Heat Pump Water/Space Heaters
MWH/MWR models (c/w UC8) R32
Installation & Maintenance

CONTENTS Page

Other Relevant Documents (at www.temperzone.com):
- MWH/MWR Applications Manual
- Specifications Sheet (model specific)
- R32 Handling : Water Heating Units
- MWH 900 LAT Control User Guide.

GENERAL

1. GENERAL

1.1 Introduction

Follow these instructions to ensure the optimum performance, reliability and durability.

The appliance uses a closed water loop and is not intended to be permanently connected to the water mains or a hose-set.

Units must be installed in accordance with all national and regional regulations and bylaws.

National Health and Safety regulations must be followed to avoid personal injuries.

The appropriate permits must be acquired and adhered to.

Seismic restraints must be fitted if required (refer NZS 4104:1994, AS 1170.4).

The accompanying 'R32 Handling' pamphlet forms part of these Installation & Maintenance instructions.

⚠ **WARNING.**

These units use R32 refrigerant (Class A2L) which is mildly flammable.

The unit shall be installed, operated and stored in a adequately ventilated space (eg outdoors) where there is no continuously operating open flames (eg an operating gas appliance) or other R32 ignition source. If the refrigerant gas comes into contact with fire, a poisonous gas may occur. Be aware that R32 does not contain an odour.

This appliance is not intended for use by persons (including children) with reduced physical, sensory, or mental capabilities, or lack of experience and knowledge, unless they have been given supervision or instruction concerning use of the appliance by a person responsible for their safety. Children should be supervised to ensure that they do not play with the appliance.

1.2 Site Preparation

System designers and installers must first familiarise themselves with the contents of the MWH/MWR Applications Manual prior to installing any unit. This contains important information about site requirements that will ensure the unit performs effectively and to its design capabilities, eg expansion tank, water loop pressure system, external piping requirements.

INSTALLATION

2. INSTALLATION

2.1 Positioning

⚠ **WARNING**

The appliance should be located in an area where leakage of the unit or connections will not result in damage to the area adjacent to the appliance or to lower floors of the structure. When such locations cannot be avoided, it is recommended that a suitable drain pan, adequately drained, be installed under the appliance.

⚠ **WARNING**

Keep appliance area clear and free from combustible materials, gasoline and other flammable vapours and liquids.

MWH/MWR units are designed to be located outdoors* and as close to the space heating area as acoustic criteria allows.

* If the unit is located indoors, ensure adequate ventilation is provided to maintain the internal air temperature no lower than 5°C below the external ambient air temperature. It is possible to duct the discharge air from the unit, however the max. external static pressure is limited (refer Spec. Sheet). It is recommended that an additional in-line fan be installed to maintain airflow through the unit.

Refer to diagram (Figure 1) and supplied Specifications sheet for minimum clearances. If multiple units are to be placed side-by-side then allow at least 1m between coil faces.

When determining the position of the unit, allow adequate space around the unit to facilitate water pipe connections, future servicing and maintenance. Ensure there is enough working space in front of the electrical access panel.

Note: The discharge air from the unit is very cold when the unit operates at full capacity, and may be well below the freezing temperature. Take care in selecting the installation position that the discharge air from the unit is not under a window or plants that are cold sensitive. It is also possible to get increased condensation on surfaces above the unit discharge air which may deteriorate some surfaces. Avoid installations where ponding of chilled air is likely to occur. Choose a well-ventilated location.

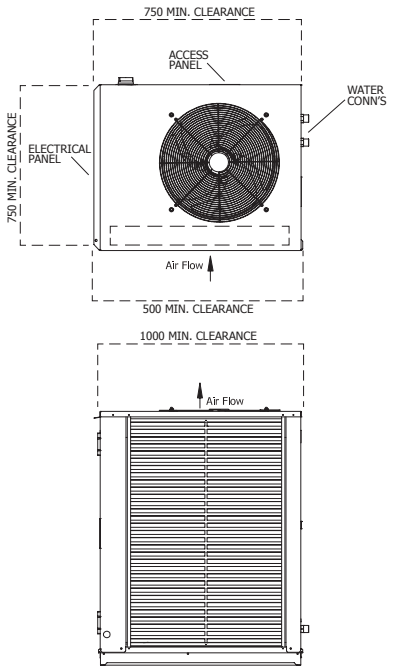


Figure 1 Clearance Requirements

Consideration should be given to the piping route to the room fan coil unit/s as well as power and control cabling. Refer Specification Sheet for maximum separation limits between MWH units and connected heat exchangers.

