externally mounted.		
Operation	Automatic (optional remote control mounted in kitchen, bathroom, or ensuite).		
Dimensions	Width - 350 mm. Height - 538 mm. Depth - 153 mm.		
Weight	15 Kilograms.		
Connections	Gas - R ¾ / 20A. Cold water inlet - R ½ / 15A. Hot water outlet - R ½ / 15A.		
Ignition system	Direct electronic ignition.		
Gas consumption	125 MJ/h HI, 32 MJ/h LOW. (96 MJ/h HI, 24 MJ/h LOW)		
Electrical consumption	Normal - 55 Watts. Standby - 8 Watts. Automatic frost protection - 80 Watts.		
Hot water capacity	3 to 16 L/min. [Raised 25℃]		
Temperature range	37℃ to 55℃ in 14 steps.		
Water temperature control	Simulation feedforward and feedback.		
Water flow control	Mechanical water flow control device.		
Minimum operating pressure	10 kPa.		
Nominal operating pressure	200 to 830 kPa.		
Minimum operating water flow	3 L/min. 25℃ temp rise		
Power supply	Appliance - 240 Volts 50 Hz. Remote control - DC 12 Volts (Digital)		
Safety devices	Flame failure	-	Flame rod.
	Boil dry	-	Water flow sensor.
	Remaining flame [OHS]	-	97℃ bi-metal strip.
	Boiling	-	105℃ lockout thermistor.
	Fusible link	-	129℃ thermal fuse.
	Pressure relief valve	-	Opens-2100 kPa, closes-1500 kPa.
	Automatic frost protection	-	Bi-metal sensor & ceramic resistors.
	Combustion fan rpm check	-	Integrated circuit system.
	Over current	-	Glass fuse. (3A)
Remote control	MC-33-1A/2A	-	Kitchen control.
	BC-45-1A/2A	-	Bathroom control
Cable	UC-25C-15A	-	Non-polarised.

§ 6 COMBUSTION SPECIFICATION

✳ Information in brackets is for REU-1616WT-A

		LPG	NG	TG
Input	(MJ/h)	125 (96)	125 (96)	120 (96)
	(kcal/h)	30 000 (23 000)	30 000 (23 000)	28 700 (23 000)
Injector quantity		12 (9)	12 (9)	12 (9)
Injector size	(mm)	Ø 1.0	Ø 1.7	Ø 2.9
Damper* (1) Marking		n/a	n/a	A
Pressure (kPa)	LO	0.16	0.08	0.06
	HI	1.91	0.73	0.40
Burner type		LP / NG	LP / NG	TG
DIP Switch positions		Refer to page 7		
Maximum Capacity				
Secondary / Primary	(mmH_2O)	195/280	74/115	41/76
Secondary / Primary	(kPa)	1.91/2.75	0.73/1.13	0.40/0.75
Modulating valve	(mA)	209	145	117
Combustion fan	(Hz)	242	224	240
Minimum Capacity				
Secondary / Primary	(mmH_2O)	16.5/280	7.8/115	6.5/76
Secondary / Primary	(kPa)	0.16/2.75	0.08/1.13	0.06/0.75
Modulating valve	(mA)	20	20	20
Combustion fan	(Hz)	95	100	115

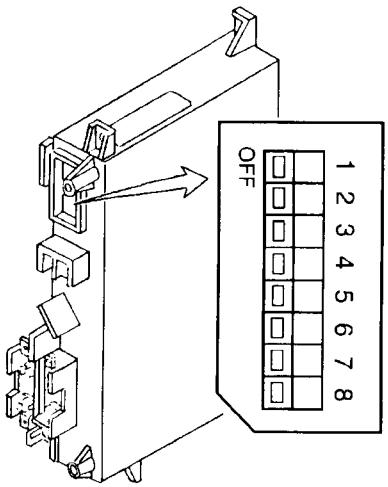
* Indicated by an imprint on actual component.

§ 7 GAS TYPE - DIP SWITCH POSITIONS

Please do not adjust the DIP Switch Positions before reading this information.

Dip switches 1 ~ 8 are provided so that the water heater can be set up in different operating configurations. The set-up configuration for the water heater differs depending on:

- Gas type
- Temperature limiting requirements



DIP Switches

1 & 2	:	Gas type (used only during conversion)
3 & 4	:	Not used
5 & 6	:	Temperature control
7 & 8	:	Gas pressure

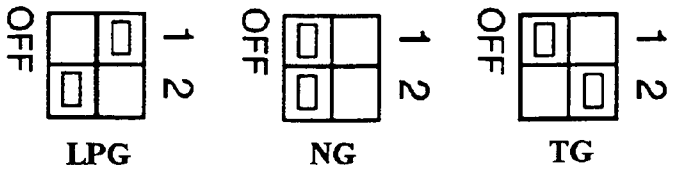
The 16 Litre series models are delivered with the maximum hot water temperature limited to 55°C. However, maximum temperature of hot water can be limited to 40°C or 50°C, when the remote control is connected, using these switches in various combinations, (see page 8, Nº ②). In some instances such as nursing homes or even domestic situations, you may be asked to limit the temperature of the hot water coming from the units.

The individual switch position functions are fully explained on the next page.

The 16 Litre series models are normally supplied from Rinnai with switches N° 5 and N° 6 in the OFF position, and switches N° 1 and N° 2 in the ON or OFF position according to the required gas type. This will allow for the broadest range of safe temperature selection by the end user.

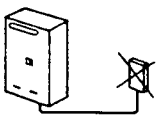
① Gas type

Only alter gas type positions when conversion is required. For conversion instructions refer to page 39.

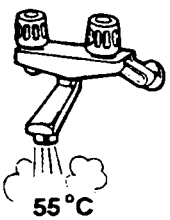


② Temperature limiting

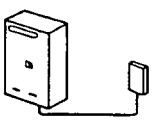
There are different positions, depending on the temperature limit required with the remote controls connected.



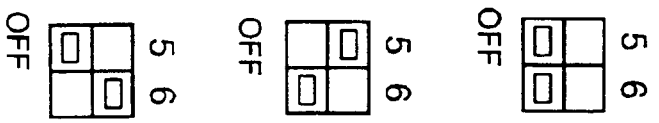
a) Pre-set temperatures with the *remotes not connected*



There is **only one** fixed default setting available with the 16 Litre series models when no remotes are connected; the outgoing water temperature will default to 55°C.



b) Pre-set temperatures with the *remotes connected*

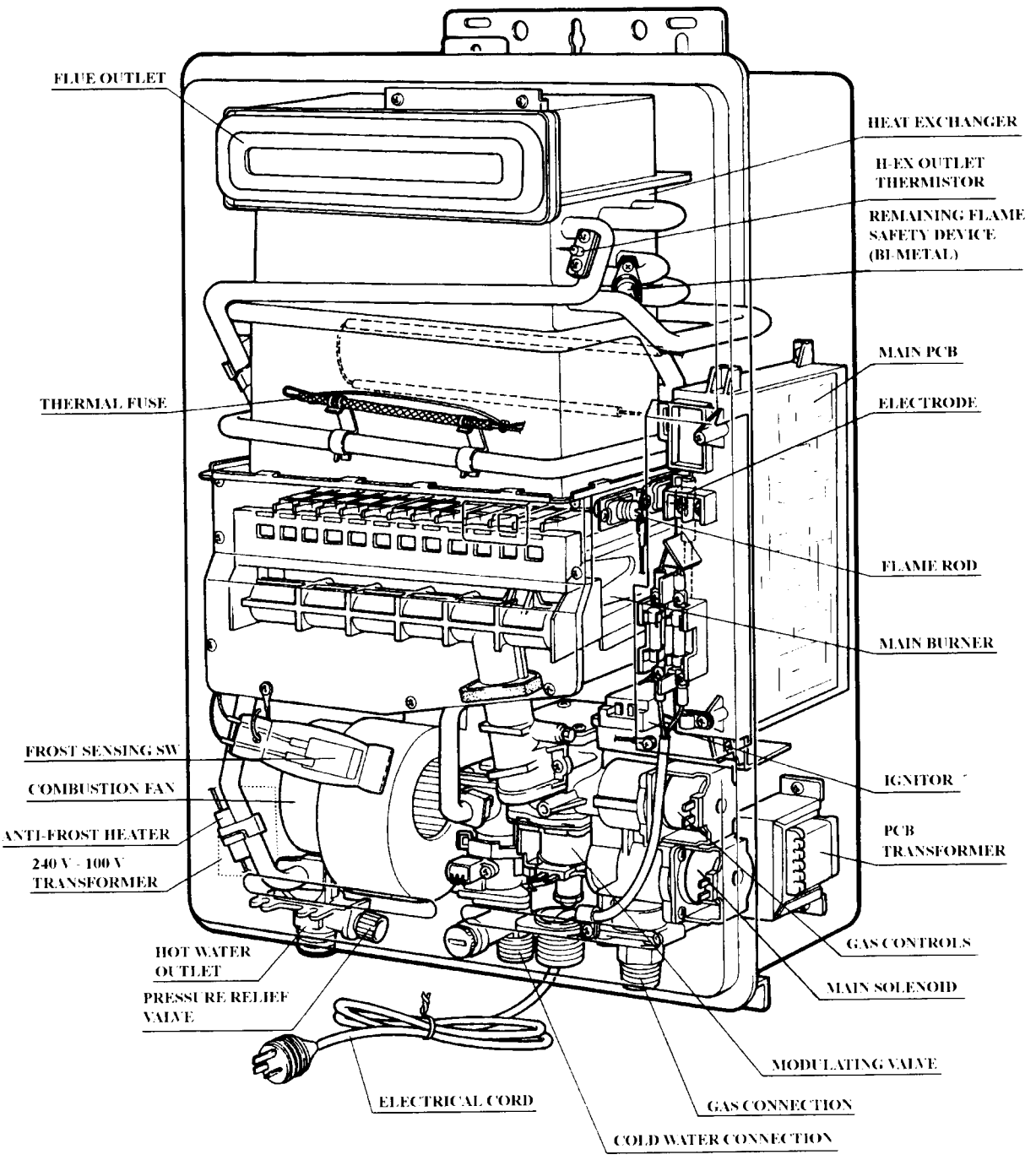


40°C	50°C	55°C	With Remote
55°C	55°C	55°C	Default temperature if remote disconnected

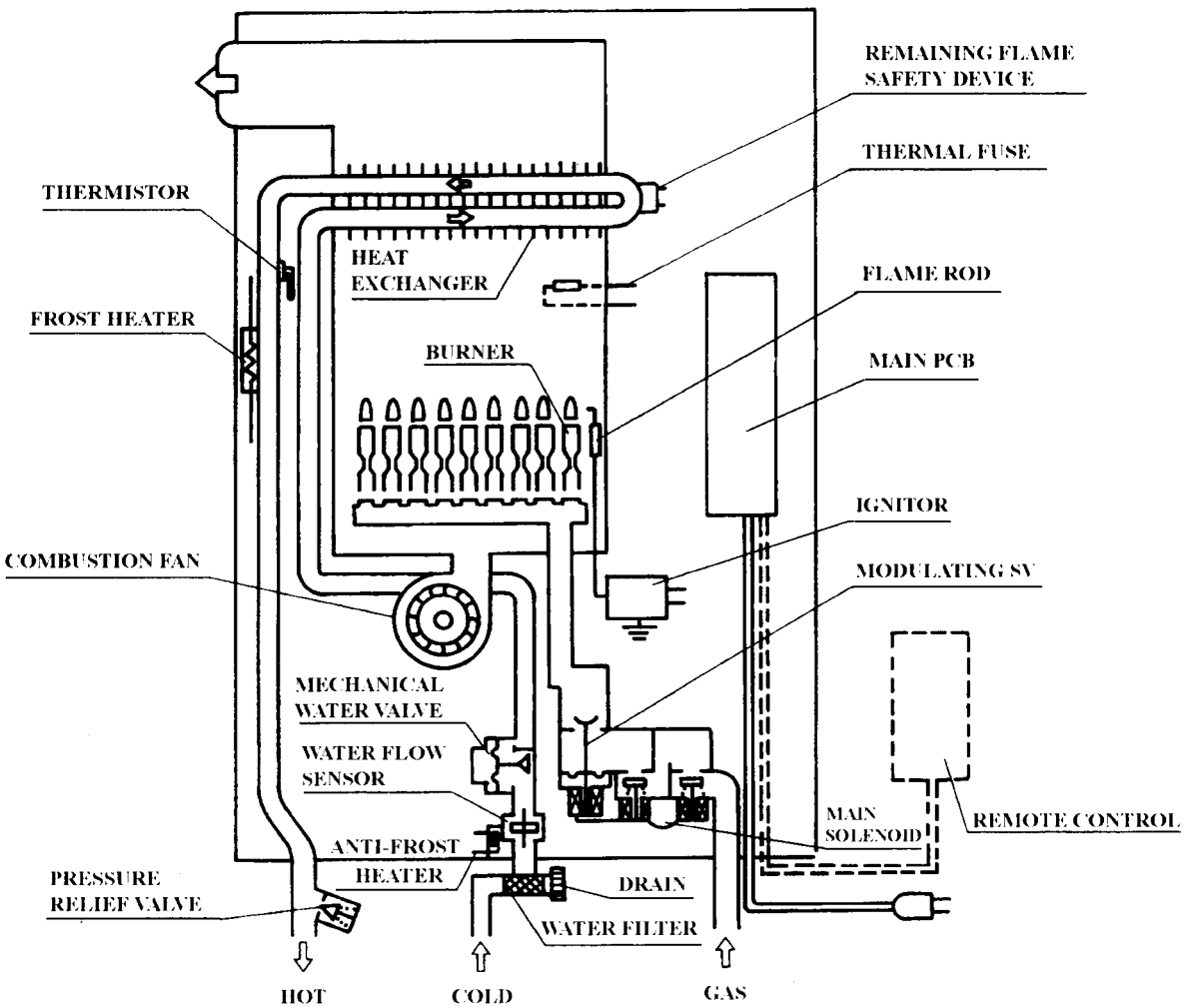
If dip switches 5 & 6 are set to any of the positions shown above and the remotes are not connected, the outgoing water temperature will be 55°C.

This default setting provides a safe default temperature if the remote controls become disconnected.

CUT-AWAY



§ 9 SCHEMATIC DIAGRAM

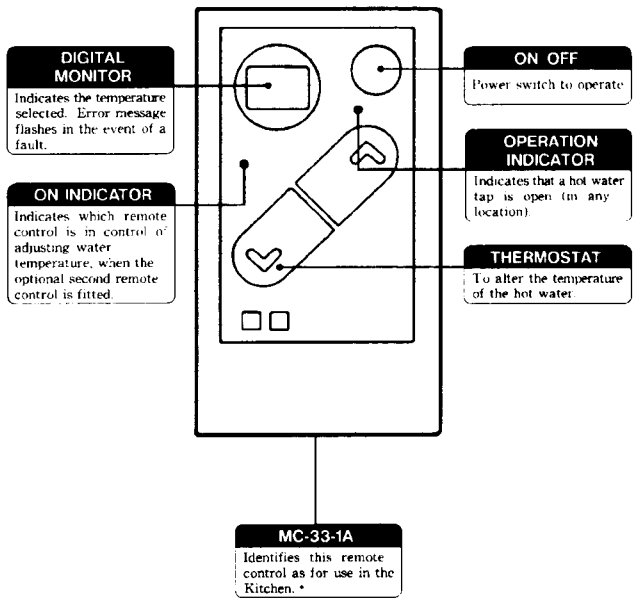


1. Up to March 1996

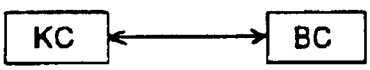
For the customer to receive the full benefit of the remote controls, they must have the remote controls specified for the water heater. Two specifications of remote controls exist. The MC-33-1A and BC-45-1A remotes were specifically designed and manufactured up to mid-March 1996. If they are connected to water heaters manufactured from mid-March 1996, the kitchen control will operate correctly, but the memory functions on the bath control will differ from those shown in the customer's Operating Booklet (for detailed information, contact Rinnai).

For water heaters manufactured from mid-March 1996, the correct remote controls to use are the MC-33-2A and BC-45-2A.

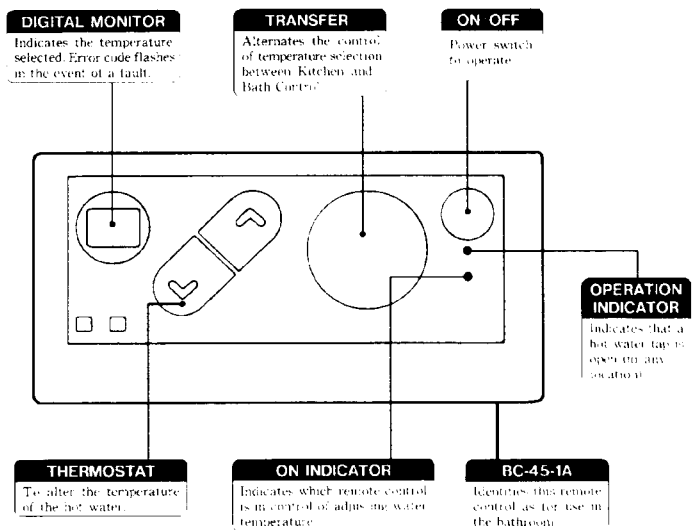
Kitchen Remote Control (up to mid-March 1996)



Only two remote controls can be fitted, and priority temperature can be switched between controls.



Bathroom Remote Control (up to mid-March 1996)



2. From March 1996

The MC-33-2A and BC-45-2A remotes were specifically designed for use with water heaters manufactured from mid-March 1996. They will operate if connected to water heaters manufactured up to mid-March 1996, but only 2 controls can be fitted to these water heaters. (For detailed information, contact Rinnai.)

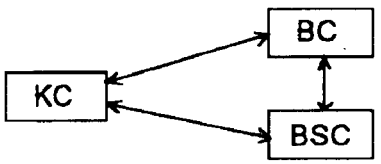
The new features which have been incorporated into these remote controls are:

* Colour coordination to allow immediate recognition of the temperature "hotter" and "cooler" buttons.

* Larger LED display.

* Water temperature adjustment in the range of 37°C to 43°C whilst hot water is flowing.

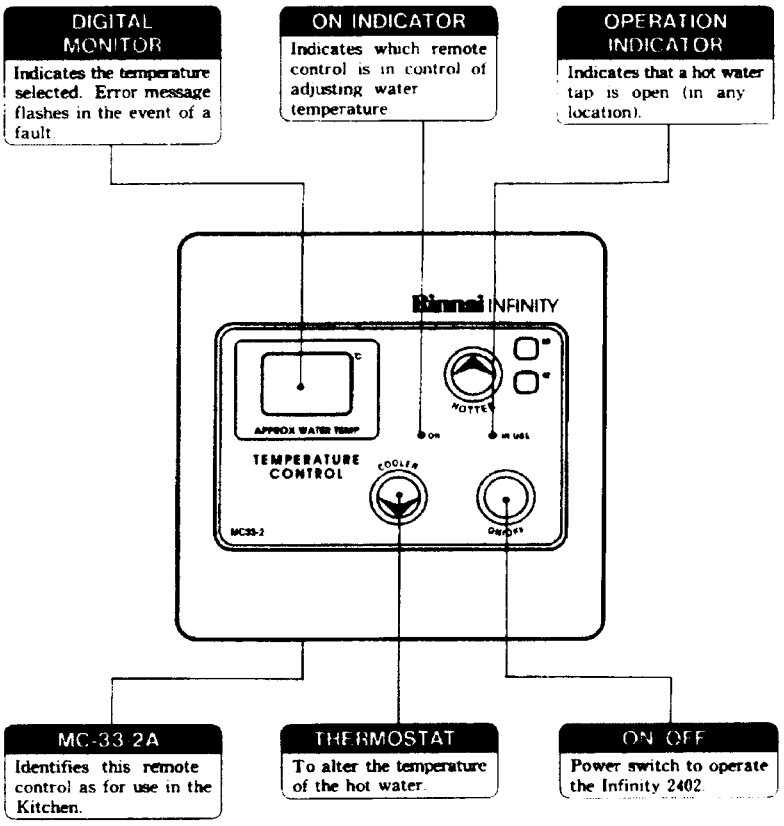
* Enhanced communication system between the remote controls, allowing priority temperature selection at each remote control.



