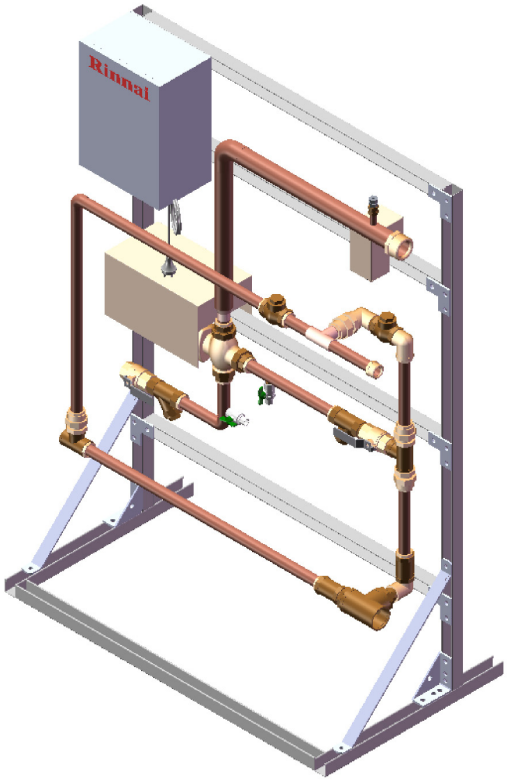
Rinnai

Demand Duo
Warm Water Valve

SERVICE MANUAL



MUST BE PRINTED IN COLOUR TO MAINTAIN ACCURACY.

This Service Manual is to be used in conjunction with the 'Owner's Guide and Installation Manual'. Installation, commissioning, operation, maintenance and service must be performed by persons competent and permitted by law to do so in accordance with the manufacturers instructions and the relevant requirements of:

- **AS/NZS 3500.4**
- **AS/NZS 3000**
- **AS/NZS 4032.3**
- **Local codes and regulatory authorities**

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WaterMark

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Part No: 15401087

TABLE OF CONTENTS

WARNINGS

This manual must be used with the Rinnai Demand Duo Warm Water Valve Owner's Guide and Installation Instructions.

Installation, commissioning, operation, maintenance and service must be performed by persons competent and permitted by law to do so in accordance with the manufacturers instructions and the relevant requirements:

- AS/NZS 3500.4
- AS/ NZS 3000
- AS/NZS 4032.3
- Local codes and regulatory authorities

The Demand Duo Warm Water Valve can only be installed in conjunction with a mains pressure storage hot water system.

To prevent the risk of electrical shock, electric supply must be isolated prior to carrying out any work on the Warm Water Valve or ancillary equipment.

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

The Compact Universal Controller (Model RWF40) is factory programmed and locked by Rinnai. Should the controller be faulty, only a new pre-programmed controller from Rinnai Australia must be fitted.

This controller cannot be programmed by entities other than Rinnai Australia.

General Information

The modulating control valves PN16 (Model numbers MXG461B) are used in conjunction with the Compact Universal Controllers (Model Number RWF40) and Limit Thermostat (Model number RAK-ST.1385-M) on Rinnai Demand Duo Warm Water systems (DDWW).

Rinnai DDWW systems delivery temperature controlled warm water by blending hot water from a separate mains pressure hot water system and mains pressure cold water using these above components.

The Rinnai Warm Water valve is able to provide a constant outlet temperature from the control valve by finely adjusting the proportion of hot and cold water that is mixed together by using a magnetic actuator to drive open or shut the cold and hot inlet ports.

The 3 Way Valve Actuator Controller converts the positioning signal to a phase-cut power signal which generates a magnetic field in the valve coil. This causes the armature to change its position in accordance with the interacting forces (magnetic field, spring and hydraulics). The armature responds rapidly to any change in signal, transferring the corresponding movement directly to the valve plug, enabling fast changes in outlet temperature to be correctly quickly and accurately. The valves position is measured continuously. The internal positioning controller balances any disturbance in the system rapidly, and delivers the position feedback signal.The valve stroke is proportional to the positioning signal. The magnetic actuator is driven by a controller specially programmed by Rinnai for this purpose.

SPECIFICATIONS

TABLE 1 - SPECIFICATIONS			
Models	DDWW80	DDWW50	DDWW32
Mixed outlet flow rate at corresponding pressure loss through system	360 l/min at 60 kPa	165 l/min at 60 kPa	61 l/min at 60 kPa
	500 l/min at 100 kPa	200 l/min at 100 kPa	83 l/min at 100 kPa
	667 l/min at 200 kPa	267 l/min at 200 kPa	117 l/min at 200 kPa
Maximum static and dynamic working pressures	1000 kPa **IMPORTANT:** The pressure limitations of the Storage Water Heater must also be considered. When installed with Rinnai Demand Duo observe the pressure limitations specified.		
Maximum dynamic differential pressure between hot and cold supplies to 3 way mixing valve	50 kPa		
Hot inlet temperature range	60° to 70° C		
Cold inlet temperature	To be less than mixed outlet temperature setting		
Minimum 'mixed return' flow rate	54 l/min	24 l/min	14 l/min
Electrical power supply	240 Volts, 50 Hz		
Average power consumption	24 W	20 W	15 W
Dimensions: (mm) Width Height: Depth:	 1200 1640 666		
Weight:	135 kg	90 kg	70 kg
Cold inlet connection *	3” RP	2” RP	1 1/4” RP
Hot inlet connection *	2” RP	1 1/4” RP	3/4” RP
Mixed outlet connection *	3” R	2” R	1 1/4” R
Mixed return connection *	2” R	1 1/4” R	3/4” R
Cold to Storage Water Heater connection *	2” RP	1 1/4”RP	34” RP
* All connections are pipe threads of Whitworth form.			

OPERATING PRINCIPLES

Demand Duo Warm Water Valve - Main Components

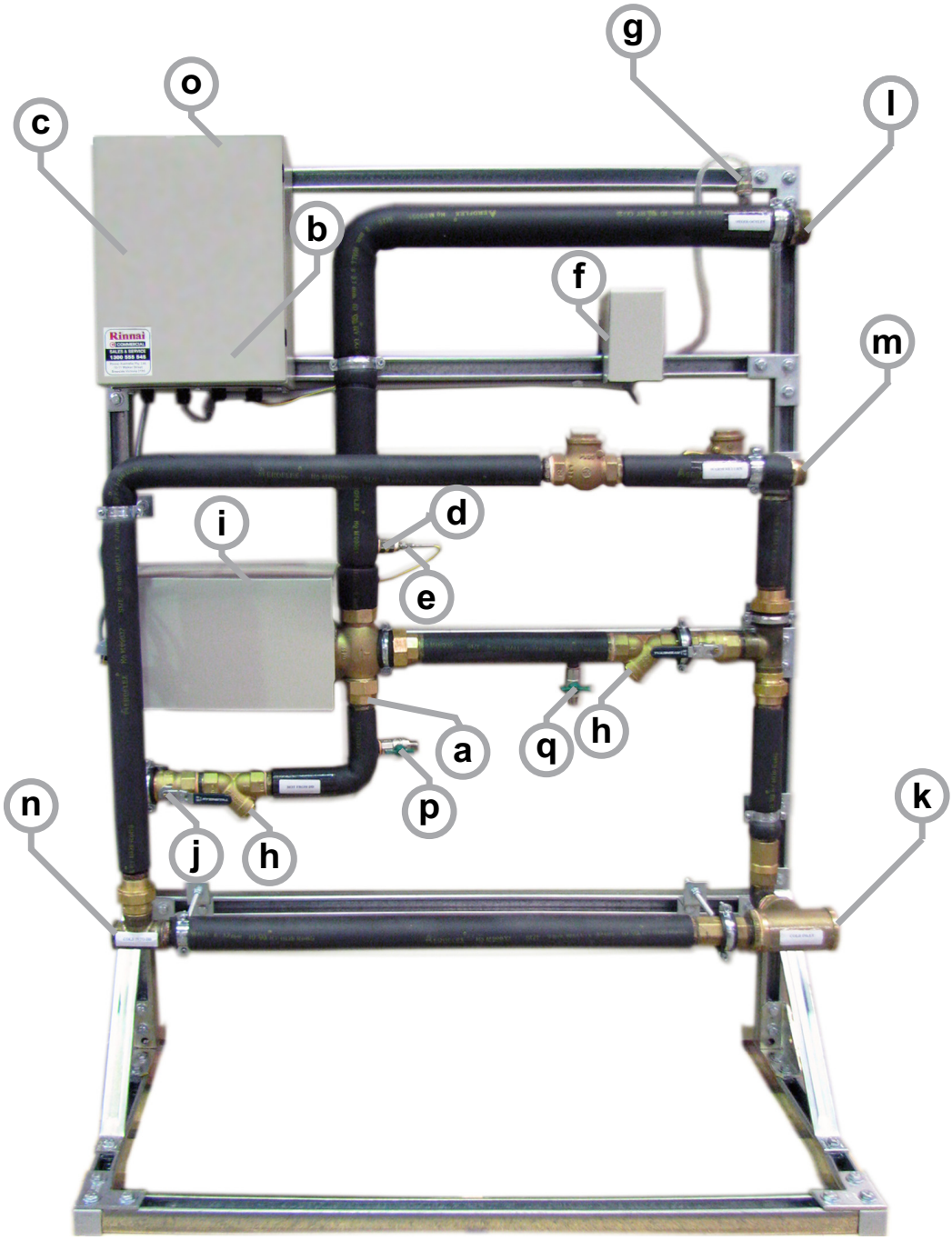


Figure 1 - Demand Duo Warm Water Valve - Main Components

Ⓐ - 3 Way Mixing Valve	Ⓙ - Hot Water Supply
Ⓑ - Universal Controller (Behind Cover)	Ⓚ - Cold Water Supply
Ⓒ - 240 - 24 Volt AC, 60 VA Transformer (Behind Cover)	Ⓛ - Mixed Delivery
Ⓓ - Thermocouple, K-Type (Mixed Outlet)	Ⓜ - Mixed Return
Ⓔ - Gland 3 mm x 1/4 BSP	Ⓝ - Cold Supply to Water Heater
Ⓕ - Temperature Limit Thermostat (Mixed Outlet) (Behind Cover)	Ⓞ - Universal Controller Enclosure
Ⓖ - Stainless Steel Pocket	Ⓟ & Ⓠ - Differential Pressure Check Points
Ⓗ - 'Y' Strainers	
Ⓘ - 3 Way Valve Actuator and Controller (Behind Cover)	

OPERATING PRINCIPLES

3 Way Mixing Valve Schematic

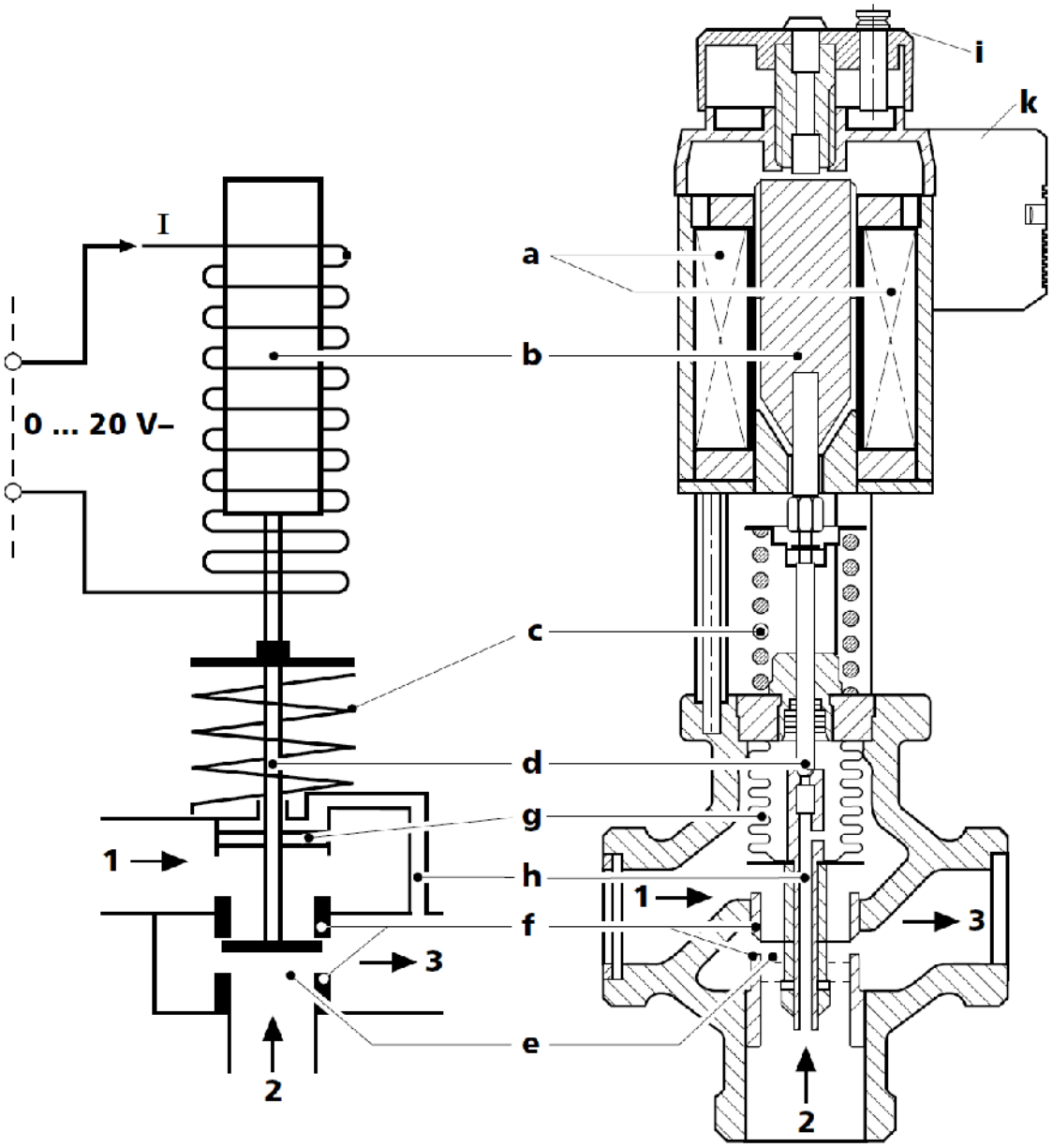


Figure 2 - Cutaway

① - Hot Inlet	Ⓔ - Disc
② - Cold Inlet	Ⓕ - Upper / Lower Valve Seats
③ - Mixed Outlet	Ⓖ - Bellows
Ⓐ - Magnetic Coil	Ⓗ - Aperture for Pressure Balancing
Ⓑ - Core	Ⓘ - Handwheel
Ⓒ - Spring	Ⓚ - Electrical Interface
Ⓓ - Stem	

OPERATING PRINCIPLES

Pressure Balancing of the 3 Way Mixing Valve Internal Bellows and bleed tube

Differing pressures across the control path affect the magnetic force, but this potential problem is virtually eliminated through pressure balance. This ensures that the magnetic force is primarily used for flow control. Pressure balancing is an extremely effective solution and is achieved in practice with the aid of a bellows (Fig. 2). Pressure p2 passes through a passage in the stem into the inside of the bellows and equalises the pressure p2 acting on the lower side of the valve disc. Pressure p1, working on the upper side of the disc, is equalised by the pressure p1 activating on the lower side of the bellows. This solution, within the valve itself, involves neither a special compensatory circuit nor any additional space.