2.1 Positioning (cont'd)

2.2 Mounting

The unit should be fastened to a firm flat raised horizontal base using the holes supplied in the mounting channels and isolation pads. Refer Building regulations for any applicable seismic site requirements.

The unit must be installed level to ensure water drains freely out the drain exits (refer 2.3)

The unit is shipped with blocks installed under the compressors. Ensure these blocks are removed from the compressor feet prior to starting the unit.

2.3 Condensate Drain

When the unit is operating, condensation forms on the coils and drains out the bottom of the unit; this is normal. It is recommended the condensate be piped to a suitable drainage point to prevent ponding and/or slippery mould growth around the base of the unit.

A Drain Connector Kit (p/n 060-000-437) is supplied with 19 mm OD stub. Alternatively, for a drip free installation a separate drain tray beneath the unit could be used to direct condensate to a suitable drainage point.

The drain line should have a slope of at least 1 in 50 and must not be piped to a level above the unit drain tray. Fit a vent pipe (10 mm ID) within 500 mm of the unit. Discharge point must comply with AS/NZS 3500.4.

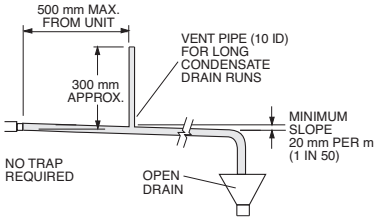


Figure 2

2.4 Water Connection

For the unit's IN and OUT water connection sizes, refer to the Specifications Sheet supplied with each unit.

The water supply to the zone manifolds must not be restricted. Pipe lengths should be as short as practical, have as few bends as possible and be sized to minimise pressure losses in the piping system.

Note: Where thermoforming plastic piping is used, care must be taken not to overheat the joints and cause restricted flow. Restricted flow rates may result in over-pressure HP faults occurring.

Use water treatment when connecting to steel piping – one that prevents internal corrosion. Poor quality water supply should be pre-filtered prior to using.

Connection pipes must be insulated to minimise heat loss, prevent icing-up in low ambient temperatures and protect against corrosive environments.

It is recommended that the pressure of water loops be maintained with either a header tank, or connection to the mains water system. If connecting to the mains water system, then a pressure reducer, back flow prevention valve and expansion tank are required.

2.4.2 Air Bleed Vents (External)

An automatic air-bleeding valve, expansion tank and water pressure gauge must be installed as part of this system. The automatic air-bleed valves function to remove small bubbles of air from the system when the pump is operating and must be installed at the highest point in the system. Do not rely on these valves to remove the air from the pipes during commissioning. Ensure the system is effectively purged through the purging port.

For ease of commissioning, an air-relief valve can be installed on each fan coil, although this is not generally necessary if the system is effectively purged.

2.4.3 Filling / Purging Port (External)

A filling port is required to be installed at the unit. It is essential the filling port is located near the return water inlet to the unit. Either install two manual ball valves, with a filling port in-between, or install a dedicated filling port valve.

Note: The pump installed within the MWH/R units is not self-priming and air remaining in the system will result in the pump not operating.

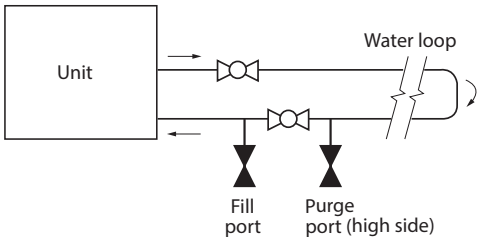


Figure 3

Refer MWH/R Applications Manual for other Site Requirements and recommendations (www.temperzone.com)

3. WIRING

3.1 General

Electrical power wiring must be fitted and certified by persons with appropriate qualifications and certification.

