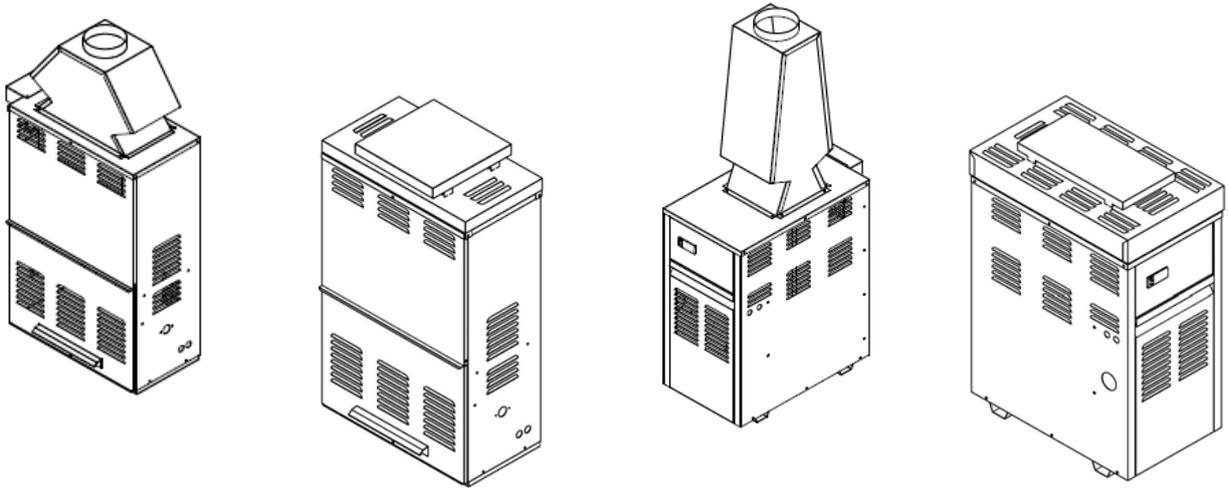


# Owners Guide and Installation Instructions



## Raypak Water Heaters



Models	Types
B0109	NCO, NCH
B0147	PCO, PCH

This water heater must be installed and serviced by an authorised person.  
Please leave this guide with the householder or responsible officer.

**Notice to Victorian Customers from the  
Victorian Plumbing Industry Commission**

**This water heater must be installed by a licensed person as required by  
The Victorian Building Act 1993**

Only a licensed person will give you a Compliance Certificate, showing that the work complies with all the relevant standards. Only a licensed person will have insurance protecting their workmanship for 6 years. Make sure you use a licensed person to install this water heater and ask for your Compliance Certificate.

**⚠ Warning:** Upon completion of the installation and commissioning of the water heater, leave this guide with the householder or a responsible officer. **DO NOT** leave this guide inside of the cover of the water heater, as it may interfere with the safe operation of the water heater or ignite when the water heater is turned on.

**Date of installation:**

---

**Model N°:**

---

**Serial N°:**

---

**Installed by:**

---

**Purchased from:**

---

**PATENTS**

This water heater may be protected by one or more patents or registered designs.

® Registered trademark of Rheem Australia Pty Ltd.

™ Trademark of Rheem Australia Pty Ltd.

# CONTENTS

---

**HOUSEHOLDER OR RESPONSIBLE OFFICER – We recommend you read pages 4 to 11.**

The other pages are intended for the installer but may be of interest

CONTENTS .....	3
ABOUT YOUR WATER HEATER .....	4
HOW YOUR WATER HEATER WORKS .....	7
SAVE A SERVICE CALL .....	9
REGULAR CARE.....	11
INSTALLATION .....	12
CONNECTIONS – PLUMBING .....	19
CONNECTIONS – ELECTRICAL.....	22
LOCATION OF CONTROLS .....	29
SAFETY PRECAUTIONS.....	30
COMMISSIONING .....	31
OPERATING THE WATER HEATER.....	32
BURNER PRESSURE ADJUSTMENT .....	33
TEMPERATURE CONTROL .....	35
SERVICE PROCEDURES.....	38
WATER SUPPLIES .....	39
WARRANTY .....	41

# ABOUT YOUR WATER HEATER

## MODEL TYPE

Congratulations for choosing a Raypak® water heater. The model you have chosen is suitable for either indoor or outdoor installation depending on use of the appropriate installation kit.

The operation of the water heater depends on the application. Typically for hot water applications a water heater with 'on/off' operation will be installed. For mechanical heating or process applications a water heater with 'Hi/Lo' operation will be installed.

## HOW HOT SHOULD THE WATER BE?

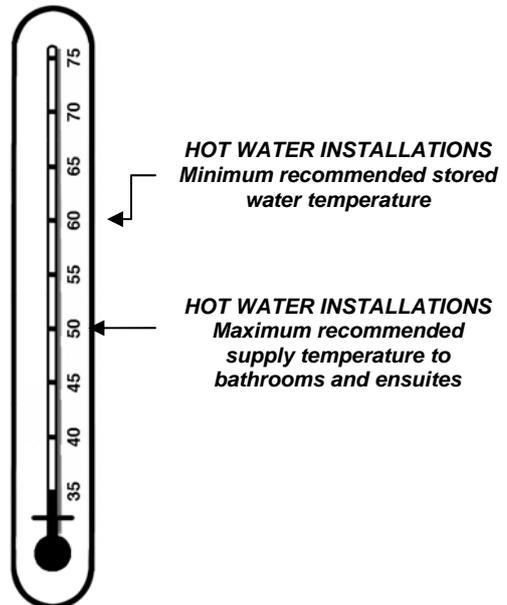
The water heater features an adjustable thermostat, which allows the most suitable temperature for the application to be chosen.

To meet the requirements of the National Plumbing Standard the temperature of the stored water for hot water applications must not be below 60°C.

## HOTTER WATER INCREASES THE RISK OF SCALD INJURY

This water heater can deliver water at temperatures which can cause scalding. Check the water temperature before use, such as when entering a shower or filling a bath or basin, to ensure it is suitable for the application and will not cause scald injury.

We recommend and it may be required by regulations that an approved temperature limiting device be fitted into the hot water piping to the bathroom and ensuite when this water heater is installed. This will keep the water temperature below 50°C at the bathroom and ensuite. The risk of scald injury will be reduced and still allow hotter water to the kitchen and laundry.



## TEMPERATURE ADJUSTMENT

The thermostat temperature will have been set by the installer to suit the application, adjustment should not be required. Consult your installer before making any adjustment to the thermostat temperature.

## ⚠ WARNING

This water heater is only intended to be operated by persons who have the experience or the knowledge and the capabilities to do so. This water heater is not intended to be operated by persons (including children) with reduced physical, sensory or mental capabilities, or lack of experience and knowledge.

Children should be supervised to ensure they do not interfere with the water heater.

The water heater uses 240 Volt AC electrical power for operation of the control systems. The removal of the access cover(s) will expose 240 Volt wiring. They must only be removed by an authorised or qualified person.

## SAFETY

For your safety do not operate this water heater before reading this instruction booklet.

This water heater is supplied with a thermostat, hi-limit thermostat and a pressure relief valve. These devices must not be tampered with or removed. The water heater must not be operated unless each of these devices is fitted and is in working order.

Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. For assistance or additional information consult your Raypak distributor, qualified installer, or Rheem® Service agent.

**The warranty can become void if relief valves or other safety devices are tampered with or if the installation is not in accordance with these instructions.**

- DO NOT store **flammable or combustible materials** near the water heater. Flammable liquids (such as petrol), newspapers and similar articles must be kept well away from the water heater and the draught diverter or flue terminal.
- DO NOT use **aerosols, stain removers and household chemicals** near the water heater whilst it is working. Gases from some aerosol sprays, stain removers and household chemicals become corrosive when drawn into a flame.
- DO NOT store **swimming pool chemicals, household cleaners, etc.**, near the water heater.
- DO NOT place anything on top of the water heater or in contact with the flue terminal. Ensure the flue terminal is not obstructed in any way at any time.
- DO NOT use Propane / Butane gas mixtures in a Propane model. A Propane model is designed to operate on Propane only. The use of Propane / Butane mixture, such as automotive LPG fuel, in a Propane model is unsafe and can cause damage to the water heater.
- DO NOT operate with panels, covers or guards removed from the water heater.
- DO NOT enclose this water heater (applies to external installations only).



If the power supply cord or electrical conduit to the water heater is damaged, it must be replaced by an authorised person in order to avoid a hazard. The power supply cord and plug must be replaced with a genuine replacement part available from Rheem. Phone your nearest Rheem Service Department or Accredited service Agent to arrange for an inspection.

Do not use the water heater if any part has been under water. Immediately call Rheem Service or Accredited service Agent to arrange for an inspection.

### WHAT TO DO IF YOU SMELL GAS?

- DO NOT try to light any gas appliance.
- DO NOT touch any electrical switch.
- TURN OFF the gas supply at the gas meter immediately, call your gas supplier or licensed gasfitter.

**NOTE:** Some gases are heavier than air and it may be necessary to check for gas leaks at floor level.

### TO TURN OFF THE WATER HEATER

If it is necessary to turn off the water heater:

- Switch off the electrical supply at the power outlet to the water heater  
**NOTE:** If the water heater is correctly installed, this will also shut down the circulating pump.
- Close the gas isolation valve at the inlet to the water heater.
- Close the cold water isolation valve at the inlet to the water heater.
- Close the isolation valves on the cold and hot water branches to shut down an individual water heater in a bank (water heating applications only).

## TO TURN ON THE WATER HEATER

**⚠ WARNING!** If you smell gas do not attempt to turn on the water heater.

- Fill the system with water (refer to “[To Fill the Water Heater](#)” on page 32)
- Open the gas isolation valve fully at the inlet to the water heater.
- Plug in the power supply cord at the power outlet.
- Switch on the electrical supply at the power outlet to the water heater.

**NOTE:** If the water heater is correctly installed, this will also activate the circulating pump.

The water heater will operate automatically when a call for heat occurs.

## HOW DO I KNOW IF THE WATER HEATER IS INSTALLED CORRECTLY?

Installation requirements are shown on page 21. The water heater must be installed by an authorised person. In Australia, the installation must comply with Standards AS/NZS 3500.4, AS/NZS 3000, AS 5601 and all local codes and regulatory authority requirements.

## DOES THE WATER QUALITY AFFECT THE WATER HEATER

The water heater is suitable for most public water supplies; however some water qualities may have detrimental effects on the finned copper tube heat exchanger and fittings. **If you are in a known harsh water area you must read page 39.** If you are not sure, have your water quality checked against the conditions described on page 39.

## HOW LONG WILL THE WATER HEATER LAST?

There are a number of factors that will affect the length of service the water heater will provide. These include the water quality, the water pressure, temperature (inlet and outlet) and the water usage pattern. However, your water heater is supported by a comprehensive warranty (refer to page 41).

## SERVICING

For safe and efficient operation, the water heater should be serviced annually by your nearest Rheem Service Department or their Accredited Service Agent. Only genuine replacement parts should be used on this water heater. Refer to “[Service Procedures](#)” on page 38

**⚠ WARNING:** Servicing of a gas water heater should only be carried out by authorised personnel.

# HOW YOUR WATER HEATER WORKS

---

The water heater consists of a gas burner, a combustion chamber lined with refractory tiles and a heat-exchanger made of finned copper tubes. Hot flue gases from the burner pass between the fins on the heat exchanger tubes and heat is transferred first to the fins and then by conduction into the water. Baffles are placed between the tubes to control the flow of the hot flue gases and ensure efficient operation of the water heater. The refractory tiles insulate the combustion chamber to minimise loss of heat and protect the surroundings from the temperature of the burner flames. The gas supply to the burner is controlled by a thermostat, which senses the temperature of the water.

Automatic safety controls are fitted to the water heater:

- to ensure safe ignition of the gas whenever there is a call for heating;
- to continuously monitor the burner flame; and
- to prevent excessive temperatures or pressures in the water system.

## MAINS PRESSURE

In water heating applications, the water heater is designed to operate in conjunction with one or more hot water storage tanks, which would be connected directly to the mains water supply. If the mains supply pressure in your area exceeds the value shown in the table on page 15 or the maximum inlet pressure for the storage tanks, a pressure limiting valve must be fitted.

In mechanical and process heating applications, the system pressure must not exceed the value shown in the table on page 15.

## 109 MODELS

### On/Off Operation

109 On/Off models are fitted with a mechanical thermostat, adjustable from 0°C to 95°C that operates the gas control by switching its power on and off, so a constant temperature is maintained. The thermostat and the protective over temperature cut out are mounted on the control panel which is located behind the lower front cover of the water heater (refer to "[Location of Controls](#)" on page 29).



There is no need to switch the water heater off when it is not in use. The thermostat is fully automatic and only allows the gas control to open when the burner requires gas for heating. To adjust the thermostat settings refer to "[Temperature Control](#)" on page 35.

### Hi/Lo Operation

109 Hi/Lo models are fitted with a mechanical thermostat, adjustable from 45°C - 85°C that operates the gas control by switching its power from high fire to low fire and off, so a constant temperature is maintained. The thermostat and the protective over temperature cut out are mounted on the control panel which is located behind the lower front cover of the water heater (refer to "[Location of Controls](#)" on page 29).



There is no need to switch the water heater off when it is not in use. The thermostat is fully automatic and only allows the gas control to open when the burner requires gas for heating. To adjust the thermostat settings refer to "[Temperature Control](#)" on page 35.

### 147 MODELS

#### On/Off Operation

147 On/Off models are fitted with an electronic thermostat that operates the gas control by switching its power on and off, so a constant temperature is maintained. The thermostat is mounted on the control panel of the water heater and the protective over temperature cut out is mounted inside the lower front cover of the water heater.



There is no need to switch the water heater off when it is not in use. The thermostat is fully automatic and only allows the gas control to open when the burner requires gas for heating. To adjust the thermostat settings refer to "[Temperature Control](#)" on page 35.

The thermostat may flash "AH" (alarm high) and the current water temperature, or "AL" (alarm low) and the current water temperature. This is not a cause for concern unless the temperature displayed is more than 10°C above the set temperature. Refer to "[Diagnostic Features of Electronic Thermostat](#)" on page 9.

#### Hi/Lo Operation

147 Hi/Lo models are fitted with an electronic thermostat that operates the gas control by switching its power from high fire to low fire and off, so a constant temperature is maintained. The thermostat is mounted on the control panel of the water heater and the protective over temperature cut out is mounted inside the lower front cover of the water heater.



There is no need to switch the water heater off when it is not in use. The thermostat is fully automatic and only allows the gas control to open when the burner requires gas for heating. To adjust the thermostat settings refer to "[Temperature Control](#)" on page 35.

The thermostat may flash "AL3" and 130, or "AL3" and -45. This indicates a failure of the water temperature sensor. Refer to "[Diagnostic Features of Electronic Thermostat](#)" on page 9.

### BURNER IGNITION

#### All 109 and 147 Hi/Lo Models

The water heater utilises an automatic burner ignition system, which lights the main burner gas when the thermostat registers a need for heating.

A hot surface igniter (HSI) heats up when there is a call for heating. When the HSI probe is up to temperature, a valve opens allowing gas to the main burner and this is ignited by the HSI probe. Provided successful ignition of the main burner flame is detected, the valve remains open to supply gas to the main burner. If the main burner fails to ignite the ignition system will lock out.