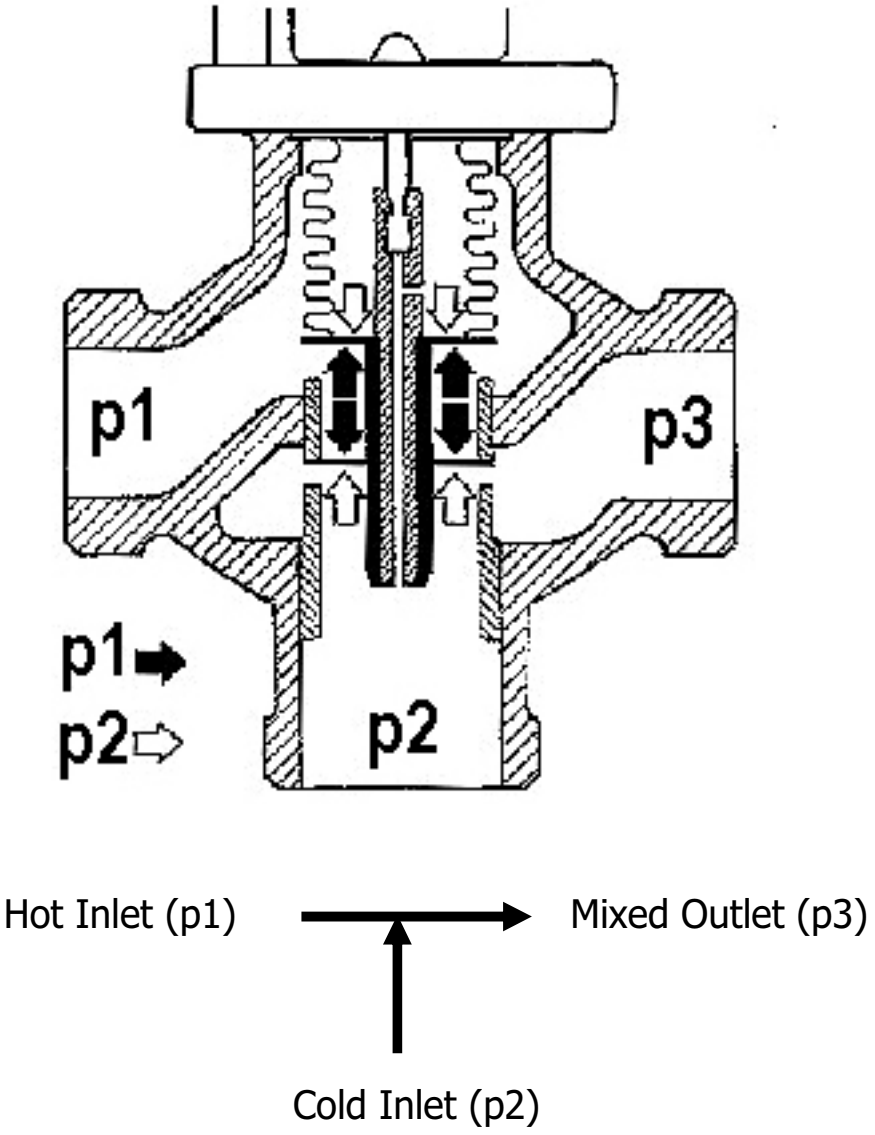


Figure 3 - Inlet and Outlet Ports

It is therefore most critical that the proper line strainers be fitted to the Rinnai Warm Water Valve assembly, using the correct sized mesh as specified by Rinnai. If debris is allowed to enter and block the pressure balancing tube, then the water held within the internal bellows can hydraulically lock the valve, which may prevent proper valve modulation to maintain correct outlet temperature.

System Schematic

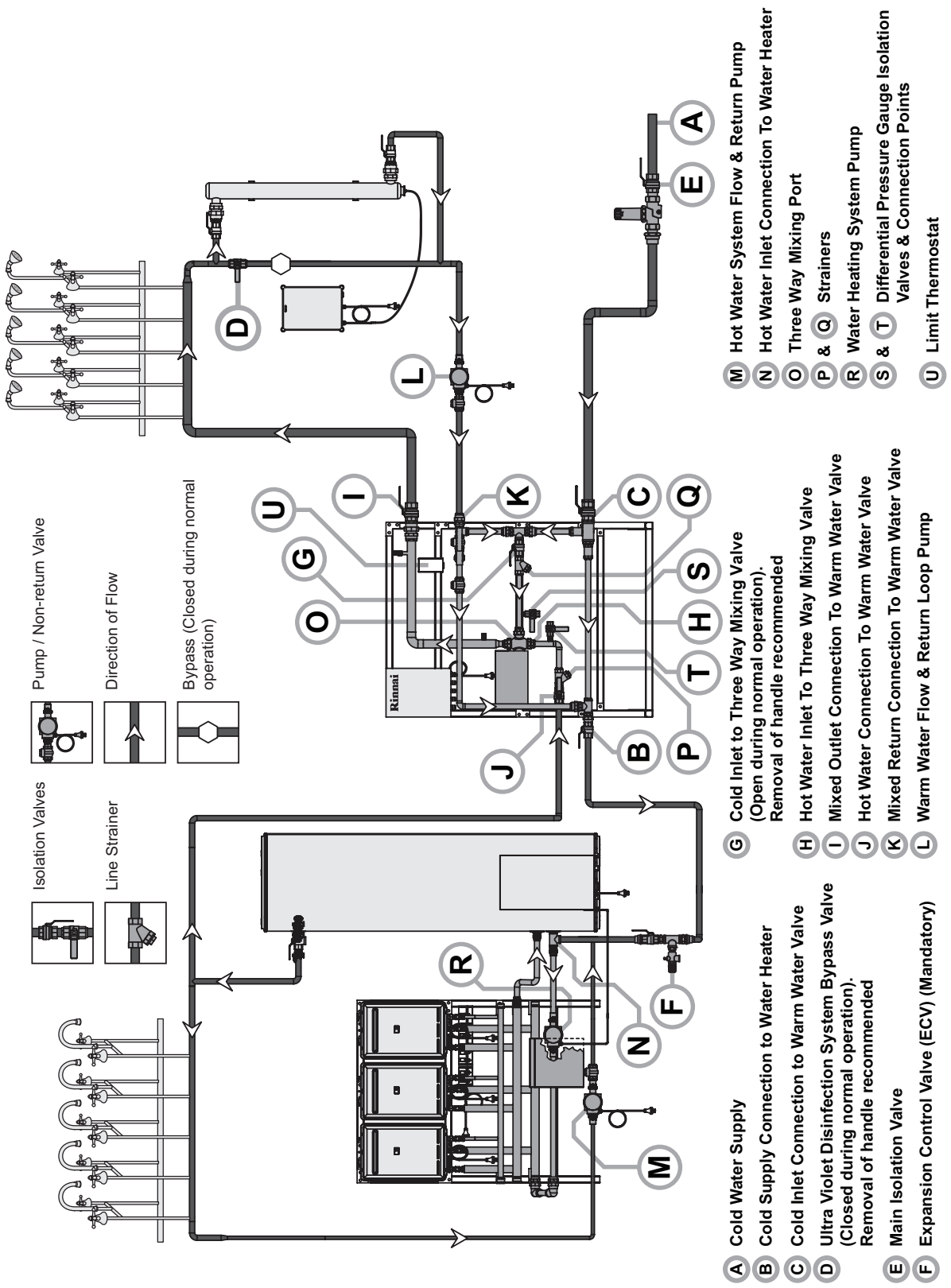


Figure 4A - Component Identification

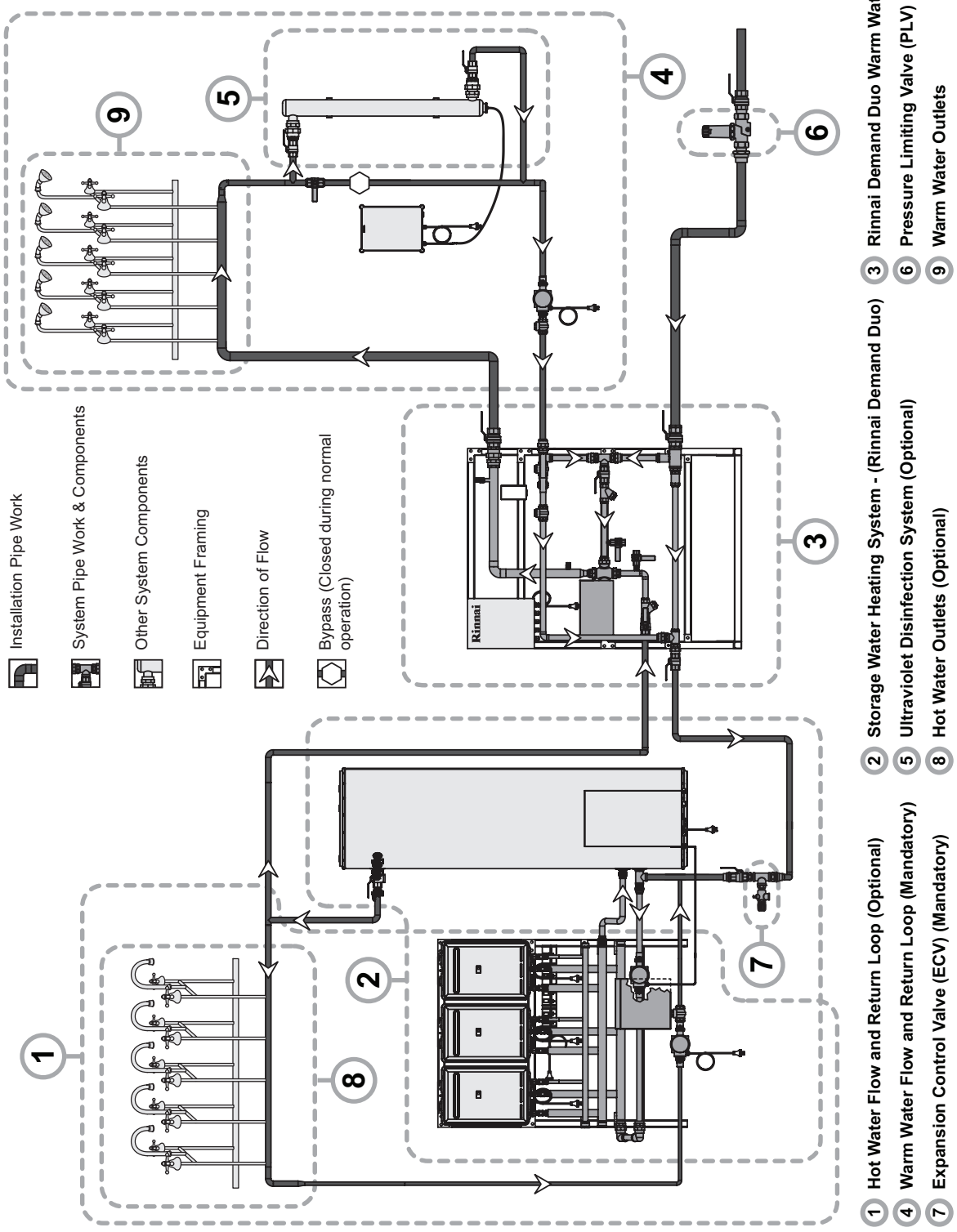


Figure 4B - Demand Duo Warm Water Valve - Typical Installation

System Schematic with Solar Preheat

When Demand Duo hot water system is used as part of a solar hot water booster, the pipework must be connected in the following manner. **NOTE: This is a concept sketch only. It is not a formal engineering drawing. Mandatory valves and fittings not shown.**

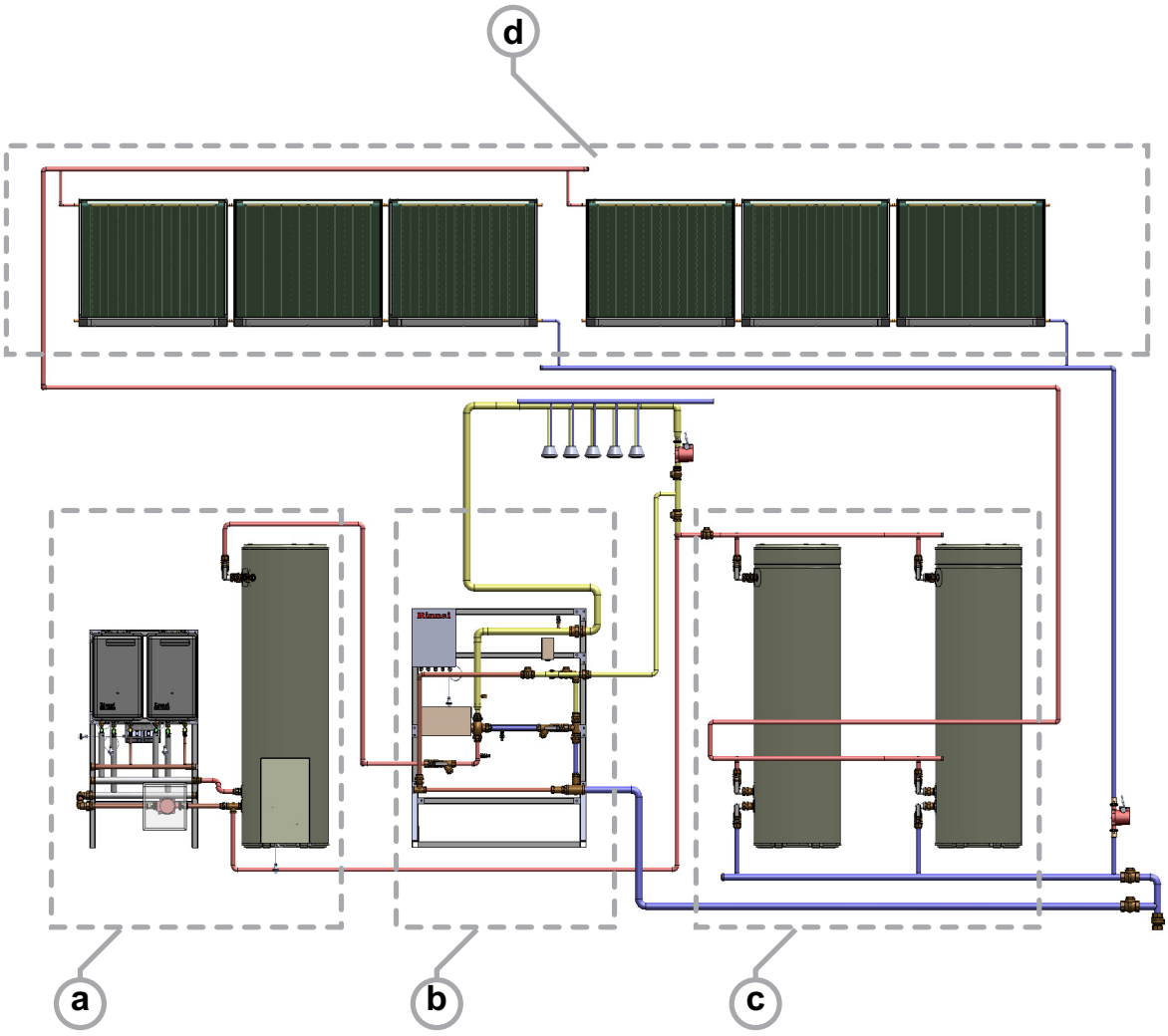


Figure 4C - Demand Duo System and Solar Preheat

Ⓐ - Rinnai Demand Duo Storage Hot Water System
Ⓑ - Rinnai Demand Duo Warm Water Valve
Ⓒ - Solar Storage Cylinders
Ⓓ - Solar Collectors

OPERATING PRINCIPLES

Description of System Operation

The Demand Duo Warm Water Valve (i) connections comprise the 'cold supply' (11), the 'hot supply' (13), 'mixed delivery' (10) and 'mixed return' (9). For maximum safety, the 'cold supply' (11) to the warm water valve (i) and the water heating system (ii) are connected to the same source via the 'cold to water heater' connection (12). Warm water is delivered to the warm water outlets (16) via a pumped flow and return system. The design of the 'flow and return' loop (iii) and the flow and return pump system (15) must result in the minimum 'mixed return' (9) flow rate specified being achieved). The Demand Duo warm water valve is unsuitable for installation as part of plumbing systems that do not incorporate a 'flow and return' loop and pump system.