A signed 'Certificate of Compliance' must be left with the unit for insurance purposes.

3.2 Power to unit

All power wiring is to be done to the appropriate electrical standard of the country in which the unit is being installed.

The person installing the wiring is responsible for the correct selection of wiring size and auxiliary components.

See the Specification Sheet for supply voltage range, frequency, phase and maximum operating current .

Wire the unit directly from the Electrical Distribution Board.

The unit should have its own dedicated circuit breaker on the Distribution Board. Route the power supply cord through the entry hole provided.
MWH/R 900: Use the mounting track provided, which includes cable ties.

DO NOT install wiring in contact with refrigeration piping.

Refer Figure 3 for client wiring.

3.3 Power to Pump

MWH/R 250, 450, 900 models include an optional on-board pump, so no additional wiring may be required. Wire any external EC pump (0-10V control) directly to the unit – refer unit's wiring diagram. All MWH/R 2000 require an external pump.

3.4 Power to optional Room AC Units – ducted type

Single phase mains power wiring to each zoned unit (if applicable) shall be taken from the distribution board.

3.5 Control

Simply connect power (and water) and switch the unit ON and the unit's built-in UC8 Controller works to maintain the default leaving water temperature (LWT) of 45°C.

The maximum LWT can be raised to a maximum of 55°C if the application requires it, eg long pipe systems and/or multiple small fan coil units or radiators.
Note: Higher LWT will reduce the efficiency of the unit.

To adjust the supply water temperature, refer Commissioning 4.3.

MWR only:
In cooling mode, the UC8 works to maintain the default leaving water temperature (LWT) of 7°C. The minimum LWT can be lowered to a minimum of 3°C if the application requires it.
Note: Lower LWT will reduce the efficiency of the unit. Adding glycol to the water loop is recommended for low LWT applications.

A single load Leaving Air Temperature (LAT) control application requires a Programmed Logic Controller (PLC) to be installed. Refer Temperzone for 'LAT Control User Guide' for set-up.

MWH 900/2000 models include a PLC for stage control of more than one compressor, external pump control and de-ice control management.

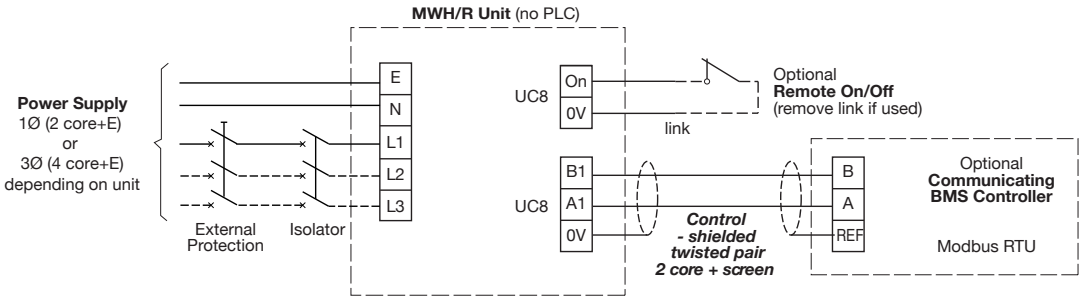
3.6 BMS Control

MWH/R external control options are limited to Remote On/Off and Modbus/RTU control using the on-board UC8 (refer Appendix I).

MWH/R 250, 450 Single Compressor models:
An optional PLC is available to enable more options including BACnet and scheduling. Refer to Temperzone for more information.

MWH 900/2000 Multiple Compressor models:
PLC supplied as standard and includes BACnet and scheduling. Refer to Temperzone for more information, including BMS control of external pump.

Figure 4 Client Wiring



External Water Pump (if applicable) – refer unit's wiring diagram.

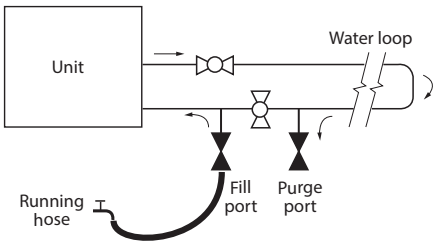
MWH/R with PLC: Refer Temperzone for BMS control information.

