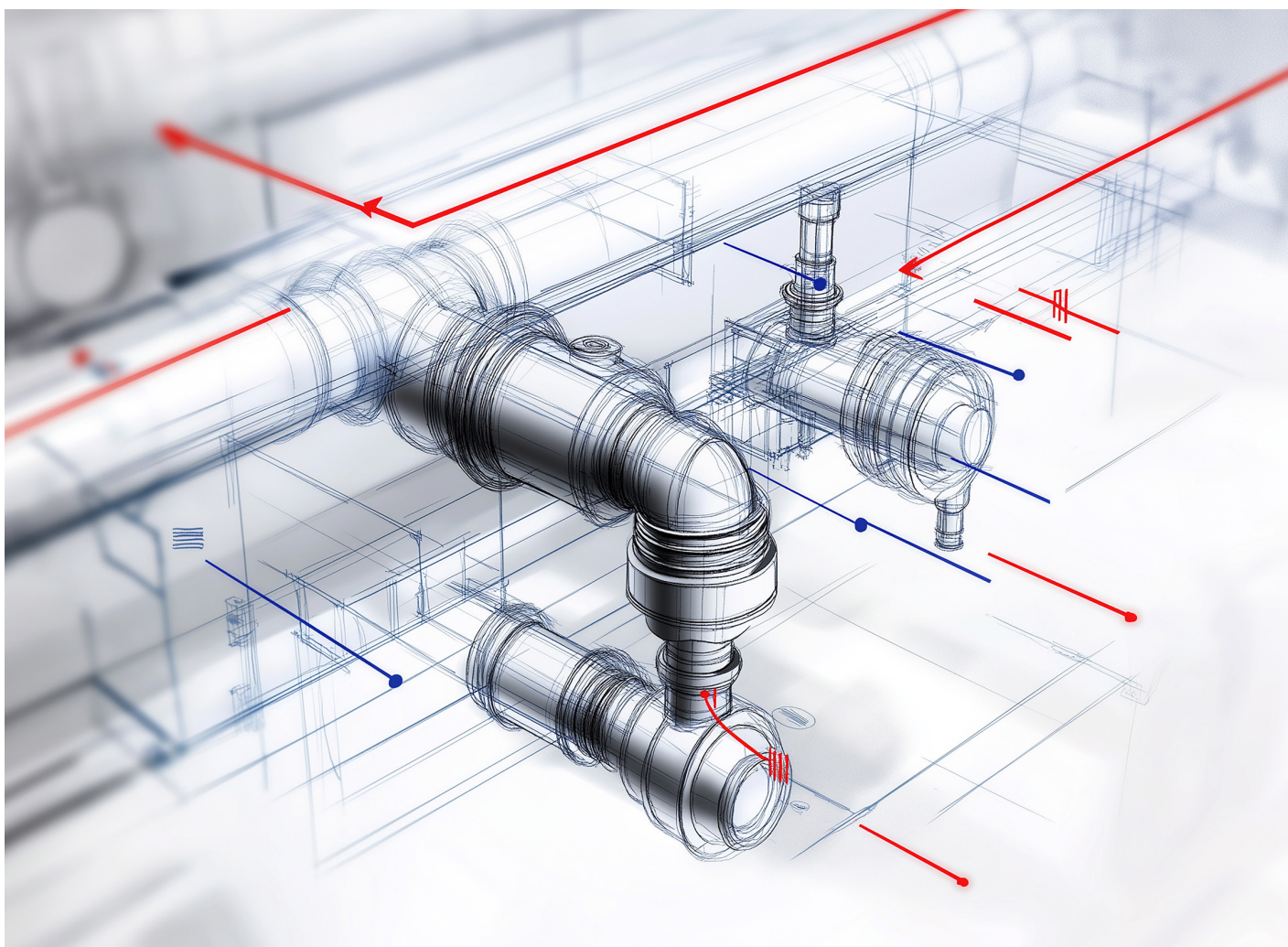




INFINITY NB-Series continuous flow water heaters

NB units and ring main systems

Rinnai

Important

This appliance must be installed in accordance with:

- Manufacturer's installation instructions
- Current AS/NZS 3000, AS/NZS 3500, AS/NZS 5601.1 and G12/AS1

For use with Natural Gas or Universal LPG as indicated on the appliance.

Not suitable as a spa or swimming pool heater.

Not suitable for hydronic applications.

Appliance must be installed, commissioned and serviced by an authorised person, being in New Zealand a licensed gasfitter.

Warning

Improper installation, adjustment, alteration, service and maintenance can cause property damage, personal injury or loss of life.