An electronic temperature sensor (1) measures the warm outlet temperature and sends an electronic signal to the system controller (2). The system controller sends an operating voltage (3) to a magnetic actuator (4) directly coupled to a 3 way mixing valve (5). The 3 way mixing valve mixes 'hot inlet' (6) and 'cold inlet' (7) water to achieve 'mixed outlet' (8) water at a set temperature. The positioning of the 3 way mixing valve (5) controls the ratio of 'hot inlet' (6) and 'cold inlet' (7) water and therefore the temperature of 'mixed outlet' (8) water. This positioning in turn depends upon the voltage sent by the system controller (2) to the magnetic actuator (4).

Warm water returning to the system via the system 'mixed return' connection (9) can flow to the 'cold inlet' (7) and/or to the water heating system (ii) via the 'cold to water heater' connection (12) and then to the 'hot supply' (13) and 'hot inlet' (6) in any proportion determined by the system controller (2) and positioning of 3 way mixing valve (5). In this way, the system controls the mixed water temperature under all specified conditions. An ultraviolet disinfection system (14) is available as an optional extra.

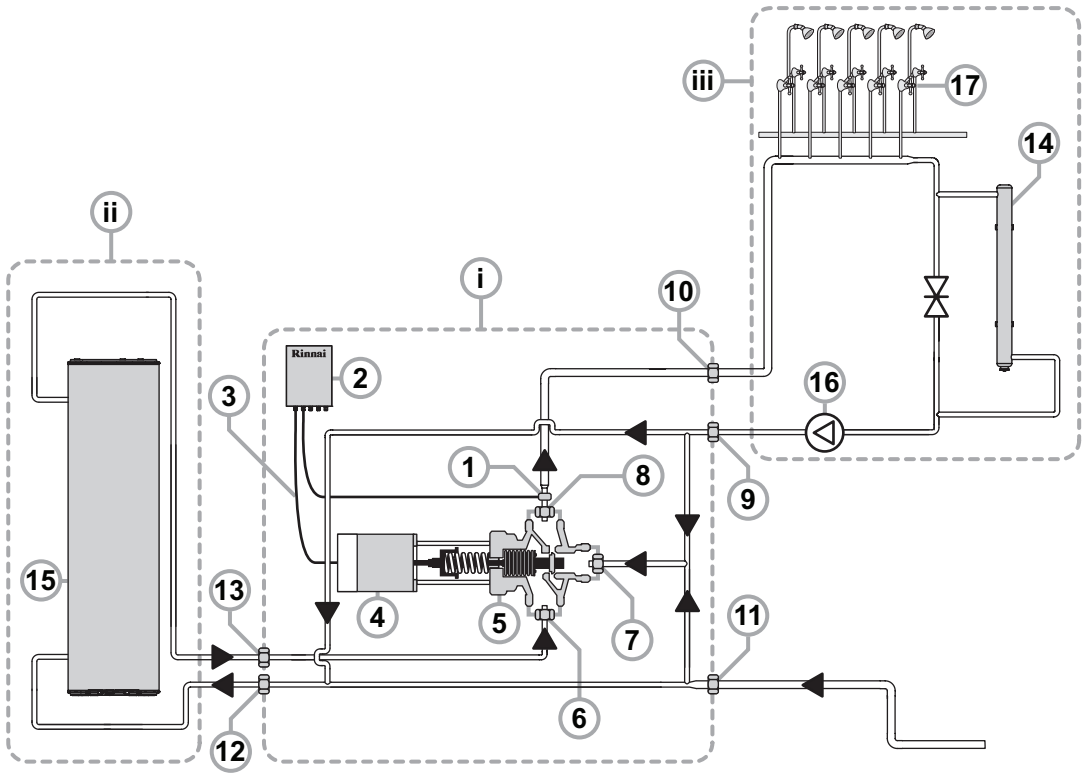


Figure 5 - Principles of Operation

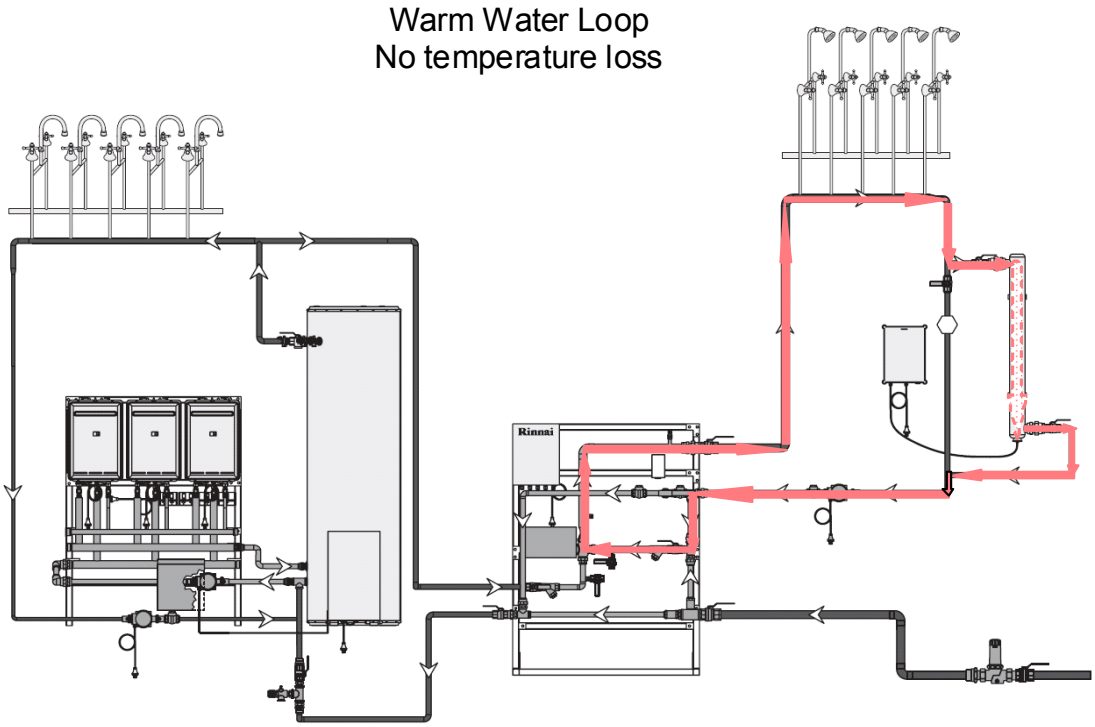


Figure 6 - Warm Water Loop - No Temperature Loss

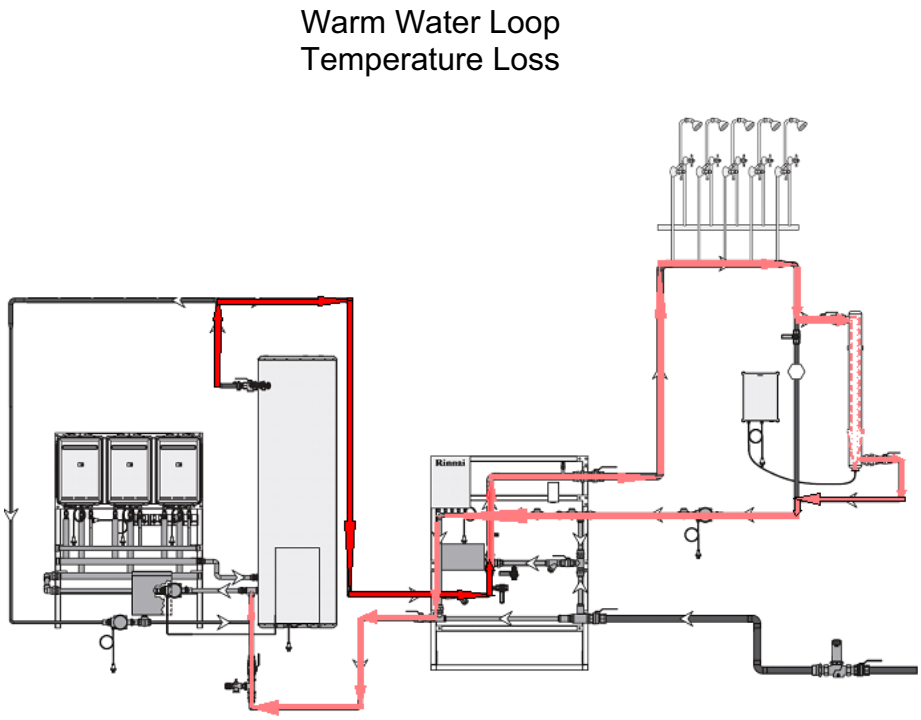


Figure 7 - Warm Water Loop - Temperature Loss

Warm Water Loop in Operation (Taps Open)

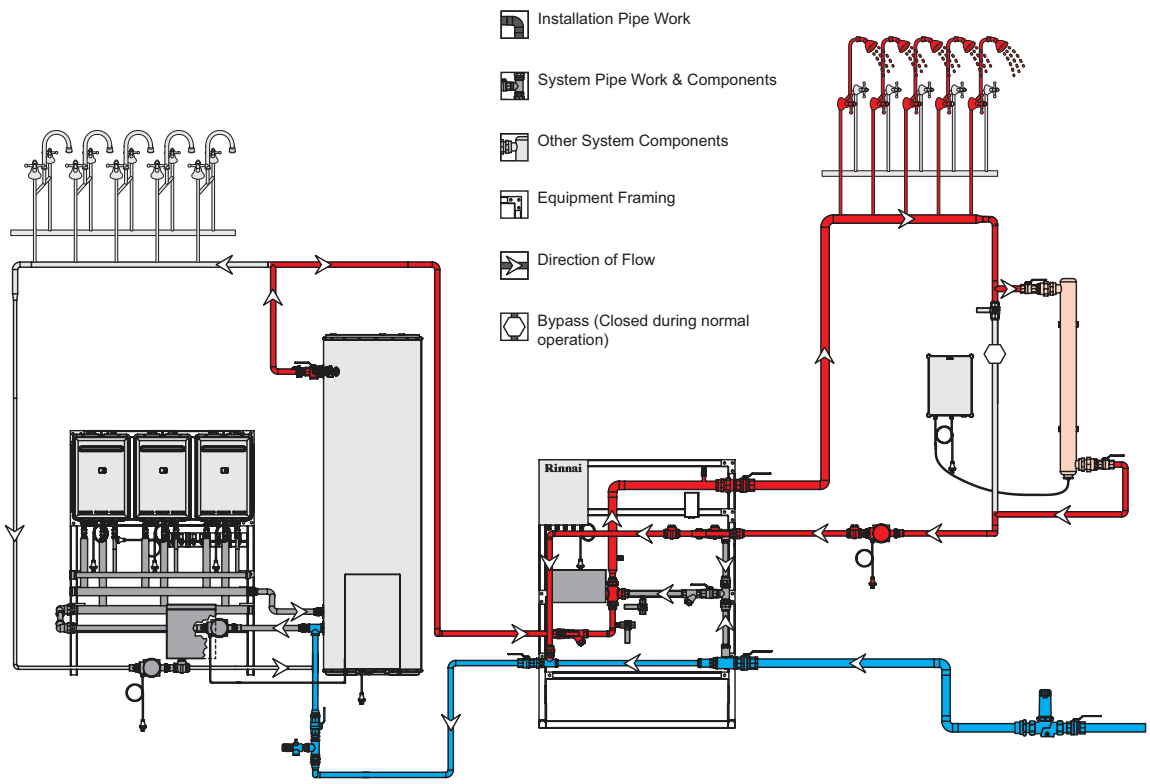


Figure 8 - Warm Water Loop in Operation (Taps Open)

SYSTEM CHECKS

General

It is recommended that the System Checks in this section are carried out and recorded at least every 12 months. This frequency is intended as a guide only and may need to be varied depending on site specific operational conditions and any local regulations and requirements. As an example, in health care installations the risks to users are generally higher than those in non health care installations and this would warrant more frequent checking.

The System Checks in this section may also be required as a result of fault rectification being carried out. In this case, the relevant System Checks are nominated in the “system adjustment / calibration” and “parts replacement” chapters.

If the warm water system is to be re-commissioned completely refer to the “Owner’s Guide and Installation Manual”.

Basic Checks

Step 1. Check strainers. There are two ‘Y’ strainers in the warm water system itself that should be checked and cleared. Any strainers in the cold water supply to the water heater and in the hot and cold water supply to the warm water valve must also be checked and cleared.

Step 2. Check for leaks from any joints or components in the warm water valve system.

Step 3. Bleed any air from the system.

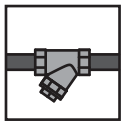


Figure 9 - “Y” Strainers

Differential Pressure Check

The maximum pressure difference between the hot and cold inlets of the 3 way mixing valve under flow conditions (referred to as the dynamic differential pressure) must not exceed 50 kPa for the system to perform as specified (see “SPECIFICATIONS”).This is checked by using a suitable differential pressure gauge and connecting it across the 'cold supply' and 'hot supply' connections to the 3 way mixing valve (Fig. 4A - Items Ⓖ and Ⓗ) and reading the maximum differential pressure at full flow conditions. A suitable differential pressure gauge is Ambit Instruments, Model CZ 300 DGC with display range of – 100 kPa to + 100 kPa. This gauge operates via a magnetic coupling with a convoluted diaphragm sensor. Gauges by other manufacturers with equivalent specifications are also suitable.

NOTE

It is recommended that the handles for the cold and hot supply valve to the three way mixing valve are removed during normal operation and kept in a safe place by the person responsible for the warm water valve and associated plumbing infrastructure in the premises to prevent unauthorised adjustment. These handles will need to be retrieved and temporarily fitted for this test.