4. COMMISSIONING

4.1 Filling & Venting

Air must be removed from the water system prior to the operating the unit. This is essential for the unit to successfully start.

a. Ensure all zones requiring heating are open.
b. Prior to connecting a water hose to the filling port, ensure all the air from the hose is flushed out by pre-running the water flow for a short period.
c. Close the ball valve on the return side of the unit. Open the purge port.



d. Open the filling port and connect the flowing hose. Purge the system until all air is expelled. This will take some time.
e. Close the purge port, and open the ball valve on the return side of the unit. Pressurise the system to 2 bar (29psi), then close the filling port.
f. Check the precharge pressure of the expansion tank is appropriate for the required system pressure

4.2 Indoor MWH/MWR Installations

a. If installed indoors, check the refrigerant charge size is in accordance with the minimum room size (refer R32 Handling document).
b. Check the ventilation machinery and outlets are operating adequately and are not obstructed.

4.2 Power

⚠ WARNING
Do not turn the unit on until the water loop is filled with water.

⚠ WARNING
Do not turn the unit on if outdoor ambient is below freezing point, otherwise damage may occur.

a. Check the units are electrically connected in accordance with the wiring diagram (refer Specifications Sheet or unit label).
b. Check all wiring connections and terminal tightness.
c. Remove the shipping blocks from beneath each compressor. Check that each compressor is securely mounted.
d. Switch ON the Mains distribution board circuit breaker, the internal circuit breakers and the unit's external ON/OFF switch.
e. Check the supply voltage.

4.3 Operation

a. Remove the remote on/off loop, and connect D3 to SC on the UC8 controller board (refer Figure 4, page 8). This will start the internal pump at full flow. Run the pump for 20 minutes and/or until no air is being expelled from the auto air bleed valve. Check system water pressure, and adjust if necessary.
b. Remove the D3 connection, and re-insert the remote on/off loop. The unit's UC8 controller board display should show 'dELAY', then 'HOLd', and countdown to zero.
c. The compressor should start, and after a few seconds the fan should also start. If not refer Troubleshooting (page 6).
d. The unit is programmed to operate on its own based on the following conditions:

Run Mode: The remote On/Off switch is On, and
- the entering water temperature (EWT) is greater than 5°C below the target set temperature (default 45°C),
  and
- the outdoor ambient temperature is above -15°C.

Stop Mode: The remote On/Off switch is Off, or
- the leaving water temperature (LWT) is greater than 2°C above the target set temperature, and
- the compressor has operated at less than 20% for longer than 2 minutes.

4.3 Setting the Leaving Water Temperature (LWT)

MWH/MWR 250, 450:

Heating: The unit's UC8 controller has a default setting of 45°C for leaving water temperature. This can be changed if necessary to better suit the application. The maximum setting is 55°C.

Enter the UC8 special modes function as follows:
a. Apply power to the unit and wait until the power-on sequence is completed.
b. The compressor must be off and there must be no request to start (CP signal or thermostat must be OFF, no Modbus RTU or BACnet/IP run request).
c. Hold down the UC8 controller's push-button 'SW3' (see Fig.3) until the display shows the number '1', then long press to select the item.
d. Short press the push-button 'SW3' until the display shows the letter 'H', then long press to select the item.
e. The selected heating LWT mode (H) starts immediately after the button is released. Use the display and short push-button presses to make changes to the settings.
f. The configuration mode automatically ends when the push-button has not been pressed for 30 seconds.
g. The UC8 controller saves the change in memory which is kept even when power is switched off. Thus changes need to be made only once.

MWR 250, 450:

Cooling: The unit's UC8 controller has a default setting of 7°C for leaving water temperature. This can be changed if necessary to better suit the application. The minimum setting is 3°C.