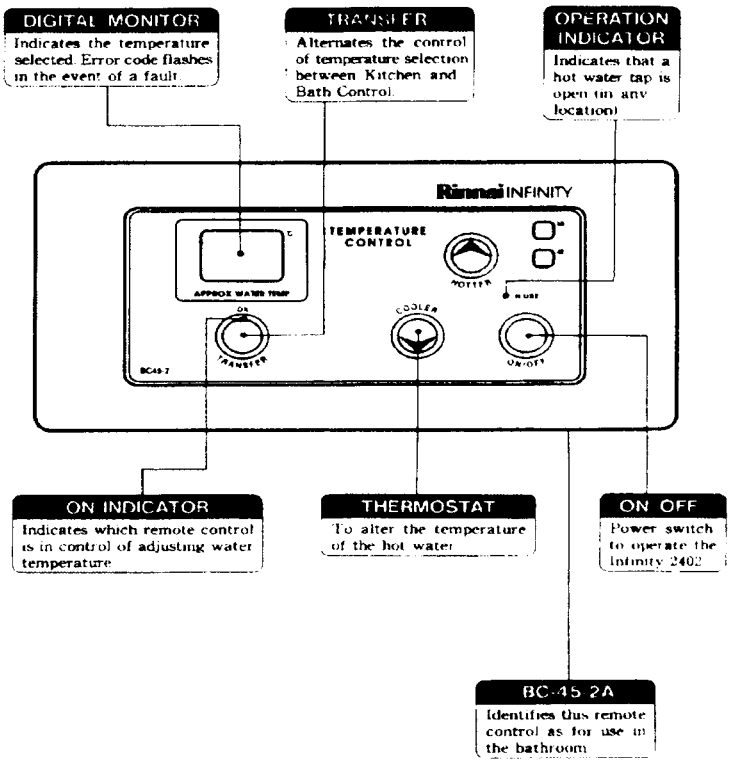
A third remote control identified as BSC-45-2A is available for use in a second bathroom or ensuite. Contact Rinnai for further details.

Different temperatures can be stored in the memory of each remote control.

Kitchen Remote Control (from mid-March 1996)



Bathroom Remote Control (from mid-March 1996)



§ 11 GAS CONSUMPTION

The most common unit used to calculate the energy required to heat water is the kilocalorie.

If the full gas rate is not required to provide the required water temperature rise, (ie when the temperature selected at the remote controls is lower, or the incoming water temperature is higher); the amount of gas that the water heater is going to use to carry out a specific heating task will change proportionally to these variables. The actual gas rate is based upon the following calculation.

Calculating The Gas Input

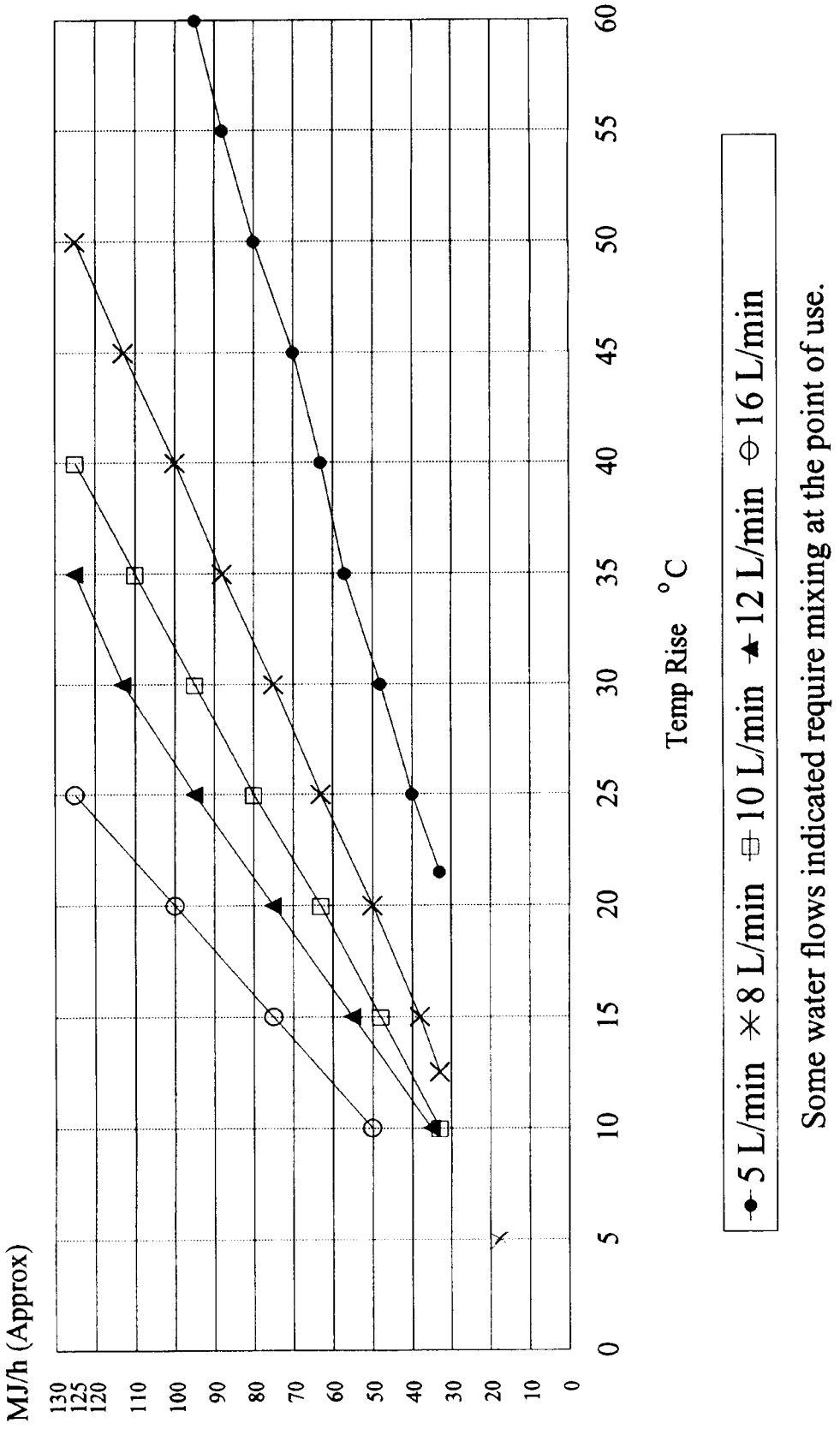
$$\text{Formula: } \frac{(T_{OUT} - T_{IN}) \times Q \times 60}{239 \times TE} = \text{IN MJ/h}$$

See page 15 for an explanation of T_{IN}, T_{OUT}, IN, TE and Q.

Example data			Calculation			
T_{IN}	=	15°C	$\frac{(42 - 15) \times 10 \times 60}{239 \times 0.8}$	=	IN	MJ/h
T_{OUT}	=	42°C				
IN	=	Gas input in MJ/h	$\frac{27 \times 10 \times 60}{239 \times 0.8}$	=	IN	MJ/h
TE	=	80%	$\frac{16\,200 \text{ (Kcal/h)}}{191.2}$	=	IN	MJ/h
Q	=	10 L/min	84.7	=	IN	MJ/h

The 16 Litre series models are able to modulate gas flows electronically, and water flows mechanically. The gas input varies depending on the water flow and incoming and outgoing water temperatures. The chart on the following page is an approximate guide to the gas input according to the various temperature rises and water flows.

To calculate the approximate gas input, first select the appropriate curve representing the water flow in litres/minute [L/min]. From the base line draw a vertical line at the point where the required temperature rise in °C is indicated. This can be calculated by subtracting the incoming water temperature from the selected temperature on the remote control. Draw a horizontal line from the point where the vertical line intersects the curve. The point where the horizontal line intersects the left hand vertical line (Gas Input), shows the approximate gas input in MJ/h.



This chart is an approximate guide to the gas input according to various temperature rises and water flows. See previous page, last paragraph for the explanation of how to calculate approximate gas consumption in MJ/h.

* Maximum input for the REU-1616WT-A is 96 MJ/h.

§ 12 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 indicate the water flow from the 16 Litre series models 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 37°C and 75°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 125 MJ/h. (96 MJ/h for the REU-1616WT-A)

Where:

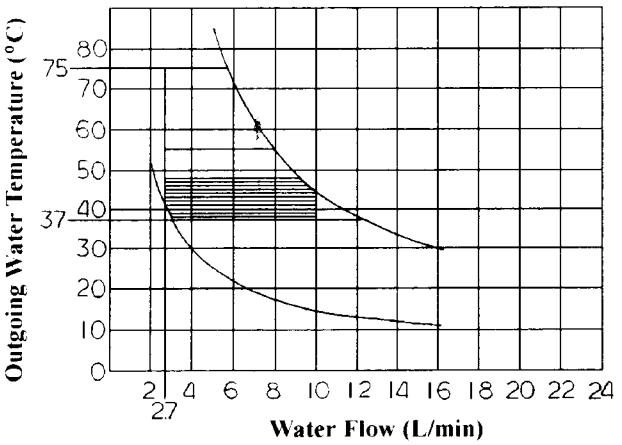
T_{IN}	=	Incoming water temperature.
T_{OUT}	=	Outgoing water temperature as selected at the remote.
IN	=	Gas input.#
TE	=	Thermal efficiency.*
Q	=	Water flow in litres per minute.

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 85%, depending on the temperature rise and water flow. For the purpose of the following calculation we have assumed an efficiency of 80%.

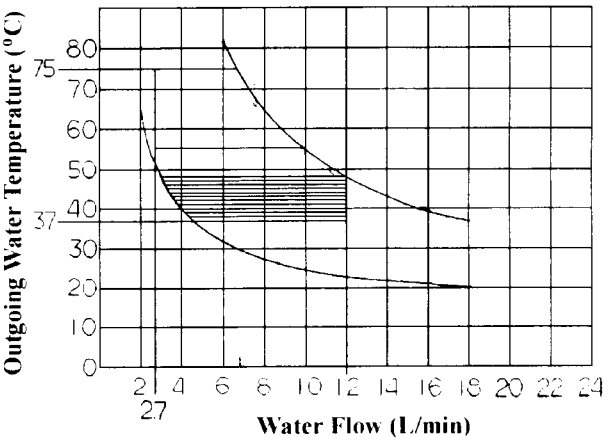
Example data			Calculation		
			Formula: IN × TE =(T_{OUT} - T_{IN}) × 60 × Q		
T_{IN}	**=**	**15°C**	**30 000 × 0.8**	**=**	**(60 - 15) × 60 × Q**
			24 000	**=**	**45 × 60 × Q**
T_{OUT}	**=**	**60°C**			
			$\frac{24\,000}{45}$	**=**	**60 × Q**
IN	**=**	**30 000 kcal/h**			
TE	**=**	**80%**	**533**	**=**	**60 × Q**
Q	**=**	**Water flow in litres per minute**	**$\frac{533}{60}$**	**=**	**Q**
					8.9 L/min

Incoming temperature 5 °C



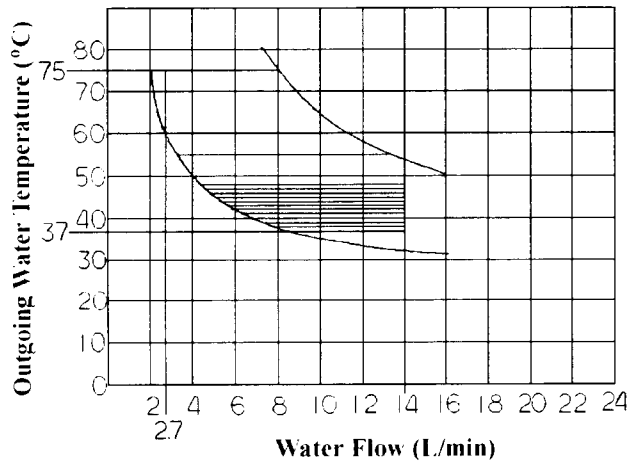
The chart opposite indicates that the water flow rate will, at a preset temperature of 50°C and an **incoming water temperature of 5°C,** be 9 litres a minute.

Incoming temperature 15°C



The chart opposite indicates that the water flow rate will, at a preset temperature of 50°C and an **incoming water temperature of 15°C,** be 11.5 litres a minute.

Incoming temperature 25°C



The chart opposite indicates that the water flow will, at a preset temperature of 50°C and an **incoming water temperature of 25°C,** be 16 litres a minute by mixing at the tap, 14 litres a minute without mixing.

Output water temperature (REU-1616W-A)	Incoming + 15°C	Incoming + 25°C	Incoming + 30°C	Incoming + 35°C	Incoming + 45°C	Incoming + 55°C
Output water volume	28 (L/min) Mixed	16 (L/min) Mixed	13 (L/min)	11 (L/min)	9 (L/min)	7 (L/min)

Water flow required for ignition

The water flow required for ignition (and shut off) is calculated by the PCB, and depends on the difference between the incoming and outgoing water temperatures, water flow, and minimum gas rate. The calculation method ensures that even when the incoming water is warm, the temperatures selected on the remote controls (or default temperatures) are not exceeded by more than 3°C.

The minimum input for the REU-1616W-A and REU-1616WE-A is 32 MJ/h (110 kcal/h) and 24 MJ/h(95 kcal/h) for the REU-1616WT-A.

The following formula determines the water flow at which the appliance ignites (or shuts off). Figures in brackets are for the REU-1616WT-A.

$$\frac{110 \quad (95)}{([\text{set temp}+3] - \text{incoming temp.})} = \text{L/min at on or off}$$

Examples

Set temperature ← 37°C, incoming water ← 20°C

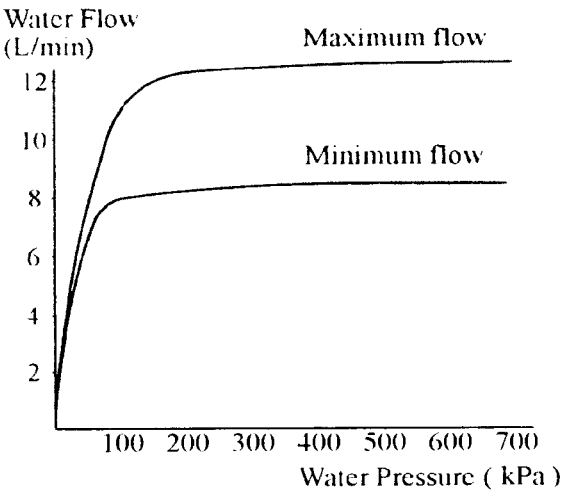
$$\frac{110 \quad (95)}{([37 + 3] - 20)} \Rightarrow \frac{110 \quad (95)}{20} = 5.5 \text{ L/min} \quad (4.75 \text{ L/min})$$

Set temperature ← 42°C, incoming water ← 15°C

$$\frac{110 \quad (95)}{([42 + 3] - 15)} \Rightarrow \frac{110 \quad (95)}{30} = 3.7 \text{ L/min} \quad (3.2 \text{ L/min})$$

Mechanical Water Regulator

The graph on the right shows the performance of the water regulator. The top line shows the performance when the incoming water temp is 25°C, and the lower line shows 5°C.The upper line shows that at 25°C the maximum flow is 14 L/min. This maximum flow is reached at 200 kPa inlet pressure. The bottom line shows that at 5°C the maximum flow is approximately 8 L/min. This maximum flow is reached at 200 kPa inlet pressure.

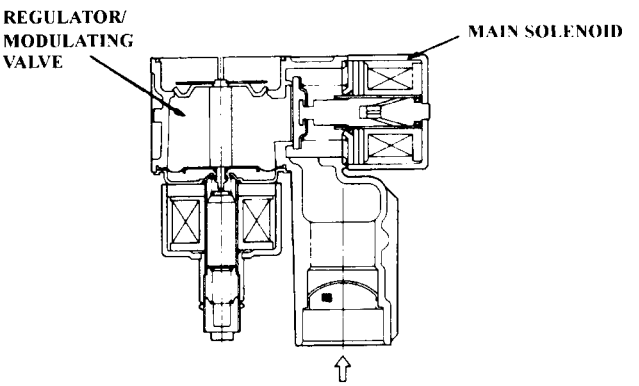


Note: Although the 16 Litre series models will operate at low water pressures, maximum performance is not reached unless the incoming pressure is 200 kPa or more.

Electronic Regulator/Modulating Valve

Gas is controlled by a composite regulator/modulating valve and double block safety valve. This modulating solenoid is electronically controlled depending on the incoming water temperature, water flow and outgoing water temperature.

When the water flow and/or selected water temperature changes, then the system will adjust the gas flow to the burner automatically in proportion to the water flow, between 32 and 125 MJ/h (24 and 96 MJ/h), ensuring that the outgoing water temperature does not exceed the temperature selected at the remote controls. A schematic diagram on page 10 shows the basic layout of the gas piping system. Maximum gas rate is pre-determined, and the appliance cannot be overloaded. In summary the 2 main functions of the modulating valve are:



1) To regulate incoming gas pressure.
2) To modulate gas flow from 32 to 125 MJ/h (24 to 96 MJ/h).

Mechanical Water Flow Control Device with Water Flow Sensor

This component includes the water flow sensor, and stabilises water flow during changes in water pressure. It also helps to prevent the water flow from exceeding the maximum capacity of the water heater. With the water flowing, the impeller (magnetised) rotates clockwise and this is detected by the magnetic sensor. The PCB calculates water flow based on the rpm signal (which is proportional to the water flow) and, determines whether to ignite or extinguish the flame.

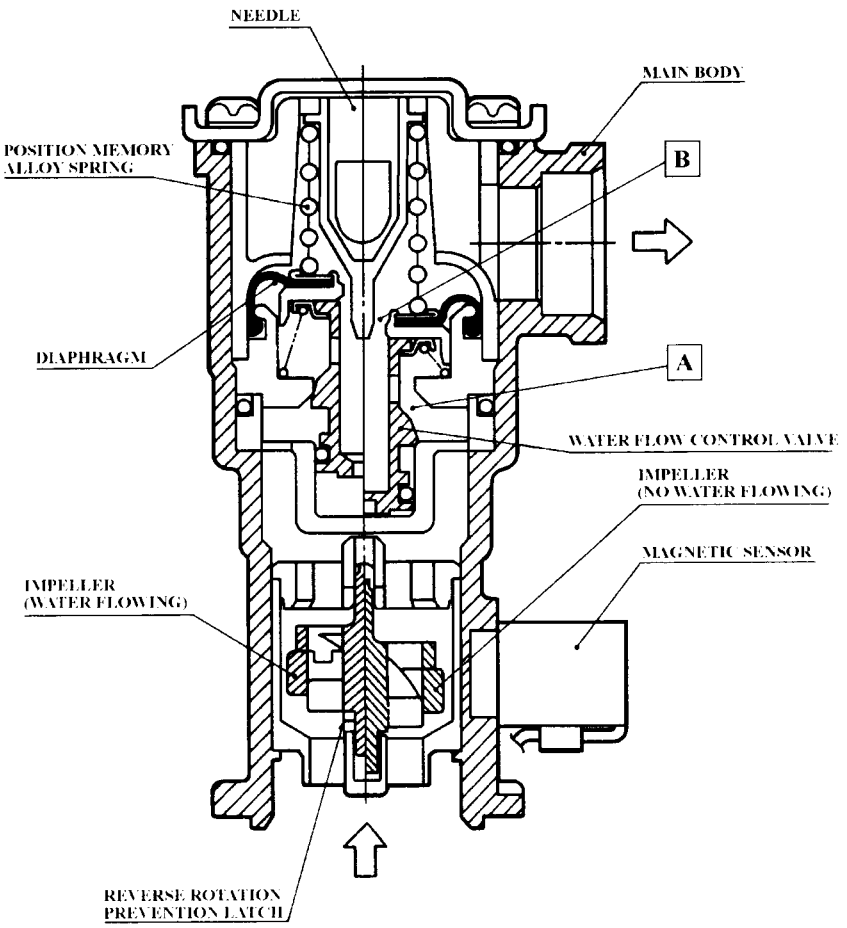
A position memory alloy spring in the mechanical water flow control device made from a metal known as NiTi Alloy alters its spring tension according to the incoming water temperature. The tension changes are shown in the table below.