To carry out the Differential Pressure Check follow steps below (Refer Figures 4A & 4B) for valve and connection locations).

Step 1. Close the mains cold water Ⓒ and hot water Ⓙ to the warm water valve system

Step 2. Open any warm water outlet ⑨ until the flow of warm water reduces to a minimum or stops completely to relieve any residual pressure in the installation. Close this warm water outlet.

Step 3. Close the cold supply Ⓖ to the 3 way mixing valve Ⓞ.

Step 4. Ensure the differential pressure gauge isolating valves Ⓢ and Ⓣ are closed. Connect the differential pressure gauge across the connection points

Step 5. Open the cold supply Ⓖ to the 3 way mixing valve Ⓞ.

Step 6. Restore the mains cold water Ⓒ and hot water Ⓙ to the warm water valve system.

Step 7. Simultaneously open the differential pressure gauge isolating valves Ⓢ and Ⓣ.

Step 8. Open all warm water outlets ⑨ to achieve maximum flow through the warm water installation.

Step 9. Check and record the differential pressure.

If the differential pressure is outside the limit in the “SPECIFICATIONS” refer to section “SYSTEM FAULT FINDING”

SYSTEM CHECKS

Checking Mixed Outlet Water Temperature - Partial Test

This test is not suitable for commissioning purposes. It is carried out at low flow rate only. It is suitable for use only during routine checking of water temperature when it is impracticable to open all warm water outlets and achieve full flow through the system. The 'Full Test' described below is always the preferred method for checking water temperature.

Step 1. Set the delivery temperature of the warm water valve in accordance with the procedure “Setting Mixed Outlet Temperature”.

Step 2. Open the warm water outlet furthest from the mixed outlet connection of the warm water valve. Check and record the temperature. Close this outlet.

Step 3. If the delivery temperature is incorrect, the 'Checking water temperature - full test' must be performed and the delivery temperature adjusted accordingly.

Checking Mixed Outlet Water Temperature - Full Test

This test must be performed during commissioning for every installation. If carrying out this test as part of commissioning ensure you have read and fully understood the section “Setting Mixed Outlet Temperature” on page 18.

This test is carried out at both full and partial flow rates.

Step 1. Set the delivery temperature of the warm water valve in accordance with the procedure “Setting Mixed Outlet Temperature” .

Step 2. Open sufficient warm water outlets ⑨ within the warm water flow and return loop to achieve the design ‘peak flow rate’ of the warm water installation. This is usually 20-30% of the total number of warm water outlets. If in doubt consult the system designer.

Step 3. Check and record the temperature at the outlet nearest to the mixed outlet connection of the warm water valve.

Step 4. Close all warm water outlets.

Step 5. Open the warm water outlet furthest from the mixed outlet connection of the warm water valve. **DO NOT** open any other warm water outlets. Check and record the temperature.

Step 6. Adjust delivery temperature in accordance with the section “Setting Mixed Outlet Temperature” .

Step 7. Repeat steps 2 to 6 as required.

Step 8. If the delivery temperature cannot be adjusted to achieve the desired temperature at outlets refer to the section “Setting Mixed Outlet Temperature” on page 18.

3 Way Valve Operation Verification

It must be confirmed that the control valve shaft is able to travel to the extreme left and right positions. This is the case if the universal controller is programmed correctly, all wiring between universal controller and control valve power supply is correct and the control valve/magnetic actuator combination are operating correctly.

Valve travel is verified by operating the system controller in 'manual' mode and manually setting the control voltages to the control valve power supply.

One operating extreme of valve travel is the 'closed against hot' position or the extreme left. This applies when the control voltage to the magnetic actuator is zero (0 Vdc). The valve is closed against the hot position by the force of the spring. The other operating extreme of valve travel is the 'closed against cold' position or the extreme right. This applies when the control voltage to the magnetic actuator is at a maximum (10 Vdc) and the valve is closed against the cold position by the magnetic actuator against the force of the spring. Both operating extremes are shown below and can be confirmed visually by the positioning of the valve shaft.

Voltages are checked on ‘X1T’ & ‘X1’ - terminals on the universal controller (RWF40) & valve terminals ‘M’ & ‘Y’.

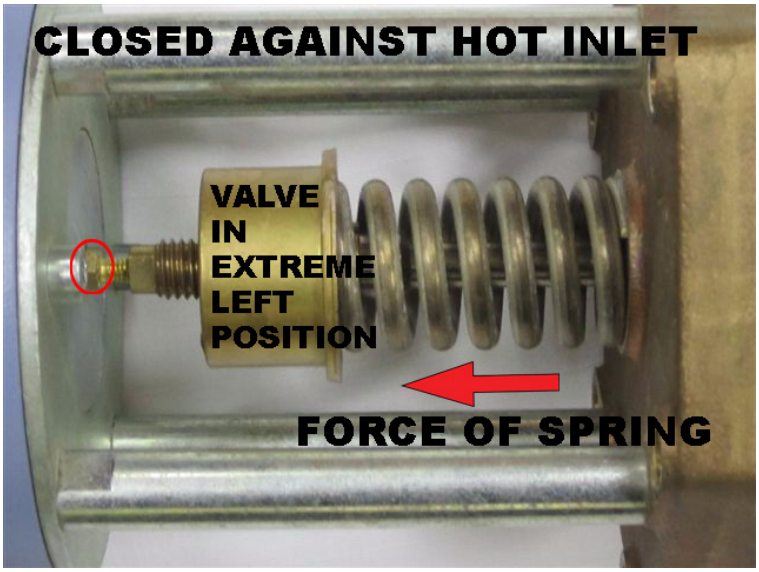


Figure 10 - Valve to extreme left - closed against Hot (0 Vdc)

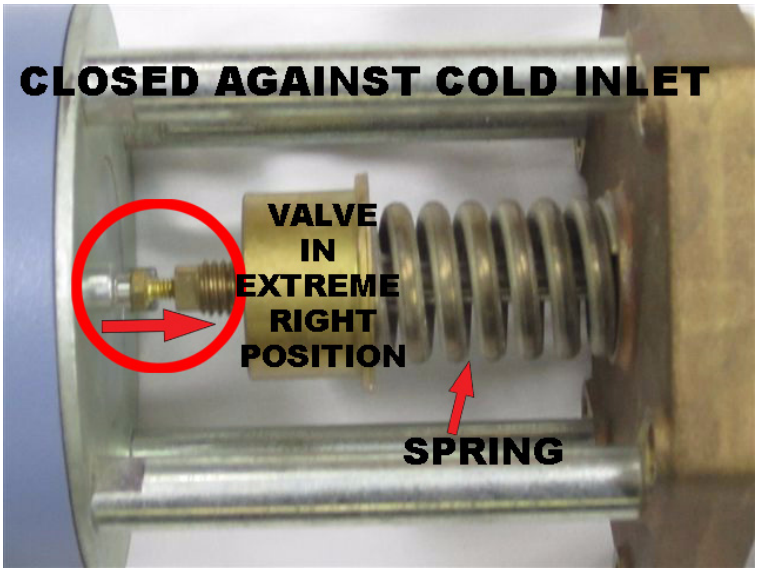


Figure 11 - Valve to extreme right - closed against Cold (10 Vdc)

Procedure for operational verification as follows:

SYSTEM CHECKS

Step 1. On the Universal Controller press EXIT for 5 second. The **Red** LED above the hand symbol will light continuously. Check that the **Green** LED on the valve power supply module is continuously lit.

Step 2. Change the position of the actuator with the ▼ and ▲ buttons so that the bottom display reads "0". This will result in zero operating voltage to the magnetic actuator. As soon as the programming buttons are let go, the valve stem should travel to the extreme 'left' hand side (facing the warm water valve from the front) closing against the hot supply.

Step 3. Change the position of the actuator with the ▼ and ▲ buttons so that the bottom display reads "100". This will result in maximum operating voltage to the magnetic actuator. As soon as the buttons are let go, the valve stem should travel to the extreme 'right' hand side (facing the warm water valve from the front) closing against the cold supply.

Step 4. If the valve alters position between the extreme left and right in accordance with steps 2 and 3 the system operates correctly.

Step 5. Return to automatic operation by pressing EXIT for 5 second. The **Red** LED above the hand symbol will go out and the controller display will revert to normal.

Step 6. Complete the relevant entries in the “SERVICE AND REPAIR LOG” on page 36.

Checking Limit Thermostat Operation

The limit thermostat is a critical safety device. When activated, it results in a control voltage of 'zero' volts to the magnetic actuator which results in the valve being closed against the hot supply and therefore a 'safe' warm outlet temperature. It activates only when the mixed outlet temperature reaches the 'set point' of the limit thermostat. This set point is reached only when the deliver temperature exceeds the normal range which occurs only during operator error or severe failure of critical components in the warm water installation.

If the limit thermostat is serviced or replaced, the 'switch off' temperature must be set and correct operation confirmed in accordance with these instructions.

Figure 12 - Power Supply to Control Valve Actuator Controller

Step 1. Ensure the power supply to the warm water valve system is activated and that the system is operating normally. This should result in the LED on the top face of the 3 way valve actuator controller to be continuously lit **Green** as shown and the normal display (set and actual temperatures) on the Universal Controller display.

Step 2. Gently remove the limit thermostat probe from the probewell near the warm outlet of the 3 way valve system. Ensure the capillary tube is not broken or damaged during this process.

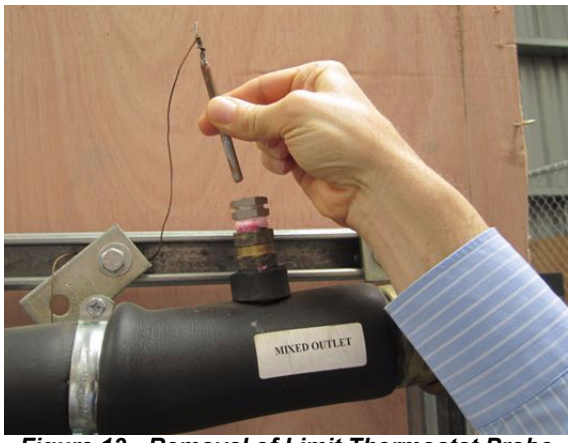


Figure 13 - Removal of Limit Thermostat Probe

Step 3. Place the limit thermostat probe in a cup of water at a temperature that is hotter than 65°C and less than 85°C. After a short time this should result in an audible 'click' as a result of the limit switch activating. This should also result in the LED on the top face of the 3 Way Valve Actuator Controller to go out. The 3 Way Valve should also close against the hot position (Refer to Fig. 10).

Step 4. Remove the thermostat probe from the cup of water and allow to cool (this may take a couple of minutes).

Figure 14 - Remove of Access Cover

Figure 15 - Resetting Limit Thermostat

Step 5. Remove the threaded nipple from the front cover of the limit thermostat and press the 'reset' button. This should result in an audible 'click' as a result of the limit switch de-activating. This should also result in the LED on the top face of the control valve power supply to go **Green**.
Note: If a 'click' is not heard the probe may not yet have cooled sufficiently.

For Limit Thermostat Rinnai P/N. 30009115

Figure 14a - Remove of Access Cover

Figure 15a - Resetting Limit Thermostat

Step 5a. Remove the threaded nipple from the front cover of the limit thermostat and press the 'reset' button. This should result in an audible 'click' as a result of the limit switch de-activating. This should also result in the LED on the top face of the control valve power supply to go **Green**.
Note: If a 'click' is not heard the probe may not yet have cooled sufficiently.

Step 6. Gently replace the limit thermostat probe from the probewell near the warm outlet of the warm water valve system. Ensure the capillary tube is not broken or damaged during this process.

Step 7. Complete the relevant entries in the "SERVICE AND REPAIR LOG" on page 36.

SYSTEM CHECKS

Cold Water Supply Failure Test

(Refer to Figures 4A and 4B for valve and connection locations).

This test simulates the failure of cold water supply to the warm water installation whilst a hot water supply still exists. Under these conditions, the system is designed such that the 3 way mixing valve closes against the 'hot supply', resulting in stopping the flow to warm water outlets.

The simulation is carried out by closing the 'cold supply' Ⓖ to the 3 way mixing valve Ⓞ within the Demand Duo warm water valve system. If the flow to warm water outlets ⑨ stops the system operation is correct.

NOTE

It is recommended that the handle for the cold supply valve to the three way mixing valve Ⓖ is removed and kept in a safe place by the person responsible for the warm water valve and associated plumbing infrastructure in the premises to prevent unauthorised opening or closing. This handle will need to be retrieved and temporarily fitted for this test.

To carry out the cold water supply failure test follow the steps below:

Step 1. Open one or more warm water outlets ⑨ within the warm water flow and return loop.

Step 2. Check and record the temperature at the warm water outlet ⑨ opened in Step 1.

Step 3. Close the 'cold supply' Ⓖ to the 3 way mixing valve Ⓞ.

Step 4. Record the maximum temperature at the warm water outlet opened in Step 1 and whether the water flow stops.

Step 5. Open the 'cold supply' to the 3 way mixing valve Ⓞ.

Step 6. Record whether water flow recommences at the outlet Ⓠ opened in Step 1 and record the maximum and stabilised temperatures.

Step 7. If the flow to warm water outlets ⑨ does not stop investigate and rectify fault (plumbing cross connections are common causes) repeat Steps 1 to 6.

Step 8. Remove the handle of the cold supply valve to the 3 way mixing valve for safe keeping by the person responsible for the warm water valve and associated plumbing infrastructure in the premises to prevent unauthorised opening or closing.

Hot Water Supply Failure Test

(Refer to Figures 4A and 4B for valve and connection locations).

This test simulates the failure of hot water supply to the warm water installation whilst a cold water supply still exists. Under these conditions, the system is designed such that the 3 way mixing valve Ⓞ closes against the 'cold supply' Ⓖ, resulting in stopping the flow to warm water outlets ⑨.

The simulation is carried out by closing the 'hot supply' to the Warm Water Valve System. If the flow to warm water outlets ⑨ stops system operation is correct.

NOTE

It is recommended that the handle for the hot supply valve Ⓙ to the Warm Water Valve System ③ is removed and kept in a safe place by the person responsible for the warm water valve and associated plumbing infrastructure in the premises to prevent unauthorised opening or closing. This handle will need to be retrieved and temporarily fitted for this test.

To carry out the hot water supply failure test follow the steps below:

Step 1. Open one or more warm water outlets ⑨ within the warm water flow and return loop.

Step 2. Check and record the temperature at the warm water outlet ⑨ opened in Step 1.

Step 3. Close the 'hot supply' to the Warm Water Valve System ③.

Step 4. Record the maximum temperature at the warm water outlet ⑨ opened in Step 1 and whether the water flow stops.

Step 5. Open the 'hot supply' to the Warm Water Valve System ③.

Step 6. Record whether water flow recommences at the warm water outlet ⑨ opened in Step 1 and record the maximum and stabilised temperatures.

Step 7. If the flow to warm water outlets ⑨ does not stop investigate and rectify fault (plumbing cross connections are common causes). Repeat Steps 1 to 7.