For more information about buying, using, and servicing of Rinnai appliances call: 0800 RINNAI (0800 746 624).

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NB-Series

NB pump cable connection 2 m (R1701)



The NB-Series water heaters have the ability to control a circulation pump, in a commercial ring main application, with the use of the pump cable connector (UV resistant and rated for outdoor installation). This allows hot water¹ to cycle through the ring main, ensuring hot water is quickly available when a tap is opened.

Suitable for

- Single unit N5B6 commercial installations
- Commercial / showerblock installations with multiple NB56 units, as specified by Rinnai commercial



Rinnai INFINITY digital controllers (Compact, Bathroom, and Kitchen Deluxe) are not compatible with the NB-Series pump cable and ring main applications.



Before commencing installation please check that you have the commissioning sheet from inside the appliance front cover. It has the information you need to change the PCB settings. These are needed in conjunction with these instructions to do the installation.

Sequence of operation

Pump recirculation begins when the water heater is turned on. The inlet and outlet thermistors measure the water temperature. The water heater produces hot water at the temperature setting. If the inlet thermistor detects an abnormal temperature then error code 51 is generated and the pump will turn off.

When the return water temperature reaches approximately 5 °C below the temperature setting, the water heater pump will turn off. The cycle will restart at the interval set in the recirculation mode setting, for example 9 minutes if set for comfort, or 18 minutes if set at economy².

- **Economy:** Cycles the pump less often and uses less energy to maintain the circulation loop temperature
- **Comfort:** Cycles the pump more frequently, ensuring the loop temperature remains higher, but also uses more energy. Select comfort mode for poorly insulated ring main piping.

Footnotes

¹ To meet the NZ Building Code requirements, (G12.3.2, G12.3.9) Verification method VM1:AS/NZS 3500.4:2018 Section 10.2 is used. "The delivery temperature flowing from the water heater, bank of water heaters, or a heated water heater storage vessel shall not be less than 60 °C". Otherwise another form of treatment, for example UV sterilisation, must be included.

² See table on p.14 for more information.