Water Temp	Opening
5 °C	Small
10 °C	↓
15 °C	↓
20 °C	↓
25 °C	Greatest

In **summer**, incoming water temperatures are generally warmer and the spring tension becomes greater. When the tension is greater, the gap in areas A and B increases in opening size and more water flows through the valve.

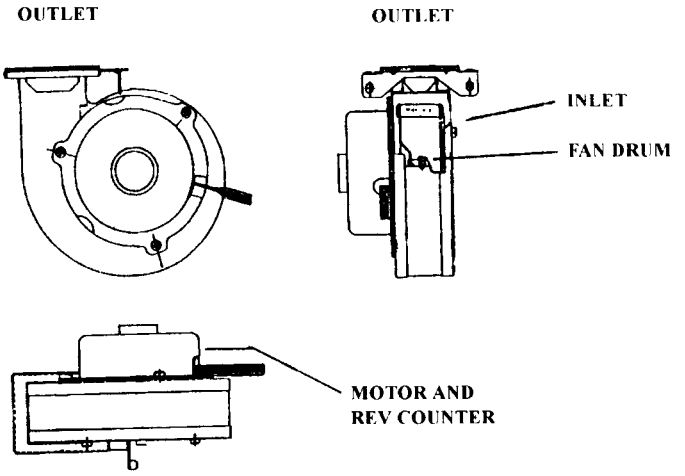
In **winter**, incoming water temperatures are cooler and the spring tension becomes less. When the tension is reduced, the gap in areas A and B decreases in opening size and less water flows through the valve.

The spring's thermal heat capacity is very low: responding to temperature changes and altering tension in about 1 second. The spring is capable of responding to changes in the range 5℃ to 25℃.



Combustion Fan

Air for combustion is supplied by a centrifugal fan driven by a DC motor. After a pre-purge period of 0.3 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.



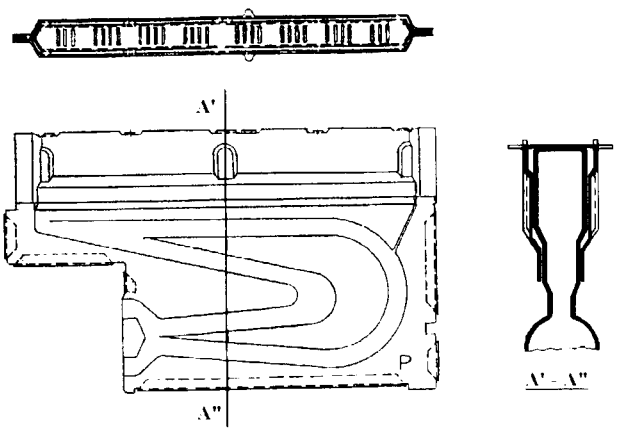
The actual speed of the motor is continuously monitored by a magnetic pulse sensor. This sensor emits 4 pulses per rotation of the fan. This is the fan feedback or confirmation data processed by the PCB and used for 2 operations.

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.

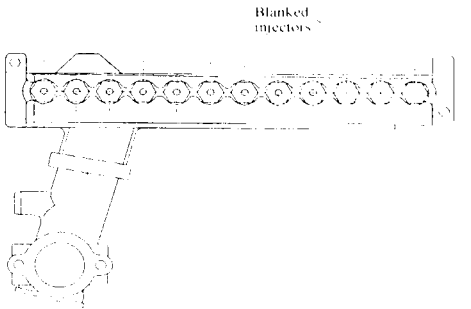
Burner

The burner assembly is made up of 12 identical stainless steel bunsen burners, secured by an aluminised steel framework. An aluminium manifold with 12 injectors supplies gas to the burners, and is attached to the front lower cover of the burner box.



Manifold

As the REU-1616WT-A is designed for use in hot weather areas, where the incoming water may be warm. The three injectors on the right are intentionally blanked to achieve the lower gas rate.



The preset temperature is selected at one of the remote controls (where fitted). Where no remote control is fitted, the default temperature is 55°C.

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 PCB. This enables the PCB to determine whether or not water is flowing, and also, the volume of water flowing. When the pre-determined water flow is sensed, the ignition sequence begins.

Incoming water pressure is regulated by a mechanical water regulator at all times.

The combustion fan pre-purges the combustion chamber. A rev counter on the combustion fan indicates the fan rpm to the 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 burner 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, see page 20 - combustion fan.

When the unit is first plugged into 240 Volts, the PCB assumes an incoming water temperature of 25°C, this means that the appliance doesn't start on HI, preventing it producing very hot water the first time it is used.

The data used to determine the outgoing water temperature initially is:

a) incoming water flow, and
b) pre-set temperature.

From this data, the unit is then able to determine a suitable gas rate; to kick the unit off.

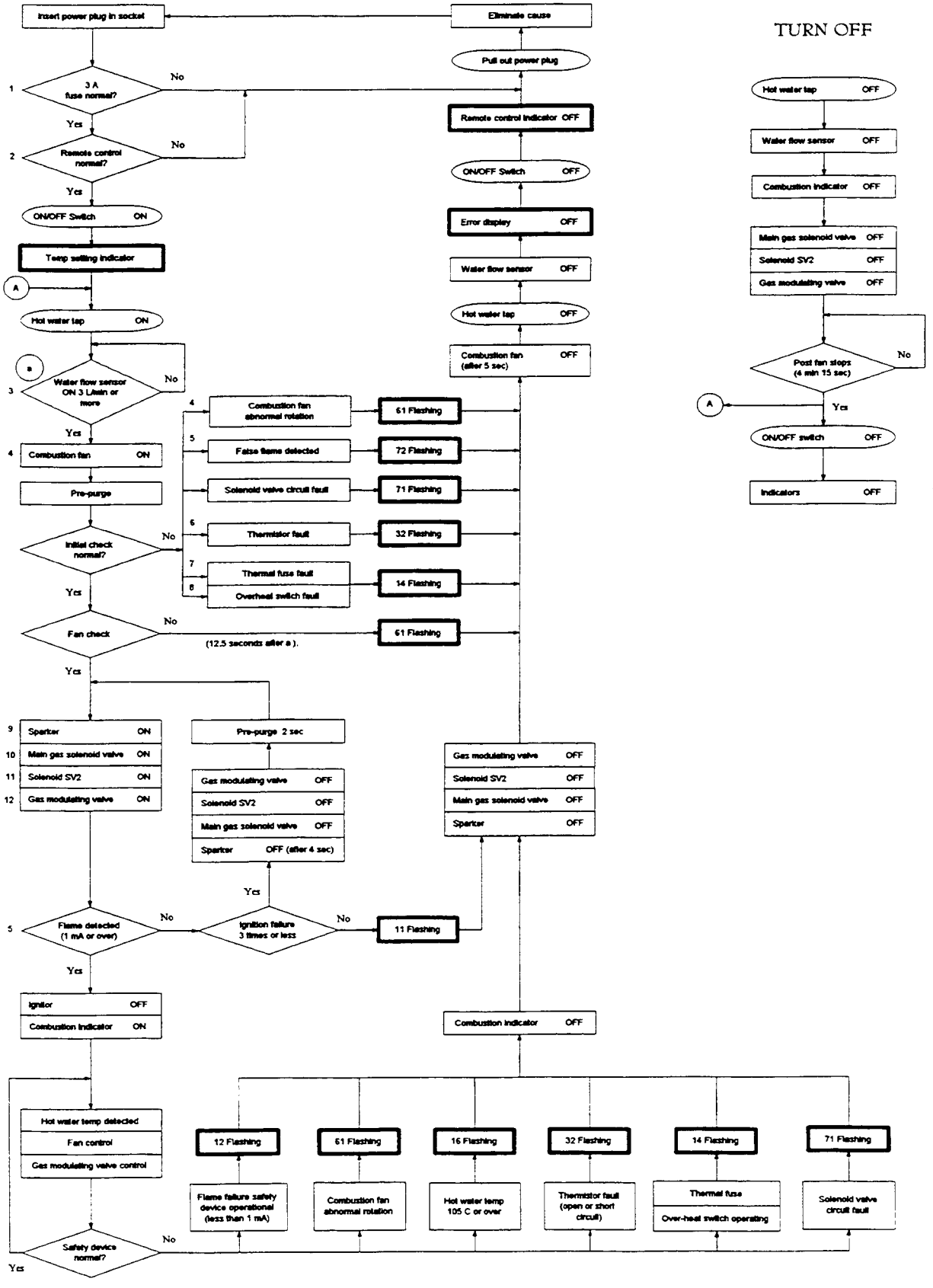
$$\frac{\text{Gas Flow}}{\text{Water Flow}} = \text{Temp Rise}$$

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

The PCB is programmed to provide control over the outgoing water temperature. As the water flow from the tap is increased, the PCB increases the gas and air flow to the burner.

The PCB continually makes adjustments in order to maintain a constant temperature; (adjusting the gas input, where necessary). The maximum water flow for this appliance is regulated by the mechanical water flow control device with water flow sensor. 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 then that requested on the remote control is produced. In this case, manually reducing the water flow at the tap will increase the temperature. The PCB 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 and the burner extinguishes.



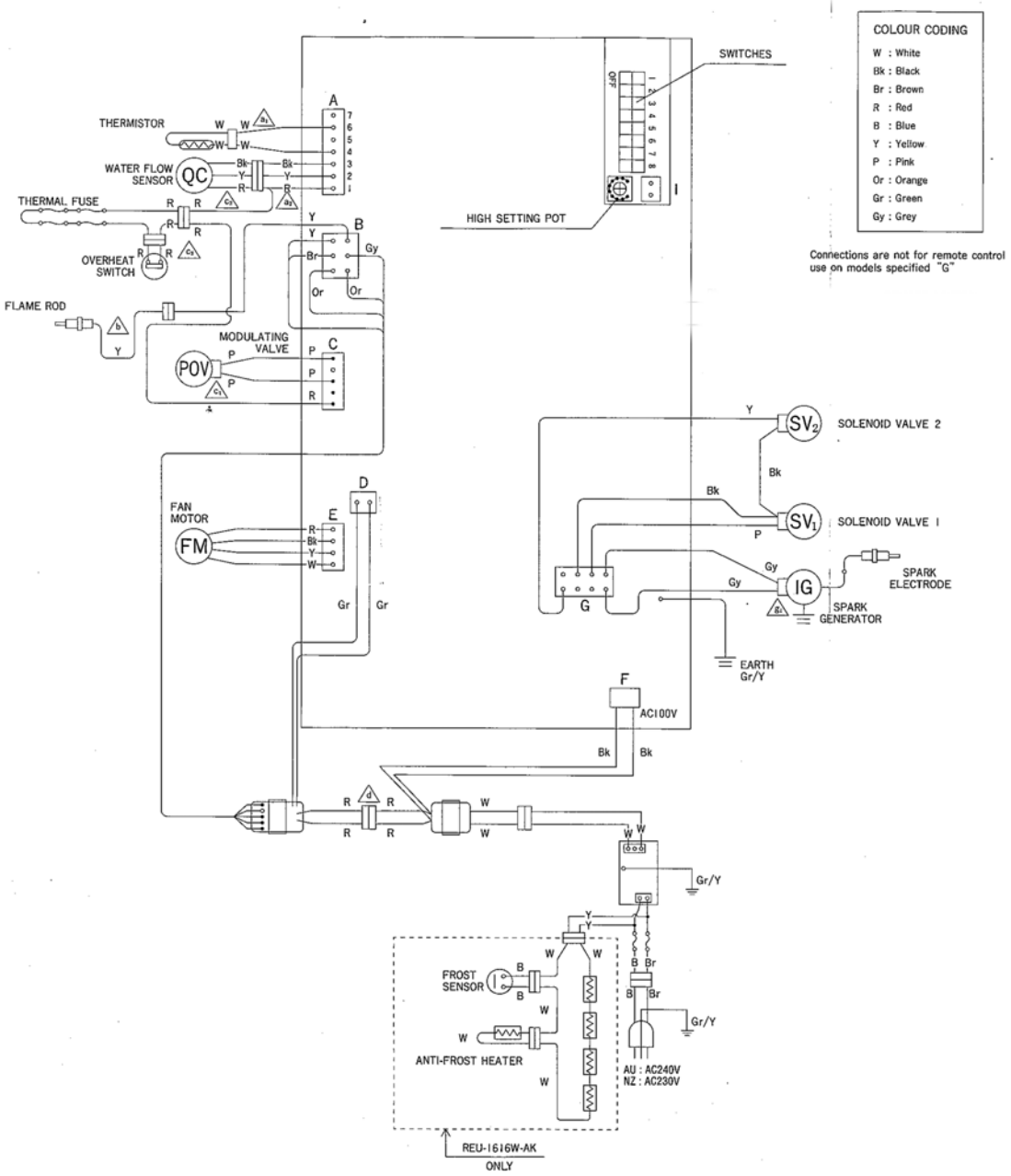
DIAGNOSTIC POINTS

Flow Chart N°	Measurement Point		Normal Value	Component
	Connector N°	Wire Colour		
1	d	Red - Red	AC 90 ~ 110 V	3 Amp Fuse
2	h	Black - Black	DC 10 ~ 13 V	Remote Control
3	a_2	Red - Black	DC 11 ~ 13 V	Water Flow Sensor
		Yellow - Black	DC 2 ~ 10 V	
4	E	White - Black	DC 2 ~ 10 V	Combustion Fan Motor
	I	Checkpin	95 ~ 330 Hz	
5	b	Yellow - body earth	AC 40 ~ 150 V	Flame Rod
6	a_1	White - White	Thermistor resistance value Temp Resistance 15 °C 11.4 ~ 14 k ohm 30 °C 6.4 ~ 7.8 k ohm 45 °C 3.6 ~ 4.5 k ohm 75 °C 1.4 ~ 1.8 k ohm	Thermistor
7	c_2	Red - Red	Below 1 ohm	Thermal Fuse
8	c_3	Red - Red	Below 1 ohm	Over-heat Safety Mechanism
9	g_1	Grey - Grey	AC 90 ~ 110 V	Sparker
10	G	Pink - Black	DC 80 ~ 100 V 1.0 ~ 1.5 k ohm	Main Solenoid Valve
11	G	Yellow - Black	DC 80 ~ 100 V 1.0 ~ 1.5 k ohm	Solenoid Valve (SV_2)
12	c_1	Pink - Pink	DC 1.2 ~ 14 V 62 ~ 92 ohm	Modulating Valve

TRANSFORMER VOLTAGES AND RESISTANCES

Connecto r	Wire Colour	Normal Value
d	Red - Red	AC 90 ~ 110 V 15 ~ 21 ohm
D	Green - Green	AC 16 ~ 20 V 6 ~ 10 ohm
B	Orange - Orange	AC 15 ~ 30 V 1.4 ~ 1.8 ohm
B	Brown - Grey	AC 30 ~ 50 V 6 ~ 10 ohm
B	Yellow - Grey	AC 180 ~ 220 V 0.4 ~ 0.6 k ohm

' 17 WIRING DIAGRAM



Error messages are displayed as numbers flashing on the remote controls.

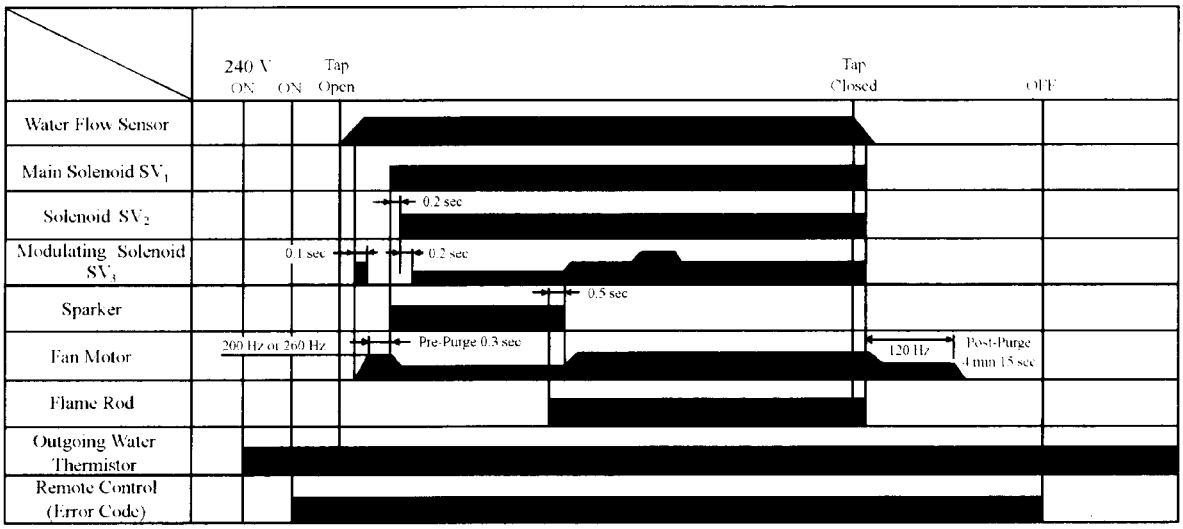
× = Does not operate

Error Code	Fault Description	Symptom	Main Solenoid Valve	Solenoid Valve	Combustion Fan	Sparker
-	Defective Water Flow Sensor	No operation	×	×	×	×
71	Solenoid Valve Operating Circuit Malfunction	No operation	×	×	×	×
72	Flame Rod Faulty	No operation	×	×	×	×
32	Outgoing Water Temperature Thermistor Open or Short Circuit	No operation	×	×	×	×
61	Combustion Fan Malfunction	Operation stops after 12.5 sec	×	×	×	×
11	Sparker Fault	Unable to detect flame and stops	-	-	-	×
11	Main Gas Solenoid Valve Faulty	Unable to detect flame and stops	×	-	-	-
11	Solenoid Valve SV_2 Faulty	Unable to detect flame and stops	-	×	-	-
12	Flame Sensing Device Malfunction	Stops after loss of flame	×	×	×	×
12	Flame Rod Harness Open Circuit	Flame failure	×	×	-	×
12	Defective Earth in PCB	Flame failure	×	×	-	×
16	Outgoing Water Temperature Abnormal	Operation ceases	×	×	×	×
14	Overheat Safety Mechanism (Bi-metal Switch)	Operation ceases	×	×	×	×
14	Overheat Safety Mechanism (Thermal Fuse)	Operation ceases	×	×	×	×

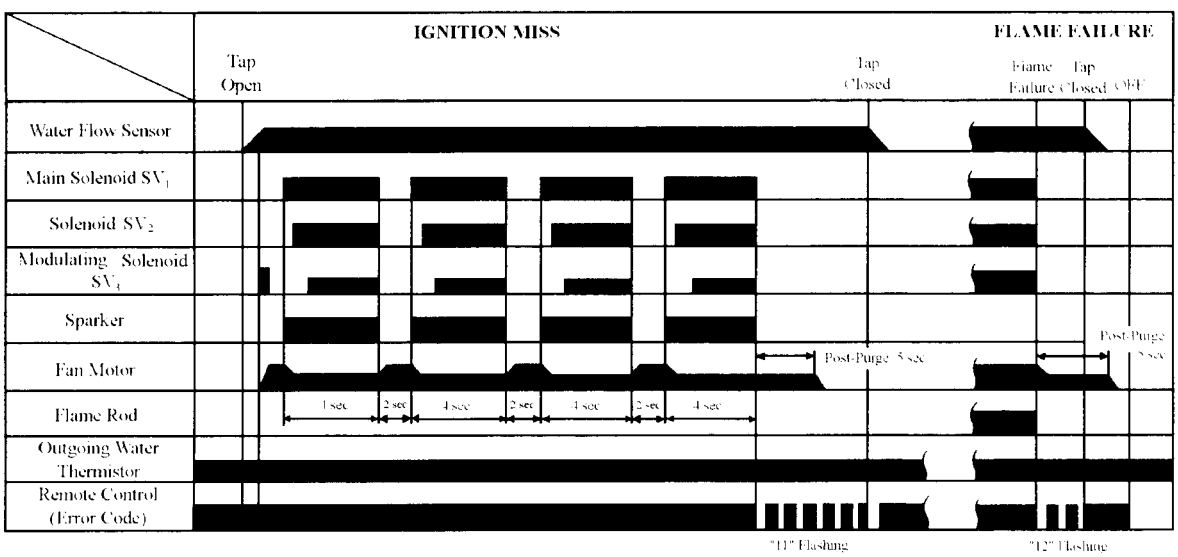
Notes

1. **Digital monitor does not illuminate when system is switched ON, or the display drops out while the appliance is operating.**
   - Check power supply to the appliance.
   - Switch system OFF. Switch OFF mains electricity supply then switch ON again, and re-attempt ignition.
   - Check remaining flame safety device, see page 29.
2. **Error coded message flashing.**
   - Refer to tables on pages 27 to 30.
3. **Appliance operates, however symptoms remain, with digital display dropping out and error coded message flashing.**
   - Isolate potential faulty component using the tables pages 27 to 30.