SYSTEM ADJUSTMENTS/CALIBRATION

Setting Mixed Outlet Temperature

The mixed outlet temperature obtainable by the end users must be compatible with the intended application and comply with AS/NZS 3500.4 and applicable local regulations and requirements. During commissioning the mixed outlet temperature must be set, checked and adjusted (if required) for every installation as applications and site conditions vary.

The Demand Duo warm water valve is factory pre-set to deliver mixed outlet water at a temperature of 43°C. It can be adjusted on site to deliver mixed outlet water at a temperature in the range of 35°C to 55°C. Delivery temperatures must always be checked using a calibrated thermometer with suitable accuracy and recorded. The "SERVICE AND REPAIR LOG" on page 36 of these instructions can be used for recording purposes.

Mixed outlet temperature adjustment should only be necessary during commissioning or after major repairs or alterations to the warm water installation. It should not be necessary during routine checking and maintenance as there should not be significant changes whilst the warm water system is in normal service. The cause(s) of any unacceptable delivery temperature change(s) during normal service must be investigated and rectified prior to performing delivery temperature adjustments. Procedure as follows:

Step 1. Open the Universal Controller enclosure door.

Step 2. Press the PGM button on the Universal Controller for a maximum of one second. **SP1** will appear in the top display and the currently programmed temperature will appear in **Red**.

Step 3. Press the UP or DOWN buttons as required to change the delivery temperature set-point.

Step 4. Press the PGM button to accept the new delivery set-point.

Step 5. Press the EXIT button to return to the normal display.

Step 6. Re-check delivery temperatures in accordance with the procedure "Checking Mixed Outlet Water Temperature - Full Test" on page 13.

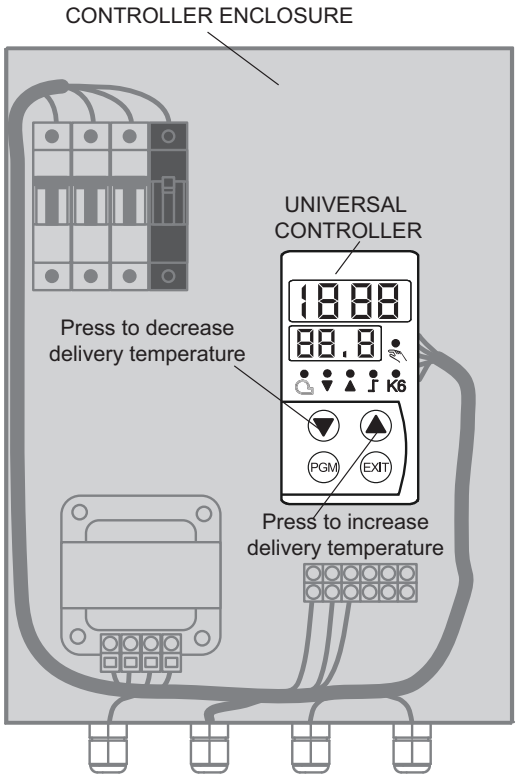


Figure 16 - Delivery temperature adjustment

IMPORTANT

It is recommended that the special key for opening the universal controller enclosure door is kept away from the warm water valve in a safe place by the person responsible for the warm water valve & associated plumbing infrastructure to prevent unauthorised opening and adjustment.

3 Way Valve Actuator Controller Calibration

- If the valve actuator controller is replaced it must be re calibrated. For that, the hand wheel must be set to Auto.
- The printed circuit board has a slot (refer to Fig. 17).

Procedure

Step 1. Calibration is performed by bridging the contacts located behind the slot using a screwdriver. The valve will then travel across the full stroke to store the end positions.

Step 2. Whilst calibration is in progress, the **Green** LED will flash for about 10 seconds.

SYSTEM ADJUSTMENTS/CALIBRATION

Top view with cover removed

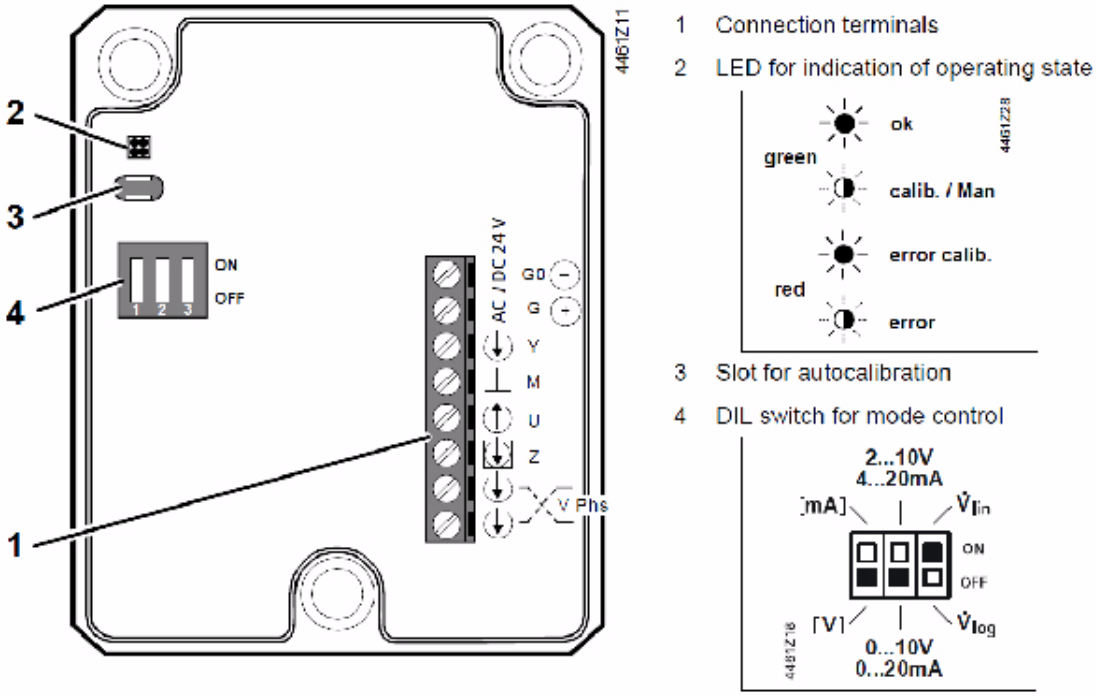
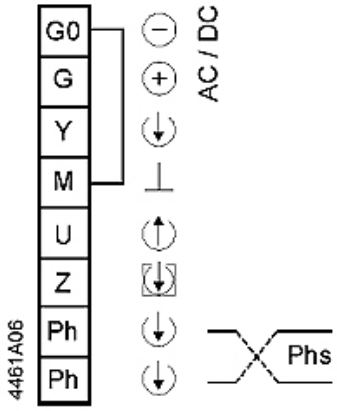


Figure 17 - Valve Connection Terminals

3 Way Valve Actuator Controller Terminals



System neutral AC 24 V, DC 20…30 V	
System potential AC 24 V, DC 20…30 V	
Control signal DC 0/2…10 V, DC 0/4…20 mA	
Measuring neutral (= G0)	
Position feedback signal DC 0/2…10 V, DC 0/4…20 mA	
Forced- control input Z	
Phase-cut signal DC 0...20 V Phs, interchangeable, galvanically isolated	
Phase-cut signal DC 0...20 V Phs, interchangeable, galvanically isolated	

3 Way Valve & Magnetic Actuator - Manual Control

Manual control mode is suitable only during checking or maintenance of system. Manual control mode is not suitable for normal use as the required mixed outlet temperature may not be maintained. During normal use the automatic control mode must always be used.

Step 1. By pressing (a) and turning (b) the hand wheel.

Step 2. In clockwise (CW) direction, control path hot inlet to mixed outlet can be mechanically opened to between 80 and 90%.

Step 3. In counterclockwise (CCW) direction, the actuator will be switched off and the valve closed against hot inlet.

As soon as the handwheel is pressed and turned, neither the forced control signal Z nor the input signal Y or the - phase-cut signal acts on the actuator. The green LED will flash.

For automatic control, the handwheel must be set to the Auto position.The **Green** LED will then be lit.

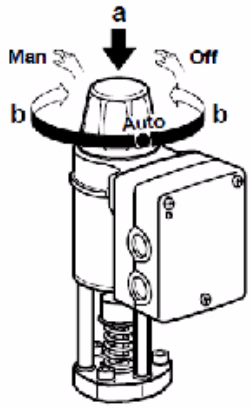


Figure 18 - Manual Control

3 Way Valve & Magnetic Actuator - Automatic Control

Control valve set up

During normal use the control valve must be set up in automatic control and locked to prevent inadvertent manual operation.

Procedure for setting up as follows:

Step 1. Ensure the power supply to the system is activated.

Step 2. Set the handwheel on the control valve to the 'Auto' position. Do this by pushing the handwheel inwards and simultaneously turning the handwheel as depicted on the cover of the handwheel until the 'Auto' dot on the handwheel aligns with the 'dot' on the actuator casing. Stop pressing the handweel. The handweel should now 'click' into position and be locked and it should no longer be possible to turn the handwheel.

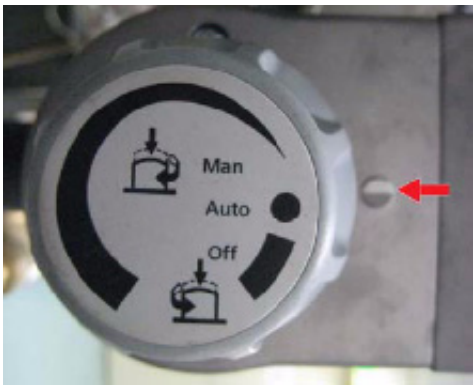


Figure 19 - Handwheel

Step 3. Position the handwheel locking ring with the raised edge towards the actuator body and push the device until it snaps in as shown.

Figure 20 - Locking Ring

Step 4. With the locking ring correctly inserted and the valve correctly set on automatic control the LED on the top face of the control valve power supply will be continuously lit **Green**. If the LED is flashing or not lit **Green** the control valve is not in the Auto position. If this is the case remove the locking ring and repeat steps 1 to 3.

Step 5. Complete the relevant entries in the "SERVICE AND REPAIR LOG" on page 36.

Setting the Limit Thermostat Temperature

General

The limit thermostat is a critical safety device. When activated, it results in a control voltage of 'zero' volts to the magnetic actuator which results in the valve being closed against the hot supply and therefore a 'safe' warm outlet temperature. It activates only when the mixed outlet temperature reaches the 'set point' of the limit thermostat. This set point is reached only when the deliver temperature exceeds the normal range which occurs only during operator error or severe failure of critical components in the warm water installation.

If the limit thermostat is serviced or replaced the ‘switch off' temperature must be set and correct operation confirmed in accordance with these instructions.

Universal controller programming should normally result in delivery temperature adjustment in the range of 35°C to 55°C (where 55°C is the 'upper set point limit' set). The limit thermostat 'switch off' temperature is normally factory set to 5°C higher than the upper set point limit temperature or 60°C to avoid nuisance activation.

NOTE

Some customers may request adjustability of the 'upper set point limit' temperature on the universal controller to higher or lower than 55°C to suit specific applications. The limit thermostat 'switch off' temperature should always be set to 5°C higher than the upper set point limit temperature. In some cases this will require an alternative limit thermostat with a different switch off temperature range.

Limit thermostats are available with the following switch off temperature ranges:

- 45°C to 60°C
- 50°C to 70°C
- 65°C to 80°C

Procedure as follows:

WARNING

Risk of electrical shock. Live terminals behind front cover of Limit Thermostat. Ensure the electric power supply to the warm water valve is switched off before removing front cover.

Step 1. Isolate the electric power supply to the warm water valve system.

Step 2. Remove the front cover by loosening the 4 screws (Fig. 21).

Figure 21 - Removal of Front Cover

Step 3. Loosen the temperature adjustment plate screw. (Fig. 22).

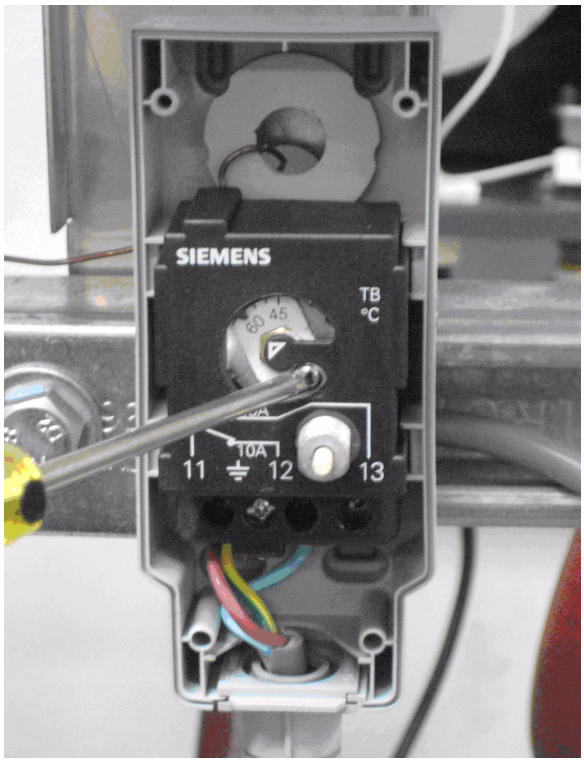


Figure 22 - Temperature adjustment plate screw

Step 4. Gently rotate the adjustment plate using a suitable 'straight' screwdriver so that the digits 60 align with the black arrow. The limit thermostat 'switch on' temperature is now 60°C. (Fig. 24).

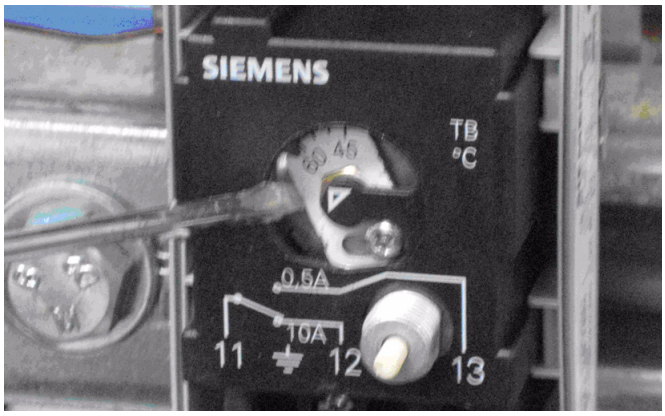


Figure 23 - Rotate Limit Thermostat Switch

Step 5. Tighten the adjustment screw.

Step 6. Replace the front cover.

Step 7. Complete the relevant entries in the See “SERVICE AND REPAIR LOG” on page 36.

Step 8. Perform the procedure See “Checking Limit Thermostat Operation” on page 15.

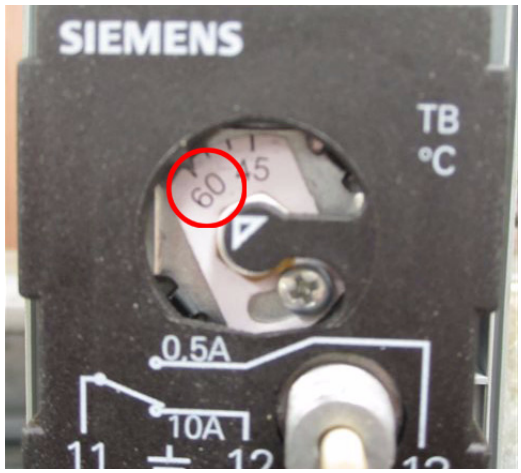


Figure 24 - Limit Thermostat Switch ‘ON’

Limit Thermostat Rinnai P/N. 30009115

Step 1. Isolate the electric power supply to the warm water valve system.