NB-Series

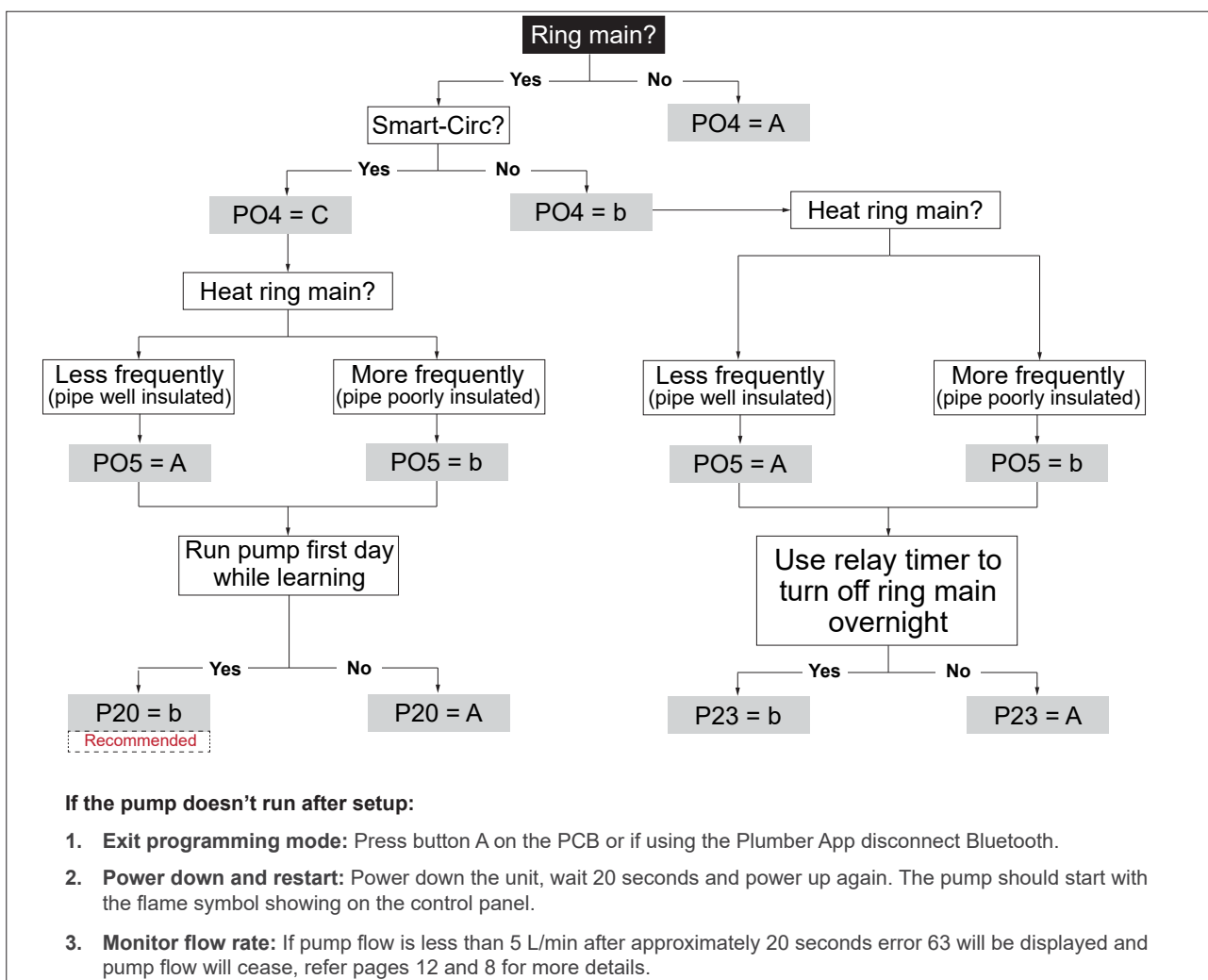
PCB parameter setup for ring main



You **MUST** connect the cable to the pump **BEFORE** connecting the cable to the unit as there may be 230 V mains power on the pump terminals.

1. Turn off the NB56 and unplug from the power.
2. Connect the cable to the pump.
3. Connect the pump cable and earth connection to the NB56.
4. Connect power to the water heater.
5. Adjust the PCB parameters shown below using the commissioning instructions and below flowchart. 02C > 04b > 05A or 5b > 11A > 13b > 20b (recommended) > 23

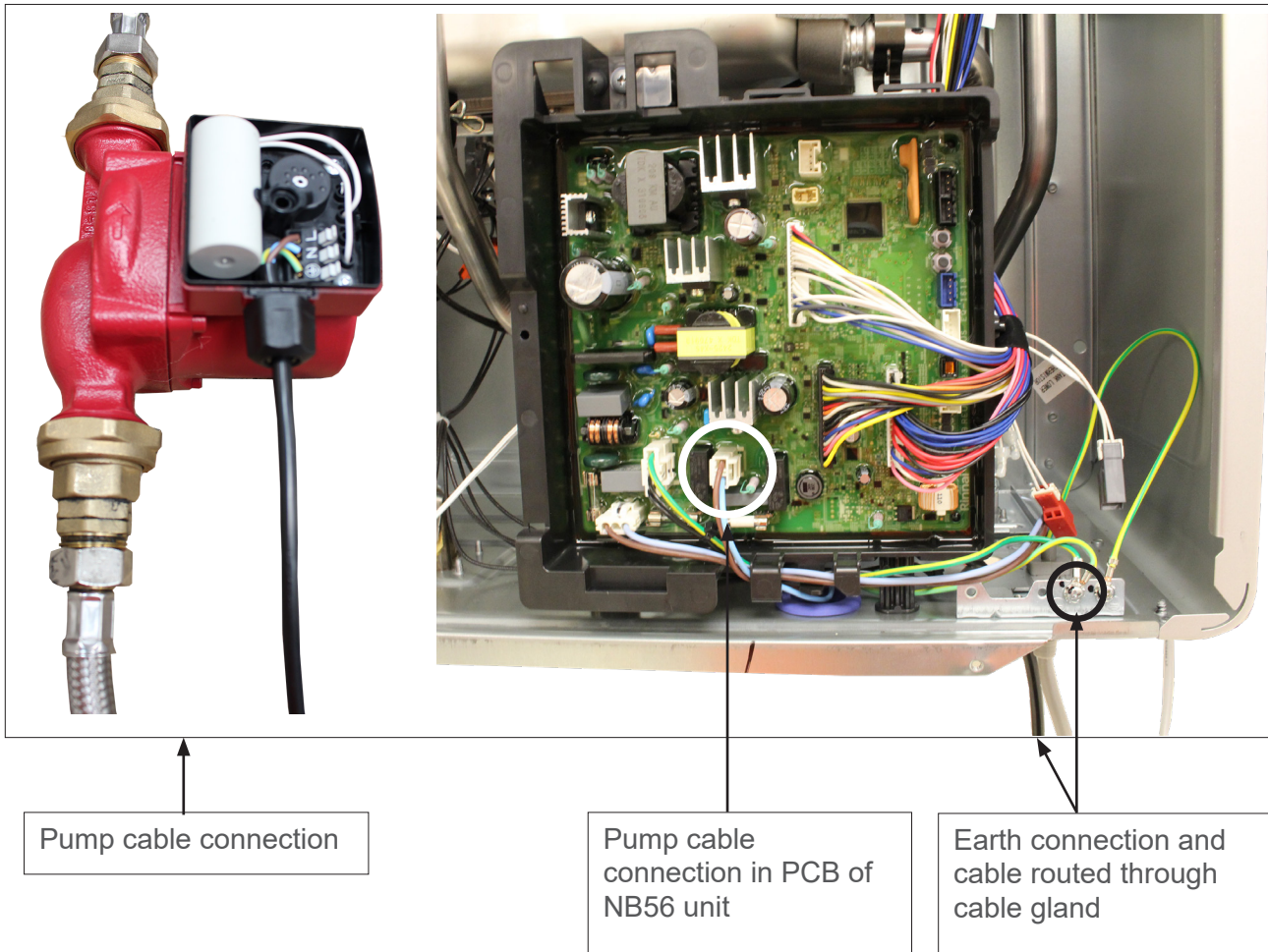
02C	= temperature setting - 65 °C ¹
04b	= recirculation pump output - yes
05A or 05b	= recirculation mode - economy or comfort
11b	= auto reset - on
13b	= temperature setting - fixed
20b	= first day pump operation - on
23	= external pump with timer function