Enter the UC8 special modes function as follows:
a. Apply power to the unit and wait until the power-on sequence is completed.
b. The compressor must be off and there must be no request to start (CP signal or thermostat must be OFF, no Modbus RTU or BACnet/IP run request).
c. Hold down the UC8 controller's push-button 'SW3' (see Fig.3) until the display shows the number '1', then long press to select the item.
d. Short press the push-button 'SW3' until the display shows the letter 'C', then long press to select the item.
e. The selected cooling LWT mode (C) starts immediately after the button is released. Use the display and short push-button presses to make changes to the settings.
f. The configuration mode automatically ends when the push-button has not been pressed for 30 seconds.
g. The UC8 controller saves the change in memory which is kept even when power is switched off. Thus changes need to be made only once.

MWH/MWR 900, 2000:
Heating: The unit's PLC controller has a default setting of 45°C for leaving water temperature. This can be changed if necessary to better suit the application. The maximum setting is 55°C. Refer to Temperzone to change the setting.

MWR 900, 2000:
Cooling: The unit's PLC controller has a default setting of 7°C for leaving water temperature. This can be changed if necessary to better suit the application. The minimum setting is 3°C. Refer Temperzone to change the setting.

4.4 General Checks

a. Check the pump head is adequate for the external system resistance.
b. Check that the air flow over the coil is not restricted and that the fan is running smoothly.
c. Check the unit is installed level and that condensate drains freely by pouring some water into the base tray.
d. Check the operation of the external controls.
e. Leave all relevant documentation with the unit.
f. Refrigerant leak check all brazed and fitted joints.
⚠ **WARNING.**
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.
g. Check for leaks at water connections.

⚠ **WARNING**
Water temperatures over 50°C can cause severe scalds.

A Commissioning Check List is provided; refer page 6.

4.5 De-Ice Cycle

Under normal operation in cold conditions the coil will at times change to a white appearance as a frost forms. The unit is programmed to de-ice no more frequently than once every 50 min. At the end of each de-ice cycle, the coil should be completely clear of ice. Should a layer of clear ice form on the coil, then contact your Installer or Temperzone Customer Service (www.temperzone.biz).

Note: A minimum system volume applies for different applications of the unit, when ambient is below 8°C (refer Specification Sheet).

4.6 Protection Against Freezing

If the outdoor ambient temperature falls and the return water temperature is close to freezing point, the pump will pulse circulate water to prevent freezing, whether heating is called for or not.
This protection relies on uninterrupted power to the unit. Two warning labels are supplied to warn against disconnecting the power supply where freezing conditions are likely (eg while building occupants are on holiday).

The labels should be fixed adjacent to the heat pump outdoor power point and on the main fuse/switchboard of the building. Advise the building occupier.

Note: The addition of glycol to the water loop is recommended In cold climates where electrical supply is unreliable.

If it is absolutely necessary to turn the power source switch OFF, extract the water from inside the chiller unit first, to avoid any internal damage by frozen water.

4.7 Water Treatment

Consideration should be give to including a chemical dosing water treatment system in areas where poor water quality may effect the longevity of the system, eg

- hard water (including Wanganui area)
- aggressive water (including Christchurch area)
- both hard and aggressive water (some bore water).

Glycol should be used in particularly cold climates with unreliable electricity.

5. MAINTENANCE

Read the additional 'R32 Handling' instructions accompanying this product.
⚠ **WARNING.**
Under no circumstances shall potential sources of ignition be used in the searching for or detection of refrigerant leaks.
If a leak is suspected, all naked flames shall be removed/ extinguished.
If a leakage of refrigerant is found which requires brazing, all of the refrigerant shall be recovered from the system, or isolated (by means of shut-off valves) in a part of the system remote from the leak.

5.1 At Four Weeks

a. Check compressor compartment for oil stains indicating refrigerant leaks.
b. Check tightness of electrical connections.
c. Check water pressure in the water loop is 2 bar (29psi); refer 4.1.