#### 147 On/Off Models

The water heater utilises an automatic burner ignition system, incorporating an automatic pilot burner, which lights the main burner gas when the thermostat registers a need for heating.

A hot surface igniter (HSI) heats up when there is a call for heating. When the HSI probe is up to temperature, a valve opens allowing gas to the pilot burner and this is ignited by the HSI probe. When successful ignition of the pilot flame is detected, the valves open to supply gas to the main burner. If the pilot fails to ignite after two attempts, the ignition system will lock out.

## SAVE A SERVICE CALL

Check the items below before making a service call. You will be charged for attending to any condition or fault that is not related to manufacture or failure of a part.

### NOT ENOUGH HOT WATER (OR NO HOT WATER)

- **Is the electricity switched on?**  
Inspect the power outlet adjacent to the water heater and ensure the water heater is plugged in and the outlet is turned on.
- **Is there a time clock on the power supply?**  
Check the settings on the time clock and ensure they are suitable to enable heating when it is required.
- **Is the ignition system 'locked out'?**  
Reset the water heater. Refer to ["Water Heater Not Operating"](#) on page 9.
- **Is a code displayed on the electronic thermostat?**  
Check the LED display on the electronic thermostat. If a code is displayed, refer to ["Diagnostic Features of Electronic Thermostat"](#) on page 9.
- **Are you using more hot water than you think?**  
Are outlets (especially the showers) using more hot water than you think? Very often it is not realised the amount of hot water used, particularly when showering. Carefully review the hot water usage. Have your plumber fit a flow control valve to each shower outlet to reduce water usage.
- **Pressure relief valve running**  
Is the relief valve discharging too much water? (Refer to ["Pressure Relief Valve Running"](#) on page 10).
- **Thermostat setting**  
Ensure the thermostat setting is appropriate. You may choose to have your installer adjust the thermostat upwards to gain additional hot water capacity.



**⚠ WARNING:** Hotter water increases the risk of scald injury.

- **Water heater size**  
Do you have the correct size water heater for your requirements? The sizing guide in the Raypak sales literature and on the Rheem website ([www.rheem.com.au](http://www.rheem.com.au)) suggests average sizes that may be needed.

### WATER HEATER NOT OPERATING

The ignition system may have 'locked out'. To reset the water heater, switch the electrical supply off at the isolating switch, wait five (5) minutes then switch on again. If the water heater fails to light, phone your nearest Rheem Service Department or Accredited Service Agent to arrange for an inspection.

### DIAGNOSTIC FEATURES OF ELECTRONIC THERMOSTAT

147 On/Off and Hi/Lo water heaters incorporate an electronic thermostat. In the event of a fault occurring, a code will be displayed on the thermostat LED to diagnose the fault.

147 On/Off Models (AKO Thermostat)		147 Hi/Lo Models (CTX Thermostat)	
Code	Fault	Code	Fault
EE	Memory error	AL1	Memory error
E1	Temperature sensor failure	AL2	Temperature below the alarm set point
AL	Temperature below the minimum set point. Refer to <a href="#">"147 On/Off Operation"</a> on page 8.	AL3 (130)	Water temperature sensor open circuit Refer to <a href="#">"147 Hi/Lo Operation"</a> on page 8
AH	Temperature above the maximum set point. Refer to <a href="#">"147 On/Off Operation"</a> on page 8.	AL3 (-45)	Water temperature sensor short circuit Refer to <a href="#">"147 Hi/Lo Operation"</a> on page 8

In the event of an "AL" fault on 147 On/Off water heaters, or an "AL2" fault on 147 Hi/Lo water heaters an attempt should be made to reset the electronic control if the burner is not already alight (refer to ["Water Heater Not Operating"](#) on page 9).

All other fault conditions should be attended to by your nearest Rheem Service Department or Accredited Service Agent.

### BURNER WILL NOT LIGHT

- **Is there gas to the water heater?**  
Check the gas isolation valve on the gas supply line is open.
- **Is there a normal gas supply to the rest of the premises?**  
Try lighting another gas appliance. If there is no gas call your gas provider.
- **Is the ignition system 'locked out'?**  
Try resetting the water heater. Refer to "Water Heater Not Operating" on page 9.
- **Is the High Limit tripped:**  
The manual reset over temperature switch will shut down the water heater in the event of a fault with the temperature control or water flow. When the system water temperature has cooled sufficiently, the red button can be pressed, this will restart the water heater. Should frequent resetting be necessary, call your nearest Rheem Service Department or Accredited Service Agent.

### PRESSURE RELIEF VALVE RUNNING

- **Normal Operation**  
It is normal and desirable that this valve allows a small quantity of water to escape during the heating cycle. However, if the discharge is deemed excessive (more than 2% of hot water used), there may be another problem.
- **Continuous dribble**  
Try gently raising the easing lever on the relief valve for a few seconds (refer to "Pressure Relief Valve" on page 11). This may dislodge a small particle of foreign matter and clear the fault. Release the lever gently.
- **Steady flows for long period (often at night)**  
This may indicate the mains water pressure sometimes rises above the designed pressure of the water heater. Ask your installing plumber to fit a pressure limiting valve.

**⚠ WARNING:** Never replace the relief valve with one of a pressure rating greater than 850 kPa.

### EXPANSION CONTROL VALVE RUNNING

If an expansion control valve is fitted in the cold water line to the water heater (refer to page 19) it may discharge a small quantity of water instead of the pressure relief valve on the water heater. The benefit is that energy is conserved as the discharged water is cooler.

### HIGH GAS BILLS

Should you at any time feel your gas account is too high, we suggest you check the following points:

Is the relief valve running excessively? (Refer to "Pressure Relief Valve Running" on page 10).

Are outlets (especially the showers) using more hot water than you think? (Refer to "Not Enough Hot Water" on page 9).

Is there a leaking hot water pipe, dripping hot water tap, etc? Even a small leak will waste a surprising quantity of hot water and gas. Replace faulty tap washers, and have your plumber rectify any leaking pipe work.

Consider recent changes to your hot water usage pattern and check if there has been any increase in tariffs since your previous account.

Is there excessive heat loss from the building? Check that there are no large uncovered windows, ceiling insulation is installed and there are no excessive draughts.



**IF YOU HAVE CHECKED ALL THE FOREGOING AND STILL BELIEVE YOU NEED ASSISTANCE, PHONE YOUR NEAREST RHEEM SERVICE DEPARTMENT OR ACCREDITED SERVICE AGENT**

## REGULAR CARE

---

### PRESSURE RELIEF VALVE

This valve is located in the in/out header of the water heater and is essential for its safe operation. It is possible for the valve to release a little water through the drain line during each heating period. This occurs as the water is heated and expands by approximately 1/50 of its volume.

Continuous leakage of water from the valve and its drain line may indicate a problem with the water heater (refer to "[Pressure Relief Valve Running](#)" on page 10).

**⚠ WARNING:** Never block the outlet of this valve or its drain line for any reason.

Operate the easing lever on the pressure relief valve once every six months. **It is very important you raise and lower the lever gently.**

**⚠ WARNING:** Failure to do this may result in the water heater heat exchanger failing.

If water does not flow freely from the drain line when the lever is lifted, then the water heater should be checked by your installing plumber, or phone your nearest Rheem Service Department or Accredited Service Agent.

The pressure relief valve should be checked for performance or replaced at intervals not exceeding 5 years, or more frequently in areas where there is a high incidence of water deposits (refer to "[Water Supplies](#)" on page 39).

### EXPANSION CONTROL VALVE

In many areas, including South Australia, Western Australia and scaling water areas, an expansion control valve is fitted to the cold water line to the water heating system. The expansion control valve may discharge a small quantity of water from its drain line during the heating period instead of the pressure relief valve on the water heater.

Operate the easing lever on the expansion control valve once every six months. **It is very important you raise and lower the lever gently.** The expansion control valve should be checked for performance or replaced at intervals not exceeding 5 years, or more frequently in areas where there is a high incidence of water deposits.

### STORAGE TANKS (If fitted)

Refer to the owners guide and installation instructions supplied with the storage tank for details on regular care required.

### SERVICE

For efficient operation the water heater should be serviced annually by your nearest Rheem Service Department or Accredited Service Agent. Only genuine replacement parts should be used on this water heater.

**⚠ WARNING:** Servicing of a gas water heater should only be carried out by authorised personnel.

# INSTALLATION

## THIS WATER HEATER IS NOT SUITABLE FOR POOL HEATING

Check the water heater is suitable for the gas type available. The gas type is marked on the side panel near the gas connection entry and shown on the rating label.

All packaging must be removed from the water heater prior to its installation. The installation kit (including the pressure relief valve) may be supplied inside the water heater casing. This kit must be removed before the water heater is operated.

## READ THESE INSTRUCTIONS IN FULL

### INSPECTION OF EQUIPMENT

Check the water heater and associated equipment for any damage. DO NOT INSTALL OR OPERATE ANY WATER HEATER THAT HAS BEEN DAMAGED. ANY ADDITIONAL DAMAGE OR FAULTS CAUSED BY UNAUTHORISED START UP MAY NOT BE COVERED BY WARRANTY.

### WATER HEATER LOCATION

This water heater is supplied for outdoor installation only. For indoor installations the correct indoor conversion kit is required (refer to "Hood Conversion" on page 16). Whether located outdoor or indoor, the position of the water heater should be chosen with safety and service in mind. Make sure people (particularly children) will not touch the flue outlet. The flue terminal must be clear of obstructions and shrubbery.

Clearance must be allowed for servicing of the water heater. The water heater must be accessible without the use of a ladder or scaffold. Make sure the pressure relief valve lever is accessible and the entire front panel and burner assembly can be removed for service. Remember you may have to remove the entire water heater later for servicing.

You must be able to read the information on the rating label.

The installation must comply with these installation instructions and with the requirements of AS/NZS 3500.4, AS/NZS 3000, AS 5601 and all local codes and regulatory authority requirements. In New Zealand, the installation must conform with NZS 5261 Code of Practice for Installation of Gas Burning Appliances and the New Zealand Building Code.

The water heater must not be installed in an area with a corrosive atmosphere where chemicals are stored or where aerosol propellants are released. Remember the air may be safe to breathe, but when it goes through a flame, chemical changes take place which may attack the water heater.

The water heater must be mounted on a level fire proof base such as a concrete slab, concrete plinth, steel plate etc. Water heaters must NOT be installed on carpeting.

The front of the water heater must not be obstructed by any gas or water piping, electrical conduits, etc.

### FIRE RESISTANT MATERIALS

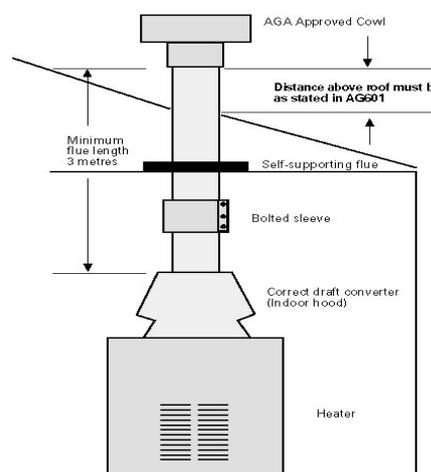
Fire resistant materials should comply with the requirements of AS 5601 Appendix C. If in doubt, seek advice from your material supplier or your local regulator.

### INDOOR INSTALLATION

The correct draft diverter must be fixed to the top of the water heater (Refer to "Hood Conversion" on page 16) and connected to a properly constructed flue, to discharge the combustion products outside the building. The flue must be self supporting and not impose a load on the water heater. Use a slip joint or similar to allow for disconnection and to enable the water heater top panel and draft diverter to be removed for servicing. There must be a vertical rise of 600 mm from the draught diverter before changing direction. The flue design and installation must comply with AS 5601.

**NOTE:** Reduction of the flue diameter or alteration to the draft diverter may void the water heater warranty.

The water heater is to be installed at ground or floor level and must stand vertically upright. There are also special requirements in AS 5601 for water heaters installed in a garage, an enclosed space and other locations. Remember all local authorities have regulations about putting water heaters into roof spaces.



**CLEARANCES (INDOOR INSTALLATIONS)**

The distances set out in the following table should be observed.

Minimum Clearances from:	109 Models	
	Non-Combustible materials (mm)	Combustible materials (mm)
Rear	150	500
Water Side	300	600
Front	750	750
Non Water side	150	500
Ceiling	1200	1200

Minimum Clearances from:	147 Models	
	Non-Combustible materials (mm)	Combustible materials (mm)
Rear	300	500
Left side	300	500
Front	750	750
Right side	300	500
Ceiling	1200	1200

The normal water heater design is with the water pipe entry from the left hand side on 109 models and the rear for 147 models. For servicing purposes allow at least 750mm in front of the water heater for burner tray removal.

**COMBUSTION / VENTILATION AIR**

Indoor model water heaters must be installed in a protective enclosure or properly constructed plant room with adequate ventilation in accordance with AS 5601.

Ideally ventilation shall be via two permanent openings DIRECTLY to outside, one at an upper level and one at low level.

Where the air is sourced DIRECTLY from outside the minimum free area required for each opening is provided in the table opposite. Where the ventilation is by an alternate method refer to AS 5601 for ventilation calculations.

Model	Total area (cm <sup>2</sup> )
109	327
147	441

**NOTE:** The minimum dimension of any opening shall be 6mm

**⚠ WARNING!** Air supply to the area where the water heater is installed must not be affected by mechanical exhaust vents such as kitchen or bathroom fans, spa blowers, etc. Mechanical exhaust vents may create a negative pressure in the area where the water heater is installed and can become a hazard by asphyxiation, explosion or fire.

**SAFE TRAY**

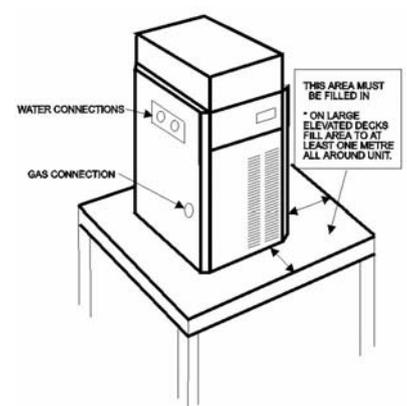
It is a requirement of AS/NZS 3500.4 that for a new installation, a water heater be installed in a safe tray where in the event of a leak, property may otherwise be damaged. Construction, installation and draining of a safe tray must comply with the abovementioned Standard. The safe tray must NOT restrict combustion airflow.

**OUTDOOR INSTALLATION**

For servicing allow at least 750 mm in front of the water heater for burner removal and 450 mm on the water connections side for heat exchanger servicing.

The water heater must NOT be installed inside any roofed structure or under eaves, roof overhangs, or pool decks.

When installing the water heater on a raised base, the base material MUST be solid and filled in (e.g. if steel mesh decking is used, a suitable plate material



must be installed to fill in the perforations) to prevent excessive drafts entering the water heater from underneath.