NORMAL COMBUSTION SEQUENCE



ERROR SEQUENCE



§20 ELECTRICAL COMPONENT ANALYSIS

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

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N°
A. Digital display does not light up, even after having switched unit on at remote control.	① Is the power cord connected to the power point?	Inspect visually.	Is plug in or not?	Yes	Go to A - ②	
				No	Plug in cord.	1
	② Is supply voltage correct?	Measure voltage at power point.	AC 230~260V	Yes	Go to A - ③	
				No	Check power supply circuit. Check breakers.	2
	③ Check 3 Amp electrical fuses.	✻ Disconnect and measure resistance, to confirm if fuse is blown. Normally < 1 Ω	Is fuse blown?	Yes	Go to A - ④ and replace fuse.	
				No	Check A - ⑤	
	④ Check for short-circuits and open circuits.	1) Measure the resistance of each solenoid valve. ✻ Remove connector G from the PCB before measuring.	Pink - Black 1.0 ~ 1.5 kΩ Yellow - Black 1.0 ~ 1.5 kΩ N.B. Confirm after checking that there are no broken wires or shorts in any harness.	Yes	Go to A - ⑤ - 2	
				No	Replace faulty solenoid valves.	3
		2) Measure the sparker resistance. ✻ Disconnect sparker connector g_1 and measure the resistance between both terminals.	> 1 MΩ	Yes	Go to A - ④ - 3	
				No	Replace sparker.	4
		3) Check wiring.	Are there any shorts or open circuits?	Yes	Rectify or replace.	5
				No	Replace PCB	6
	⑤ Check transformer.	1) Measure the voltage between red and red connector d.	AC 90~110V?	Yes	Go to A - ⑤ - 2	
				No	Replace PCB	7
		2) Measure the voltage at connectors B, D. Measure values with appliance on "standby".	Green - Green AC 16 ~ 20 V Orange - Orange AC 15 ~ 30 V Brown - Grey AC 30 ~ 50 V Yellow (LH)- Grey AC 180~220V	Yes	Go to A - ⑥	
				No	Replace transformer.	8

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N°
	⑥ Check remote control.	Measure voltage between the remote control terminals at H.	DC 10 ~ 13 V	Yes	After checking cable for shorts and broken wires, replace the remote control.	9
				No	Replace PCB	10
B. Digital display lights up, but combustion does not commence.	① Check water flow sensor.	1) Measure voltage between red and black of connector a_2.	DC 11 ~ 13 V	Yes	Go to B - ① - 2	
				No	Replace PCB	11
		2) Measure voltage between yellow and black of connector a_2.	DC 2 ~ 10 V	Yes	Go to B - ②	
				No	Replace water flow sensor.	12
Error code "72" displayed on digital display.	② Check flame rod.	✻ Measure resistance between flame rod terminal b and earth.	>1 MΩ	Yes	Replace PCB	13
				No	Replace faulty flame rod.	14
Error code "32" displayed on digital display.	③ Check outgoing water temperature thermistor.	Disconnect connector a_1 and measure resistance.	Open circuit: > 1 MΩ Short circuit: < 1 Ω	Yes	Replace outgoing water temperature thermistor.	15
				No	Go to B - ④.	15
Error code "61" displayed on digital display.	④ Check combustion fan.	1) Check motor. Measure voltage between black and red at connector E.	DC 6 ~ 40 V (Fan ON)	Yes	Go to B - ④ - 2	
				No	Replace PCB	16
		2) ✻Remove connector E from PCB, and measure resistance between black (+) and red (COM).	7.7 ~ 0 kΩ	Yes	Go to B - ④ - 3	
				No	Replace combustion fan.	17
		3) Check rev. counter. Measure voltage between black and yellow at connector E.	DC 11 ~ 13 V	Yes	Go to B - ④ - 4	
				No	Replace PCB	18
		4) Measure voltage between black and white of connector E.	DC 2 ~ 10 V	Yes	Go to B - ⑤.	
				No	Replace combustion fan.	19
Error code "11" displayed on digital display.	⑤ Check sparker.	1) Measure voltage between grey and grey of connector g_1.	AC 90~110 V	Yes	Go to B - ⑤ - 2	
				No	Replace PCB	20
		2) Remove connector g_1 and measure the resistance between terminals.	>1 MΩ	Yes	Go to B - ⑤ - 3	
				No	Replace sparker.	21
		3) Check whether unit is sparking.	Is the sparker sparking?	Yes	Go to B - ⑥	
				No	Adjust or replace electrode.	22
	⑥ Check main gas solenoid valve.	1) ✻Disconnect the main gas solenoid valve connector G from the PCB, and measure resistance between the pink and black.	1.0 ~ 1.5 kΩ	Yes	Go to B - ⑥ - 2	
				No	Replace main gas solenoid valve.	23

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N°
		2) Measure voltage between pink and black of main gas solenoid valve.	DC 80~100 V	Yes	Go to B - ⑦	
				No	Replace PCB	24
	⑦ Check solenoid valve SV_2.	1) ✻Disconnect SV_2 connector G from PCB Measure resistance between yellow and black.	1.0 ~ 1.5 kΩ	Yes	Go to B - ⑦ - 2	
				No	Replace SV_2.	25
		2) Measure voltage between yellow and black on SV_2 connector.	DC 80~100 V	Yes	Go to B - ⑧	
				No	Replace PCB	26
Error code "14" displayed on digital display.	⑧ Check thermal fuse.	✻Disconnect connector c_2 and measure resistance between red and red.	< 1 Ω	Yes	Go to B - ⑨	
				No	Replace thermal fuse.	27
	⑨ Check remaining flame safety device. (Bi-metal SW)	✻Disconnect remaining flame safety device (Bi-metal SW) festoon terminals, and measure resistance between them.	< 1 Ω	Yes	Replace PCB	28
				No	Replace remaining flame safety device. (Bi-metal SW)	29
C. Combustion occurs, flame fails. Error code "12" displayed digital display.	① Check flame rod.	1) Measure the voltage between flame rod terminal b and appliance earth.	AC 40~150 V	Yes	Go to C - ① - 2	
				No	Replace PCB	30
		2) Check flame rod bracket is not loose.	Is it secure?	Yes	Go to C - ②	
				No	Replace flame rod.	31
	② Check earth wire.	Check earth wire for connections (to round terminals), broken wires, short circuits.	Is it OK?	Yes	Check for other causes of flame failure.	32
				No	Replace or adjust earth wire.	33
D. Cannot adjust water temperature.	① Check outgoing water temperature thermistor.	Disconnect connector a_1 and measure the resistance between white and white.	(T °C) R(kΩ) 15 12.7 30 7.0 45 4.1 75 1.6	Yes	Go to D - ②	
				No	Replace outgoing water temperature thermistor.	34
	② Check modulating valve.	1. ✻Disconnect modulating valve festoon terminals and measure resistance between solenoid terminals.	62 ~ 92 Ω	Yes	Go to D - ② - 2	
				No	Replace modulating valve.	35
		2. Measure the voltage between the two terminals.	DC 1.2 ~ 14 V	Yes	Go to D ② - 3	
				No	Replace PCB	36
		3. Check whether the secondary gas pressure alters when the remote control temperature is changed between 37°C and 55°C.	Does the secondary pressure change?	Yes	Normal	
				No	Replace modulating valve.	37

Nature of Fault	Examination Point	Diagnostic Point	Values	Y/N	Action	Repair N°
E. Anti-frost heater does not operate.	① Check anti-frost heater.	1) ✻Disconnect connector F_2 and measure resistance between blue and blue.	22 ~ 28 Ω	Yes	Go to E - ① - 2	
				No	Replace anti- frost heater assembly.	38
		2) ✻Disconnect connector F_1 and measure resistance between white and white (short circuit connector G4 before measuring).	111 ~ 138 Ω	Yes	Normal	
				No	Replace anti-frost heater assembly.	39

§ 21 FAULT DIAGNOSIS

- Before carrying out checks marked ✻, remove power plug from wall socket.
- Wiring diagram - page 24.

Appliance fails to operate (even remote control fails to operate).

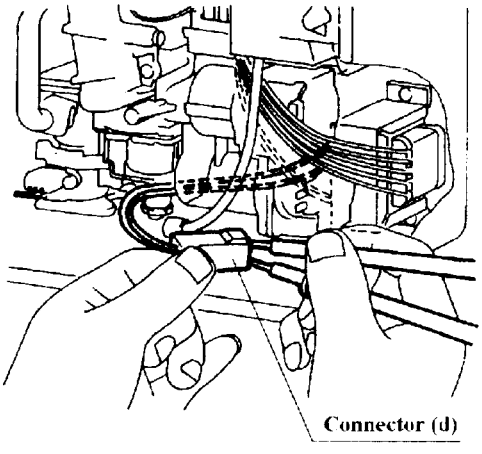
1. Is the fuse blown?

Fuse are located in plastic holders in the main harness, on the lower right hand side of the appliance.

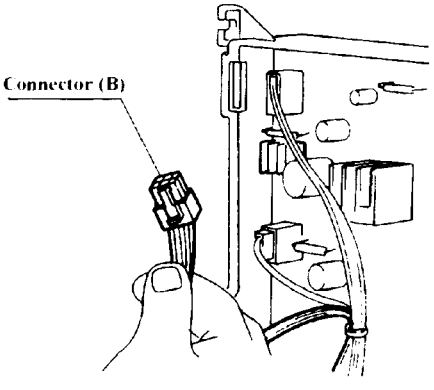
Check fuse.
① Remove 240 V plug from socket.
② ✻ Measure resistance to check the fuse (3A).

Normal: less than 1 Ω
If normal, check 2 below.
Faulty: Replace fuse (3A).
If it blows again, investigate cause of short-circuit.

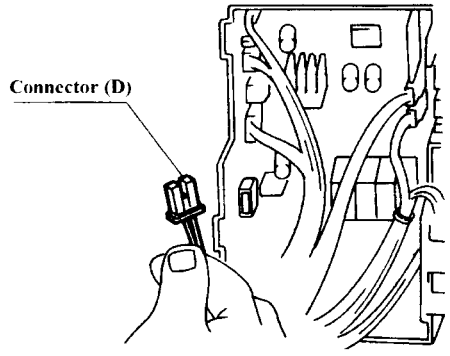
2. Is the transformer faulty?



Check the transformer.
① Measure the voltage at connector d, red - red.
Normal: AC 90 ~ 110 V
If normal, check ② below.
Faulty: Check for AC 90 ~ 110 V at terminal F on the PCB unit.

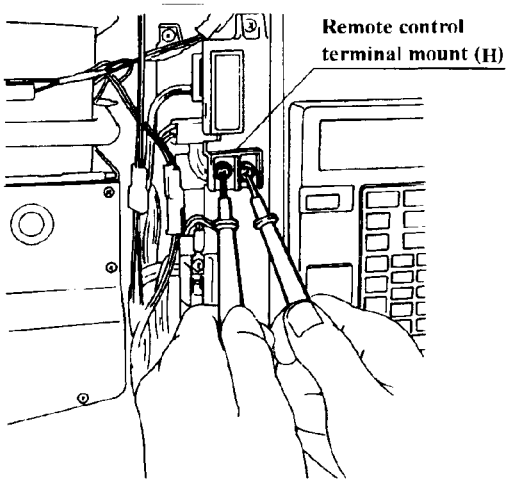


② Check the voltages below at PCB connector B.
Normal: orange - orange
AC 15 ~ 30 V
brown - grey
AC 39 ~ 50 V
yellow - grey
AC 180 ~ 220 V
If normal, check ③ below.
Faulty: Replace the transformer.



③ Check the voltage at PCB connector D, green - green.
Normal: AC 16 ~ 20 V
If normal, check 3 below.
Faulty: Replace the transformer.
NB: The transformer voltage above applies to the appliance in a standby, non-functioning state.

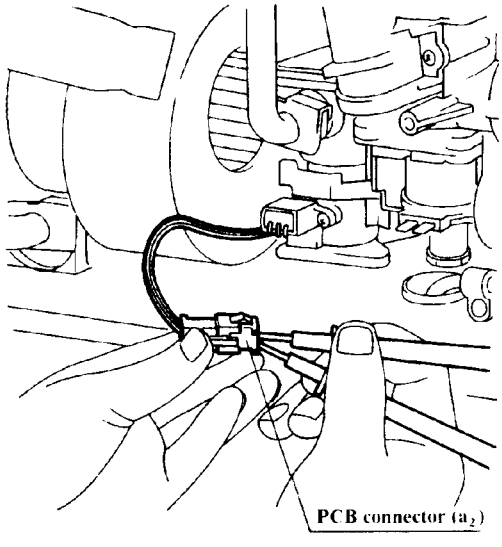
3. Is the remote control faulty?



Check voltage between the two remote control cable conductors.
① Check the voltage between the terminals on the remote control terminal mount H.
Normal: DC 10 ~ 13 V
If normal, check for a cable break or short before relacing the remote control.
Faulty: Replace the PCB

No combustion (remote control on).

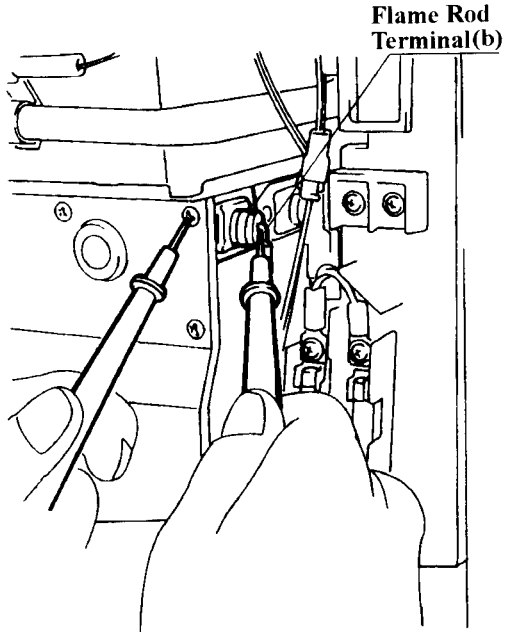
1. Is the water flow sensor faulty?



① Check the voltage at PCB connector a_2, red - black.
Normal: DC 11 ~ 13 V
If normal, check ② below.
Faulty: Replace the PCB

② Check the voltage at PCB connector a_2, yellow - black.
Normal: DC 2 ~ 10 V
If normal, check item 2 below.
Faulty: Replace the water flow sensor.

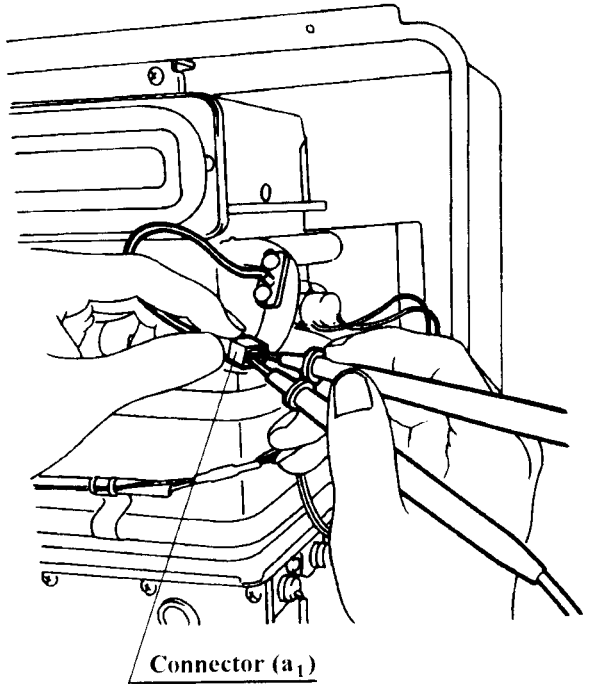
2. Error code "72" is displayed.



Flame Rod

① Remove the flame rod terminal b and re-attempt operation.
("72" display)
Check item 3 below.
(no "72" display)
Inspect for electrical current leak from the flame rod.
Measure resistance between the flame rod terminal b and the appliance earth.
Normal: 1 MΩ or more
If normal, replace the PCB unit.
Faulty: Replace the flame rod.

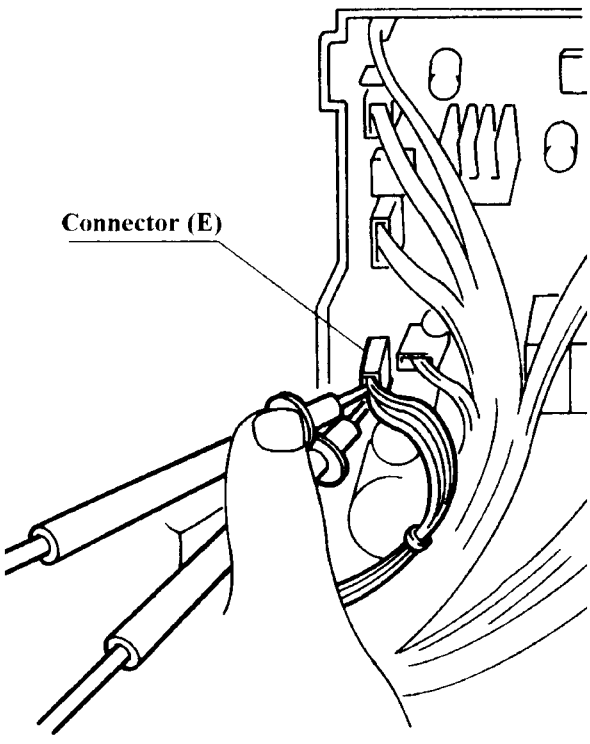
3. Is the outgoing water temperature thermistor normal?



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

① Disconnect the connector a_1 and measure white - white resistance.
Resistance > 1 MΩ - Open circuit
Value < 1 Ω - Short circuit
If normal, check item 4 below.
If faulty, replace the hot water output thermistor.