¹ The pump cable will only work on a temperature setting 65 °C or lower. If set to 70 °C ring main functions will cease, if below 60 °C UV sterilisation will be required.

NB-Series

Pump cable connection images



Please note:

To gain access to the pump connection on the PCB, the inbuilt front control panel and PCB cover will need to be temporarily removed.

NB-Series

Pump selection

A Grundfos UPS 20-60 N 150 96913096, set to speed 3, should be sufficient. Maximum current draw (including any surge on startup) MUST BE < 2 A at 230 V. Most domestic circulating pumps will be well under this current draw. The pump must have sufficient flow to activate the NB56, 10 L/min should be sufficient for this.



At 10 L/min the pressure loss through the NB56 will be approximately 20 kPa—the pump should be sufficient to pump 10 L/min at 20 kPa, plus allow for pipe system pressure losses.

NZS 3501 Copper pressure losses at 10 L/min* example

Size	kPa / m	m	Pressure loss
DN25	0.05	8	0.4
DN20	0.22	20	4.4
DN15	1.60	10	16
NB56	-	-	20
Total			40.8 kPa

For other piping systems, please refer to suppliers instructions.

A Grundfos 20-60 will be sufficient for up to approximately 50 kPa pressure loss.

Pump placement considerations

Most domestic pumps are not rated for outdoor installations, including the Grundfos pump noted above. These will require a rain shield for protection from direct rain and UV.

Domestic pumps are also usually limited in the installation orientation of the impeller shaft and electrical junction boxes. Be sure to follow the manufacturers instructions when installing the pump.

Position the pump within a 2 m cable run of the NB56—the cable can be extended.