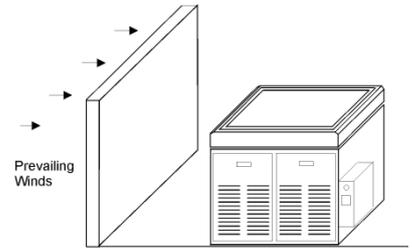
The following distances extracted from the Australian Gas Installations Standard AS 5601 must be observed:

- At least 500 mm between the top of the flue terminal and the eaves.
- At least 1 500 mm horizontally between the flue terminal and the edge of any opening into the building, measured horizontally.
- At least 500 mm between the flue terminal and a return wall or external corner, measured horizontally along the wall.
- At least 1 500 mm below any openable window.
- At least 500 mm between the flue terminal and a fence, wall or other obstruction facing the terminal.

**HIGH WIND CONDITIONS**

In areas where high winds frequently occur, it WILL be necessary to:

- Locate the water heater a minimum of one (1) metre away from high vertical walls.
- Install a wind break to protect the water heater from the prevailing winds.
- 147 Models Only: Replace the standard flue terminal with a HIGH WIND top (at extra cost). A high wind top is not available for 109 models.



**COLD WATER SUPPLY**

**Water Heating Applications**

Where the cold water supply pressure exceeds that shown in the table below, an approved pressure limiting valve is required and should be fitted as shown in the installation diagram (refer to diagram on page 19).

**Mechanical/Process Heating Applications**

A cold water feed regulator (Pressure Reducing Valve) should be installed on the cold water make up line. The minimum water pressure should be as shown in the table below. Backflow prevention in accordance with AS/NZS 3500.1 may be required.

**Pressure Specifications**

Operation Type	On/Off	Hi/Lo
<b>Relief Valve Setting</b>		
Water Heating (kPa)	850 (700) <sup>1</sup>	850 (700) <sup>1 3</sup>
Mechanical Heating (kPa)	-	310
<b>Expansion Control Valve (ECV<sup>2</sup>) Setting</b>		
Water Heating (kPa)	700 (550) <sup>1</sup>	700 (550) <sup>1 3</sup>
Mechanical Heating (kPa)	-	-
<b>Minimum Supply Pressure</b>		
System water temperatures up to 65°C (kPa)	70	70
System water temperatures above 65°C (kPa)	120	120
<b>Maximum Supply Pressure</b>		
with ECV <sup>2</sup> fitted		
Water Heating (kPa)	680 (550) <sup>1</sup>	680 (550) <sup>1 3</sup>
Mechanical Heating (kPa)	-	240
without ECV <sup>2</sup> fitted		
Water Heating (kPa)	550 (450) <sup>1</sup>	550 (450) <sup>1 3</sup>
Mechanical Heating (kPa)	-	-

<sup>1</sup> Figures in brackets are to be used if a stainless steel storage tank is utilised in the system.

<sup>2</sup> Expansion control valve is not supplied with the water heater.

<sup>3</sup> An 850kPa relief valve can be fitted to Hi/Lo water heaters when used in water heating applications.

**TANK WATER SUPPLY**

If the water heater is supplied with water from a tank supply and a pressure pump system is not installed then the height to the bottom of the supply tank must be as specified in the table opposite.

<b>Minimum Tank Height</b>	
System water temperatures up to 65°C	7 metres
System water temperatures above 65°C	12 metres

## HOT WATER DELIVERY (WATER HEATING APPLICATIONS)

This water heater can deliver water at temperatures which can cause scalding.

It is necessary and we recommend that a temperature limiting device be fitted between the water heating system and the hot water outlets in any ablution and public areas such as bathrooms, ensuites or public amenities, to reduce the risk of scalding. The installing plumber may have a legal obligation to ensure the installation of this water heater meets the delivery water temperature requirements of AS/NZS 3500.4 so that scalding water temperatures are not delivered to a bathroom, ensuite, or other ablution or public area.

Where a temperature limiting device is installed adjacent to the hot water storage tanks, the cold water line to the temperature limiting device can be branched off the cold water line either before or after the isolation valve, pressure limiting valve and non return valve to the storage tanks. If an expansion control valve is required, it must always be installed after the non return valve and be the last valve prior to the water heating system.

If a pressure limiting valve is installed on the cold water line to the water heating system and the cold water line to a temperature limiting device branches off before this valve or from another cold water line in the premises, then a pressure limiting valve of an equal pressure setting may be required prior to the temperature limiting device.

## REDUCING HEAT LOSSES (WATER HEATING APPLICATIONS)

The cold water line to and the hot water line from the storage cylinder must be insulated in accordance with the requirements of AS/NZS 3500.4. The insulation must be weatherproof and UV resistant if exposed.

Keep temperature settings down. Lower temperatures reduce heat losses and prolong storage cylinder life. Do not set the controlling electronic thermostat above 70°C unless it is necessary. A time clock to control the electrical supply can be used to switch off the water heater during hours or days when it is not in use.

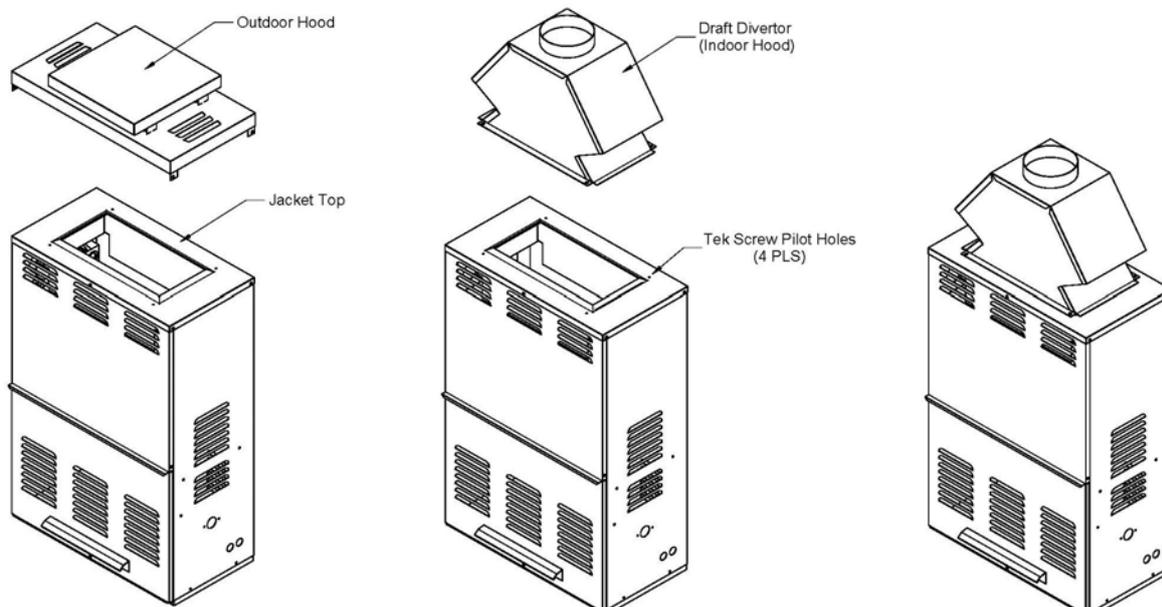
## HOOD CONVERSION

To convert a water heater from an outdoor configuration to an Indoor or High Wind Top configuration, proceed as follows:

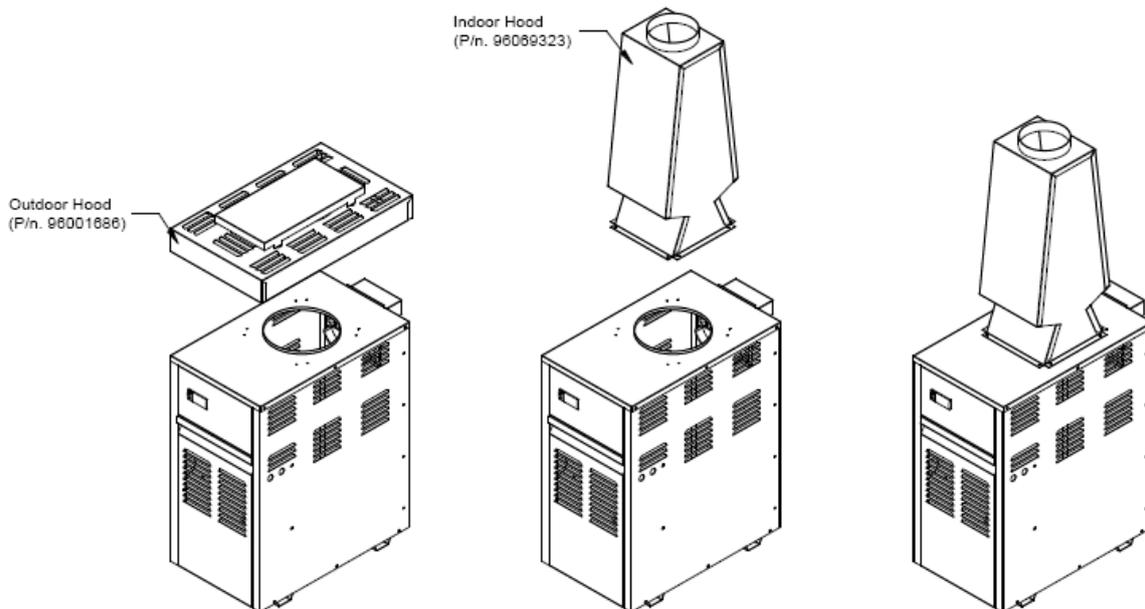
1. Remove the flue terminal (outdoor hood) from the water heater leaving the jacket top in place.
2. Place the stack adaptor over the flue collector and secure into place with self tapping screws.
3. Fit the draft diverter over the spigot and sit squarely on the stack adapter. Secure in place using self tapping screws.
4. (Indoor installations only) Install and connect the secondary flue to the draft diverter in accordance with the requirements of AS 5601.

**NOTE:** For High Wind Top conversion (147 models only) follow steps 1 to 3 and assess whether tie downs for the High Wind Cowl are required.

### 109 Indoor Conversions



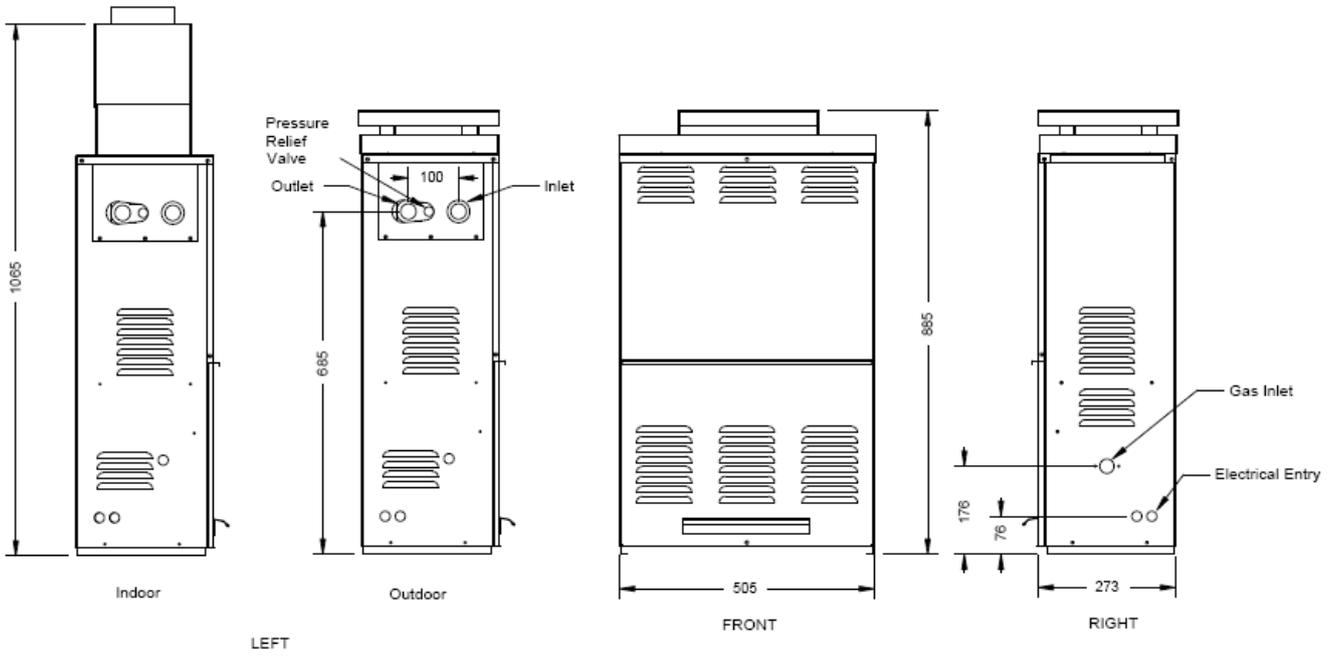
**147 Indoor Conversions**



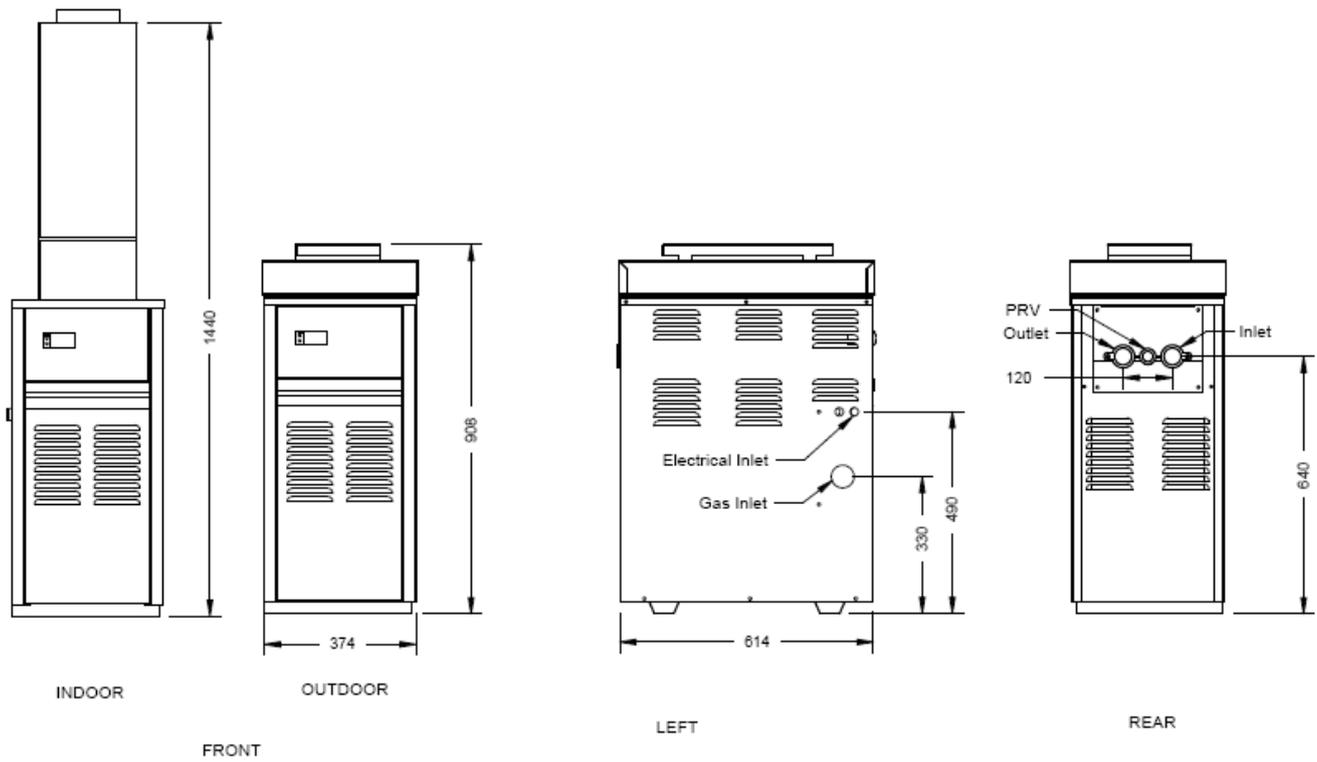
**DIMENSIONS AND TECHNICAL DATA**

		<b>109</b>	<b>147</b>
Natural Gas	Input (MJ/h)	99	144
	Output (kW)	22	32
Propane Gas	Input (MJ/h)	99	144
	Output (kW)	22	32
Electrical Rating 240V 50 Hz	Power (W)	50	50
	Current (A)	0.21	0.21
Weight empty	Kg	42	58
Flue Connection	mm	125	150

**109 Models**



**147 Models**



## CONNECTIONS – PLUMBING

**IMPORTANT:** When installing a new water heater to an old or existing system, it is a requirement that the system and its equipment be thoroughly inspected and if necessary, drained and flushed with clean fresh water, before the new water heater is connected. Failure to do this may cause blockages and/or damage to the water heater which is not covered by warranty.