4. Is the combustion fan normal? Error code "61" is displayed.



Check the motor.

① Check the voltage at connector E between the black and red wires.
Normal: DC 6 ~ 40 V (Fan on)
DC 0 V (Fan off)
If normal, check ②.
Faulty: Replace the PCB Unit.

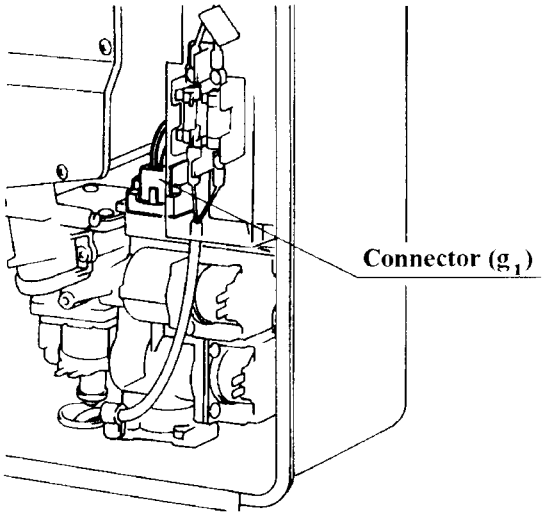
② ❋ Disconnect connector E, and measure the resistance between black (+) and red (com).
Normal: 3.9 ~ 4.9 kΩ
If normal, check the fan revolution sensor.
Faulty: Replace the combustion fan.

Check the rev counter.

① ❋ Check the voltage at connector E between the black and yellow wires.
Normal: DC 11 ~ 13 V
If normal, check ② below.
Faulty: Replace the PCB unit.

② Measure voltage at connector E, between black and white.
Normal: DC 2 ~ 10 V.
If normal, proceed to 5.
Faulty: Replace the combustion fan.

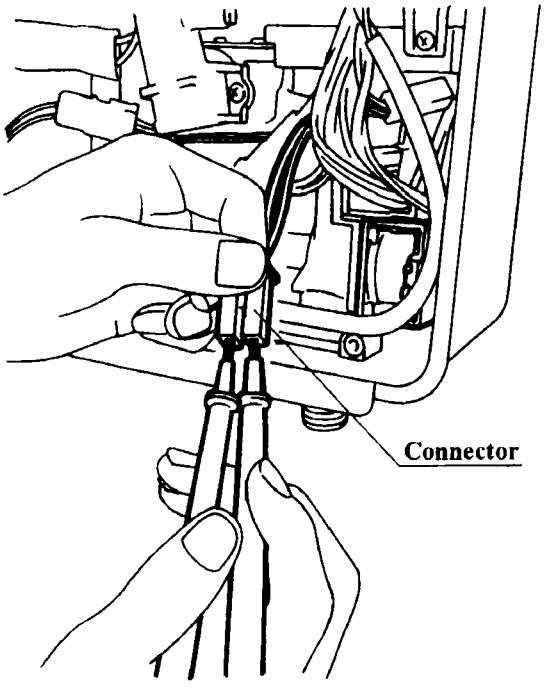
5. Is the sparker operating normally?



① Measure the voltage between the two grey wires at connector g_1.
Normal: AC 90 ~ 100 V.
If normal, check ② below.
Faulty: Replace the PCB unit.

② ❋ Disconnect connector g_1, and measure the resistance between the two sparker terminals.
Normal: 1 MΩ or more
If there is no spark, adjust or replace the electrode.
Faulty: Replace the sparker.

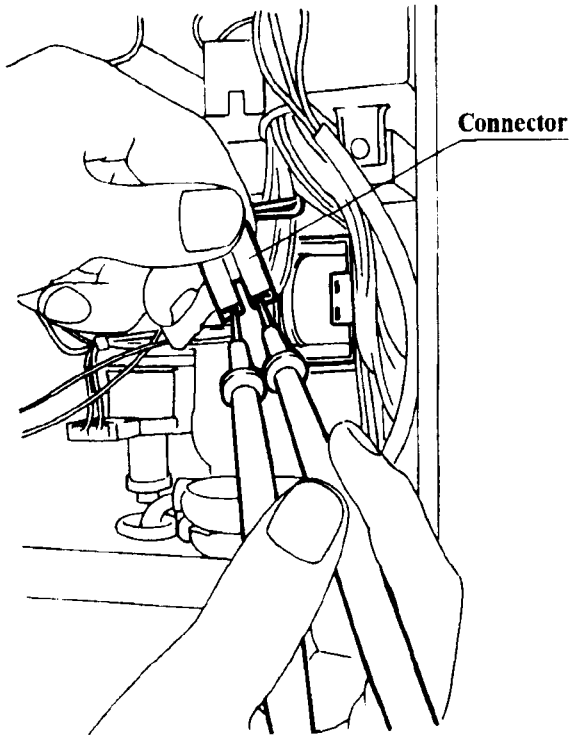
6. Is the main gas solenoid valve (SV_1) operating normally? Error code "11" is displayed.



① ❋ Disconnect the main gas solenoid valve connector G (not shown in diagram) and measure pink - black resistance.
Normal: 1.0 ~ 1.5 kΩ
If normal, check ② below.
Faulty: Replace the main gas solenoid valve.

② Measure voltage on the main gas solenoid valve connector (shown in diagram), pink - black.
Normal: DC 80 ~ 100 V
If normal, proceed to 7.
Faulty: Replace the PCB unit.

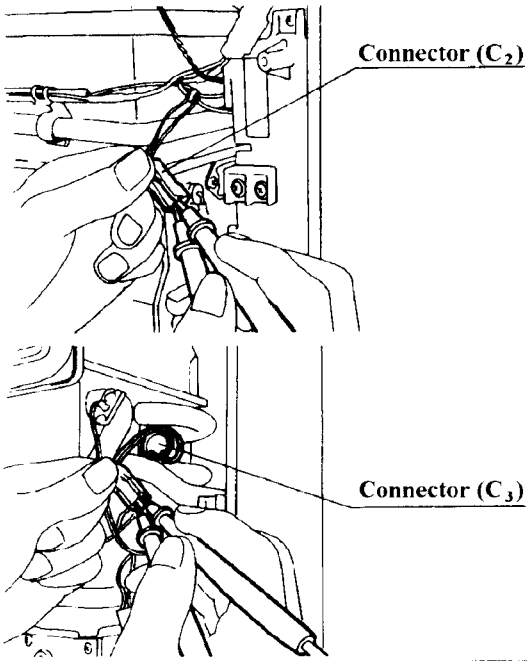
7. Is solenoid valve (SV_2) operating normally? Error code "11" is displayed.



① ❋ Disconnect solenoid valve SV_2 connector G (not shown in diagram) and measure yellow - black resistance.
Normal: 1.0 ~ 1.5 kΩ
If normal, check ② below.
Faulty: Replace solenoid valve (SV_2).

② Measure the yellow -black voltage at solenoid valve SV_2 connector (shown in diagram).
Normal: DC 80 ~ 100 V.
If normal, check item 8 below.
Faulty: Replace the PCB unit.

8. Are the safety devices operating normally?



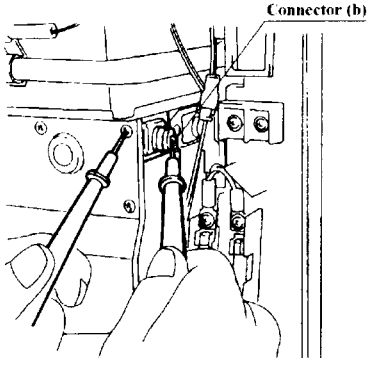
Check the thermal fuse

① Disconnect connector C_2, and measure the resistance between the two red wires.
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.

② ✻ Measure resistance between the two terminals C_3 of the remaining flame safety device.
Normal: Less than 1 Ω
If normal, replace the PCB unit.
Faulty: Replace the remaining flame safety device.

Combustion stops due to flame failure.

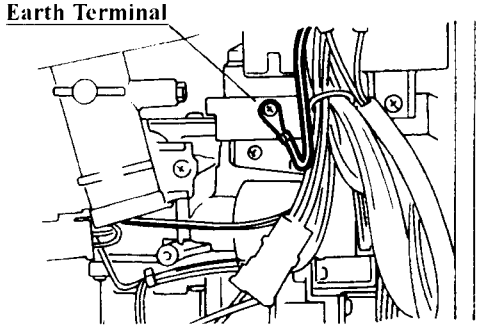
1. Is the flame rod functioning normally?



① Measure the voltage between the flame rod terminal b and the appliance earth.
Normal: AC 40 ~ 150 V.
If normal, check ② below.
Faulty: Replace the PCB unit.

② Check that the flame rod attachment is not loose.
If normal, replace the PCB unit.
If Faulty, adjust the flame rod attachment.

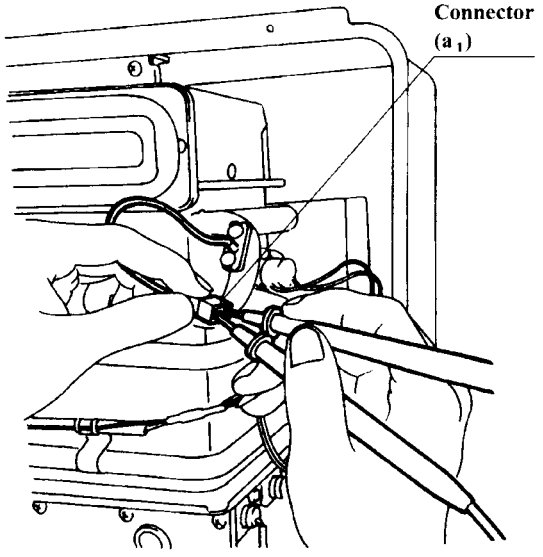
2. Is the earth lead wire normal?



① Check for defective connection of the earth lead wire (round terminal), or an open circuit. If normal, investigate other possible causes for the flame failure. (Is the gas cock open? Is the filter mesh blocked?)
Faulty, attach the earth lead wire.

Unable to adjust hot water temperature.

1. Is the outgoing water temperature thermistor operating normally?

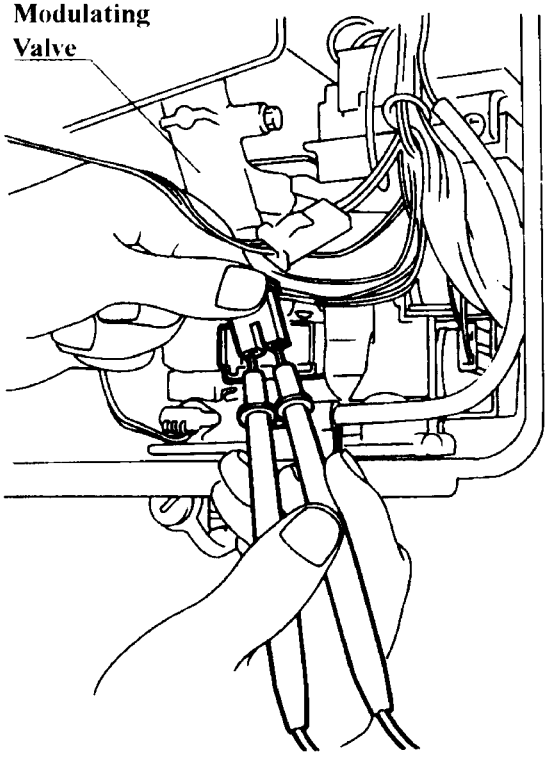


1. ✻ Disconnect the connector a_1 and measure the resistance between the white wires.
Normal (Standard)

Temperature °C	15	30	45	75
Resistance value kΩ	12.7	7.0	4.1	1.6

If normal, proceed to 2.
Faulty: Replace the thermistor.

2. Is the modulating valve operating normally?



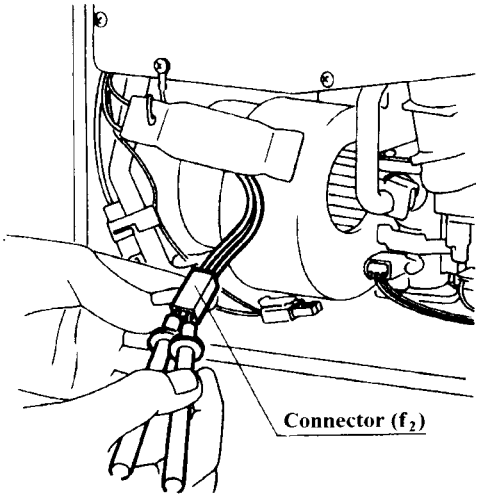
① ✻ Remove the modulating valve festoon terminal and measure the resistance between the terminals (not shown in diagram).
Normal: 62 ~ 92 Ω
If normal, proceed to ②.
Faulty: Replace the modulating valve.

② Measure the voltage between the two orange wires of the modulating valve terminals (shown in diagram).
Normal: DC 1.2 ~ 14 V.
If normal, proceed to ③.

③ Check the change in secondary gas pressure at test point when the remote control temperature is altered from 37 °C to 55 °C.
Normal: If the secondary pressure changes.
Faulty: If the secondary pressure does not change, replace the modulating valve.

Anti-frost heater does not operate.

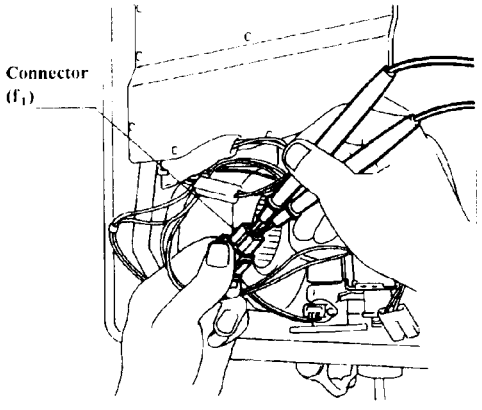
1. Is the anti-frost heater OK?



① ❋ Disconnect PCB connector f_2, and measure the resistance between white and white on the heater side.

Normal: 25 Ω
If normal, proceed to ②.

Faulty: Replace the anti-frost heater assembly.

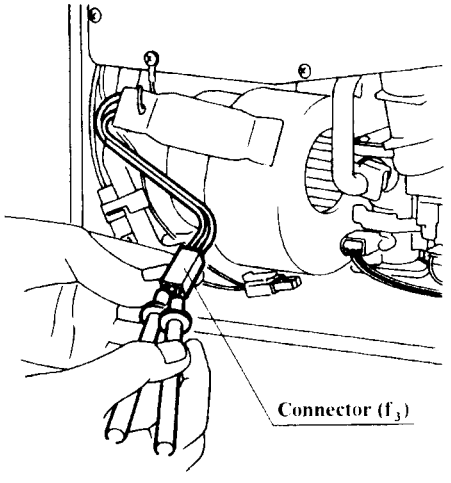


② ❋ Disconnect the PCB connector f_1 and measure the resistance between white - white on the heater side.

Normal: 125 Ω
If normal, proceed to 2.

Faulty: Replace the anti-frost heater assembly.

2. Is the temperature sensing switch operating normally?



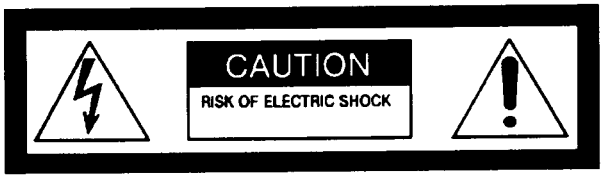
① ❋ Disconnect PCB connector f_2, and measure blue - blue resistance. (perform the measurement with temperature at 4 ± 3°C.)

Normal: Less than 1 Ω
If normal, check the wiring (AC 240 V) circuit.

Faulty: Replace the temperature sensing switch.

Note: When the temperature is too high, cool the switch with ice, for example.

§ 22 CONVERSION PROCEDURE



Refer to page 6 for detailed combustion specification.

1) Disconnect electrical supply.

2) Remove front panel cover (4 screws).

3) Remove manifold cover (12 screws) and manifold (4 screws).

4) Exchange main injectors × 12(a).

For conversion from NG to LP, LP to NG: There is no need to exchange burner.

For conversion to Town Gas from NG or LP only: Exchange damper and burner.

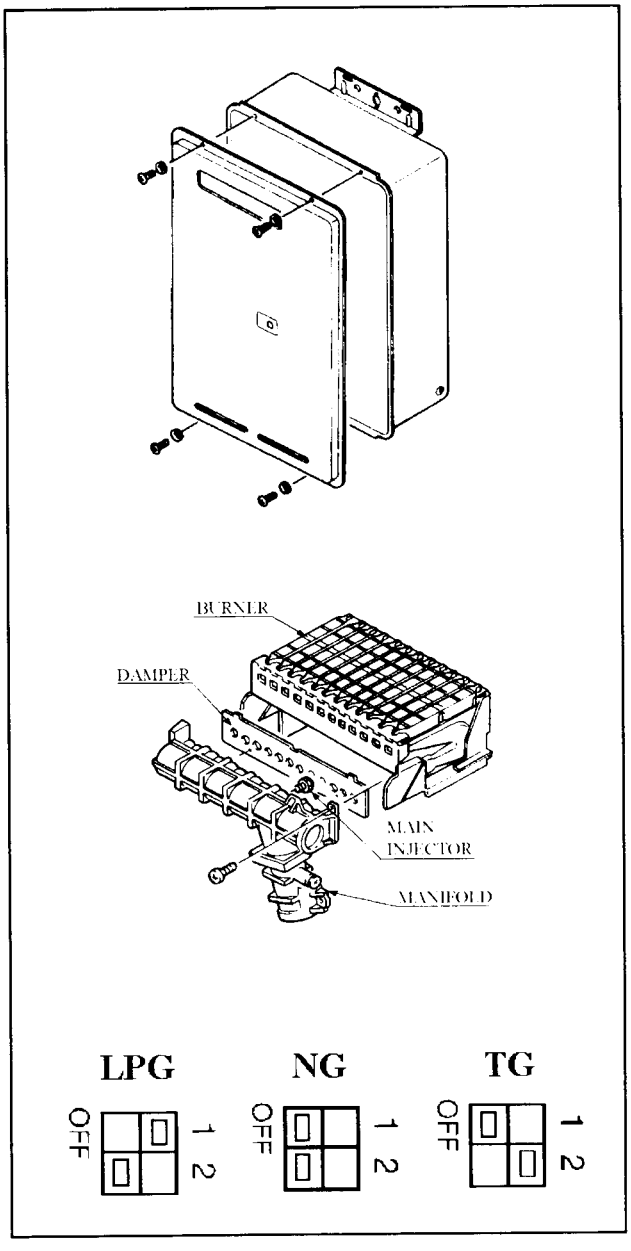
5) Replace manifold (4 screws) and manifold cover (12 screws).

6) Remove PCB plastic cover. Position gas type selection switches to the correct position. See diagram opposite.

NOTE: Do not alter other Dip switch positions.

7) Remove pressure point screw and attach pressure gauge.

8) Connect electrical supply. **Take care with connections, 240 V.**



9) **Pressure Adjustment *with water flowing*.**

1. **LOW**

   a. Place N° 7 switch to ON position.

   b. Remove plug in base of unit for access to regulator screw. Adjust regulator screw.

LPG	0.16 kPa
NG	0.08 kPa
TG	0.06 kPa

   c. Place N° 7 switch to OFF position.

   Lock regulator screw.

2. **HIGH**

   a. Place N° 8 switch to ON position.

   b. Adjust HI potentiometer on PCB.

LPG	1.91 kPa
NG	0.73 kPa
TG	0.40 kPa

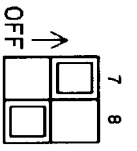
   c. Place N° 8 switch to OFF position.