5.2 Yearly

a. Check tightness of all fan and motor mountings.
b. Check tightness of electrical connections.
c. Check that fan motors are free running.
d. Check water pressure in the water loop is 2 bar (29psi); refer 4.1.
e. Check condensate drains for free drainage.
f. Check for leaks at water connections.
g. Check and remove as necessary any organic material and dust accumulation from coil fins and inside the fan chamber (power off). In corrosive environments, the checking and cleaning frequency should be increased.
h. Touch up any unit paintwork damage to prevent corrosion.

5.3 Battery

The PLC Controller (M172) has a long life non-user serviceable battery. DO NOT attempt to replace the battery. Contact your local Schneider Electric representative.

Refer to separate documents for maintenance requirements of connected heat exchangers, eg fan coil units, radiators, etc.

TROUBLESHOOTING

6. TROUBLESHOOTING

6.1 **Room temperature varies significantly from its setting**

- Unit may have been incorrectly sized for the load, or the external water system is limiting the unit's performance.
- Unit may be in a protection or diagnostic failure mode (refer 6.6 below).

6.2 **Unit does not seem to deliver the heating when most needed**

- Heating capacity at design conditions may be incorrect. As the outside temperature falls, heat losses through the walls, floor and ceiling increase.
- Check the unit's brochure for information on the minimum/ maximum operating temperatures.
- Check the supply water temperature is appropriate for the installation (refer MWH Applications Manual)

6.3 **In a new building, why does it take some days before the heat pump unit seems to work properly?**

- Many new buildings have a large amount of concrete and other structural materials that are generally cold and full of moisture. This is most evident in the winter when trying to heat the building from scratch.
- Allow sufficient amount of time for unit to heat the floor. This could be up to 60 hours. Start heating well before you need the warmth most.
- Units need to be checked regularly to ensure proper operation and that they are not exceeding operating limits for any length of time.

6.4 **Unit runs excessively – the temperature remains too cold in winter.**

- Windows or doors may be opened to non-heated areas.
- Keep doors to unheated areas (eg laundries, bathrooms etc.) closed.
- Location of wall controller or remote temperature sensor is wrong.
- Check top air discharge is unblocked and air flow to the coil face is clear and not restricted or blocked.
- Check no ice is forming on the coil between de-ice cycles (Refer 7.10).

6.5 **Unit stopped and displaying 'HP' fault code**

The most likely reason is insufficient purging of air through the system. Repeat the above steps to purge air from the system (Refer 4.1). Should this unit again result in a HP fault, then keep the hose connected on unit start-up, and open the purge port with the internal passage closed (filling port) / partially disconnect the return water pipe, and close the return side ball valve. The unit should operate. Once the unit is operating normally, then close the internal passage and purge port.

Note: Cold water in the system is more likely to result in air-locks than warm water. Once the water heats the air will tend to be naturally removed through the automatic air-bleed. Cooler water absorbs air, and heating water will release it. Installing the air-bleed on the supply water side of the manifold allows the air to be removed prior to the water entering the plastic tubing. It is normal for the system pressure to reduce over several days as the remaining air is eliminated from the system. Return to site, and re-pressurize, ensuring that the water hose is free of air prior to connecting to the filling port.

6.6 **Unit displays an error code:**

Refer to UC8 Controller label on the unit for operation & fault diagnostics information; or visit www.temperzone.biz and model search 'UC8 Controller'. Here you will also find a 'UC8 Troubleshooting Guide'.

6.7 **Unit Does Not Start**

- Circuit breaker may have been tripped. Reset circuit breaker.
- Unit may be off or in wall thermostat mode. Check unit is switched on at the unit, and external temperature controller is in Heating mode.
- Unit may be in a protection or diagnostic failure mode. Check for fault code display on unit's controller board (refer also 6.5).

6.8 **Water Dripping Outside**

Condensation released during unit operation is normal. The unit should have been drain connected at the time of installation (refer 2.3)

- Check drain line is unblocked.
- If a condensate drain has been installed and is connected to a drain system, check gaskets and fittings around drain for leaks and plugs.

6.9 **Ice or Frost Forms On Unit's Coil**

Under normal operation in cold conditions the coil will at times change to a white appearance as a frost forms. The unit is programmed to de-ice no more frequently than once every 50 min. At the end of each de-ice cycle, the coil should be completely clear of ice. Should a layer of clear ice form on the coil, then contact your Installer or Temperzone Customer Service (www.temperzone.biz).