**IF THERE IS ANY DOUBT ABOUT THE SYSTEM, DRAIN AND FLUSH AS A PRECAUTION.**

### CONNECTION SIZES

	109 On/Off	109 Hi/Lo	147 On/Off	147 Hi/Lo
Inlet water connection	RP1 <sup>1</sup> / <sub>4</sub> /32			
Outlet water connection	RP1 <sup>1</sup> / <sub>4</sub> /32			
Relief valve connection	RP1 <sup>1</sup> / <sub>2</sub> /15	RP1 <sup>1</sup> / <sub>2</sub> /15	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20
Gas inlet	R <sup>3</sup> / <sub>4</sub> /20	R <sup>3</sup> / <sub>4</sub> /20	RP <sup>3</sup> / <sub>4</sub> /20	RP <sup>1</sup> / <sub>2</sub> /15

All plumbing work must be carried out by a qualified person and in accordance with the National Plumbing Standard AS/NZS 3500.4 and local authority requirements.

All gas work must be carried out by a qualified person and in accordance with the Australian Gas Installations Standard AS 5601 and local authority requirements.

### WATER INLET AND OUTLET

All pipe work must be cleared of foreign matter before connection and purged before attempting to operate the water heater. All olive compression fittings must use brass or copper olives. Use thread sealing tape or approved thread sealant on all fittings.

An isolation valve and non-return valve must be installed on the cold water line to the water heating system. An acceptable arrangement is shown in the diagram opposite for a water heating application.

A disconnection union must always be provided at the inlet and outlet on the water heater to allow for disconnection of the water heater.

Do not reduce the pipe work size and water heater water connections without allowing for friction loss which will occur. Low water flow will cause damage to the water heater and system components.

### GAS INLET

The gas connection is made at the right hand end of the water heater for 109 Models and at the inlet of the gas control for 147 models. The pipe work must be cleared of foreign matter before connection and purged before attempting to light the water heater. An isolation valve and disconnection union must be used to allow servicing and removal of the water heater.

Refer to the Gas Installations Standard AS 5601 for the correct method of sizing the gas supply pipe to the water heater.

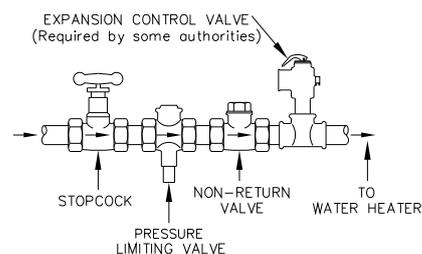
**⚠ WARNING:** Before pressure testing the gas supply system always isolate and disconnect the water heater after the isolating cock to prevent the risk of serious damage to the gas control. Warranty does not cover damage of any nature resulting from failure to observe this precaution. Refer to rating label for gas types and pressures.

Ensure the gas line is also purged at the union connection to the water heater. If this procedure is not followed, a retry lockout may result on initial start up.

**CAUTION:** Care is necessary when tightening fittings into the gas control. The gas control casting may crack if the fittings are over tightened. Cracked castings are not covered under warranty. Damaged gas controls must be replaced.

### PIPE SIZES

The pipe sizing for water heating and mechanical heating systems should be carried out by persons competent to do so, choosing the most suitable pipe size for each individual application. Reference to the technical specifications of the water heater and local regulatory authority requirements must be made.



The table below provides indicative pipe and pump sizes for typical installations

Model	Pump		Branch Size		Minimum Manifold Header Size Required (mm)			
	UPS Series	Speed	inches	mm	1 Unit	2 Units	3 Units	4 Units
109	20-60B	3	1	25	25	32	32	40
147	20-60B	3	1	25	20	32	32	40

**PUMP SELECTION**

In order to obtain the best possible water flow in the system a correctly sized pump must be installed. Refer to the Flow Rate and Pressure Drop table below and allow for the system head pressure when sizing the pump.

The pump selected should provide a 10 to 20°C temperature difference between the water heater inlet and outlet when the water heater is at full fire.

Mechanical heating systems with multiple zones may require additional pump(s) refer to 'Multi Pump Options' on page 28.

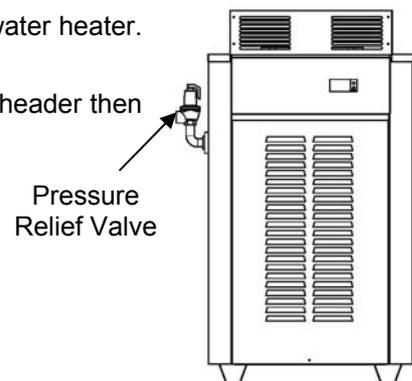
WATER FLOW RATE AND PRESSURE DROP							
	10°C Rise		15°C Rise		20°C Rise		
Model	l/sec	kPa	l/sec	kPa	l/sec	kPa	
109	0.5	5.0	0.4	4.0	0.3	3.0	
147	0.8	5.0	0.5	3.0	0.4	3.0	

**PRESSURE RELIEF VALVE**

The pressure relief valve and elbow are shipped in a plastic bag inside the water heater. The pressure relief valve must be fitted before the water heater is operated.

Fit the elbow supplied in the plastic bag to the connection on the inlet/outlet header then screw the relief valve onto the other end of the elbow.

Seal the threads using Teflon tape, never hemp. A drain line must be installed in accordance with AS/NZS 3500.4 to carry the discharge from the valve to a suitable discharge point.



**Relief Valve Pressure Rating**

- On/Off Models      850 kPa (125 psi)
- Hi/Lo Models        310 kPa (45 psi)

When the water heater is connected to a storage cylinder for water heating applications, a correctly sized and pressure rated TPR valve MUST be fitted to the storage cylinder.

**NOTE:** Where a Hi/Lo water heater is used in a water heating application it will be necessary to replace the 310 kPa relief valve provided with the water heater with one rated at 850 kPa.

**RELIEF VALVE DRAIN**

A copper drain line must be fitted to the relief valve to carry the discharge clear of the water heater. Connect the drain line to the relief valve using a disconnection union. The pipe work from the relief valve to the drain should be as short as possible and fall all the way from the water heater with no restrictions. It should have no more than three right angle bends in it. Use DN20 pipe.

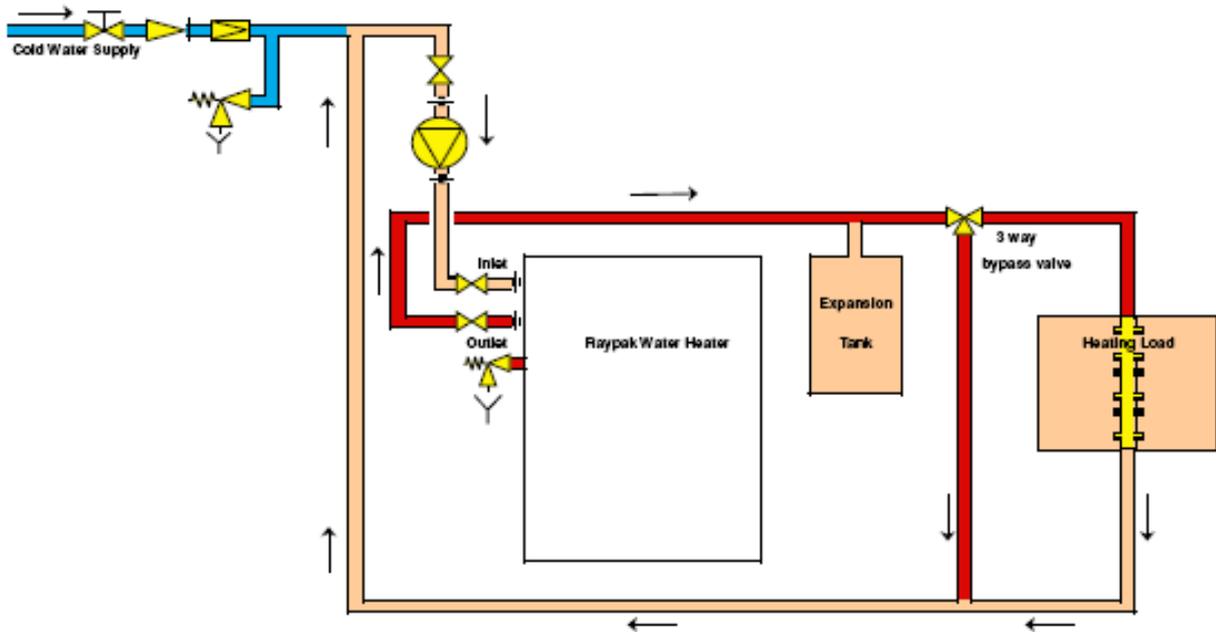
The outlet of the drain line must be in such a position that flow out of the pipe can be easily seen (refer to AS/NZS 3500.4) - but arranged so hot water discharge will not cause injury, damage or nuisance. The drain line must discharge at an outlet or air break not more than 9 metres from the relief valve.

In locations where water pipes are prone to freezing, the drain line must be insulated and not exceed 300 mm in length. In this instance, the drain line is to discharge into a tundish through an air gap of between 75 mm and 150 mm.

**⚠ WARNING:** The pressure relief valve on this water heater may discharge high temperature water under certain conditions, it is strongly recommended the pipe work downstream of the relief valve be capable of carrying water exceeding 93°C. Failure to observe this precaution may result in damage to pipe work and property.

**MECHANICAL HEATING**

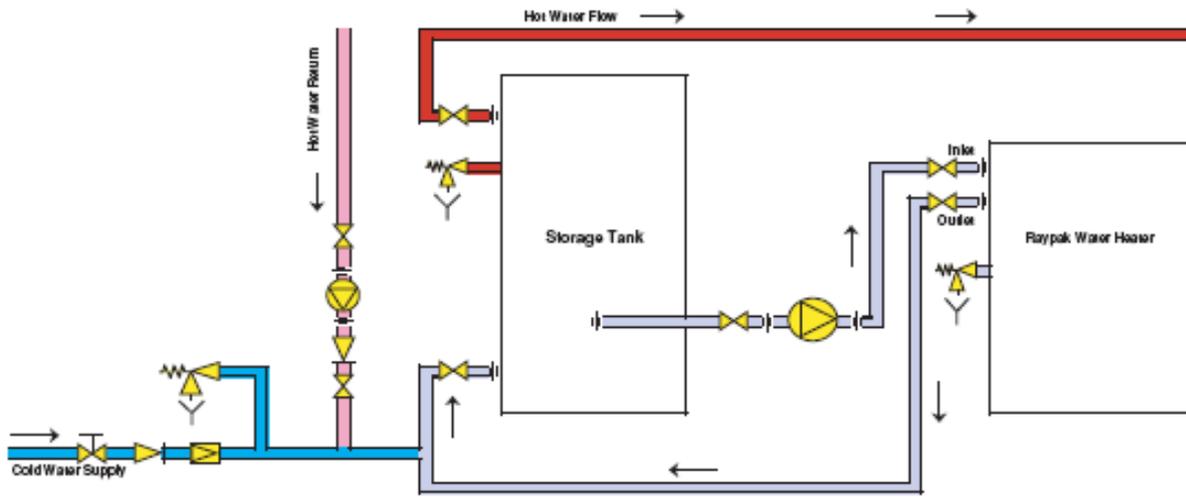
All high points of a mechanical heating system should be provided with manual bleed points or fitted with automatic air vents. The design of the system must be such that the water heater is provided with adequate water flow and pressure at all times (refer to 'Pump Selection' on page 20). On radiator or heating systems where thermostatic valves will vary the water flow a suitable by-pass valve must be installed to maintain the correct flow rate.



**Typical Mechanical Heating Installation**

**WATER HEATING**

Where the water heater is supplied as part of a package, including the storage cylinder and pump, the installation must comply with the drawing provided. Failure to observe this requirement may result in ineffective hot water capacity or damage.



**Typical Water Heating Installation**

## CONNECTIONS – ELECTRICAL

All electrical work and permanent wiring must be carried out by a qualified person and in accordance with the Wiring Rules AS/NZS 3000 and local authority requirements.

The water heater is supplied with a 1.8 metre lead and plug and requires a 240 V 50 Hz general purpose outlet (GPO) to be located within 1.0 metre of the installation. NOTE: For outdoor installations the GPO must be weatherproof. The GPO must be clear of the flue exhaust, draining water, gas supply pipe and water connections.

The water heater must be properly earthed and the installation of a Residual Current Device (RCD) is recommended for added electrical safety

**CAUTION: DO NOT LOCATE CABLES IN FRONT OF OR UNDERNEATH THE BURNER.**

Where conduit is mounted to the water heater a 10mm air gap must be maintained from the water heater casing to eliminate possible overheating. DO NOT locate conduits or cables where they will obstruct or restrict removal of panels, access doors etc.

**The water heater must NOT be able to operate without the pump running.**

The water heater and pump may be supplied from the same electrical circuit, alternatively the 240 volt supply to the water heater may be provided via auxiliary contacts of the pump contactor or relay (if fitted).

Where additional control wiring is connected to the water heater, which is not isolated by the GPO, a suitable warning label must be affixed to the water heater identifying the isolation point for that particular wiring (e.g. by circuit breaker or fuse number and switchboard identification number or location).

### THERMOSTAT SETTING

The thermostat is adjustable; the range varies according to the capacity and operation type (refer to the table opposite).

	On/Off	Hi/Lo
<b>109</b>	25°C - 95°C	45°C - 85°C
<b>147</b>	20°C - 80°C	0°C - 95°C

For reasons of safety and economy, we recommend that the thermostat is set at the lowest temperature that will provide sufficient hot water. Discuss the thermostat setting requirements with the householder or responsible officer. Refer to "Temperature Control" on page 35.