Step 2. Remove the front cover by loosening the 4 screws (Fig. 25).

Figure 25 - Limit Thermostat (P/N. 30009115) March 2012

Step 3. Gently rotate the adjustment Indicator using a suitable 'straight' screwdriver so that the digits 60 align with the black arrow. The limit thermostat 'switch on' temperature is now 60°C. (Fig. 26).

Step 4. Replace the front cover.

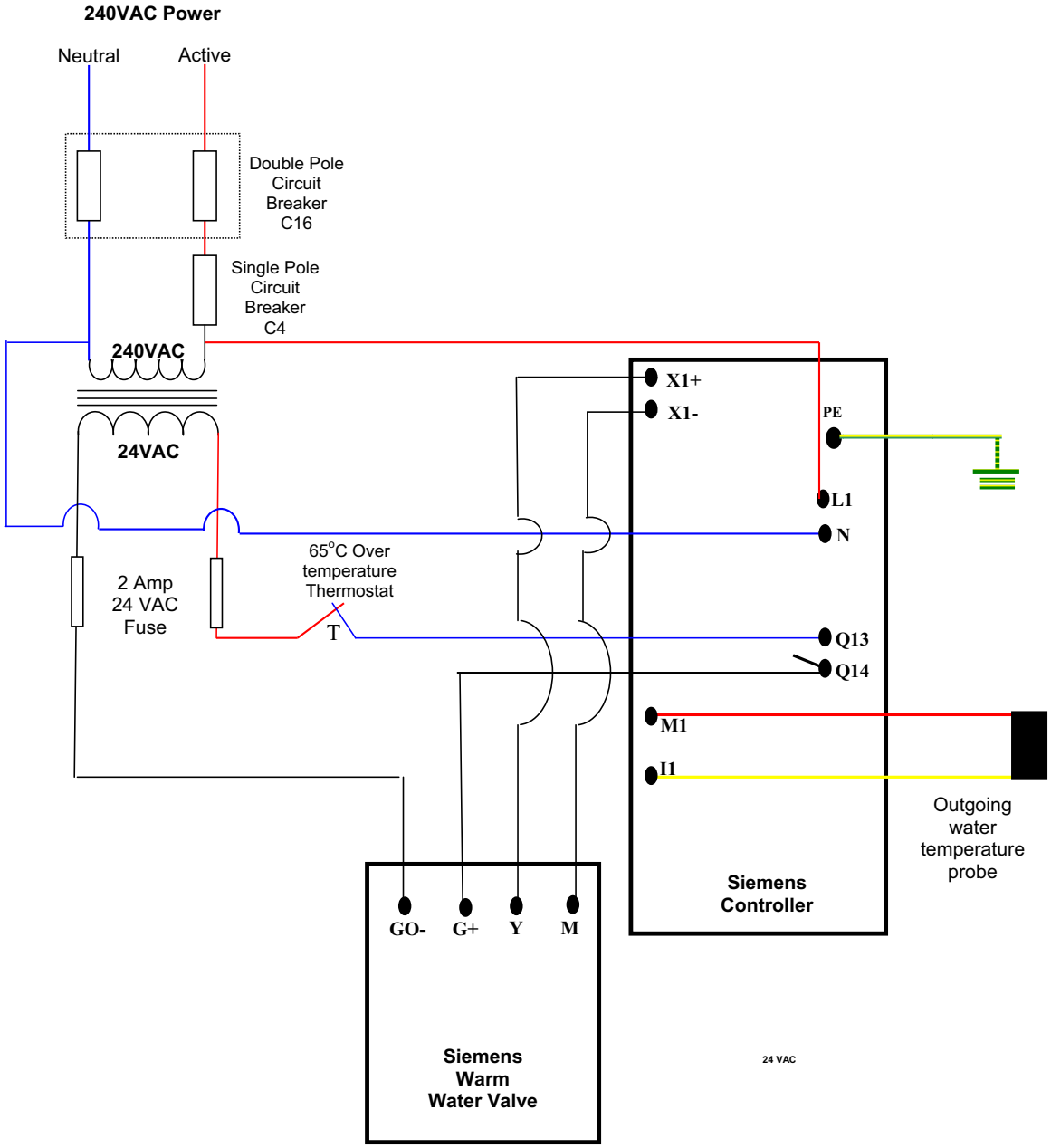
Step 5. Complete the relevant entries in the “SERVICE AND REPAIR LOG” on page 36.

Step 6. Perform the procedure “Checking Limit Thermostat Operation” on page 15.

Figure 26 - Rotate adjustment on Limit Thermostat

ELECTRICAL FAULT FINDING

WIRING DIAGRAM



When LED is illuminated on Universal Controller contact between **Q13** to **Q14** is made.
Testing 3 Way Valve Activation Voltage from Rear of Universal Controller:

Terminal X1+ (RED) to **Terminal X1** – (BLACK)
Range 0 Vdc to 10 Vdc

Positioning Signal:
0 Vdc Cold (P2) Fully Open
10 Vdc Hot (P1) Fully Open
5 Vdc Hot (P1) ½ Open Cold (P2) ½ Open

Testing Transformer and Circuit Breakers

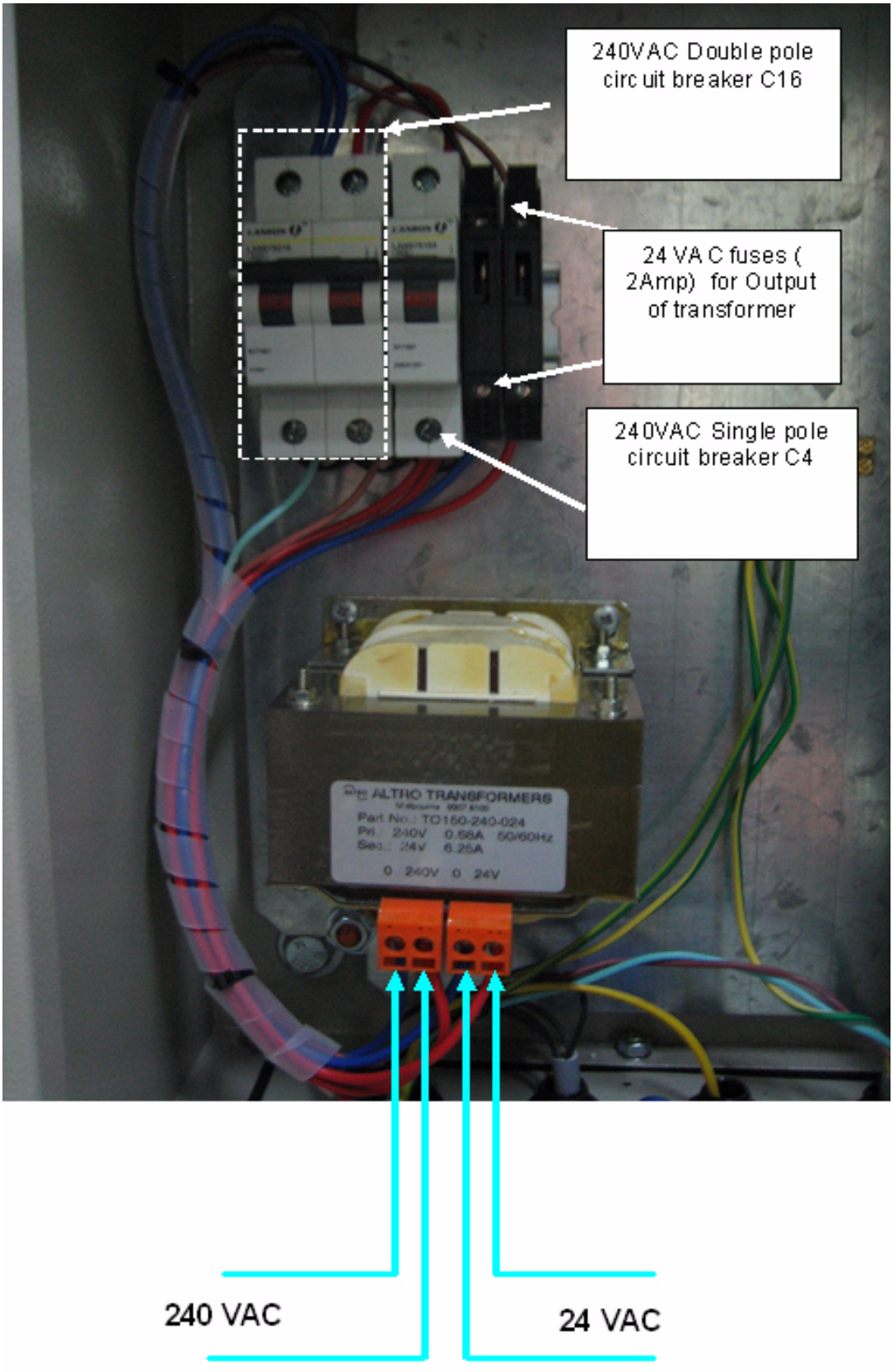


Figure 27 - Testing Power Transformer & Circuit Breakers

Testing Power to Universal Controller:

Testing power to measure for 240 VAC between connections L1 & N.

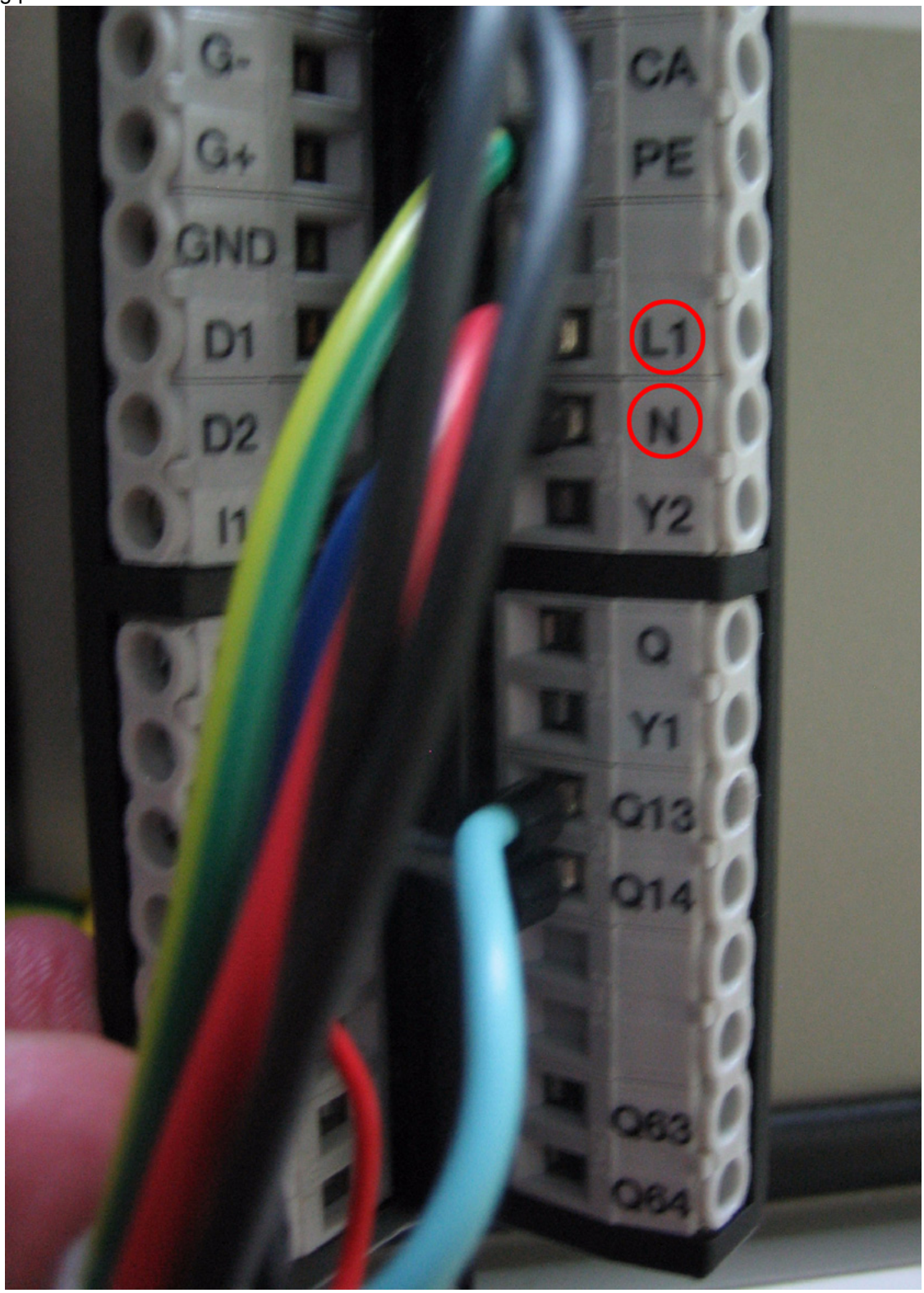


Figure 28 - Checking Power to Universal Controller

Testing Temperature Thermocouple (Mixed Outlet):

- Thermocouple is connected to terminals I1 & M1 on rear of universal controller.
- Resistance reading of 6 Ω (Ohms) @ 20ºC if OK.
- Error code **1999** displayed on Universal Controller if output temperature thermocouple defective.

Testing Temperature Limit Thermostat (Mixed Outlet):

- Isolate power supply to DD Warm Water Valve.
- Ensure limit thermostat has not been previously activated by pressing the manual reset button as described on page 16. (Refer Fig. 15).
- Remove 4 screws from front cover of Temperature Limit Thermostat (Mixed Outlet).
- Check continuity between Brown & Blue wires.
- 1.0 Ω resistance if OK. If >1.0M Ω Limit Thermostat is faulty.