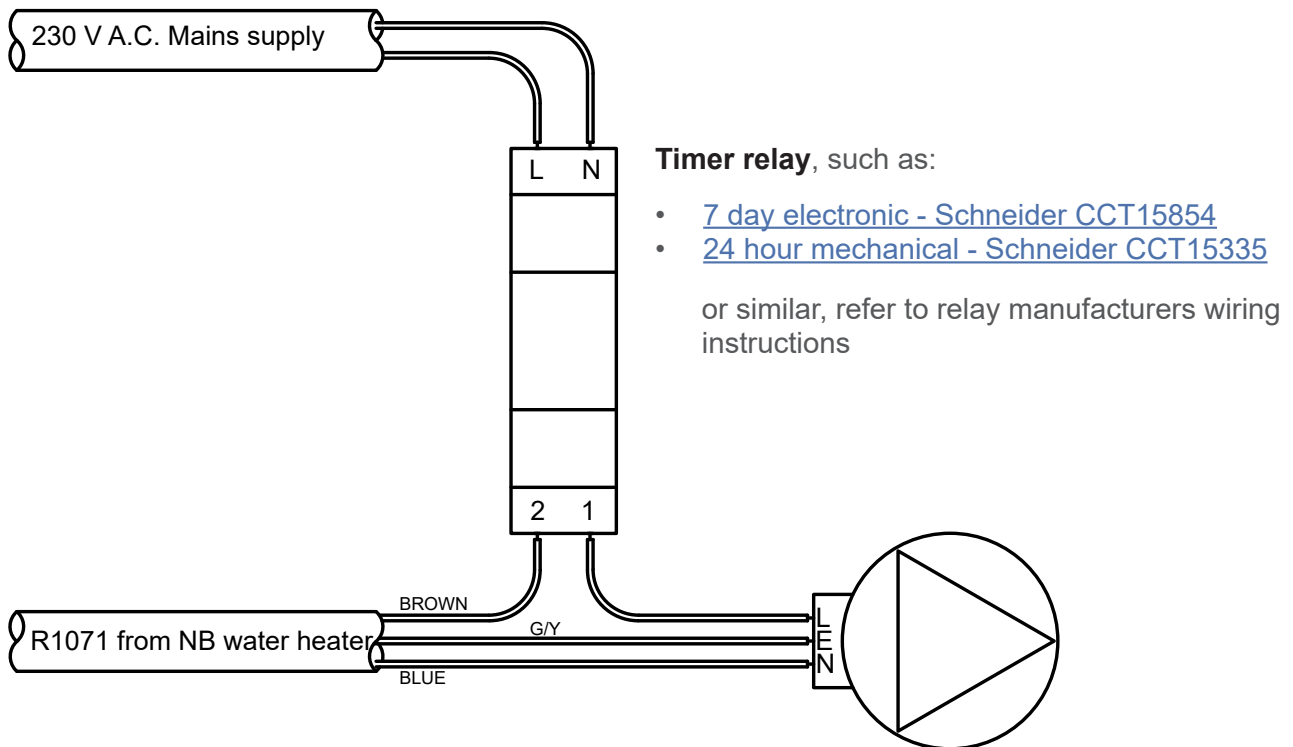
* Calculated using the Kembla NZS3501 Plumbing Copper Brochure

NB-Series

Externally powered timer

A timer, powered by the water heater can't be used, as the water heater's power supply is off most of the time. When the power is off, the timer will stop working.

The power from the water heater to the pump needs to be switched by an externally powered timer.



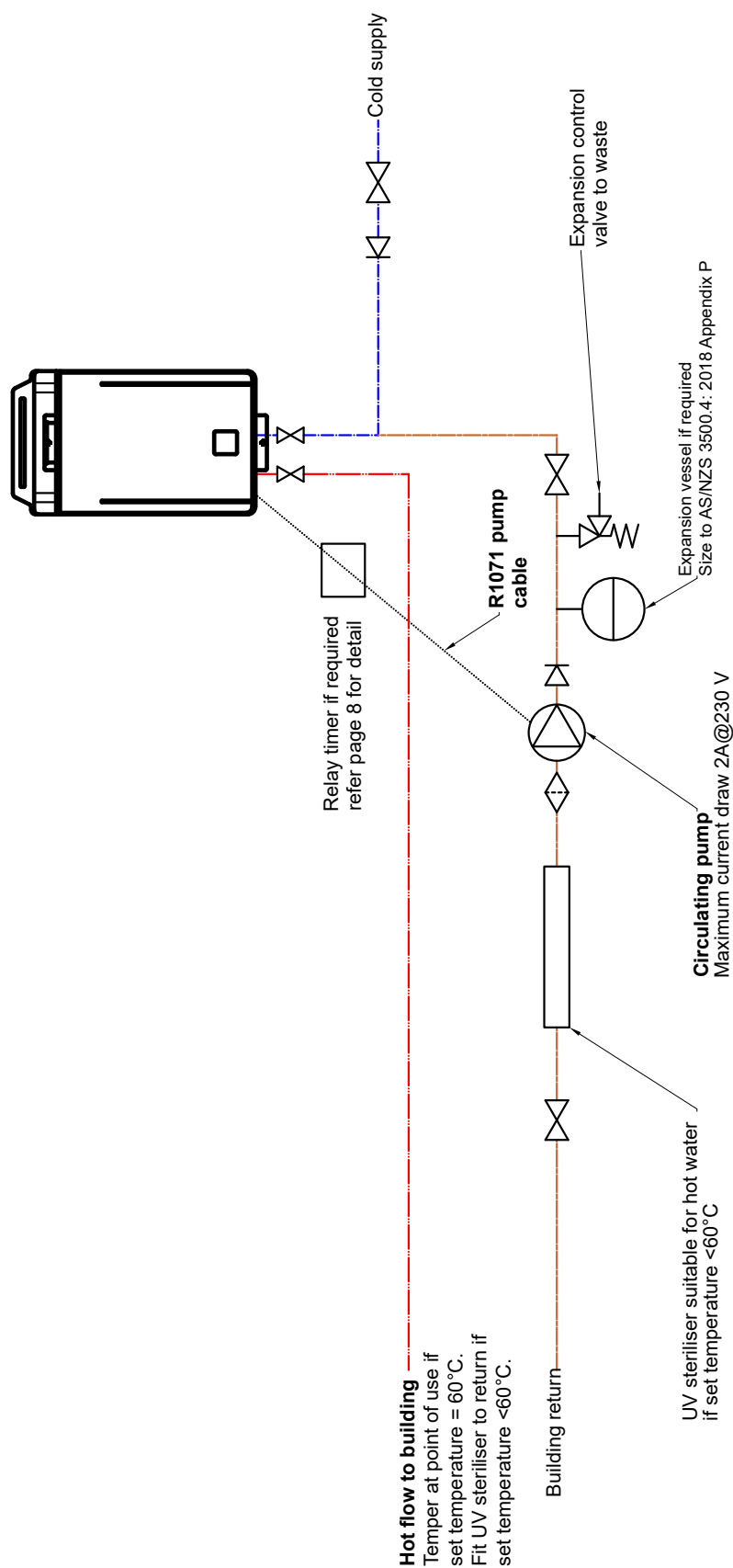
When using a relay timer in the pump power supply cable, parameter 23 (external pump with timer function) must be set to b.