### INTERMITTENT PUMP OPERATION

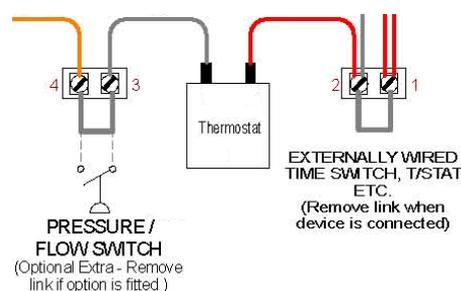
For applications utilising intermittent pump operation a pump run on timer is fitted as standard equipment to the water heater and must be utilised to prevent nuisance tripping of the high limit thermostat due to heat build up in the heat exchanger. The timer should be set to allow the pump to operate for at least ten (10) minutes.

### EXTERNAL CONTROLS

The water heater can be wired for use with an external flow switch, remote control thermostat or a remote time switch.

To connect an external switch, time clock or thermostat to the water heater it is necessary to remove the bridging wire between terminals 1 and 2 of the water heater terminal block and connect the external control across these two terminals (refer to the diagram opposite and to the wiring diagrams on pages 24 to 27).

To connect a flow switch to the water heater it is necessary to remove the bridging wire from between terminals 3 and 4 of the water heater terminal block and connect the flow switch across these two terminals (refer to the diagram opposite and to the wiring diagrams on pages 24 to 27).



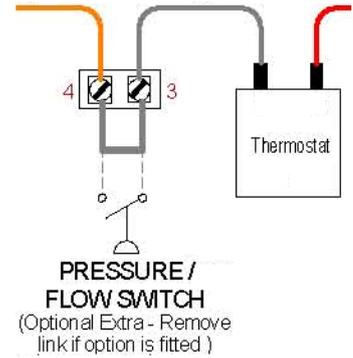
Where an external thermostat is utilised the water heater thermostat should be adjusted to a temperature higher than the setting on the remote thermostat (Refer to "Temperature Control" on page 35).

**WIRING A POWER FLUED SYSTEM TO THE WATER HEATER**

An indoor model can be wired to a power flued system. A power flued system must be designed by a qualified person to suit the particular installation. The power flue system must be interlocked with the water heater(s) to prevent the water heater(s) from operating if the power flue is not working.

Where multiple water heaters are connected to a power flue, the control system must be designed so that any of the water heaters can activate the fan in the flue and none of the burners can come on until the flow in the flue has been established.

To connect a power flue to the water heater it is necessary to remove the bridging wire between terminals 3 and 4 of the water heater terminal block and connect the wiring to the power flue across these two terminals (refer to the diagram opposite and to the wiring diagrams on pages 24 to 27).



**BUILDING MANAGEMENT SYSTEM (BMS)**

For applications requiring connection to a building management system, an optional BMS kit suitable for 147 On/Off models ONLY must be fitted to the water heater to provide 'run' and 'fail' status.

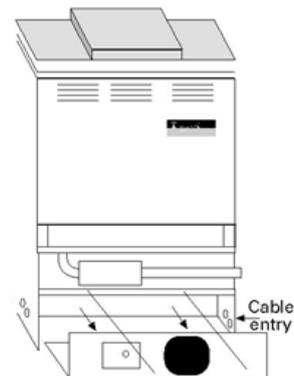
109 and 147 Hi/Lo models cannot be connected to a building management system.

**CONTROL PANEL ACCESS**

To access the electrical enclosure:

**109 Models**

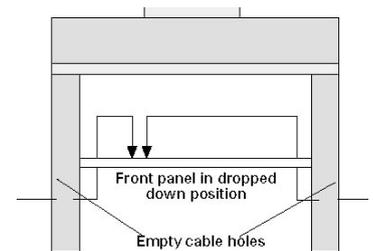
- Remove the knurled screw from the centre of the lower front panel and pull out at the bottom of the panel to remove.
- Remove the 8mm hex head screw from the centre of the electrical access panel.
- Slide the electrical access panel out.



Control Box Electrical Access 109

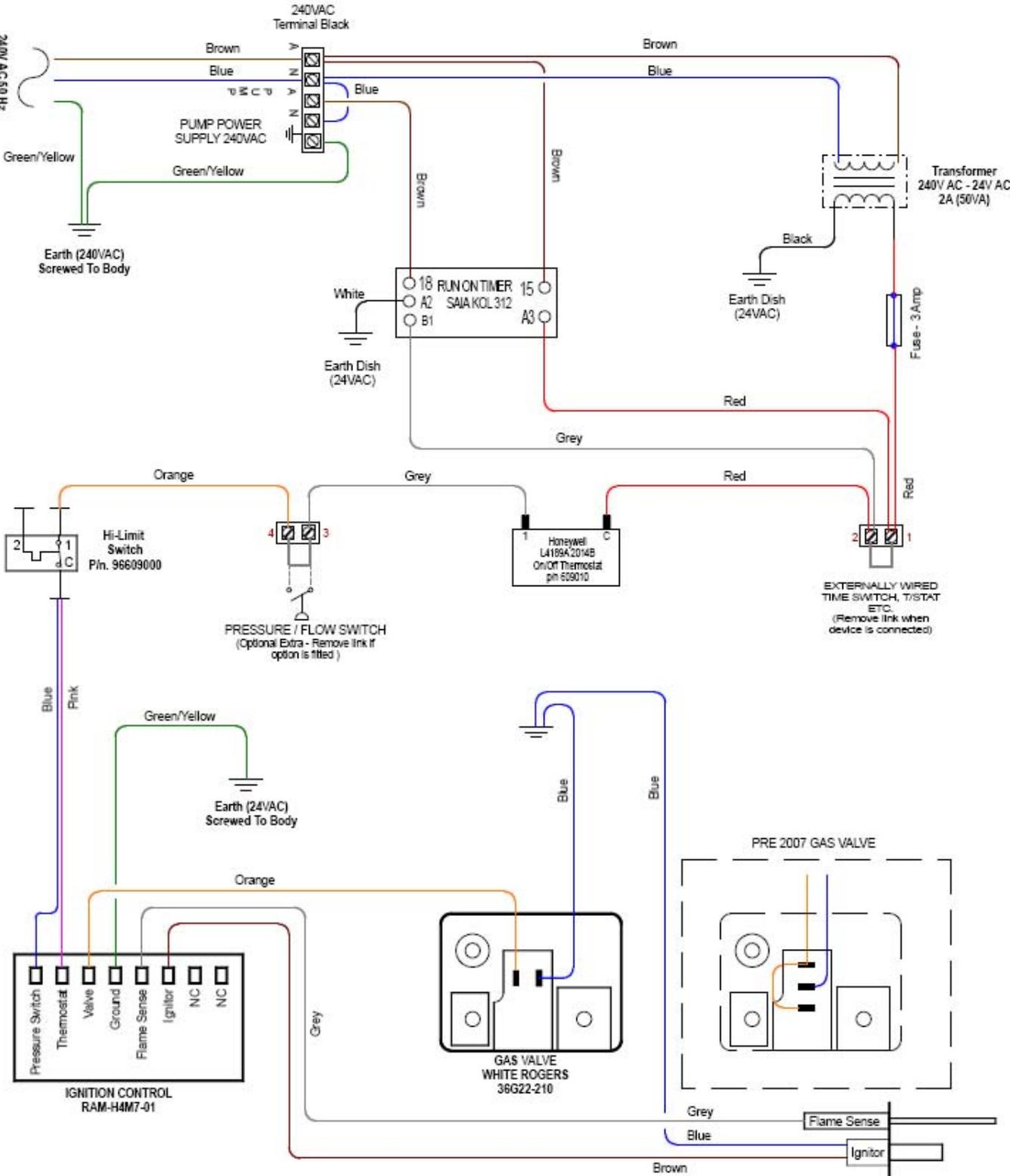
**147 Models**

- Remove the lower front panel by lifting up and out.
- Remove 2 x Philips head screws (1 on each side) from the lower edge of the control panel.
- Slide the control panel down and hinge out. NOTE: The control panel has tabs fitted to support it on the water heater in the open position.