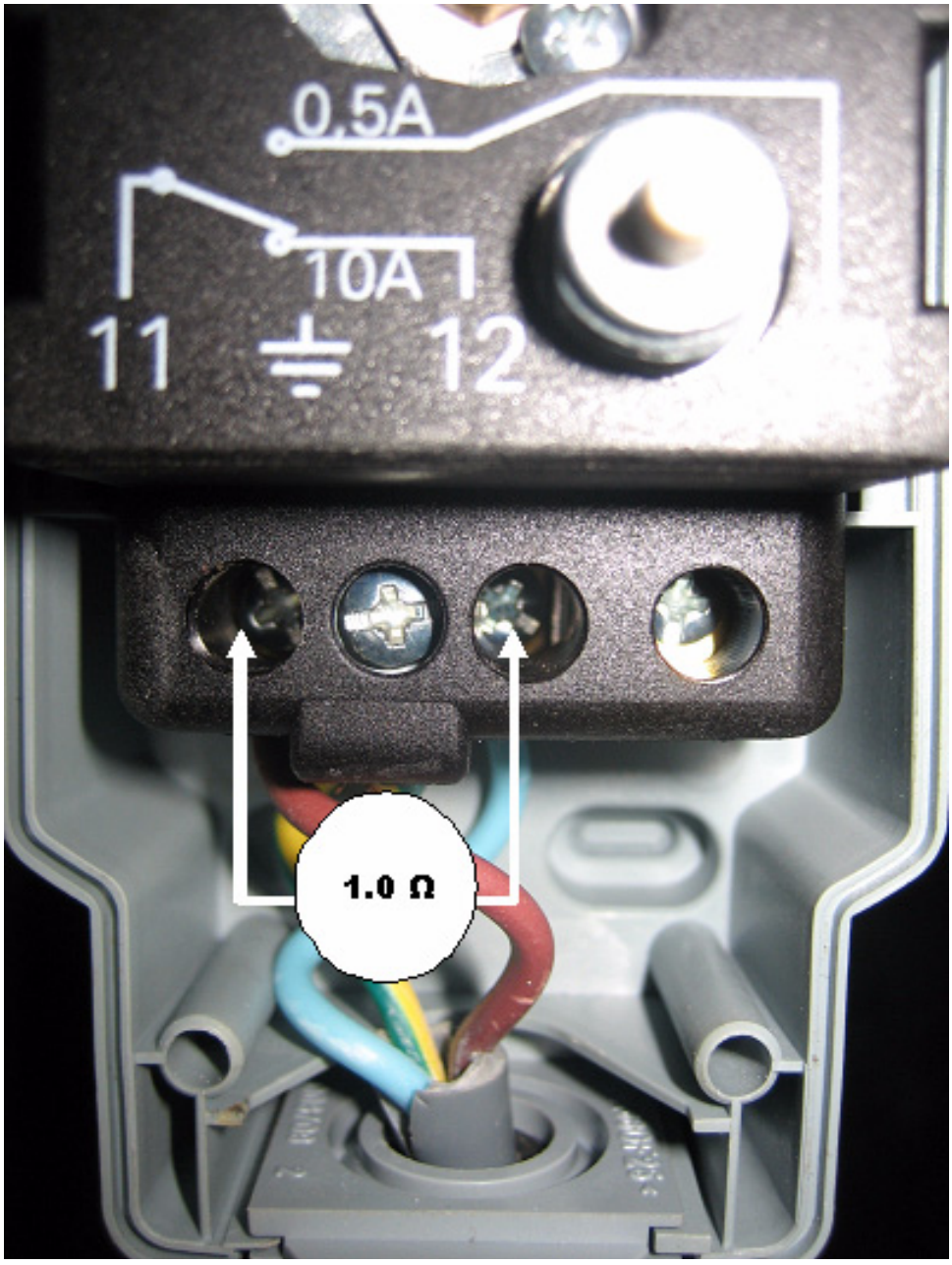


Figure 29 - Testing Temperature Limit Thermostat

SYSTEM FAULT FINDING

TABLE 2 - System Fault Finding Table		
FAULT	**POSSIBLE CAUSES**	**REMEDY**
Delivery temperature not hot enough	Warm water valve system power supply switched off	Check and turn on the power supply
	No electrical or gas supplies to the hot water system	Check and turn on the gas and electricity supplies
	Power supply to circulating pumps switched off.	Check and turn on circulating pump power supplies.
	Circulating pumps not operating correctly	Check priming and flow through pumps.
	System valves that are meant to be open are shut and vice versa.	
	Faults in the plumbing pipework	Check for cross connections between hot/cold/warm pipework, non return valves installed the wrong way around.
	Blocked Strainers	
	Design Flaws	Undersized pumps, undersized hot water system, incorrectly sized or configured pipework.
	Defective 3 way valve assembly	
	Defective hot water system	
Dynamic differential pressure across 3 way valve exceeds 50 kPa	Blocked strainers	
	System valves that are meant to be open are shut and vice versa	
	Faults in plumbing pipework	Check for non return valves installed the wrong way around, incorrect positions of pressure limiting valves.
	Incorrectly designed pipework between warm water valve and (length, size and path)	
Flow from warm water outlets continues during hot water supply failure tests	Warm water valve system power supply switched off	Check and turn on the power supply
	System valves that are meant to be open are shut and vice versa	
	Faults in the plumbing pipework	Check for cross connections between hot/cold/warm pipework, non return valves installed the wrong way around.
	Defective 3 way valve assembly	
No water flowing from warm water outlets	The mains cold supply to the warm water valve and/or water heating system is isolated. **Note: For maximum safety it is recommended that the cold water supply to the warm water valve and the water heating system are connected to the same source.**	Check position of 'mains cold supply' to mixed water system (See Figures 4A,4B & 5). **Important: Do not alter the position of any other valves in the system.**
Delivery temperature too hot		**To prevent scald injury, immediately isolate mains supply to the warm water valve and/or water heating system.** Service person to check and rectify. This work must be performed by persons permitted by law to do so.

PARTS REPLACEMENT

CAUTION - 240 volt potential inside appliance

Disconnect electrical supply

ONLY AUTHORISED PERSONS MUST CARRY OUT REPAIRS TO THIS APPLIANCE

NOTE

Before commencing any dismantling for parts replacement, refer to the "Service and Repair Log" for the system. This log is kept behind the controller box door or with the customer. The "Service and Repair Log" contains information that is useful during parts replacement. (Refer to the Owner's Guide and Installation Instructions).

Universal Controller

Step 1. Isolate power.

Step 2. Using special security key, open control box door to gain access to controller.

Step 3. Remove 4 x screws securing controller mounting bracket.

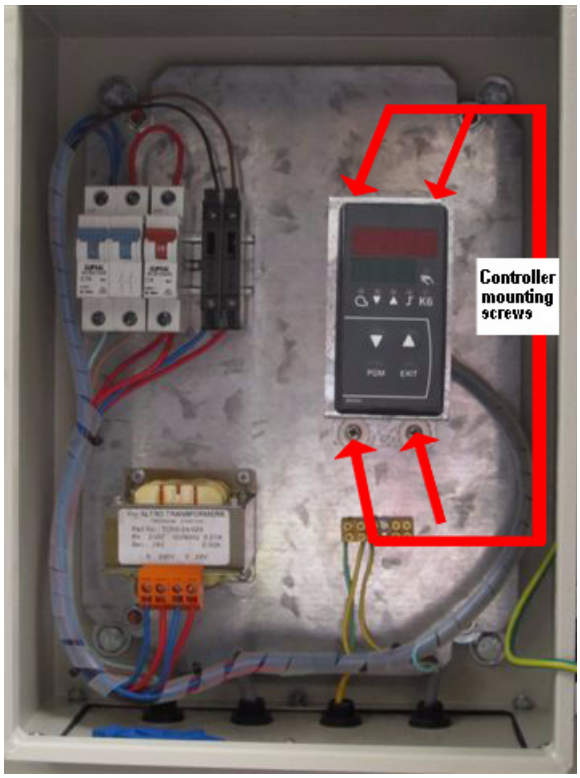


Figure 30 - Controller mounting screws

NOTE

Refer to wiring diagram when re-fitting wires to replacement controller.

Step 4. Using a small flat blade screwdriver, remove wire from terminals

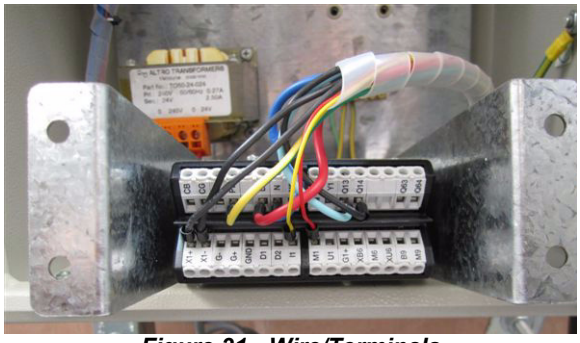


Figure 31 - Wire/Terminals

Step 5. Remove controller from bracket by using small flat blade screwdriver to remove locking screw. (One each side of controller)

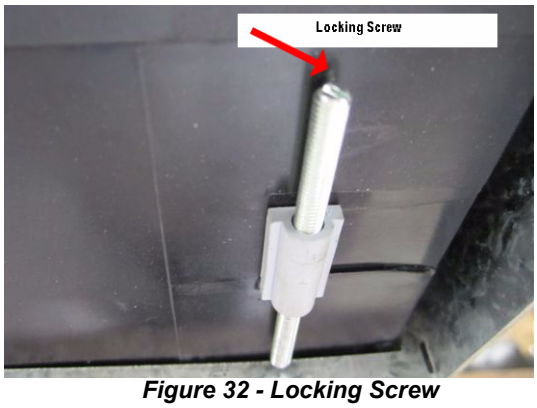


Figure 32 - Locking Screw

Step 6. Re-fit new Controller. Refer to wiring diagram for correct location of wiring into controller terminals.

WARNING **New controller must have been supplied and programmed by Rinnai Australia. Correct controllers will be labelled with the word 'programmed'. Programming cannot be done on site.**

IMPORTANT **The replacement controller is factory pre-set to deliver warm water at a temperature of 43° C. It can be adjusted on site to deliver water at a temperature in the range of 35°C to 55° C. During replacement, the delivery temperature must be set and checked to be appropriate for the application.**

Step 7. If the value of the mixed outlet temperature on the main controller installed previously is known, the replacement controller must be set to this value. Perform the "Setting Mixed Outlet Temperature" on page 18 procedure as required. Then carry out the following in the order shown:

a. Carry out "Basic Checks" on page 12.
b. Carry out "3 Way Valve Operation Verification" on page 13.
c. Carry out "Checking Limit Thermostat Operation" on page 15.
d. Carry out "Checking Mixed Outlet Water Temperature - Partial Test" on page 13.
e. Carry out "Cold Water Supply Failure Test" on page 17.
f. Carry out "Hot Water Supply Failure Test" on page 17.
g. Fill in two copies of the "SERVICE AND REPAIR LOG" on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

Step 8. If the value of the mixed outlet temperature on the main controller installed previously is NOT known, determine a suitable temperature with the person responsible for the warm water system and associated plumbing infrastructure in the premises. Perform the "Setting Mixed Outlet Temperature" adjustment procedure as required. Then carry out the following in the order shown:

a. Carry out "Basic Checks" on page 12.
b. Carry out "3 Way Valve Operation Verification" on page 13.
c. Carry out "Checking Limit Thermostat Operation" on page 15.
d. Carry out "Checking Mixed Outlet Water Temperature - Full Test" on page 13.
e. Carry out "Cold Water Supply Failure Test" on page 17.
f. Carry out "Hot Water Supply Failure Test" on page 17.
g. Fill in two copies of the "SERVICE AND REPAIR LOG" on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

PARTS REPLACEMENT

240 / 24AC Transformer

Step 1. Isolate power.

Step 2. Using special security key, open control box door to gain access to transformer.

Step 3. Disconnect 24 VAC & 240VAC wiring from transformer terminals.

Step 4. Remove 4 x mounting screws from transformer.

Step 5. Re-fit new Transformer.

Step 6. Re-connect wiring using wiring diagram in this manual.

Step 7. Carry out “Basic Checks” on page 12.

Step 8. Carry out “3 Way Valve Operation Verification” on page 13.

Step 9. Carry out “Checking Limit Thermostat Operation” on page 15.

Step 10. Carry out “Checking Mixed Outlet Water Temperature - Partial Test” on page 13.

Step 11. Carry out “Cold Water Supply Failure Test” on page 17.

Step 12. Carry out “Hot Water Supply Failure Test” on page 17.

Step 13. Fill in two copies of the “SERVICE AND REPAIR LOG” on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises and obtain that person’s signature. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

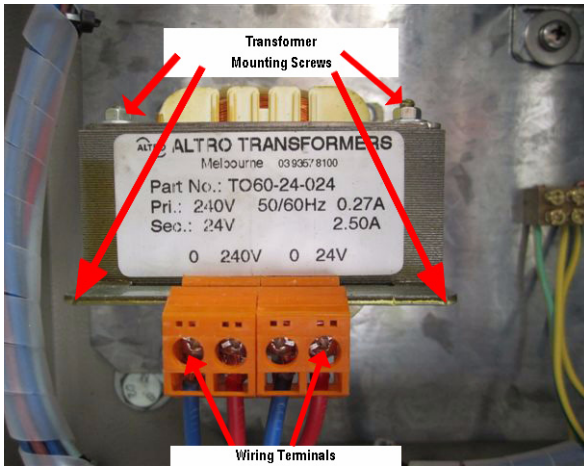


Figure 33 - Transformer

Thermocouple (Mixed Outlet) Probe

IMPORTANT

Probe is NOT installed into a dry well. Ensure water supply is isolated before removing probe.

Step 1. Isolate power and water supply to Demand Duo Warm Water Valve Assembly.

Step 2. Using special security key, open control box door to gain access to Universal Controller.

Step 3. Remove 4 x screws securing controller mounting bracket.

Step 4. Remove red and yellow thermocouple wires from rear of universal controller connected to ‘L1’ and ‘M1’ terminals.

Step 5. Undo gland nut from thermocouple probe and remove probe from pipe work.

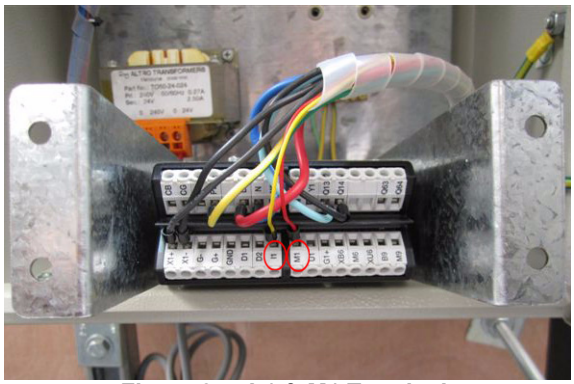


Figure 34 - L1 & M1 Terminals

Step 6. Re-fit new thermocouple probe.

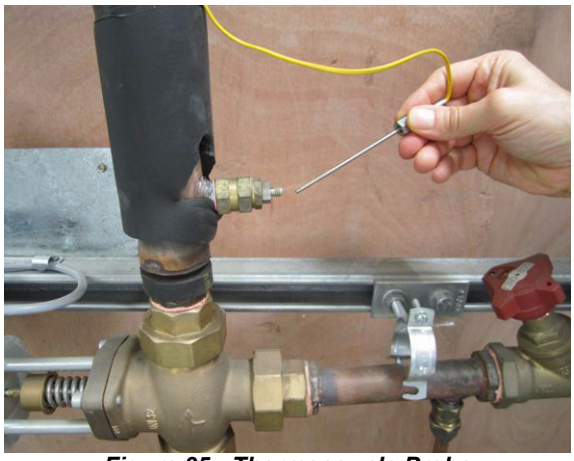


Figure 35 - Thermocouple Probe

Step 7. Ensure gland nut is tightened sufficiently to create a water tight seal, but do not over tighten.

Step 8. Re-connect red and yellow wires to rear of universal controller.

IMPORTANT **Red wire MUST be fitted to Terminal M1 on the rear of the controller and Yellow wire MUST be fitted to terminal 'L1' on rear of controller, otherwise temperature will be read incorrectly.**

Step 9. Carry out "Basic Checks" on page 12.