When the relay timer has cut power to the pump 63 will be displayed on the appliance control panel. When the relay timer reconnects the power to the pump the 63 error code will clear.

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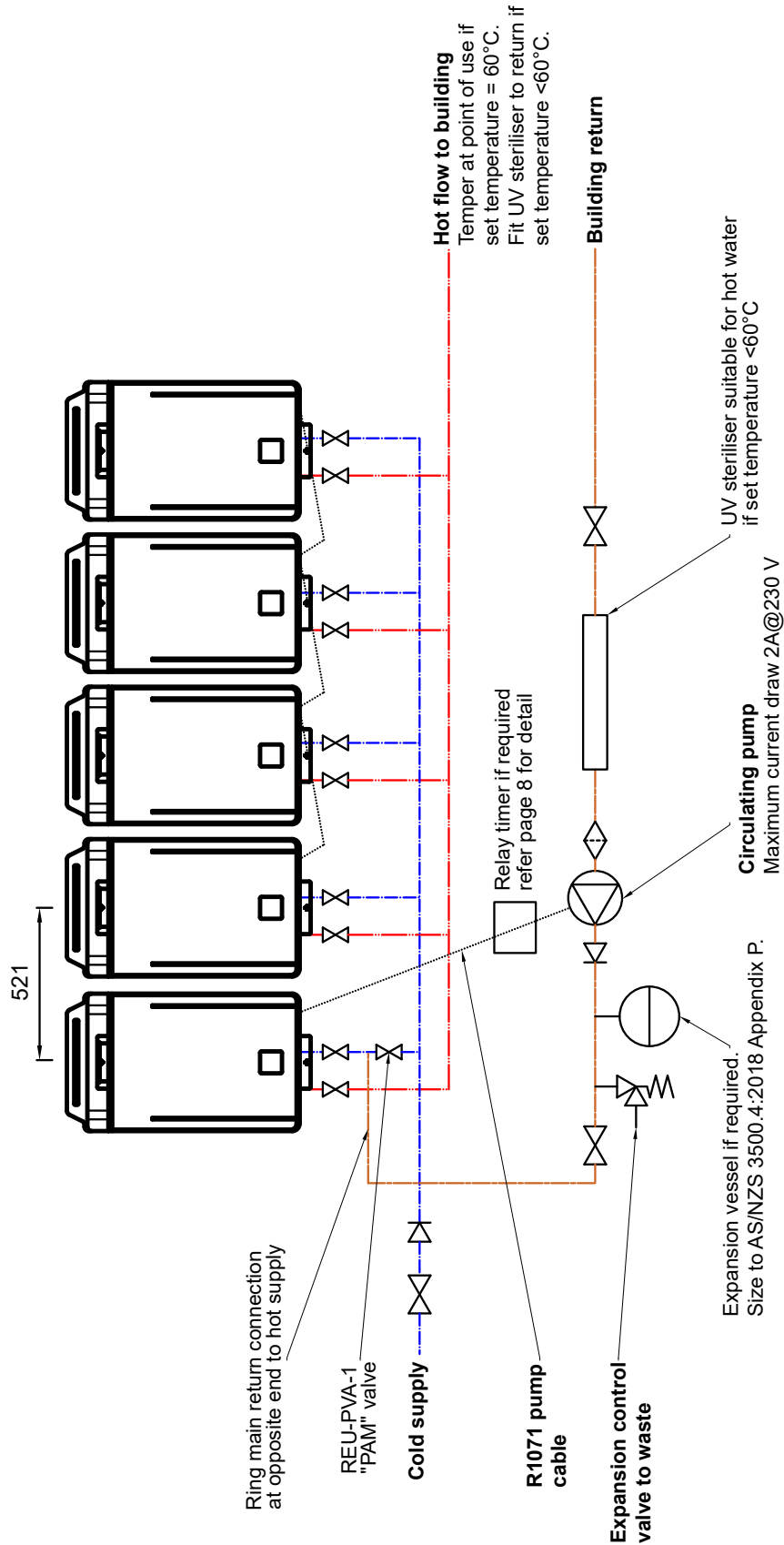
NB-Series