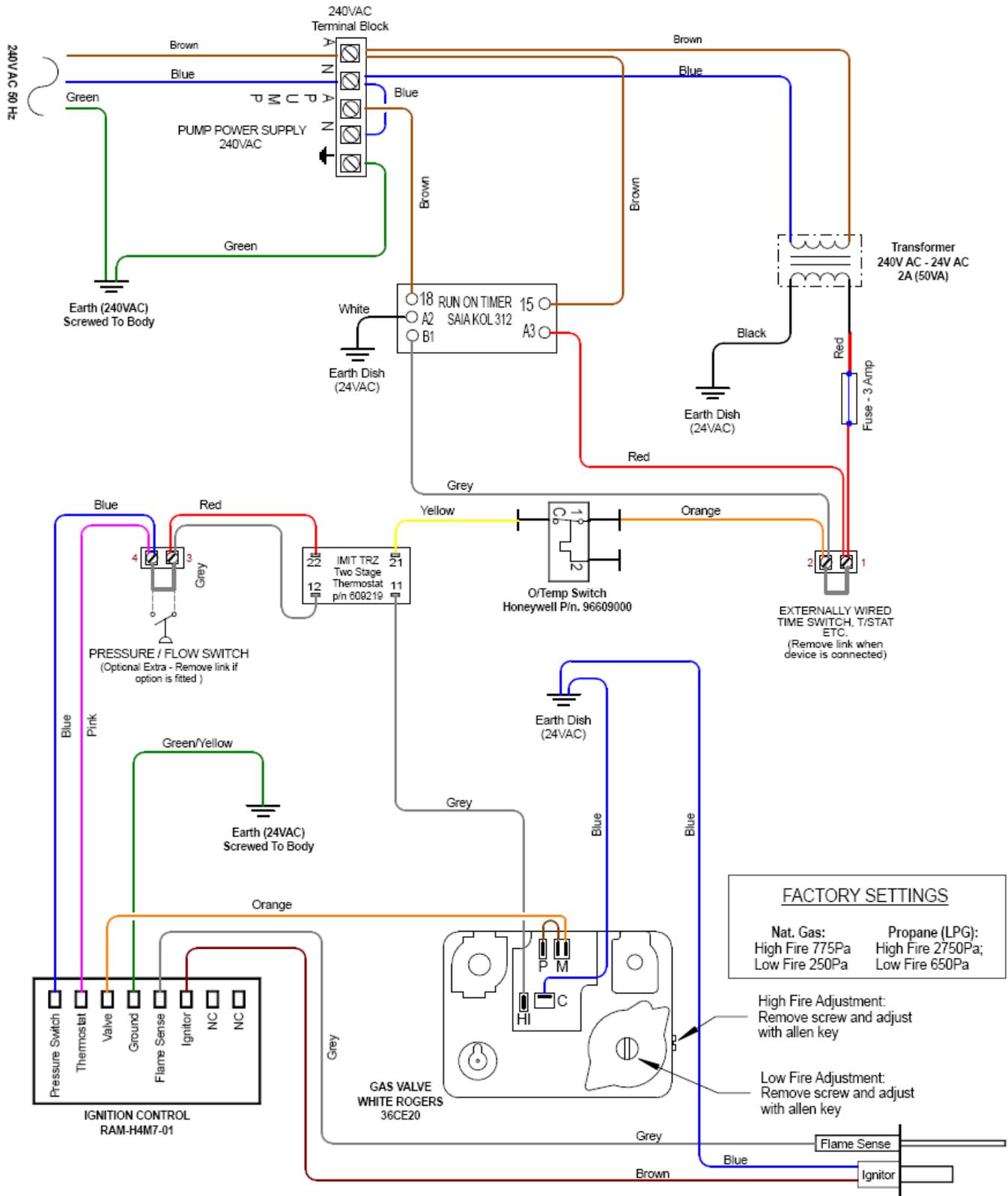


Control Box Electrical Access 147

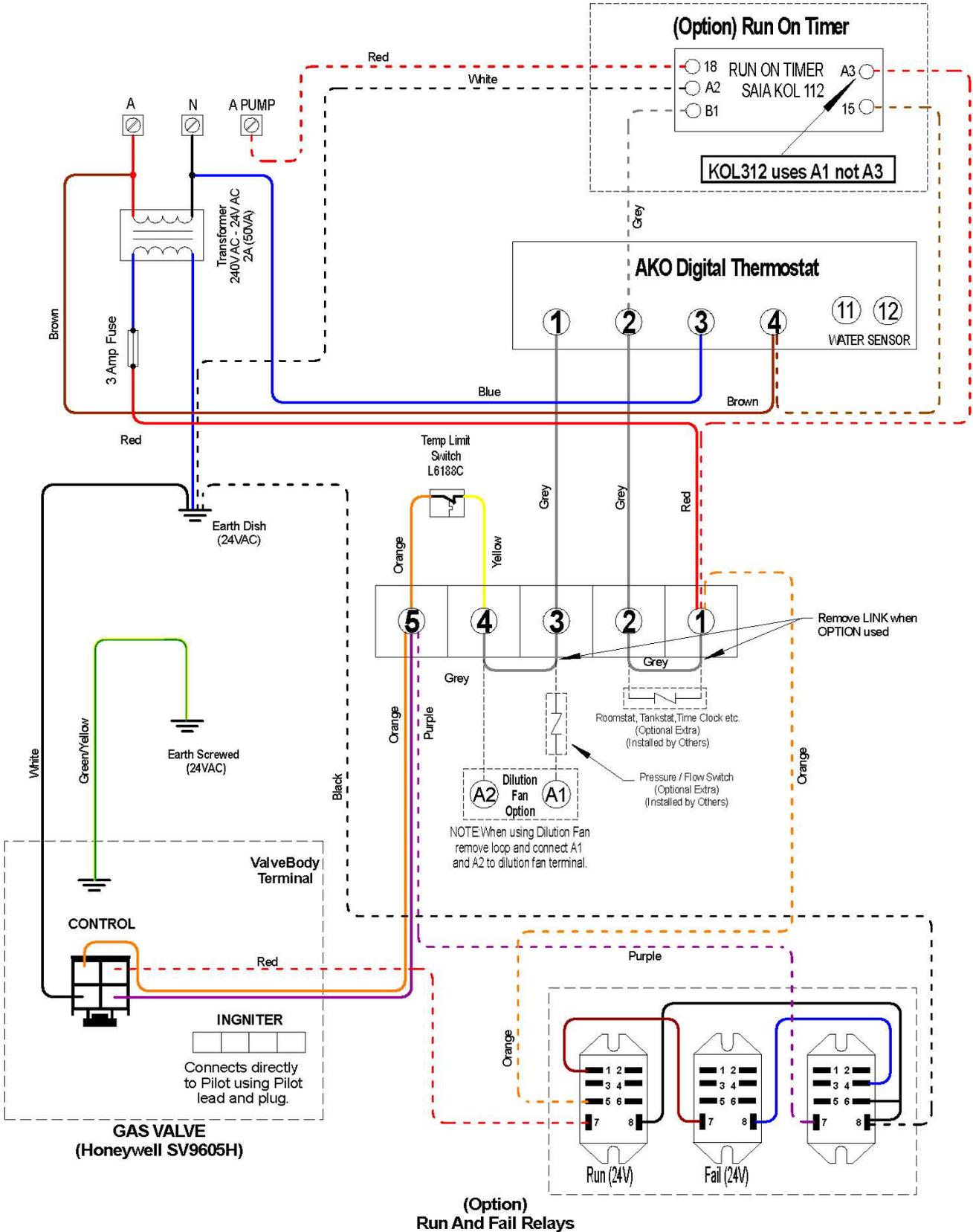
WIRING DIAGRAM – 109 ON/OFF MODELS



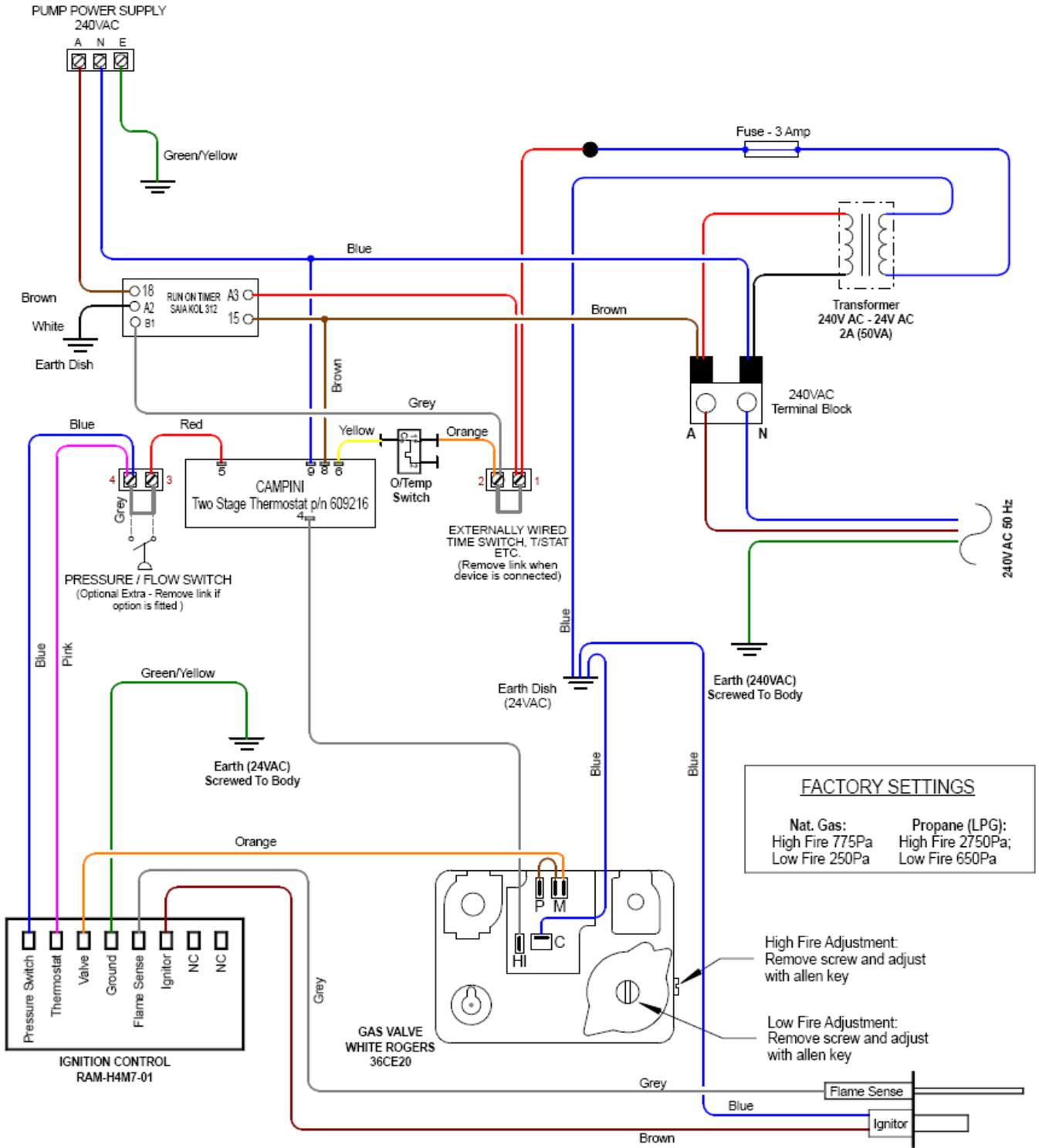
WIRING DIAGRAM – 109 HI/LO MODELS



WIRING DIAGRAM – 147 ON/OFF MODELS

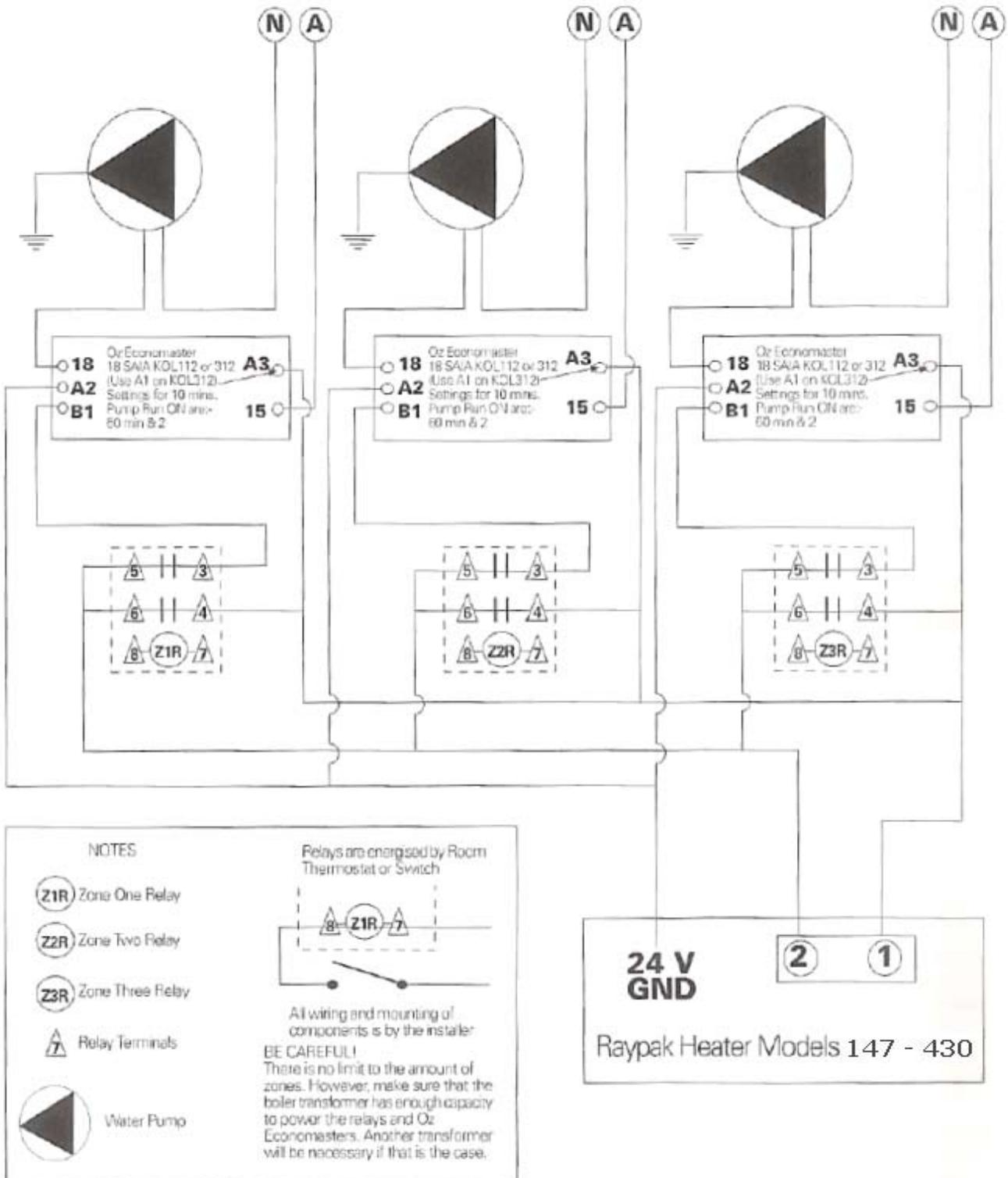


WIRING DIAGRAM – 147 HI/LO MODELS



**MULTI PUMP OPTION - MECHANICAL HEATING SYSTEMS**

**NOTE:** When connecting additional controls the relays and timers etc must be located in an additional enclosure NOT fitted within the water heater. For outdoor installations the enclosure MUST be weatherproof.



# LOCATION OF CONTROLS

## THERMOSTAT (1)

### On/Off Models

109 On/Off type water heaters are fitted with a Honeywell L4189A2014B mechanical thermostat with its sensor located in the inlet side of the water heater header.

147 On/Off type water heaters are fitted with an AKO 14123 electronic thermostat with its sensor located in the inlet side of the water heater header.

On/Off type controls are typically used where the system load is constant (e.g. hot water supplied from a storage tank or in floor slab heating).

**NOTE:** If the water heater is connected to a storage tank with a tank thermostat fitted, the water heater thermostat should be set slightly higher than the tank thermostat setting.

### Hi/Lo Models

109 Hi/Lo type water heaters are fitted with an IMT TRZ 2 stage mechanical thermostat with its sensor located in the outlet side of the water heater header.

147 Hi/Lo type water heaters are fitted with a Campini CTX032Y01 2 stage electronic thermostat with its sensor located in the outlet side of the water heater header.

Hi/Lo type controls are typically used where the system load is variable (e.g. hot water supplying radiator coils for room heating).

## GAS CONTROL (2)

### On/Off Models

109 On/Off type water heaters are fitted with a White Rodgers 36G22 Type 210 single stage gas valve.

147 On/Off type water heaters are fitted with a Honeywell SV9605 smart valve. This gas control incorporates the ignition electronics and provides the gas supply to the pilot and main burners.

### Hi/Lo Models

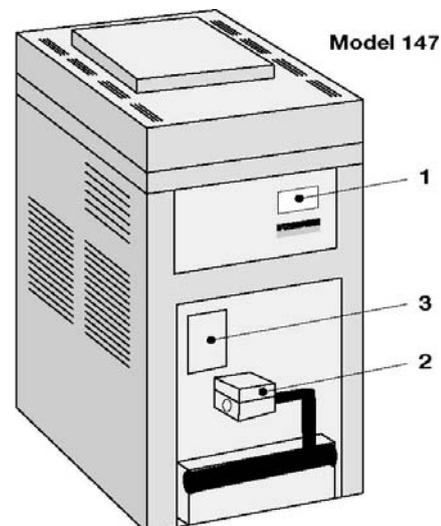
109 and 147 Hi/Lo type water heaters are fitted with a White Rodgers 36E20 Type 301 two stage gas valve.

## RATING LABEL (3)

Details the model number, serial number, gas type, burner pressure, water pressure and electrical specifications of the water heater are given on this label.

## HIGH LIMIT (4)

A manual reset over temperature switch which will shut down the water heater in the event of a fault with the temperature control or water flow. When the system water temperature has cooled sufficiently the high limit can be reset by pressing the red button.



## SAFETY PRECAUTIONS

---



Ceramic fire tile refractories are used in Raypak water heaters. Refractories must be treated with care because they can be harmful by inhalation and irritating to the skin, eyes and respiratory system.

### **DURING FIRST FIRING OF THE WATER HEATER**

- Fumes and smoke may be produced.
- Avoid breathing fumes and ventilate the area to clear.
- Production of smoke should cease within 30 minutes.

### **WHEN HANDLING**

- Minimise airborne dust.
- Wear an approved mask or respirator.
- Avoid any contact with the skin and eyes.
- Wear suitable loose-fitting, long-sleeved clothing or disposable overalls.
- Wear gloves and eye protection.
- Consult Occupational Health and Safety Authorities for any further information.

### **AFTER HANDLING**

- Rinse any exposed skin areas with clean water.
- Wash work clothing separately.

### **REMOVAL OF USED PRODUCT**

- Follow the precautions as detailed in the section 'WHEN HANDLING' above, over-exposure to dust formed after service may cause respiratory disease as cristobalite, a form of crystalline silica, may be formed above 900 degrees Celsius.
- Seal used product in a disposable bag and dispose of via normal garbage collection methods.

**Consult Occupational Health and Safety Authorities for further Information regarding removal of used ceramic fibre lining.**

# COMMISSIONING

---

## COMMISSIONING MUST ONLY BE UNDERTAKEN BY AN APPROPRIATELY LICENSED PERSON WHO IS FAMILIAR WITH SAFE COMMISSIONING PROCEDURES.



Ceramic fire tile refractories are used in Raypak water heaters. Refractories must be treated with care because they can be harmful by inhalation and irritating to the skin, eyes and respiratory system.

Refer to “[Safety Precautions](#)” on page 30 for the precautions to be taken when the water heater is first operated.

### PRE-START CHECKS

- Ensure all packaging materials have been removed from the water heater.
- Conduct a visual inspection of the water heater and equipment for any damage or installation problems and report as necessary.
- Ensure that the water heater is clean and the surrounding area is clear of all combustible and flammable materials.
- Remove all liquids and chemicals from the plant room and check that combustion air openings are not obstructed.
- Test ALL gas connections for leaks, using soapy water. **NOT A NAKED FLAME**
- Ensure the water heater is filled with water (refer to “[To Fill the Water Heater](#)” on page 32).
- Check that the correct power supply is available and the circulation pump is supplied from the same electrical circuit as the water heater.
- Check that the ventilation to the plant room complies with the requirements, of AS 5601 and local authority regulations.
- If mechanical ventilation or power fluing is provided, check the operation of the fan(s) and interlocks.
- Check that the flue complies with the appropriate regulations and is fitted with an approved cowl.
- Ensure that the main gas isolation valve is closed.

### OPERATIONAL CHECKS

- Turn on the water heater and circulation pump and verify the flow switch operation - if fitted (refer to “[To Turn on the Water Heater](#)” on page 32).
- Test the operation of the water heater with no gas flow to confirm its operation up to lockout stage, then turn off the power.
- Open the gas isolation valve and switch on power to the water heater.
- With the main burner lit and at high fire, check the inlet gas pressure (refer to “[Gas Inlet Pressure](#)” on page 33).
- Check the water heater gas train and components for gas leaks using soapy water. **NOT A NAKED FLAME**
- Set the burner gas pressure to that shown on the rating label (refer to “[Gas Pressure Adjustment](#)” on page 33).
- Make a visual check of the burners. The flame should be blue with a well-defined pattern. A yellow or floating flame indicates restricted air openings or incorrect burner pressure setting.
- Verify that the high limit is operating and set correctly (refer to “[High Limit Adjustment](#)” on page 37).
- Check that the flue on an indoor installation is drawing correctly.
- Check operation of the water pressure relief valve.
- It is normal for the water heater to produce some smoke and possibly condensation for the first thirty (30) minutes of operation from new (refer to “[Safety Precautions](#)” on page 30).

**⚠ WARNING:** Upon completion of the installation and commissioning of the water heater, leave this guide with the householder or a responsible officer. **DO NOT** leave this guide inside of the cover of the water heater, as it may interfere with the safe operation of the water heater or ignite when the water heater is turned on.

Explain to the householder or a responsible officer the functions and operation of the water heater.