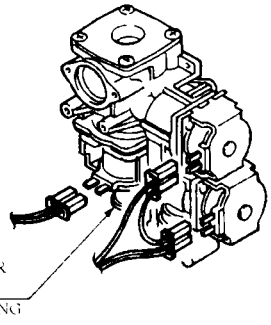
   d. Turn unit OFF.

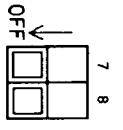
10) Remove pressure gauge and replace test point screw. Replace plastic cover.
Replace plug in base

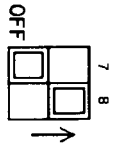
11) Check for gas escapes.

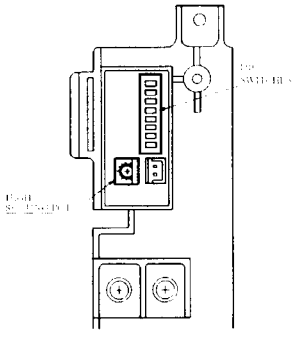
12) Replace front panel (4 screws).

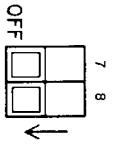












§ 23 DISMANTLING FOR SERVICE

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

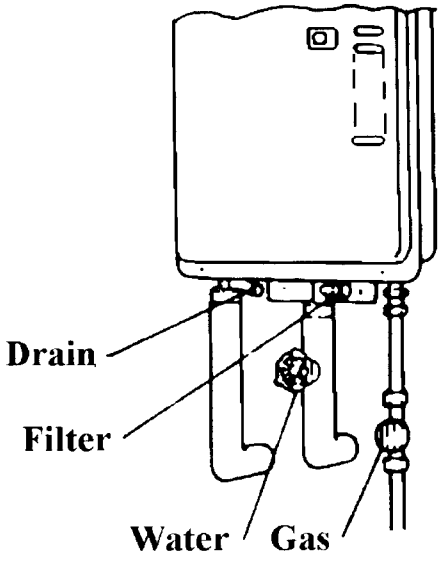
eg. - Isolate gas supply.
- Disconnect electrical supply from wall socket.
- Isolate the water supply.
- Drain **all** water from the appliance.

IMPORTANT

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

* Close the gas valve.
* Remove the power plug from the wall socket.
* Isolate water supply.
* Drain all water from appliance.

The following diagram may be of assistance.



1) Removal of the Front Panel

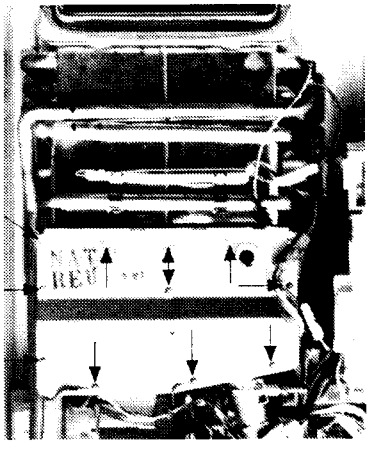
CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove the front cover (4 screws).

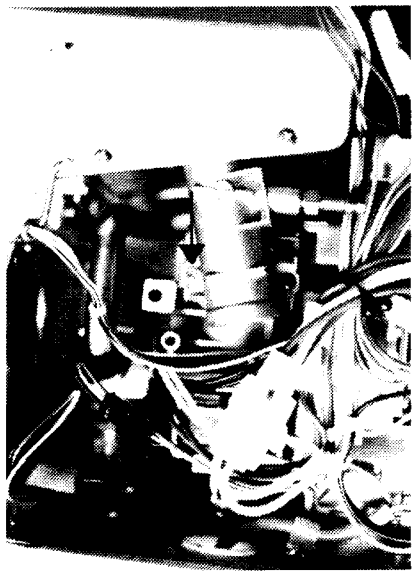
2) Removal of the Burner Unit

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove combustion chamber cover. (12 screws)

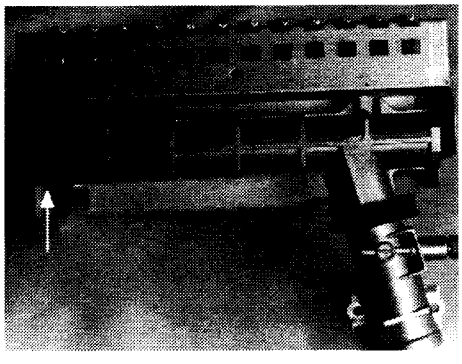


② Disconnect the manifold and gas control connection (2 screws).

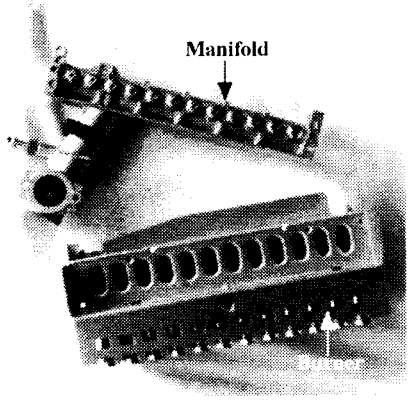


③ Remove the manifold and burner unit assembly from the combustion chamber, by gently pulling forward.

④ Disconnect the manifold. (2 screws)



⑤ Remove damper if attached. (2 screws) (Town gas unit only)

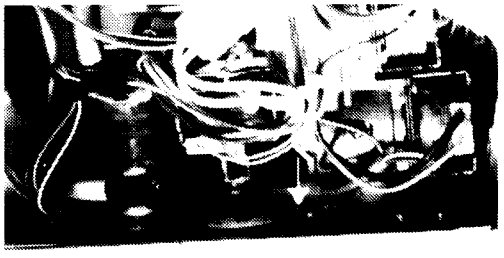


3) Removal of the Gas Control Assembly

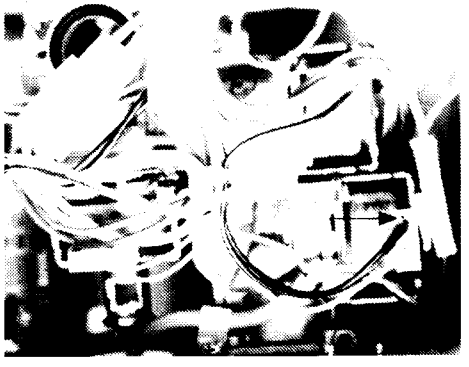
CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove manifold and burner unit assembly. Refer to 2) ① ~ ③.

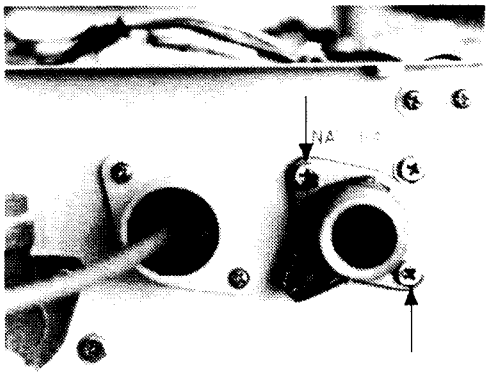
② Remove the power cord, cable clamp screw.



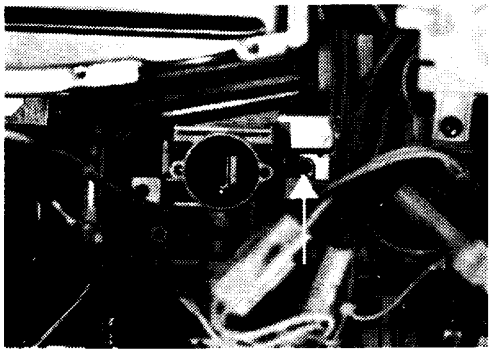
③ Pull off the 3 positive lock terminals from solenoid coils. (Black, yellow) (Black, pink) (Pink, pink).
Don't pull wires.



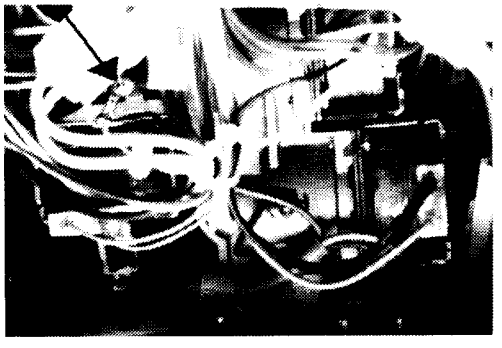
④ Remove gas inlet connection. (2 screws)



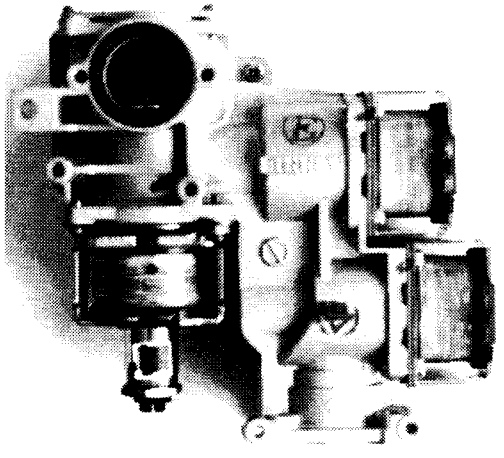
⑤ Remove the gas control assembly fixing screw. (3 screws)



⑥ Disconnect Earth wire from gas control assembly. (1 screw)



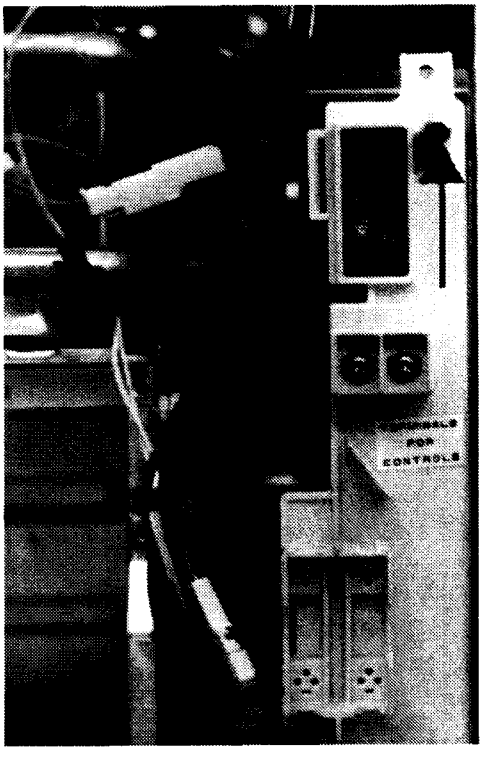
⑦ Remove gas control assembly from appliance.



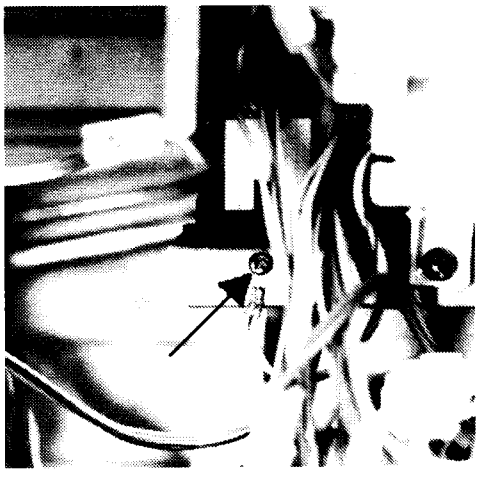
4) Removal of the PCB Unit

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove plastic PCB cover. (1 screw)

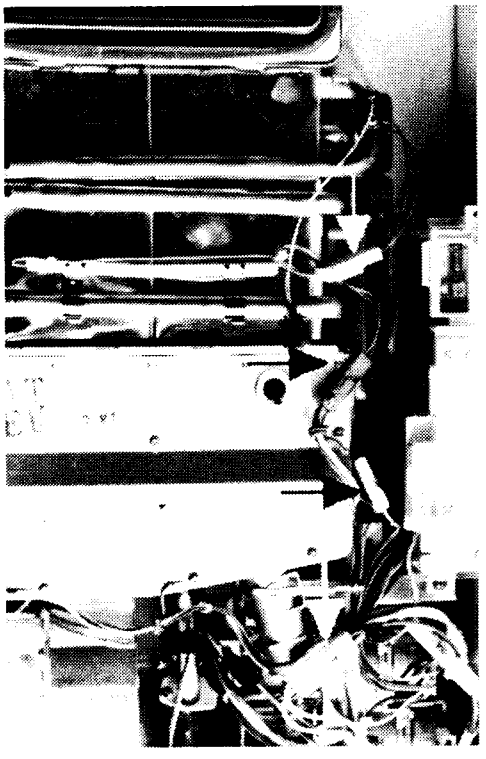


② Disconnect the Earth wire. (1 screw)

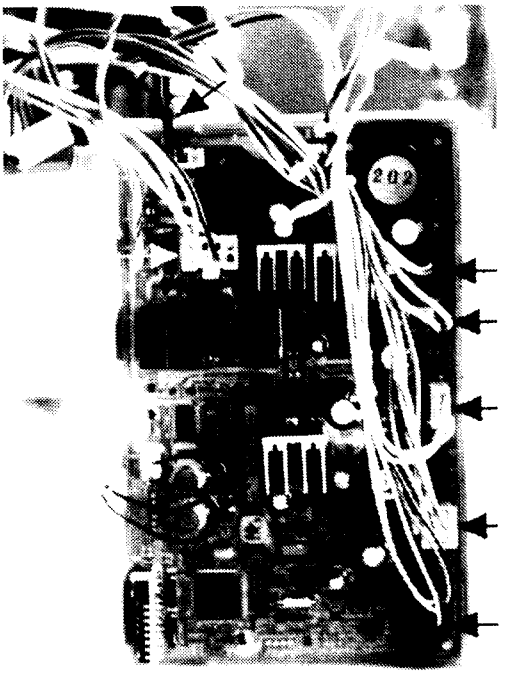


③ Remove PCB fixing screws. (2 screws)

④ Detach connectors, and remove PCB Unit from appliance.



⑤ Remove PCB and disconnect 7 connectors.



5) Removal of the PCB Transformer

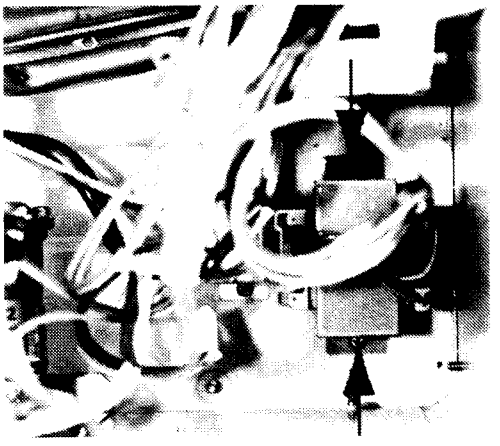
CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove the gas control assembly. Refer to 3) ① ~ ⑦.

② Remove PCB unit. Refer to 4) ① ~ ⑤.

③ Undo clips.

④ Remove transformer. (2 screws)

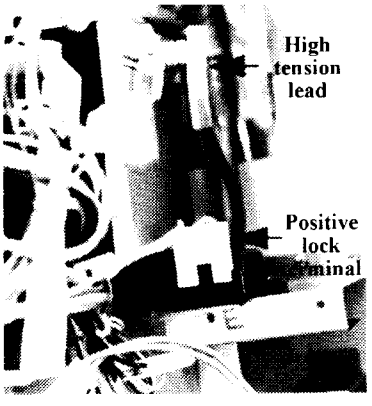


6) Removal of the Sparker

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

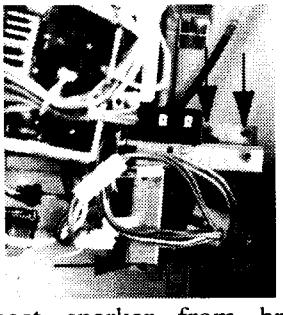
① Remove the gas control assembly. Refer to 3) ① ~ ⑦.

② Remove the PCB Unit and position it over the combustion chamber. There is no need to disconnect connections to PCB Unit. Refer to 4) ① ~ ④.

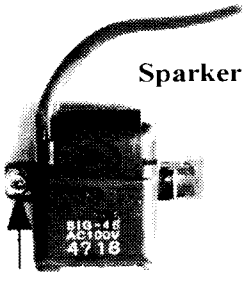


③ Pull off high tension lead from the electrode, and the positive lock terminal (grey, grey) from the sparker.

④ Remove gas control/sparker/PCB bracket. (3 screws)



⑤ Disconnect sparker from bracket. (1 screw)

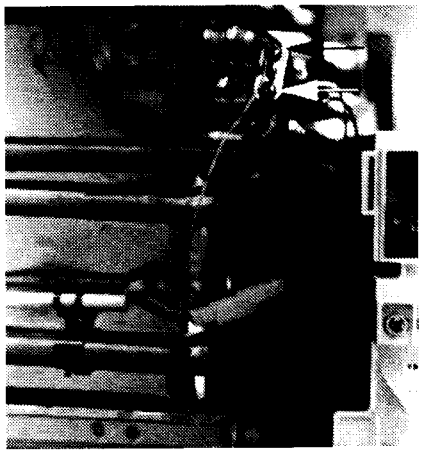


7) Removal of the Thermistor

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Disconnect the black 2P connector (white, white), from the wire harness.

② Remove thermistor. (2 screws)

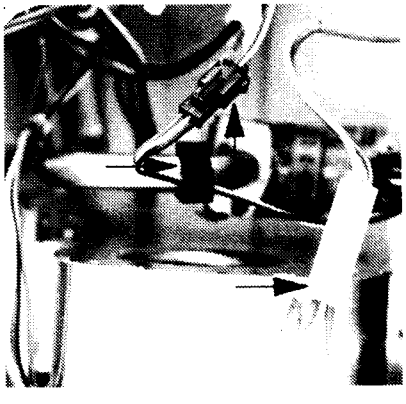


8) Removal of the Mechanical Water Flow Control Device

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

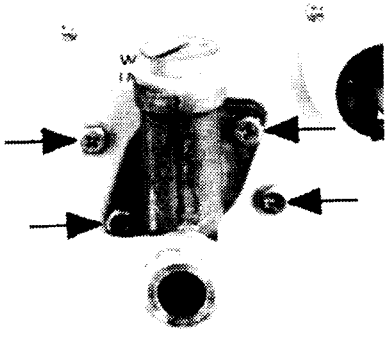
① Disconnect the black water flow sensor 3P connector (red, yellow, black) from the harness.

② For anti-frost unit, disconnect the white 2P anti-frost heater connector (blue, blue) B from anti-frost heater A, and remove the cable clamp (black).

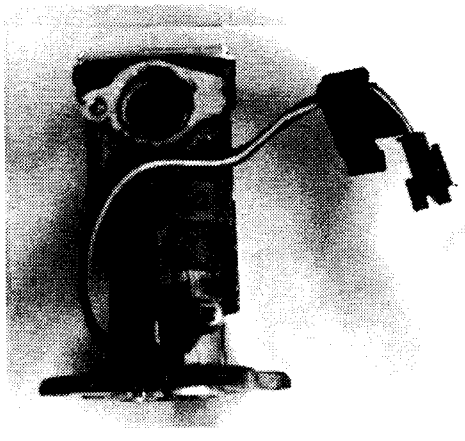


③ Disconnect the water flow control device from heat exchanger inlet pipe. (1 screw)

④ Remove the water flow control device. (4 screws)



⑤ For anti-frost unit, remove the anti-frost heater B from mechanical water control device.



9) Removal of the Frost Sensing Switch

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Disconnect frost sensing switch white 2P connector (blue, blue).