Step 10. Carry out "3 Way Valve Operation Verification" on page 13.

Step 11. Carry out "Checking Limit Thermostat Operation" on page 15.

Step 12. Carry out "Checking Mixed Outlet Water Temperature - Partial Test" on page 13.

Step 13. Carry out "Cold Water Supply Failure Test" on page 17.

Step 14. Carry out "Hot Water Supply Failure Test" on page 17.

Step 15. Fill in two copies of the "SERVICE AND REPAIR LOG" on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises and obtain that person's signature. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

Limit Thermostat

Step 1. Isolate power.

Step 2. Carefully remove limit thermostat probe from dry well.

Step 3. Remove front cover of Limit Thermostat.

Step 4. Disconnect Limit Thermostat wiring.

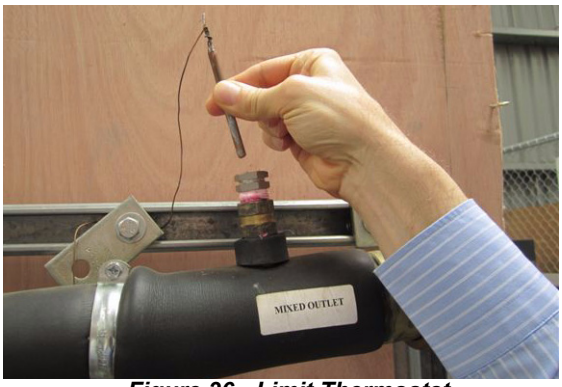


Figure 36 - Limit Thermostat

Step 5. Remove hose clamp securing the Limit Thermostat to frame.

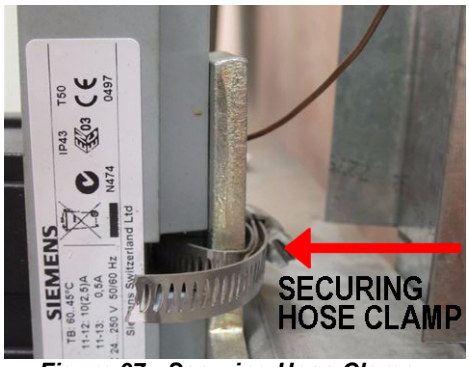


Figure 37 - Securing Hose Clamp

Step 6. Re-fit new probe. Lubricate the replacement probe with 'heat transfer' grease/paste before replacing into the dry well.

Step 7. Re-fit the replacement Limit Thermostat. Perform "Checking Limit Thermostat Operation" on page 15.

NOTE **Refer to wiring diagram in this manual when re-connecting limit thermostat wires to ensure correct connections.**

Step 8. Carry out "Basic Checks" on page 12.

Step 9. Carry out "3 Way Valve Operation Verification" on page 13.

Step 10. Carry out "Setting the Limit Thermostat Temperature" on page 21.

Step 11. Carry out "Checking Limit Thermostat Operation" on page 15.

Step 12. Carry out "Checking Mixed Outlet Water Temperature - Partial Test" on page 13.

Step 13. Carry out "Cold Water Supply Failure Test" on page 17.

Step 14. Carry out "Hot Water Supply Failure Test" on page 17.

Step 15. Fill in two copies of the "SERVICE AND REPAIR LOG" on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises and obtain that person's signature. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

PARTS REPLACEMENT

Replacement of 3 Way Valve Assembly

WARNING **The actuator and valve are factory calibrated and supplied as one assembly and MUST be replaced as one assembly. NEVER disconnect an actuator from the valve it was supplied with. Doing so will void calibration and if re-assembled will result in the system not performing to specification.**

Step 1. Isolate power supply to Warm Water Valve system and building circulation pump(s).
Step 2. Isolate hot and cold water supply to the Warm Water Valve system.
Step 3. Remove cover plate on 3 Way valve actuator controller.
Step 4. Disconnect wiring from terminal strip, noting the location of wires.
Step 5. Undo three connection nuts on the 3 way mixing valve assembly and carefully remove.
Step 6. Remove old flange gaskets.
Step 7. Fit new 3 way mixing valve assembly with the new gaskets supplied with the replacement valve assembly.

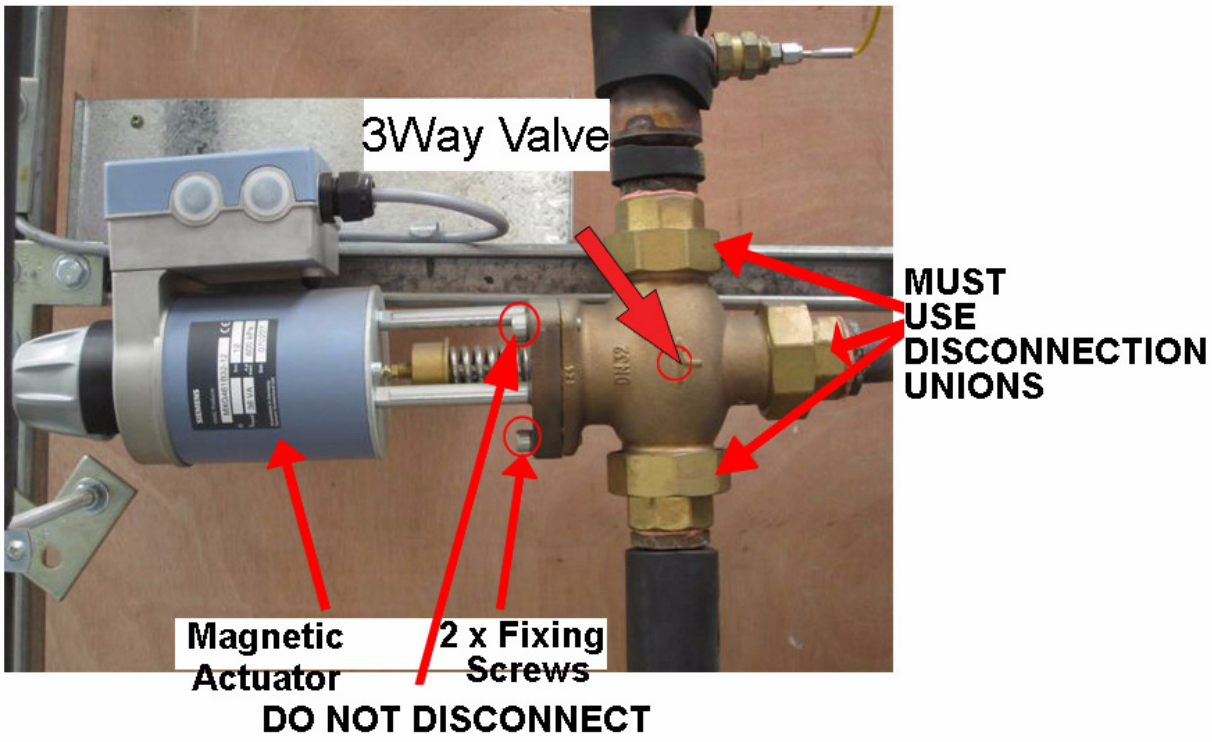


Figure 38 - 3 Way Valve Assembly

Step 8. Refer to wiring diagram in this manual to re-connect the four control wires into terminal strip of 3 way valve actuator controller, ensuring a good electrical connection within strip terminal.

Step 9. Replace electrical cover plate.

Step 10. Turn on hot and cold water supply and check for water leaks.

Step 11. Turn on Power supply to Warm Water Valve system.

Step 12. Bleed air from the system.

Step 13. Perform “3 Way Valve Actuator Controller Calibration” on page 18.

Step 14. Perform the procedure “3 Way Valve Operation Verification” on page 13.

Step 15. Turn on power to building circulation pump(s).

Step 16. Carry out “Basic Checks” as described on page 12.

Step 17. Carry out “Checking Limit Thermostat Operation” on page 15.

Step 18. Carry out “Checking Mixed Outlet Water Temperature - Partial Test” on page 13.

Step 19. Carry out “Cold Water Supply Failure Test” on page 17.

Step 20. Carry out “Hot Water Supply Failure Test” on page 17.

Step 21. Fill in two copies of the “SERVICE AND REPAIR LOG” on page 36, review with the person responsible for the warm water system and associated plumbing infrastructure in the premises and obtain that persons’ signature. Leave one copy with the customer. The other copy is to be forwarded to Rinnai by the servicing person.

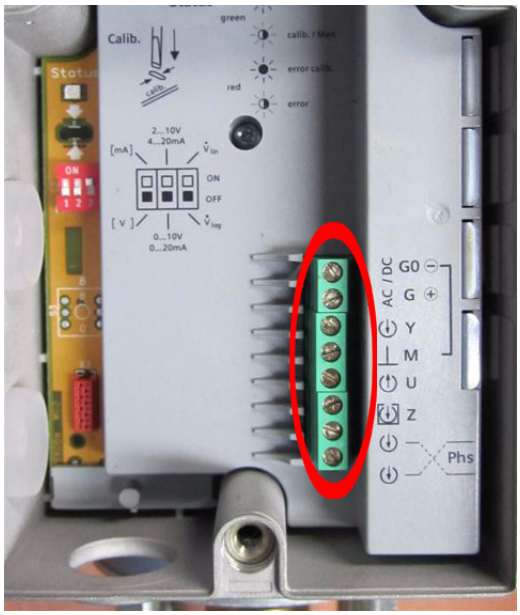


Figure 39 - 3 Way Valve Controller Connection Terminals

SERVICE AND REPAIR LOG

COPY 1

NOTE TO SERVICE PERSON - It is a mandatory requirement of Rinnai Australia that this 'Service and Repair log' is filled in and submitted to Rinnai on completion with a copy left with the customer. Ensure all fields are filled in correctly. Missing or incorrect information will need to be corrected by you and may result in delay of any payment.

Model / Serial Number		
Date Of Manufacture	/ /	
Installation Address	Street	
	Suburb	
	State	
Person responsible for system at installation address		
Servicing Person Name & Licence Number		
Servicing Person Contact Phone Number		
Servicing / Repair Date	/ /	
REASON FOR WORK:	**FAULT INVESTIGATION REPAIR** ☐	**GENERAL SERVICE** ☐

DESCRIPTION
(summary of service work carried out, faults found, and advice given)

PARTS REPLACED (place tick next to part replaced)

Universal Controller		Limit Thermostat (Mixed Outlet)		
240 / 24 VAC Transformer		3 Way Mixing Valve Assembly		
Thermocouple 'K' type Mixed Outlet		Other		

CHECKS CARRIED OUT
(place tick next to checks carried out)

Basic Checks		3 Way Valve Operation Verification		3 Way Valve Actuator Controller Calibration	
Check/Set Mixed Outlet Temperature		Check Limit Thermostat set-point			
Check Water Temperature - Partial Test		Check Limit Thermostat operation			
Check Water Temperature - Full Test		Cold Water Supply Failure Test			
Universal Controller Temperature set-point **before** service/repair work was carried out (if known)	°C	Hot Water Supply Failure Test			
Universal Controller Temperature set-point **after** service/repair work was carried out	°C	3 Way Valve Confirmed in "Automatic" Operation			

SERVICE PERSON DECLARATION - The desired mixed outlet temperature was confirmed with the person responsible for the Warm Water System and associated plumbing infrastructure in the premises where the Warm Water System is installed.

The mixed outlet temperature at the delivery point(s) was checked after service/repair work was carried out.

Signature:	Name:	Date:

SERVICE AND REPAIR LOG

COPY 2

NOTE TO SERVICE PERSON - It is a mandatory requirement of Rinnai Australia that this 'Service and Repair log' is filled in and submitted to Rinnai on completion with a copy left with the customer. Ensure all fields are filled in correctly. Missing or incorrect information will need to be corrected by you and may result in delay of any payment.

Model / Serial Number		
Date Of Manufacture	/ /	
Installation Address	Street	
	Suburb	
	State	
Person responsible for system at installation address		
Servicing Person Name & Licence Number		
Servicing Person Contact Phone Number		
Servicing / Repair Date	/ /	
REASON FOR WORK:	**FAULT INVESTIGATION REPAIR** ☐	**GENERAL SERVICE** ☐

DESCRIPTION
(summary of service work carried out, faults found, and advice given)

PARTS REPLACED (place tick next to part replaced)

Universal Controller		Limit Thermostat (Mixed Outlet)		
240 / 24 VAC Transformer		3 Way Mixing Valve Assembly		
Thermocouple 'K' type Mixed Outlet		Other		

CHECKS CARRIED OUT
(place tick next to checks carried out)

Basic Checks		3 Way Valve Operation Verification		3 Way Valve Actuator Controller Calibration	
Check/Set Mixed Outlet Temperature		Check Limit Thermostat set-point			
Check Water Temperature - Partial Test		Check Limit Thermostat operation			
Check Water Temperature - Full Test		Cold Water Supply Failure Test			
Universal Controller Temperature set-point **before** service/repair work was carried out (if known)	°C	Hot Water Supply Failure Test			
Universal Controller Temperature set-point **after** service/repair work was carried out	°C	3 Way Valve Confirmed in "Automatic" Operation			

SERVICE PERSON DECLARATION - The desired mixed outlet temperature was confirmed with the person responsible for the Warm Water System and associated plumbing infrastructure in the premises where the Warm Water System is installed.

The mixed outlet temperature at the delivery point(s) was checked after service/repair work was carried out.

Signature:	Name:	Date:

PARTS LIST

Marketing Code	PRODUCT DESCRIPTION (Max 30 Characters as per naming protocols)	Category	Product Group	Product Segment	Inventory Code	Supplier Code Cross reference	BAR CODE Number allocated
30009101	VALVE 3 WAY MIXING 20MM KVS 3	SPR	SPW	PWW	**30009101**	N/A SA FACTORY	9014109191219
30009103	VALVE 3 WAY MIXING 32MM KVS 12	SPR	SPW	PWW	**30009103**	N/A SA FACTORY	9014109191233
30009105	VALVE 3 WAY MIXING 50MM KVS 30	SPR	SPW	PWW	**30009105**	N/A SA FACTORY	9014109191257
30009107	CONTROLLER UNIVERSAL PID 240V	SPR	SPW	PWW	**30009107**	N/A SA FACTORY	9014109191264
30009109	TRANSFORMER MAIN 32MM 50MM	SPR	SPW	PWW	**30009109**	N/A SA FACTORY	9014109191271
30009111	SENSOR LEAD T/COUPLE C/W 10M	SPR	SPW	PWW	**30009111**	N/A SA FACTORY	9014109191288
30009113	GLAND SS 3MM x 1/4" BSP	SPR	SPW	PWW	**30009113**	N/A SA FACTORY	9014109191295
30009115	THERMOSTAT TEMP LIMIT 45-60DEG	SPR	SPW	PWW	**30009115**	N/A SA FACTORY	9014109191301
30009117	SHEATH T/COUPLE SS 100MM	SPR	SPW	PWW	**30009117**	N/A SA FACTORY	9014109191318
30009119	TRANSFORMER MAIN 80MM	SPR	SPW	PWW	**30009118**	N/A SA FACTORY	9314109192230

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Rinnai

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Cost of a local call Higher from mobile or public phones.