Ring main configuration: NB56 single unit



NB-Series

Ring main configuration: NB56 Demand Direct



NB-Series

Error code 63: Recirculation low flow

Troubleshooting error code 63

Step	Action	Detail
1	Double check PCB parameter settings	Refer p.5
2	Circulation flow rate below 5 L/min	Using the temperature controller see if the water heater is producing flow. To display the recovery flow rate in L/min through the water heater, press the UP button for three seconds followed by the On/Off button. The display will show the flow rate. Example 040 = 4.0 L/min. If the flow rate is below 5 L/min do the following: 1. Bleed all air from the system, including the pump. 2. Clean the inlet water filter. 3. Check you have the proper water supply to the water heater at a flow rate higher than 5 L/min. 4. Check you have at least 300 kPa of water pressure to the water heater. 5. Inspect check valves are functional and that you have no restrictions if installed on a dedicated circulation return line.

When using a relay timer in the pump power supply cable, parameter 23 (external pump with timer function) must be set to b.

When the relay timer has cut power to the pump 63 will be displayed on the appliance control panel. When the relay timer reconnects the power to the pump the 63 error code will clear.

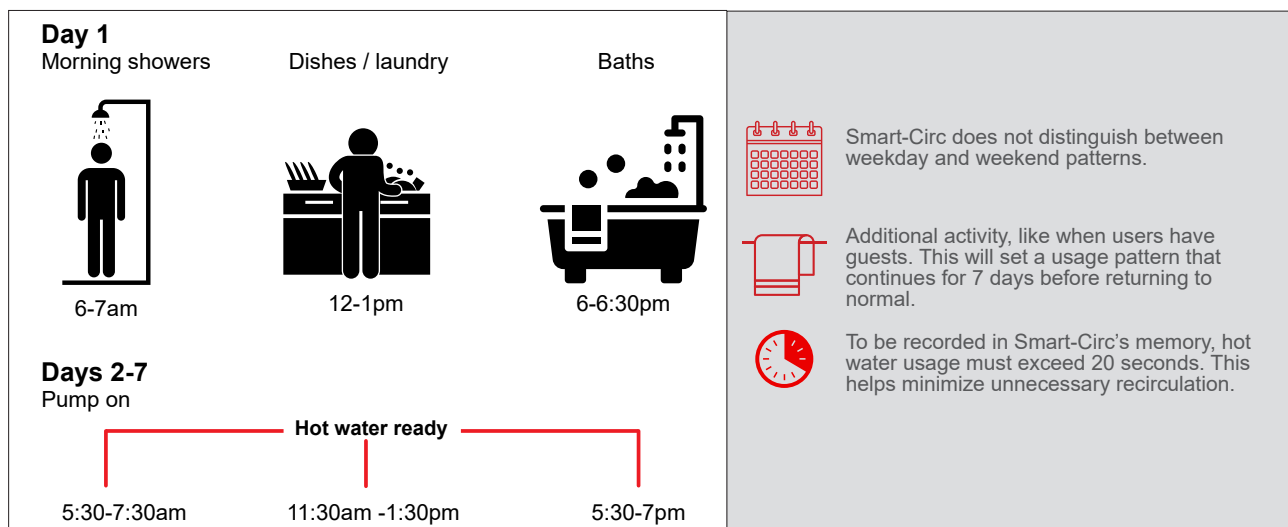
NB-Series

Smart-Circ intelligent recirculation

What it does

The NB-Series of continuous flow gas hot water heaters have a built in pump with recirculation technology. This technology learns users hot water patterns over a 7-day period then schedules pump and recirculation patterns accordingly—it preheats the water in the plumbing lines so it's ready when you are. This minimises cold water slugs, when a hot tap is first turned on, and reduces water waste. The system is constantly updating based on the previous 7 days.