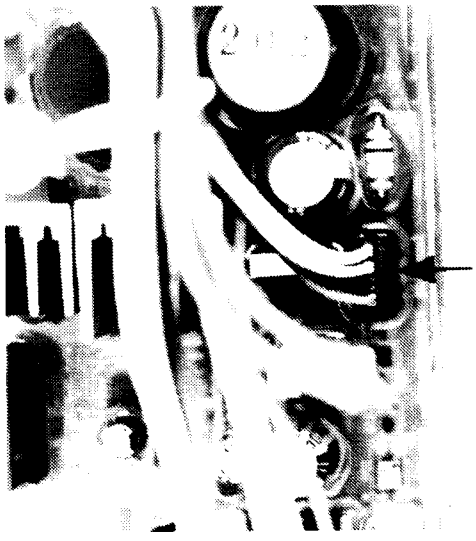
② Disconnect anti-frost heater A.

10) Removal of the Fan Motor / Casing

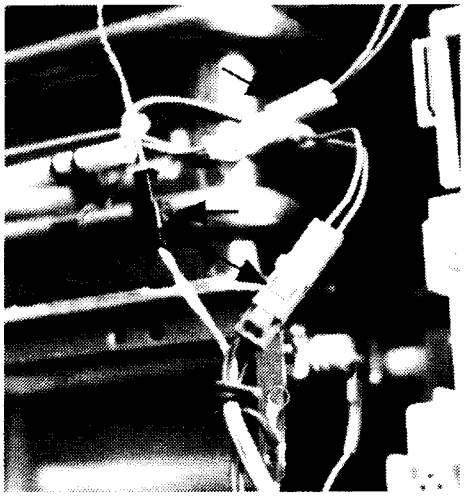
CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Remove the PCB Unit. Refer to 4) ① ~ ④.

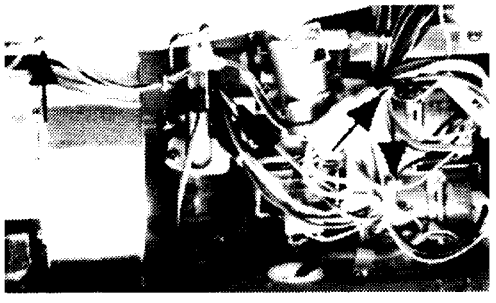
② Remove the PCB cover and remove the black fan motor 4P connectors (red, black, yellow white).



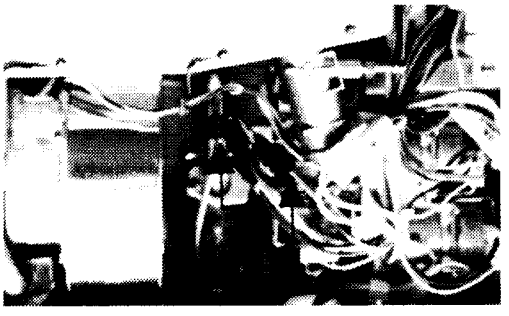
③ Disconnect the black thermistor 2P connector (white, white), the white 2P connector (red, red) and the red 2P connector (red, red) to the thermal fuse, and the white flame rod 1P protector (yellow harness).



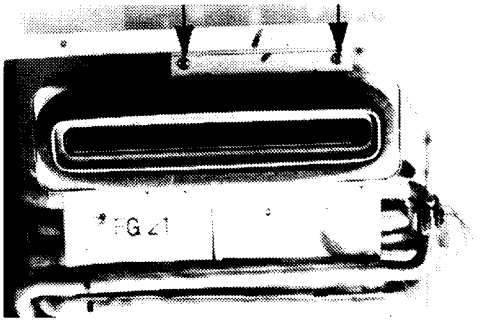
④ Release all clips from harness.

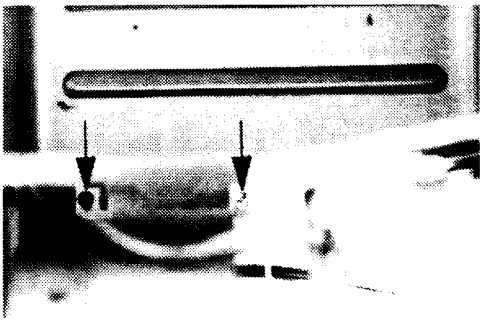


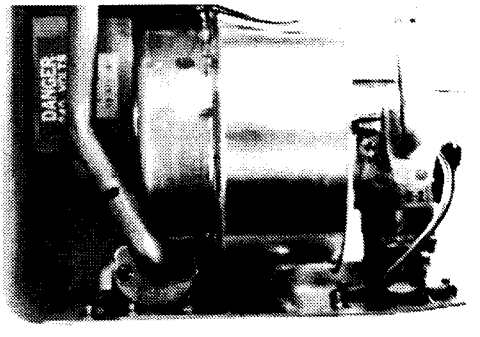
⑤ Disconnect the 2 white 2P connectors (blue, blue) to the anti-frost heater A, and the black 3P connector (red, yellow, black) to the water flow sensor, and remove the cable clamp (black) attached to the cold water connecting pipe.

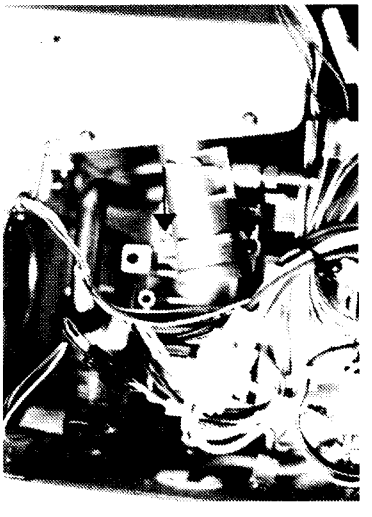


⑥ Remove the 4 heat exchanger screws (2 above, 2 below), the 1 hot water connecting pipe screw, the 1 cold water connecting pipe screw and the 2 manifold screws.

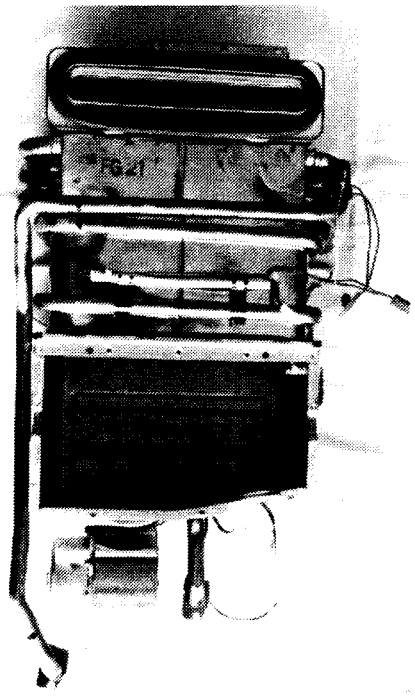




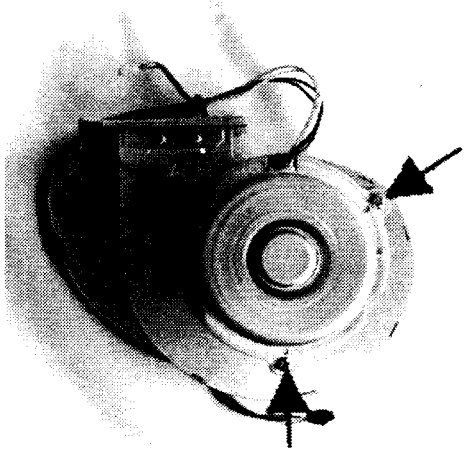




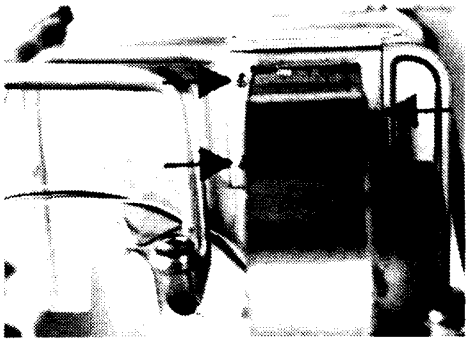
⑦ Remove the heat exchanger, burner, and fan motor assembly from the main casing of the appliance.



⑧ Remove the fan motor from the fan casing, if only the fan motor needs replacing. (3 screws)



⑨ If the fan casing also needs to be removed, detach the fan casing with the fan motor from the base of the combustion chamber. (3 screws)

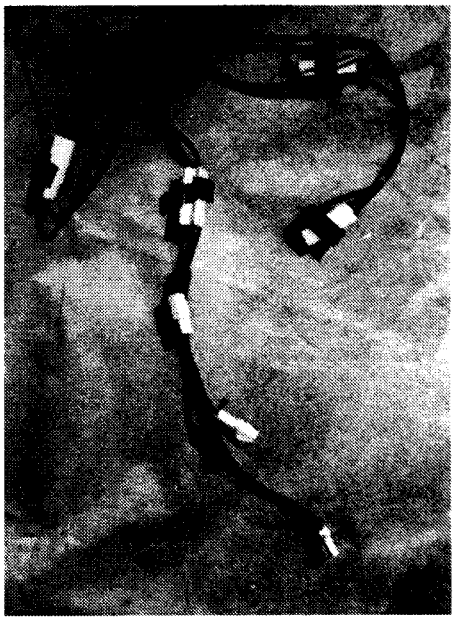


11) Removal of the Anti-frost Heater Assembly

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Remove the heat exchanger, burner, and fan motor assembly from the appliance. Refer to 10) ① ~ ⑥.

② Disconnect the white 2P connector to the frost sensing switch (blue, blue) and remove the 4 heater clips from the heat exchanger.

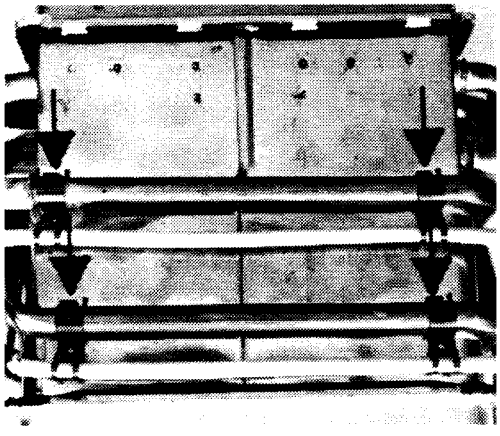


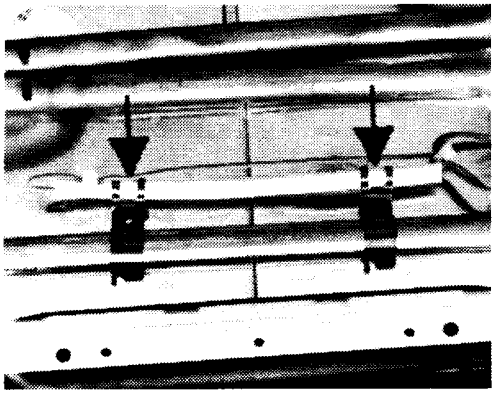
12) Removal of the Thermal Fuse Assembly

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Remove the heat exchanger, burner, and fan motor assembly from the appliance. Refer to 10) ① ~ ⑥.

② Remove the 6 clips (front, 2; back, 4) from the heat exchanger.



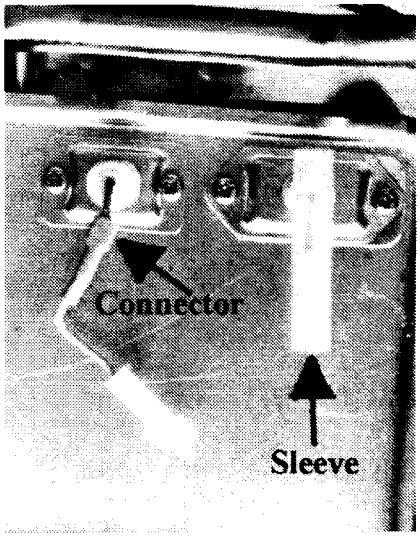


13) Removal of the Electrode and Flame Rod

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

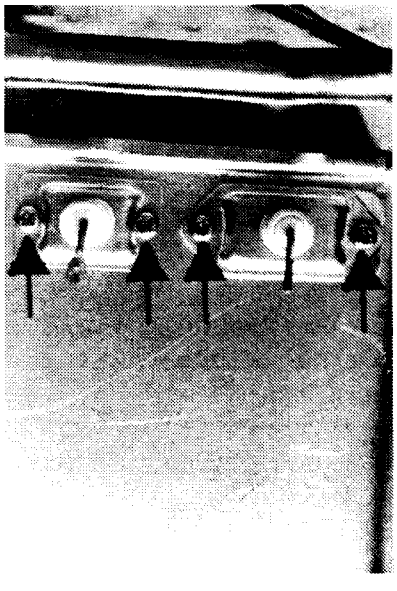
① Remove the heat exchanger, burner, and fan motor assembly from the appliance. Refer to 10) ① ~ ⑥

② Remove the sleeve from the electrode and the connector (yellow) from the flame rod.



③ Remove the 2 electrode and 2 flame rod screws.

Electrode, flame rod.



14) Removal of the Remaining Flame Safety Device

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter.

① Remove the remaining flame safety device. (1 screw)

② Disconnect connector c_3 (red-red).

15) Removal of the Heat Exchanger

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Remove the heat exchanger, burner, and fan motor assembly from the main body. Refer 10) ① ~ ⑥.

② Remove the thermistor. Refer to 7) ②.

③ Remove the fan casing. Refer to 10) ⑧.

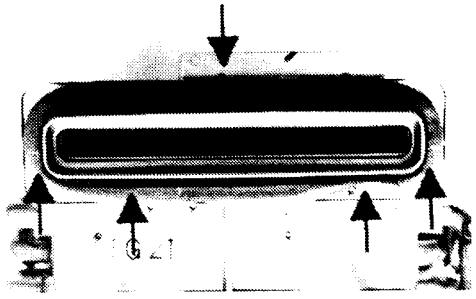
④ Remove the anti-frost heater A and frost sensing switch. Refer to 11) ②.

⑤ Remove the thermal fuse. Refer to 12).

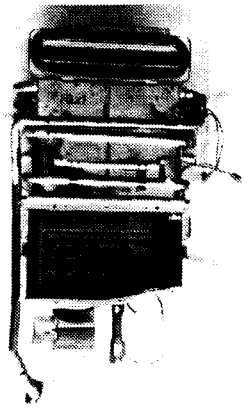
⑥ Remove the electrode and flame rod. Refer to 13) ③.

⑦ Remove the remaining flame safety device. Refer to 14).

⑧ Remove the front panel assembly packing and the exhaust outlet (5 screws).



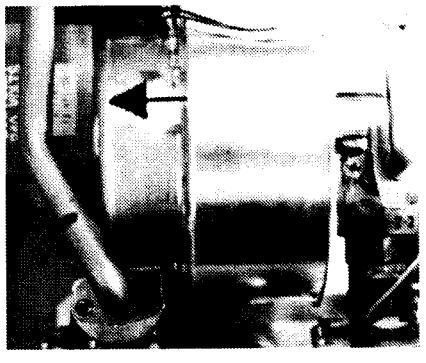
Note: The heat exchanger assembly comes complete with combustion chamber and exhaust hood attached.



16) Removal of the 240 ~ 100 V Transformer

CAUTION: 240 Volt exposure. Isolate the electrical supply to the appliance and reconfirm with a neon screwdriver or multimeter. Isolate water supply.

① Remove front cover.
② Disconnect water outlet pipe (1 screw).
③ Remove 2 screws securing transformer.
④ Manoeuvre transformer out of appliance through opening.
⑤ Disconnect connectors.



PARTS LIST REU-1616W-A, AK

Issued by Technical Support Services - Melb

No.	Part Name	RJ Part No.	RA Part No.	RNZ Part No.	QTY
001	Main Body Assembly - Standard	DU168-1510-1			1
001	Main Body Assembly - Rustproof	DU168-1510-2		3002	
004	Heat Shield A	CU168-123X02			1
006	Front Panel Assembly - Standard	CU168-1511-1X01	92073014	3003	1
006	Front Panel Assembly - rustproof	CU168-1511-2X02	92073006		1
009	Wall Bracket F (SPCC)	BU129-121fX01			2
009	Wall Bracket D (SGCC)	BU129-121-Dx01			2
013	Main Body Packing A	BU103-105X02	92073345	3572	1
014	Main Body Packing Sides	BU131-129		3004	2
015	Wiring Reinforcement Panel	BU168-121X02			1
016	Cable Connection	BU56-602X02-N			1
017	Cable Seal Packing	AU169-126			1
100	3/4" Gas Connection	BCF2-417X02	92073360	3836	1
101	Gas Control Assembly (LP/NG)	C36B-2	92072990	3005	1
101	Gas Control Assembly (TG)	C36B-1	92072982		1
102	Manifold Assembly B	DU168-204-2	92072974		1
103	Main Injector - LP	AU129-210X02-1.0	92072958	3558	12
103	Main Injector - NG	AU129-210X02-1.7	92072966	3814	12
103	Main Injector - TG	AU129-210X02-2.9	92072941		12
104	Damper (TG only)	BU168-259	92072933		1
105	Burner Unit Assembly (TG)	CU168-251-2X01	92072925		1
105	Burner Unit Assembly (LP, NG)	CU168-252X01	92074806		1
106	Burner Box Front	CU168-255X01			1
107	Horizontal Bunsen Burner (TG)	B3A1-1X06	92073444	3014	12
107	Horizontal Bunsen Burner (LP/NG)	B3A1-4X06	92073451		12
108	Burner Box, Rear Panel	BU168-256			1
109	Electrode Clip	AU168-323			1
110	Electrode	AU168-321	92072917	3016	1
111	Ignition Target	AU168-325X01	92073469		1
112	Electrode Packing	AU168-326X01	92072909	3017	1
113	Flame Rod Clip	AU168-324			1
114	Flame Rod	AU168-322	92072891	3018	1
115	Combustion Chamber Front Panel	CU168-311X02			1
116	Heat Exchanger Complete Assy	DU168-402X02	92072883	3019	
117	Exhaust Outlet Packing	BU168-363X01	92072875		1
118	Exhaust Outlet	BU168-361X01			1
119	Front Panel Seal Packing	AU168-362	92072867		1
125	Gas Inlet "O" Ring	OR1AP24NP	92072859	3559	1