# OPERATING THE WATER HEATER

---

## FOR YOUR SAFETY READ BEFORE LIGHTING

### TO FILL THE WATER HEATER

#### Water Heating Applications

- Open all of the hot water tap(s) in the building (don't forget the showers) and supply cock(s) and valve(s) in the system.
- Open the isolation valves fully on the cold, flow / return and hot water branches to the storage tank(s) installed in a bank.
- Open the cold water isolation valve on the cold water line to the storage tank(s).  
Air will be forced out of the taps.
- Close each tap as water flows freely from it.
- Check the pipe work for leaks.

#### Mechanical/Process Heating Applications

- If a header tank is fitted, ensure it is filled with water.
- Open the isolation valve on the inlet line to the water heater.
- Bleed air from the system at all high points to ensure that the entire system is filled with water.
- Check the pipe work for leaks.

### TO TURN ON THE WATER HEATER

**⚠ WARNING!** If you smell gas do not attempt to turn on the water heater.

**The power supply to the water heater must not be switched on until the system is filled with water.**

- Fill the system with water (refer to "[To Fill the Water Heater](#)" on page 32)
- Open the gas isolation valve fully at the inlet to the water heater.
- Plug in the power supply cord at the power outlet.
- Switch on the electrical supply at the power outlet to the water heater.

**NOTE:** If the water heater is correctly installed, this will also activate the circulating pump.

The water heater will operate automatically when a call for heat occurs.

### TO TURN OFF THE WATER HEATER

If it is necessary to turn off the water heater on completion of the installation, such as on a building site or where the premises is vacant, then:

- Switch off the electrical supply at the power outlet to the water heater  
**NOTE:** If the water heater is correctly installed, this will also shut down the circulating pump.
- Close the gas isolation valve at the inlet to the water heater.
- Close the cold water isolation valve at the inlet to the water heater.
- Close the isolation valves on the cold and hot water branches to shut down an individual water heater in a bank (water heating applications only).

### TO RESET THE WATER HEATER

If the system water temperature is abnormally low, the ignition system may have locked out. The ignition system can be reset as follows:

- Turn the power to the water heater off.
- Wait five (5) minutes.
- Turn the power to the water heater on.

If the water heater still fails to operate, call your nearest Rheem Service Department or Accredited Service Agent to arrange for an inspection.

# BURNER PRESSURE ADJUSTMENT

## GAS INLET PRESSURE

**IMPORTANT – CHECK** the gas supply pressure at the inlet to the water heater with the water heater and all other gas burning appliances in the premises operating (burners alight). The minimum gas supply pressures are:

Natural Gas - 1.13 kPa          Propane - 2.75 kPa

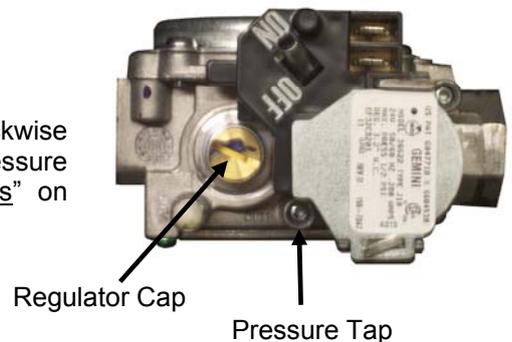
If this minimum cannot be achieved, it may indicate the meter or the gas line to the water heater is undersized. It is important to ensure that an adequate gas supply pressure is available to the water heater when other gas burning appliances, on the same gas supply, are operating.

## GAS PRESSURE ADJUSTMENT

### 109 On/Off Models

To adjust the burner pressure on a water heater with a White Rodgers 36G22 Type 210 gas valve proceed as follows:

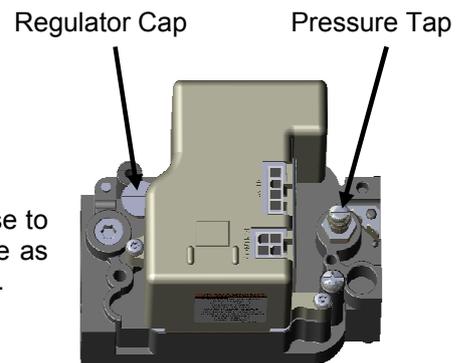
- Remove the screw from the outlet pressure tap.
- Attach a manometer to the outlet pressure tap.
- Remove the cap from the pressure regulator adjuster.
- With the main burner operating, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to “Location of Controls” on page 29).
- Turn off the water heater.
- Replace the cap on the pressure regulator adjuster.
- Disconnect the manometer and replace the pressure tap screw and washer.
- Check for gas leaks, using soapy water.



### 147 On/Off Models

To adjust the burner pressure on a water heater with a Honeywell Smart Valve, proceed as follows:

- Remove the screw and washer from the outlet pressure tap.
- Attach a manometer to the outlet pressure tap.
- Remove the cap from the pressure regulator adjuster.
- With the main burner operating, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to “Location of Controls” on page 29).
- Turn off the water heater.
- Replace the cap on the pressure regulator adjuster.
- Disconnect the manometer and replace the pressure tap screw and washer.
- Check for gas leaks, using soapy water.



**Hi/Lo Models**

To adjust the burner pressure on a water heater with a White Rodgers 36E20 Type 301 Hi/Lo gas control, proceed as follows:

**109 Hi/Lo Models**

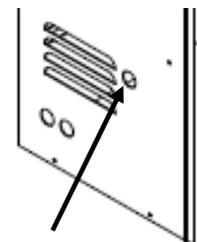
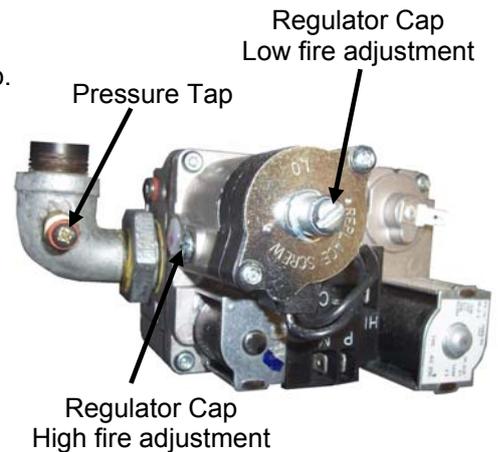
- Remove the screw and washer from the burner feed pipe pressure tap.
- Attach a manometer to the pressure tap.
- Remove the 20mm plug from the left hand side of the water heater and remove the cap from the high fire pressure regulator adjuster.
- With the main burner operating on high fire, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to "Location of Controls" on page 29).

**NOTE:** To ensure the burner is operating at high fire it may be necessary to increase set point on the thermostat (refer to "Temperature Control" on page 35).

- Remove the cap from the low fire pressure regulator adjuster.
- With the main burner operating on low fire, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to "Location of Controls" on page 29).

**NOTE:** To ensure the burner is operating on low fire it may be necessary to decrease the set point on the thermostat (refer to "Temperature Control" on page 35).

- Turn off the water heater.
- Replace the caps on the pressure regulator adjusters and the 20 mm plug in the left hand side panel.
- Disconnect the manometer and replace the pressure tap screw and washer.
- Check for gas leaks, using soapy water.



High fire adjustment access hole

**147 Hi/Lo Models**

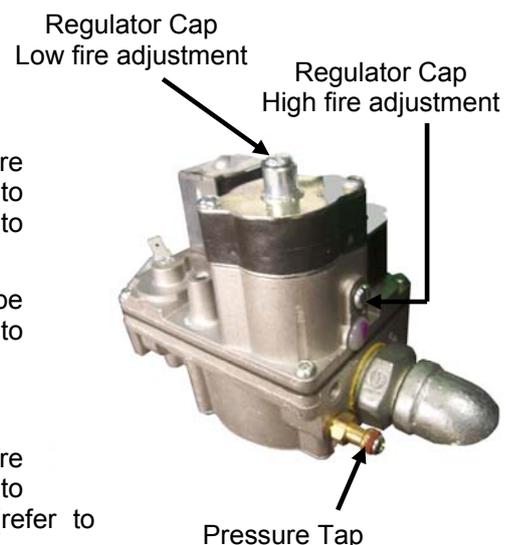
- Remove the screw and washer from the outlet pressure tap.
- Attach a manometer to the outlet pressure tap.
- Remove the cap from the high fire pressure regulator adjuster.
- With the main burner operating on high fire, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to "Location of Controls" on page 29).

**NOTE:** To ensure the burner is operating at high fire it may be necessary to increase set point "SE.1" on the thermostat (refer to "Temperature Control" on page 36).

- Remove the cap from the low fire pressure regulator adjuster.
- With the main burner operating on low fire, adjust the pressure regulator (clockwise to increase or anti-clockwise to decrease) to achieve the burner pressure as specified on the rating label (refer to "Location of Controls" on page 29).

**NOTE:** To ensure the burner is operating on low fire it may be necessary to decrease the set point of "SE.2" on the thermostat (refer to "Temperature Control" on page 36).

- Turn off the water heater.
- Replace the high and low fire caps on the pressure regulator adjusters.
- Disconnect the manometer and replace the pressure tap screw and washer.
- Check for gas leaks, using soapy water.



# TEMPERATURE CONTROL

---

## HOTTER WATER INCREASES THE RISK OF SCALD INJURY.

**This water heater can deliver water at temperatures which can cause scalding.**

**Water heating applications:** It is necessary and we recommend that a temperature limiting device be fitted between the water heating system and the hot water outlets in any ablution and public areas such as bathrooms, ensuites or public amenities, to reduce the risk of scalding. The installing plumber may have a legal obligation to ensure the installation of this water heater meets the delivery water temperature requirements of AS/NZS 3500.4 so that scalding water temperatures are not delivered to a bathroom, ensuite, or other ablution or public area.

## THERMOSTAT ADJUSTMENT

### All 109 Models

- Rotate the temperature adjustment knob until the required temperature is selected.

### 147 On/Off models (AKO Thermostat)

#### Set Point Adjustment:

- Press the down button (▼) for five (5) seconds.  
The current set point value will be displayed.
- Press the down button (▼) to decrease the set point or the up button (▲) to increase the set point.
- Once the required set point is selected, press and hold the down button (▼) and the up button (▲) simultaneously.  
The display will revert to the current temperature in the water heater.

#### Differential Adjustment:

- Press and hold the down button (▼) and the up button (▲) simultaneously for ten (10) seconds, "C0" will be displayed.
- Release the buttons.
- Press the down button (▼) until "C1" (differential) is displayed.
- Press and hold the down button (▼) and the up button (▲) simultaneously again.  
The current setting for "C1" will be displayed.
- Release the buttons.
- Press the down button (▼) to decrease the setting or the up button (▲) to increase the setting to the required value.
- Once the required differential is selected, press and hold the down button (▼) and the up button (▲) simultaneously.  
"C1" will be displayed.
- Press the down button (▼) until "EP" (exit program) is displayed.
- Press and hold the down button (▼) and the up button (▲) simultaneously.  
The current temperature in the water heater will now be displayed and programming complete.

## NOTES

- During the programming process if a button is not pressed for 25 seconds the thermostat will revert to its previous temperature display. It will be necessary to start again from step 1.
- Do **NOT** adjust any other parameter settings; this may cause the thermostat to malfunction.

**147 Hi/Low Models (CTX Thermostat)****Set Point Adjustment:**

- Press the 'set' button,  
SE.1 will be displayed for twelve (12) seconds.
- Press the 'set' button again,  
The current set point value will be displayed.
- Press the down button (▼/PRG) to decrease the set point or the up button (▲/ALM) to increase the set point.
- Once the required set point is selected, press the 'set' button to save the setting,  
SE.1 will be re-displayed for twelve (12) seconds.
- Press the up button (▲/ALM),  
SE.2 will be displayed.
- Press the 'set' button,  
The current set point for Low Fire will be displayed.
- Press the down button (▼/PRG) to decrease the set point or the up button (▲/ALM) to increase the set point.
- Once the required set point is selected, press the 'set' button to save the setting,  
SE.2 will be re-displayed
- Wait 12 seconds,  
The current temperature in the water heater will now be displayed and programming complete.

The recommended set points for SE.1 and SE.2 are 82°C and 75°C respectively for a heating system. However, it may be necessary to increase SE.2 if there is an unacceptable variation in room temperature.

**Differential Adjustment:**

- Press and hold the down button (▼/PRG) for at least 5 seconds,  
“E0” will be displayed.
- Press the up button (▲/ALM) until “E5.1” (differential setting for SE1).is displayed
- Press the 'set' button,  
The current differential value will be displayed.
- Press the down button (▼/PRG) to decrease the differential or the up button (▲/ALM) to increase the differential. NOTE: The differential is adjustable from 1°C to 6°C.
- Once the required differential is selected, press the 'set' button to save the setting,  
“E5.1” will be re-displayed.
- Wait 12 seconds,  
The current temperature in the water heater will now be displayed and programming complete.

**NOTES**

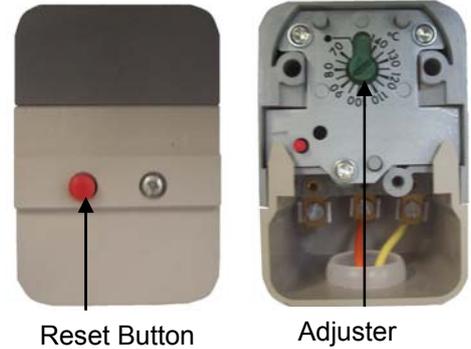
- To adjust the differential setting for SE2 repeat the 'Differential Adjustment' steps above however when selecting the 'E' parameter press the up button (▲/ALM) until “E5.2” is displayed.
- Do **NOT** adjust any other parameter settings; this may cause the thermostat to malfunction.

### HIGH-LIMIT THERMOSTAT ADJUSTMENT

A Honeywell high limit thermostat is used on both On/Off and Hi/Lo water heaters (refer to “Location of Controls” on page 29). The thermostat has a capillary style temperature sensor located in a well (pocket) fitted in the outlet header and senses the temperature of the water leaving the water heater.

The high limit temperature setting is adjusted by removing the front cover (loosen one Phillips-head screw) and turning the adjuster.

The high limit is reset by pressing the red button on the front of the thermostat. It may be necessary to allow the system water temperature to cool sufficiently before the high limit can be reset.



In general, the high limit should be set approximately 15°C above the operating temperature, however the following maximum limits must be observed:

- **Water Heating Applications:** 90°C maximum.
- **Mechanical/Process Heating Applications:** 99°C maximum for vented systems and 90°C maximum for unvented systems.

# SERVICE PROCEDURES

---

## ONLY AN AUTHORISED PERSON MAY REPAIR OR SERVICE A GAS APPLIANCE.



Ceramic fire tile refractories are used in Raypak water heaters. Refractories must be treated with care because they can be harmful by inhalation and irritating to the skin, eyes and respiratory system.

Refer to "Safety precautions" on page 30 for the precautions to be taken when servicing the water heater.

### Six Monthly Service Procedure

1. Isolate power to the water heater.
2. Operate the pressure relief valve (PRV) manually to check that the drain is clear and the valve reseals.
3. Remove burner access door and header access panels
4. Visually inspect combustion chamber area for build up of debris and clean if necessary.
5. Check the water heater thoroughly for any damage.
6. Check the heat exchanger and water seal areas for leaks and signs of sooting.
7. Check air vents and louvers, clean as required.
8. Restore power and check operation of the ignition system and all safety devices.
9. Check operation and calibration of all temperature control devices.
10. Perform a leak test on all gas unions using soapy water solution.
11. Check and monitor the operation of the water heater for at least ten (10) minutes.
  - With the burner lit, make a visual check of the main burner and pilot flame. Yellow flames indicate some restriction of the combustion air openings or incorrect burner gas pressure setting.
  - A bright orange, luminous flame is not normal and can cause sooting under prolonged operation.
12. Refit burner access door and header access panels.
13. Clean and remove any dust and debris from the water heater and its immediate area.