- ✓ Faster hot water during regular demand periods
- ✓ Saves energy and money



Technical information

When Smart-Circ is enabled in the PCB settings, you can choose from the pump recycling frequency in setting #05 - Recirculation Mode. There are two options available Economy and Comfort. For more information refer to the next page.

- **Economy mode**
Cycles the pump less often, using less energy to maintain the circulation loop temperature.
- **Circulation mode**
Cycles the pump more frequently, ensuring the circulation loop temperature remains higher, but it uses more energy. Select comfort mode for poorly insulated ring main piping.

The second parameter setting on the PCB (setting #20) determines pump operation on the first day. For the first 24-hours of operation, Smart-Circ will learn hot water usage patterns and operate the pump based on learned patterns. On the first day, when the water heater has no learned patterns, the unit can be set to:

- 20A = OFF: Pump off / no circulation
- 20b = ON: Pump on / recirculation multiple times per hour depending on setting in #5

NB-Series

Smart-Circ intelligent recirculation

#5 Recirculation mode

Pump recirculation begins when the water heater is turned on and produces hot water at the set temperature. Inlet and outlet thermistors measure the water temperature. If the inlet thermistor detects an abnormal temperature then error code 51 is generated and the pump will turn off.

When the return water temperature reaches approximately 3 °C below the set temperature, the water heater and pump will turn off. The cycle will restart at the approximate time interval based on the temperature thermistor readings.

Economy mode

- Less energy consumed due to fewer pump cycles
- Assumes plumbing is insulated (minimal pipe loss)
- Pump cycles on every 18-68 minutes, see table below

Comfort mode

- Higher energy consumption due to more pump cycles
- Assumes plumbing is not insulated resulting in higher pipe heat loss
- Pump cycles every 9-34 minutes, see table below

Temp. setting (°C)	Typical pump ON intervals* (mins)	
	Economy	Comfort
35	68	34
38	56	28
39	52	26
40	48	24
41	44	22
42	40	20
43	38	19
44	36	18
45	34	17
46	32	16
48	30	15
50	28	14
55	22	11
65	18	9

* The pump will cycle on these calculated intervals which are based on the temperature setting, insulation, and estimated heat loss in the system. The values for each installation will vary.

NB-Series

Smart-Circ intelligent recirculation

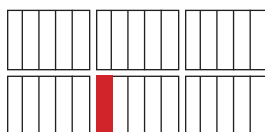
#20 First day pump operation

The default setting for #20 is A (first day pump off). If you switch to setting 20b, the pump will operate for the first 24 hours and it will turn on and off depending on the setting in #5, this keeps the system warm as it won't be familiar with your hot water usage pattern.

With the default "off" setting for the first day, the system will still learn your hot water usage, but please note that you might experience some delays in getting warm water on that first day.



Pump on

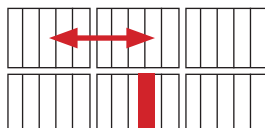


If 20A, no recirculation for first 24 hours

7:00~7:10 hot water use



Pump on

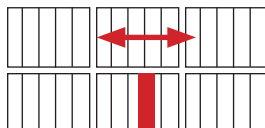


Recirculation will start based on day 1 hot water use. Interval based on parameter #5 setting. Timer 6:30~7:40 (based on 30 mins before and after 7:00~7:10).

Day 2 7:30~7:40 hot water use.



Pump on

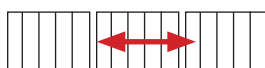


Timer of 7:00~8:10 (based on 30 mins before and after 7:30~7:40).

Days 3-8 7:30~7:40 hot water use.



Pump on



No hot water usage before 7:30 for seven days in a row, timer based on day 1 is cancelled. Based on 7 days hot water use (days 2-8), the timer 7:00~8:10 remains.



If on holiday for more than 7 consecutive days, and P20 = b (first day pump operation), to ensure the ring main operates on return with minimal warm water delays, advise the owner, on the first day back to turn off the power supply to the NB56 for 30 seconds, then turn back on. The pump will run for the next 24 hours while the system re-learns the usage pattern.

Please note

Appliance power should not be turned off while away if there's a risk of frost.

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