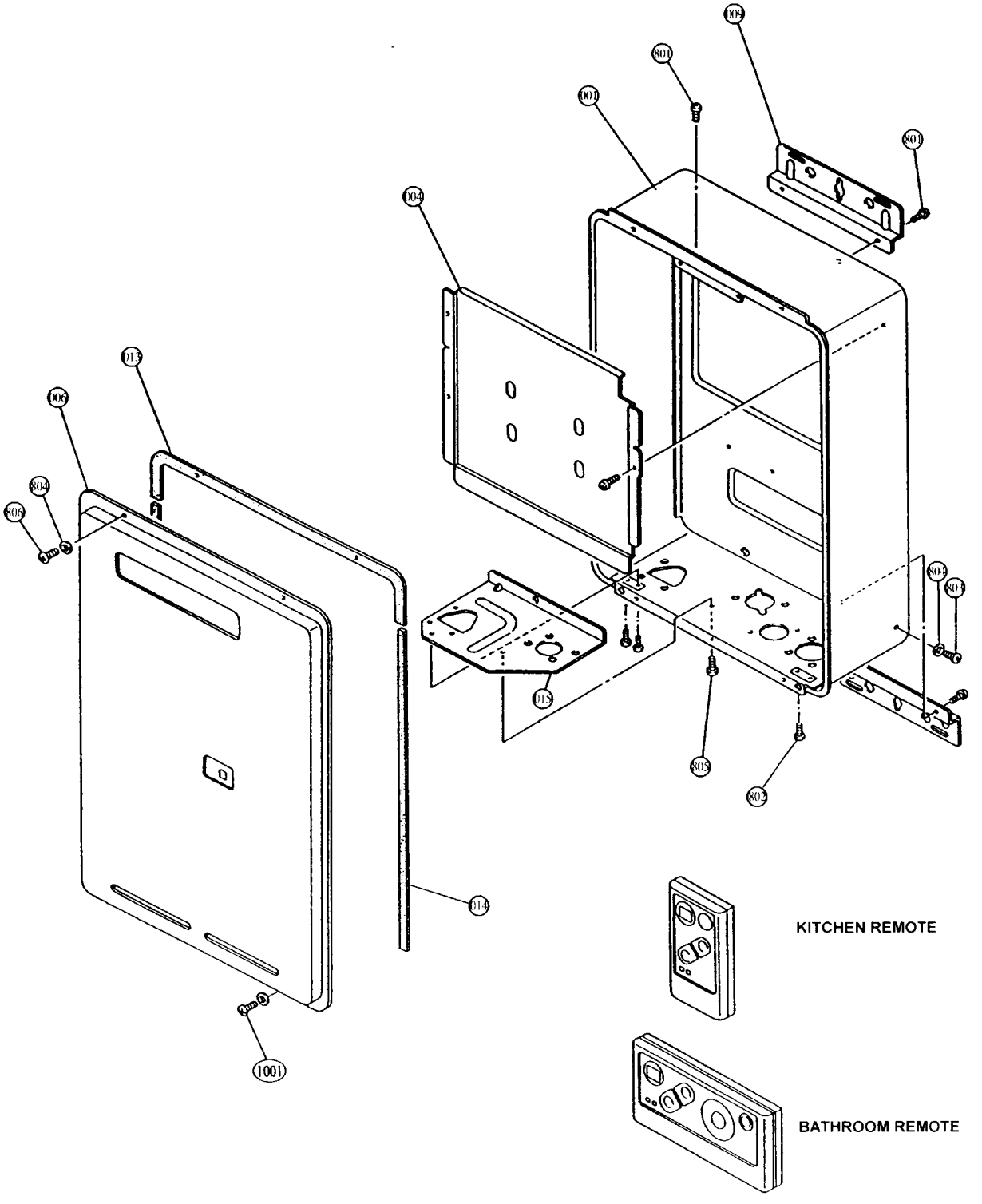
No.	Part Name	RJ Part No.	RA Part No.	RNZ Part No.	QTY
126	Fan (Complete Assembly)	CU168-611X01	92078252		1
127	Fan Casing Assembly	CU168-612X01			1
128	Fan Bracket	BU168-616X01			1
129	Motor Assembly	BH38-351-CCWX02		3020	1
130	Sirocco Fan Assembly	BH36-622		3023	1
131	Fan Bracket Seal	AU169-556X01	92073535	3025	1
133	Electrode Sleeve	AU102-681X01			1
134	High Tension Lead	BH38-710-120			1
135	Gas Valve "O" Ring	C36B3-4	92072842	3012	
*400	1/2" Cold Water Connection	BH39-400-2X02			1
401	Filter	M8D1-11X01		3048	1
402	Plug Band L	AU115-344X01			1
403	Cold Water Supply Filter Assembly	AU115-343	92062280	3839	1
*404	Filter Plug	AU101-502X03	92072834	3609	
*405	Mechanical Water Regulator	M8D-2	92095561	3027	1
*406	1/2" Hot Water Connection	BU129-515X02	92071273		1
407	Hot Water Supply Plug Clip	AU129-526			1
*408	Drain-off Valve Assembly	BU129-520-CX02		3870	1
409	Water Filter "O" Ring	M10B-2-12	92063551	1106	1
410	Water Inlet "O" Ring	M10B-2-18/	92072818	3013	1
411	Heat Exchanger "O" Ring	M10B-2-12.5	92072800	3165	2
412	Thermistor "O" Ring	M10B-2-4	92062249	3832	1
413	HX Outgoing Water Temp. Thermistor	BU124-621S-2	92072792	3029	1
414	Thermistor Clip	CP-90172		3882	1
415	Pressure Relief "O" Ring	M10B-2-7	92062348	3849	1
416	Solenoid Valve Harness	BU168-711X02		3033	1
417	Fan Motor Harness	BU169-602X02	92073600	3034	1
418	Sensor Harness	BU169-603X02		3035	1
419	Flame Rod Harness	AU169-608-1X02		3037	1
701	P. C. B. Unit	CU168-1530X02	92072784	3039	1
703	P. C. B. Cover	BU168-706X02		3040	1
704	P. C. B. Cover Front	BU168-707		3041	1
705	Power Supply Cord	CP-90386	90161894		1
706	Sparker	EI-144	92072776	3042	1
707	Gas Control Bracket	BU168-126X03			1
708	P. C. B. Transformer Assembly	ET-150X02	92072768	3043	1
709	Anti-Frost Heater Assembly	AU132-1126X01	92073659	3044	1
710	Heater Mounting Plate	AU100-721X03			4

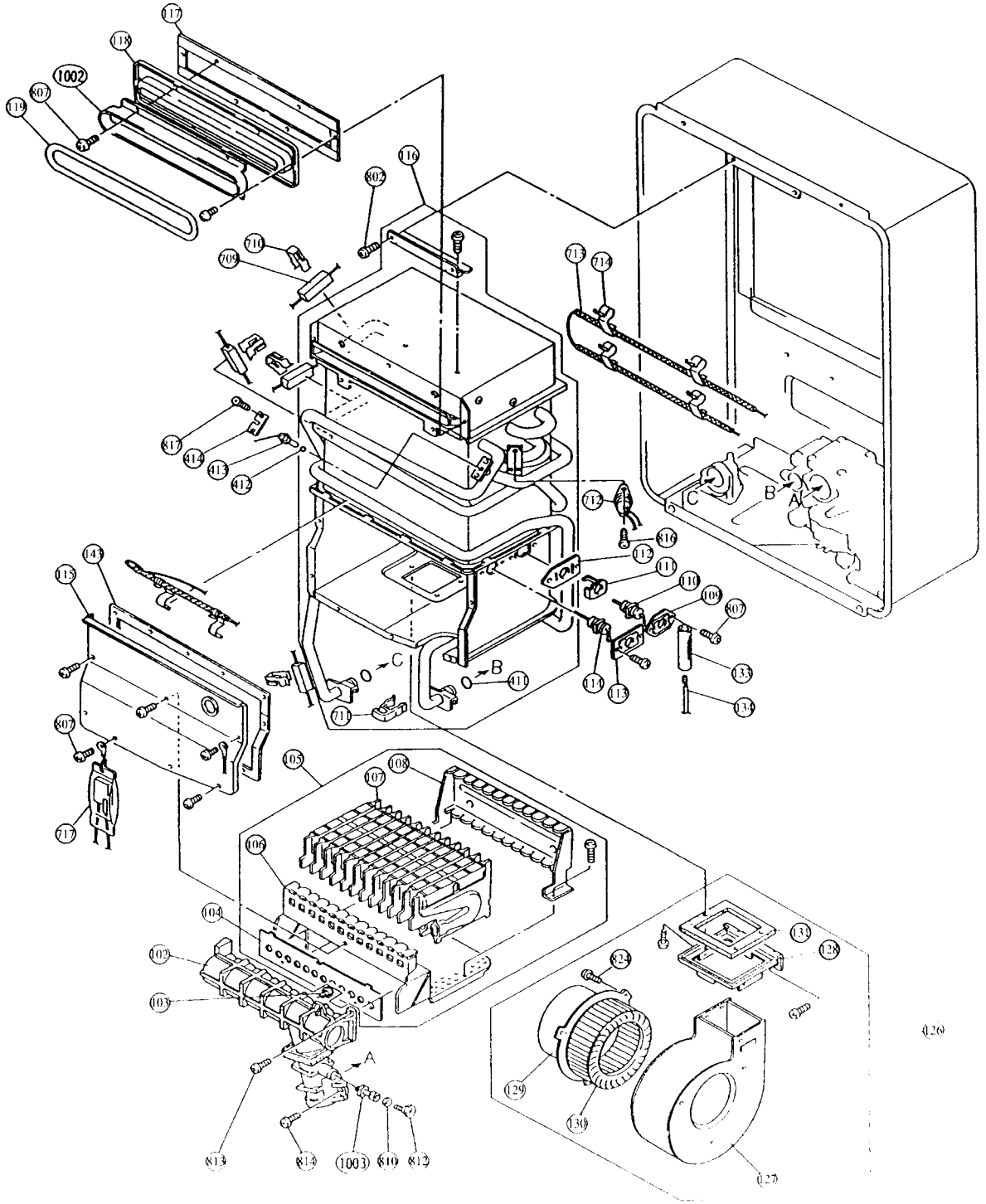
PARTS LIST REU-1616W-A, AK

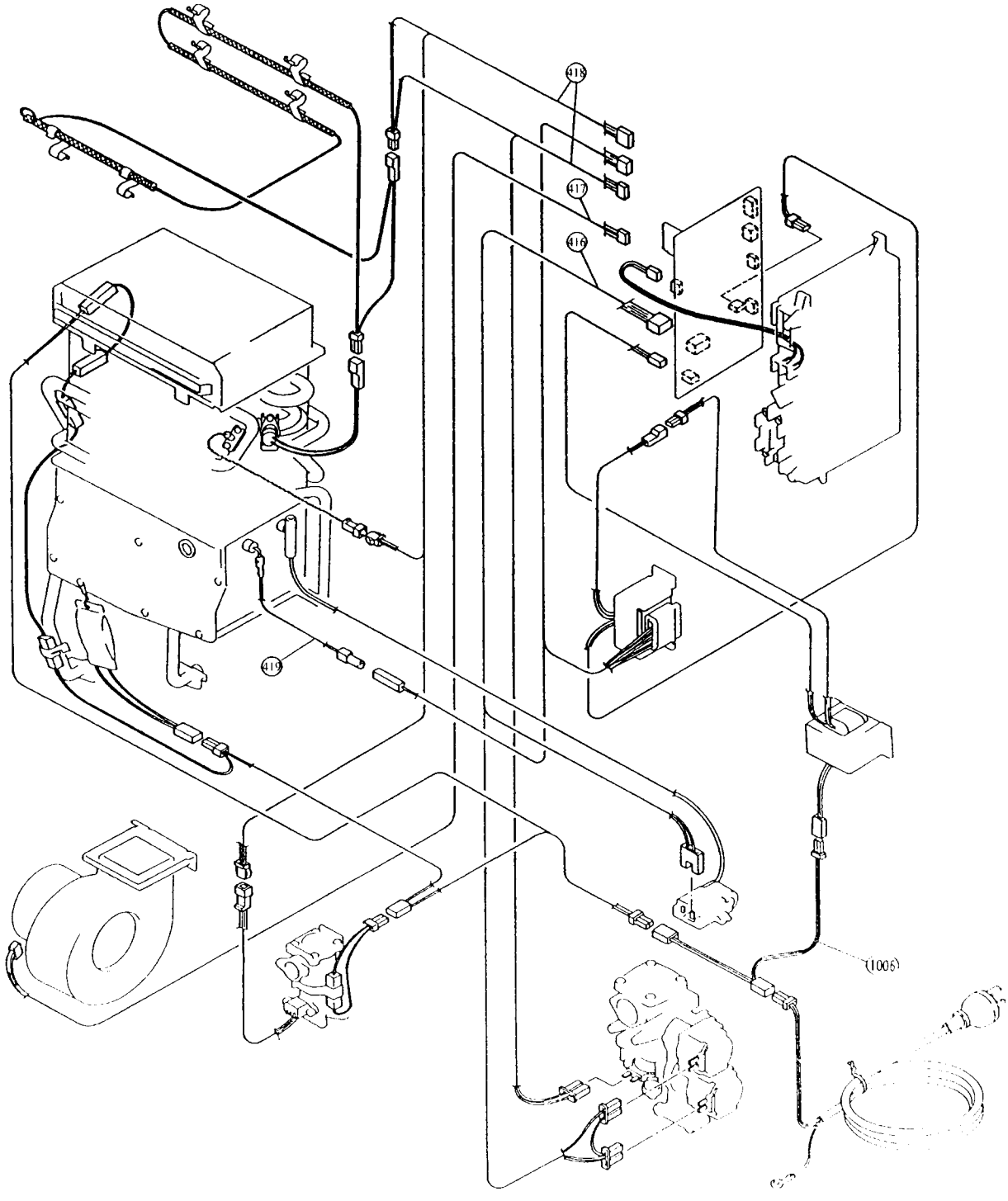
Issued by Technical Support Services - Melb

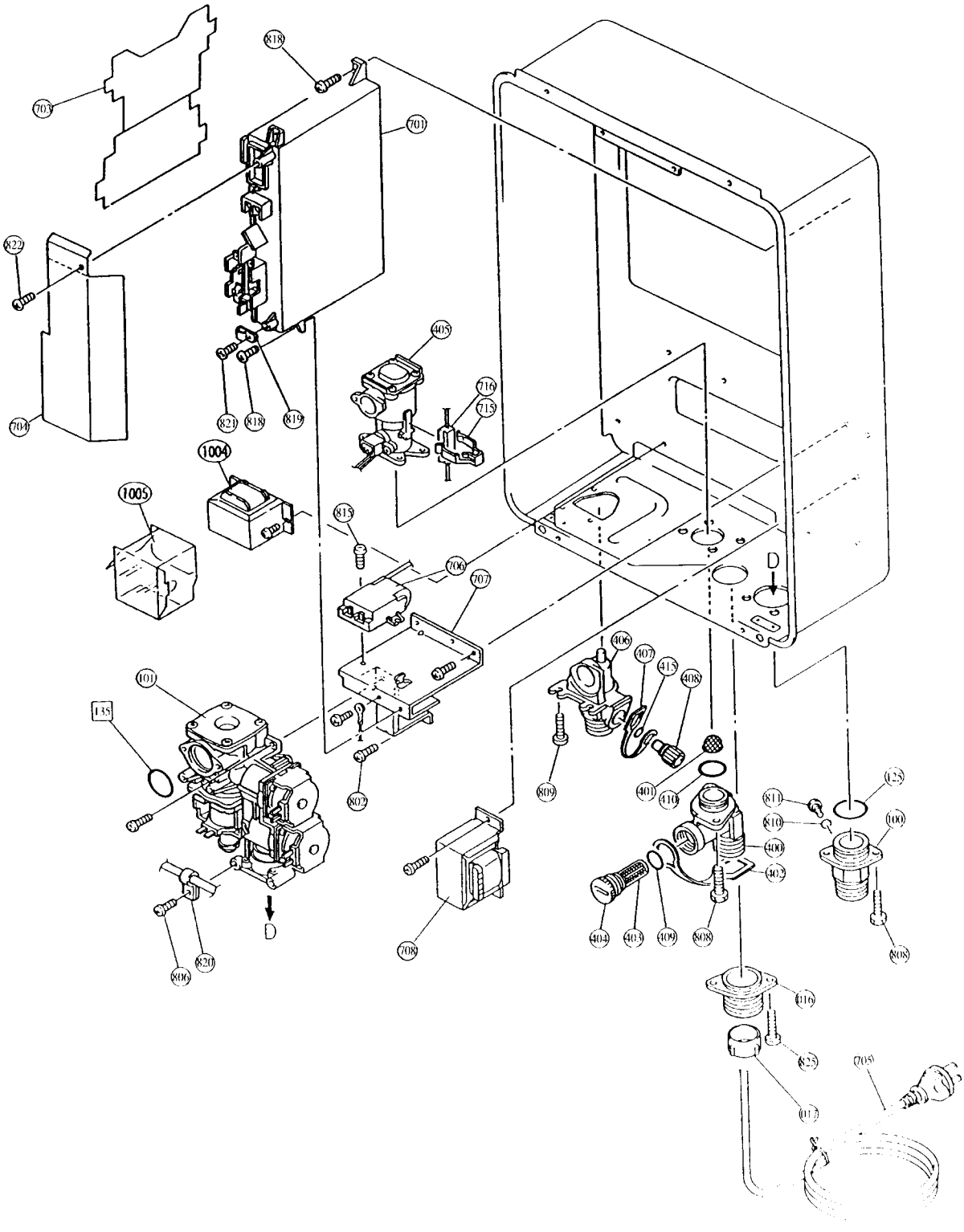
No.	Part Name	RJ Part No.	RA Part No.	RNZ Part No.	QTY
711	Harness Clamp	AU129-685X01			1
712	Over - Heat Switch	BU129-820	92072750	3045	1
713	Thermal Fuse Harness Assembly	BU168-721X02	92072743	3046	1
714	Fuse Clip A	CP-80531			6
715	Heater Mounting Plate	BH39-719X01			1
716	Anti-Frost Heater Assembly	BU168-1531X02	92063593	3047	1
717	Frost Sensing Switch - C	CH643-CX02	92069079	3976	1
722	Surge Arrestor	BU195-1643			
723	Relay Harness	AU168-1544			
724	EMC Bracket	BU168-1545			
	Kitchen Remote Control Assembly (pre-M	MC-33-1A	92072495	MC-33-1A	1
	Bath Remote Control Assembly (pre Mar	BC-45-1A	92072503	BC-45-1A	1
	Kitchen Remote Control Assembly(post M	MC-33-2A	92078583		1
	Bath Remote Control Assembly (post Ma	BC-45-2A	92078591		1
	Instruction Book (for Australia)	BU168-1570			1
	Instruction Book (for New Zealand)	BU168-1573			1
1001	External Teeth Set Truss Screw	ZHDC0408UK			
1002	Wind Shield Assy	BU168-1520X01			1
1003	Pressure Test Point	C10D-4			1
1004	Main Transformer 240V - 100V	ET-160	92072735	3061	1
1005	Transformer Cover	BU168-1533		3067	1
1006	Fuse Harness	AU195-1630			1

§ 25 EXPLODED DIAGRAM









SERVICE CONTACT POINTS

Rinnai AUSTRALIA PTY. LTD. A.C.N. 005 138 769

Victoria :	**Service**	Tel: (03) 9271 6699 Fax: (03) 9271 6688
	Spare Parts	Tel: (03) 9271 6600 Fax: (03) 9271 6688
	Sales	Tel: (03) 9271 6666 Fax: (03) 9271 6611
		Emergency Hot Water Tel: (1800) 632 386
		10-11 Walker Street, Braeside, VIC 3195
		Tel: (03) 9271 6625 Fax: (03) 9271 6622
New South Wales:	**Service**	Tel: (02) 9609 2600 Fax: (02) 9729 0467
	Sales	Tel: (02) 9609 2888 Fax: (02) 9609 5260
		Emergency Hot Water Tel: (02) 9729 0468
		62 Elizabeth Street, Wetherill Park, NSW 2164
		Tel: (02) 9609 2111 Fax: (02) 9609 5260
South Australia:	**Service**	Tel: (08) 8345 0292 Fax: (08) 8345 4760
		Emergency Hot Water Tel: (018) 81 4379
		140 Days Road, Ferryden Park, SA 5010
Western Australia:	**Service**	Tel: (08) 9478 3355 Fax: (08) 9277 2531
		Emergency Hot Water Tel: (08) 9401 2562 North
		Tel: (08) 9457 1909 South
		18 Belgravia Street, Belmont, WA 6104
Queensland:	**Service**	Tel: (07) 3209 4622 Fax: (07) 3209 4722
		1/6 Booran Drive, Logan City, QLD 4114
A.C.T.:	**Service**	Tel (06) 280 4833 Fax: (06) 280 6561
		Emergency Hot Water Tel: (02) 9729 0468
		Rinnai Southern (Bird & Stirling Agencies Pty. Ltd.)
		3 Lithgow Street, Fyshwick, ACT 2609
Tasmania:		**Contact Rinnai Melbourne on:**
	Service	Tel: (03) 9271 6699 Fax: (03) 9271 6688
		Tel: (03) 9271 6625 Fax: (03) 9271 6622

Rinnai NEW ZEALAND LTD.

24 hr Service	Tel: 0800 746624 (0800 Rinnai)
	Tel: (09) 625 4285 Fax: (09) 624 3018
	691 Mt. Albert Road, Royal Oak, Auckland
	P O Box 24-068