### Annual Service Procedure

1. Conduct the Six Monthly Service Procedure detailed above PLUS
2. Isolate gas, electricity and water supplies.
3. Disconnect and remove the burner tray.
4. Check igniter electrode and flame rod - clean and re-align if required.
5. Check main burner injectors – clean if required.
6. Clean burner bars.
7. Inspect external area of heat exchanger, clean fins and baffles.
8. Refit the burner tray and reconnect the gas train.
9. Restore gas, electricity and water supplies.
10. Perform a leak test on the gas train using soapy water solution.
11. Check burner pressure - adjust if required. Refer to "Gas Pressure Adjustment" on page 33
12. Refit all panels and the burner access door.

During the maintenance procedures detailed above all damaged or faulty components should be reported to the householder or responsible officer and arrangements made to effect immediate repairs.

**DO NOT** return the water heater to service where an unsafe condition exists.

**⚠ WARNING!** Operation of the water heater when faulty or incorrectly adjusted will result in rapid and severe damage which is not covered by warranty.

## WATER SUPPLIES

---

### **WATER HEATERS NOT INSTALLED IN ACCORDANCE WITH THIS ADVICE WILL NOT BE COVERED BY THE WARRANTY.**

This water heater is manufactured to suit the water conditions of most public reticulated water supplies. However, there are some known water supplies which can have detrimental effects on the water heater and its operation and/or life expectancy. If you are unsure of your water quality, you may be able to obtain information from your local water supply authority. This water heater should only be connected to a water supply which complies with these guidelines for the water heater warranty to apply.

#### **SATURATION INDEX**

The saturation index is used as a measure of the water's corrosive or scaling properties. In a corrosive water supply, the water can attack copper parts and cause them to fail. Where the saturation index is less than  $-1.0$ , the water is very corrosive. An expansion control valve\* may need to be fitted on the cold water line after the non-return valve in a corrosive water area where there are sufficient quantities of silica dissolved in the water.

In a scaling water supply calcium carbonate is deposited out of the water onto any hot metallic surface. Where the saturation index exceeds  $+0.40$ , the water is very scaling. An expansion control valve\* must be fitted on the cold water line after the non-return valve to protect and for warranty to apply to the temperature pressure relief valve and water heater cylinder.

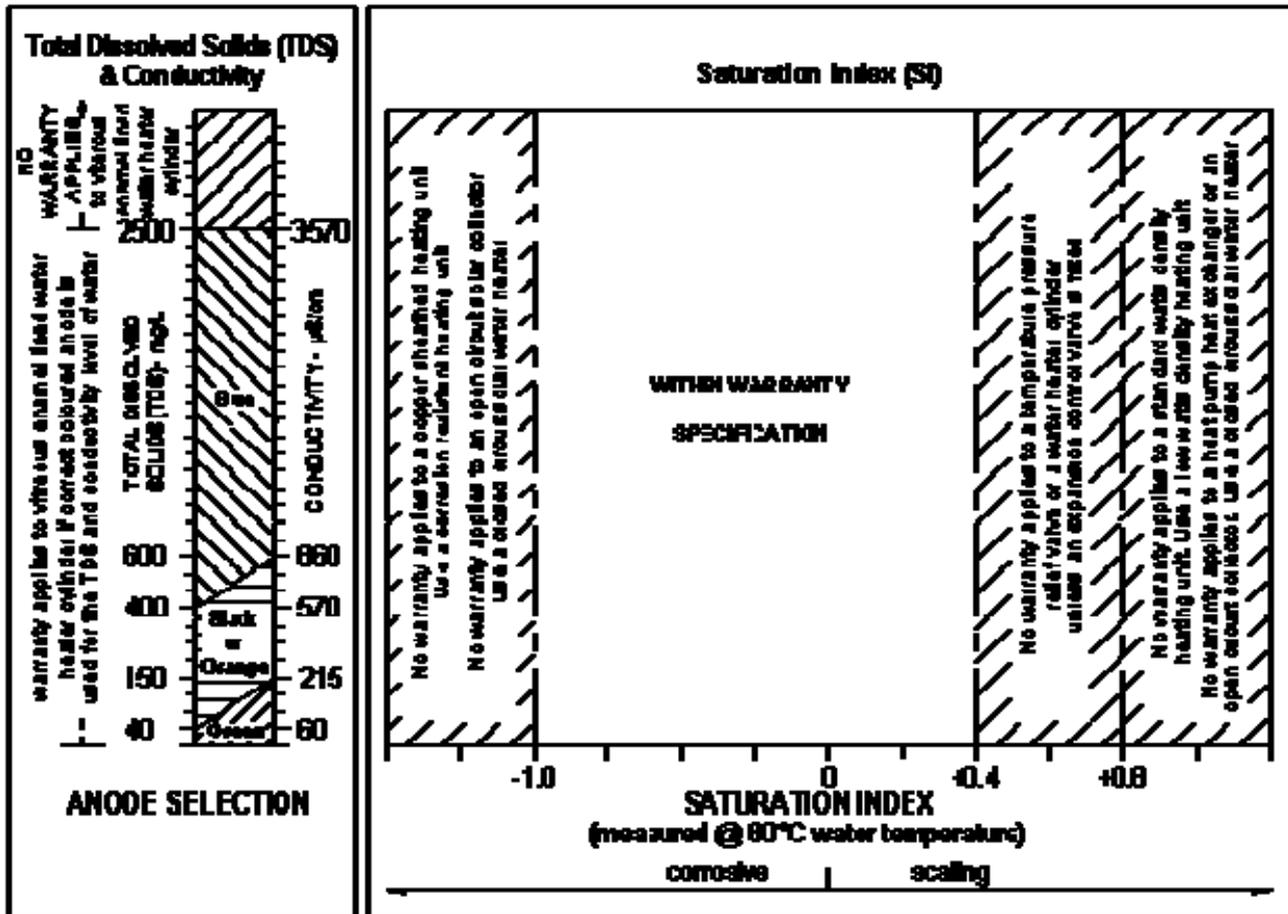
\* Refer to the cold water connection detail on page 19.

#### **CHANGE OF WATER SUPPLY**

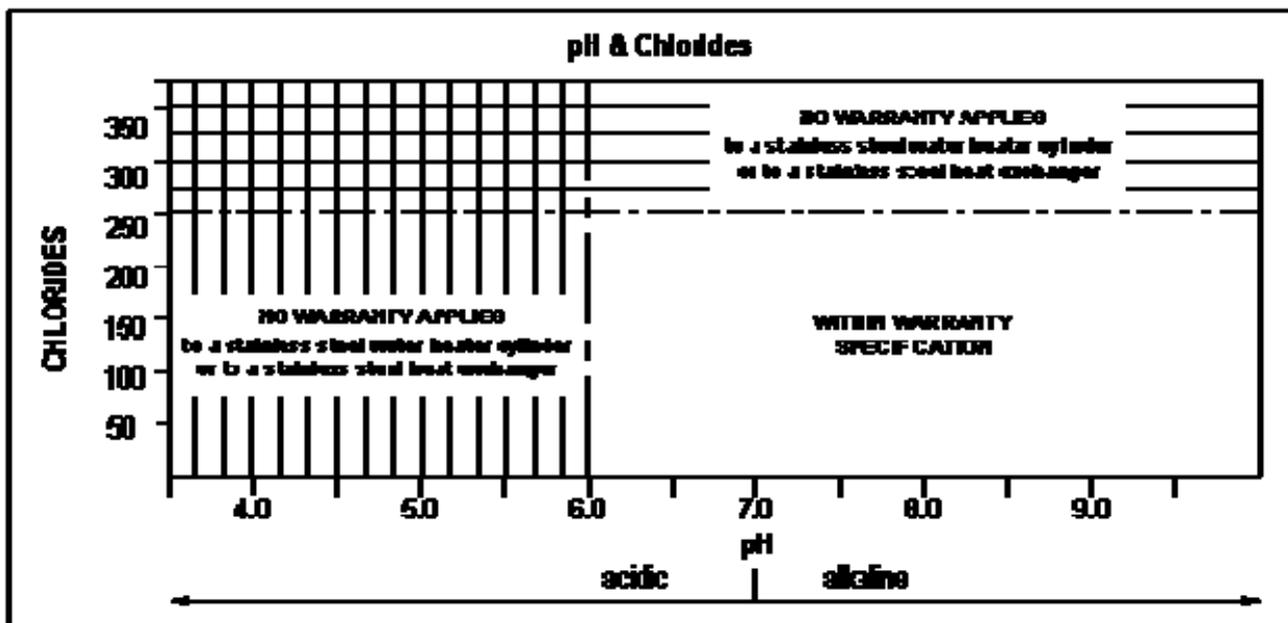
The changing or alternating from one water supply to another can have a detrimental effect on the operation and / or life expectation of the water heater, the storage cylinder and the relief valves.

Where there is a changeover from one water supply to another, eg, a rainwater tank supply, desalinated water supply, public reticulated water supply or water brought in from another supply, then water quality information should be sought from the supplier or it should be tested to ensure the water supply meets the requirements given in these guidelines for warranty to apply.

WATER QUALITY CHART



WATER QUALITY CHART



Water Quality Charts  
Saturation index, Total Dissolved Solids (TDS), pH & Chlorides

# WARRANTY

---

## RAYPAK WATER HEATER WARRANTY – AUSTRALIA ONLY

### WARRANTY CONDITIONS

1. This warranty is applicable only to water heaters manufactured from 1st May 2008.
2. The water heater must be installed in accordance with the Raypak water heater installation instructions, supplied with the water heater, and in accordance with all relevant statutory and local requirements of the State in which the water heater is installed.
3. Where a failed component or water heater is replaced under warranty, the balance of the original warranty period will remain effective. The replaced part or water heater does not carry a new warranty.
4. Where the water heater is installed outside the boundaries of a metropolitan area as defined by Rheem or further than 25 km from a regional Rheem branch office, or an Accredited Service Agent, the cost of transport, insurance and travelling costs between the nearest Rheem Accredited Service Agent's premises and the installed site shall be the owner's responsibility.
5. Where the water heater is installed in a position that does not allow safe, ready access, the cost of accessing the site safely, including the cost of additional materials handling and / or safety equipment, shall be the owner's responsibility.
6. The warranty only applies to the water heater and original or genuine (company) component replacement parts and therefore does not cover any plumbing or electrical parts supplied by the installer and not an integral part of the water heater, e.g. pressure limiting valve; isolation valves; non-return valves; electrical switches; pumps or fuse.
7. The water heater must be sized to supply the hot water demand in accordance with the guidelines in the Rheem water heater literature.

### WARRANTY EXCLUSIONS

1. REPAIR AND REPLACEMENT WORK WILL BE CARRIED OUT AS SET OUT IN THE RAYPAK WATER HEATER WARRANTY, HOWEVER THE FOLLOWING EXCLUSIONS MAY CAUSE THE WATER HEATER WARRANTY TO BECOME VOID AND MAY INCUR A SERVICE CHARGE AND / OR COST OF PARTS.
  - a) Accidental damage to the water heater or any component, including: Acts of God; failure due to misuse; incorrect installation; attempts to repair the water heater other than by a Rheem Accredited Service Agent or the Rheem Service Department.
  - b) Where it is found there is nothing wrong with the water heater; where the complaint is related to excessive discharge from the temperature and / or pressure relief valve due to high water pressure; where there is no flow of hot water due to faulty plumbing; where water leaks are related to plumbing and not the water heater or water heater components; where there is a failure of gas, electricity or water supplies; where the supply of gas, electricity or water does not comply with relevant codes or acts.
  - c) Where the water heater or water heater component has failed directly or indirectly as a result of: excessive water pressure; excessive temperature and / or thermal input; blocked overflow / vent drain; corrosive atmosphere; ice formation in the pipe work to or from the water heater.
  - d) Where the water heater is located in a position that does not comply with the Raypak water heater installation instructions or relevant statutory requirements, causing the need for major dismantling or removal of cupboards, doors or walls, or use of special equipment to bring the water heater to floor or ground level or to a serviceable position.
  - e) Repair and / or replacement of the water heater due to scale formation in the waterways or the effects of corrosive water when the water heater has been connected to a scaling or corrosive water supply as outlined in the Owner's Guide and Installation Instructions booklet.
2. SUBJECT TO ANY STATUTORY PROVISIONS TO THE CONTRARY, THIS WARRANTY EXCLUDES ANY AND ALL CLAIMS FOR DAMAGE TO FURNITURE, CARPETS, WALLS, FOUNDATIONS OR ANY OTHER CONSEQUENTIAL LOSS EITHER DIRECTLY OR INDIRECTLY DUE TO LEAKAGE FROM THE WATER HEATER, OR DUE TO LEAKAGE FROM FITTINGS AND / OR PIPE WORK OF METAL, PLASTIC OR OTHER MATERIALS CAUSED BY WATER TEMPERATURE, WORKMANSHIP OR OTHER MODES OF FAILURE.

**RAYPAK WATER HEATER WARRANTY – AUSTRALIA ONLY****Rheem will:**

- a) Repair or, if necessary replace any Raypak water heater; or  
 b) Replace any component (or, if necessary, arrange the installation of a new water heater),  
 which falls within the Warranty Periods specified below, subject to the warranty conditions and exclusions.

<b>Installation</b>	<b>Model</b>	<b>Period</b>	<b>Warranty</b>
<b>All Components (from date of installation)</b>			
All installations	All models	Year 1	New component or water heater (at Rheem's sole discretion), free of charge, including labour.*
<b>Heat Exchanger / Tube Bundle (from date of installation)</b>			
All installations	All models	Years 2 to 5	New heat exchanger or tube bundle, free of charge, with installation and labour costs being the responsibility of the owner.

**Note:**

\* Refer to items 4 and 5 of warranty conditions.

Rheem reserves the right to transfer fully functional components from the defective water heater to the replacement water heater if required. The term "water heater" used in the Warranty, Warranty Conditions and Warranty Exclusions means the Rheem supplied water heater(s), kit(s) and components.

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

This is the only warranty given by Rheem and no one is authorised to make any other warranties on Rheem's behalf.

Please complete the area on the inside front page of the Owner's Guide and Installation Instructions and retain this document in case you need to make a warranty claim.

**RHEEM AUSTRALIA PTY LTD**

A.B.N. 21 098 823 511

[www.rheem.com.au](http://www.rheem.com.au)**RAYPAK AUSTRALIA PTY LTD**

A.B.N. 65 078 743 414

[www.raypak.com.au](http://www.raypak.com.au)

FOR SERVICE TELEPHONE  
**131 031 AUSTRALIA**  
**0800 657 335 NEW ZEALAND**  
 or refer local Yellow Pages

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



**Proudly Manufactured by Raypak Australia**

**Head Office & Sales**

**Tel: (03) 9757 3333**

**Fax: (03) 9757 3350**

**Sales Enquiries: 1300 729 725**

**[www.raypak.com.au](http://www.raypak.com.au)**