WARRANTY

7 WARRANTY

Please refer to the separate warranty document supplied with the unit, or visit www.temperzone.biz for details.

Australia:

warranty@temperzone.com.au

spares@temperzone.com.au

Telephone: 1800 21 1800

New Zealand:

nztechnical support@temperzone.com

Telephone: 0800 TZWARRANTY (899 2777)

NOTE Specifications are subject to change without notice due to the manufacturer's ongoing research and development programme.

APPENDIX I - BMS CONTROL OPTION

1 General

The MWH/R 250, 450 single compressor models (no PLC) can be controlled by any external controller with Modbus master which is appropriately configured.

MWH/R 900, 2000 multi-compressor systems require BMS RTU or BACnet wired to PLC RS-485-1 terminals (+, - , Com); refer to Temperzone for more information.

2 Communications format for controller

Communications format must be set as per recommended Modbus RTU:

- Baud rate (bd or br) 19200
- Data bits 8
- Parity Even
- Stop bits (Pa) 1

3 Control via Modbus RTU communications

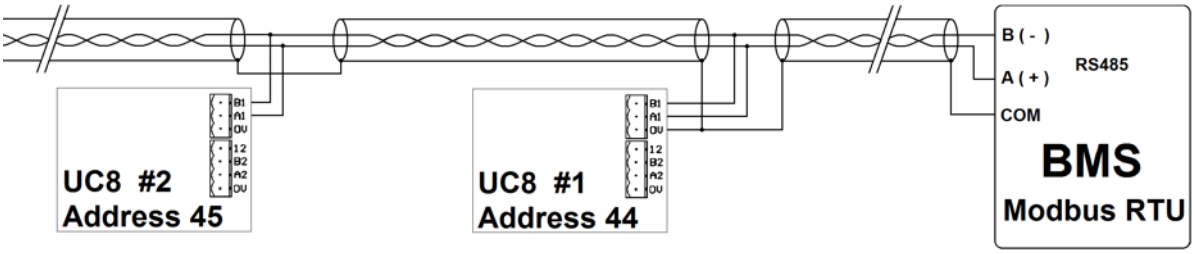
Single or multiple MWH/R 250, 450 models can be fully monitored and controlled via Modbus RTU serial communications. The following is typical for most installations:

- Set DIP switches 11 and 12 OFF on the UC8 controller.
- Connect BMS terminal A / TX+ to terminal A1 on the UC8 controller.
- Connect BMS terminal B / TX- to terminal B1 on the UC8 controller.

It is recommended to 'daisy-chain' the A&B connections using shielded twisted pair type cable, suitable for RS485 communications. Signals A and B should form one twisted pair. The cable shield should connect to terminal '0V' on the UC8 controller.

- To avoid collisions of messages on the RS485 serial communications cable it is necessary to ensure each connected UC8 controller has a unique Modbus device address. Refer to section 5.4 for the procedure.

Example:



Above example applies to MWH/R 250, 450 models only. For detailed information about monitoring and control via Modbus RTU refer to document "UC8 Modbus communications" available at www.temperzone.biz; model search 'UC8'.

4 Setting the UC8 Modbus device address

To view or change the Modbus device address of a UC8 follow these steps:

- Power up the unit but leave the compressor off.
- Hold down the pushbutton on the UC8, release the button as soon as the display shows the letter 'A'.
- The display will show the current Modbus device address. The factory default address is 44. Press the button to select higher numbers, for example press once to change the address to 45, press twice for address 46 and so forth. After address 99 the number returns back to 1.
- When the desired address is selected wait for 30 seconds. The controller will save the selected address in memory.

5 Fault monitoring

UC8 includes a Fault Status monitoring output signal. A non-specific Fault monitoring output signal is available. Refer Appendix II (page 8) for fault codes. For more information model search 'UC8' at www.temperzone.biz or contact your local Temperzone Office (page 5).

Figure 4, UC8 Controller

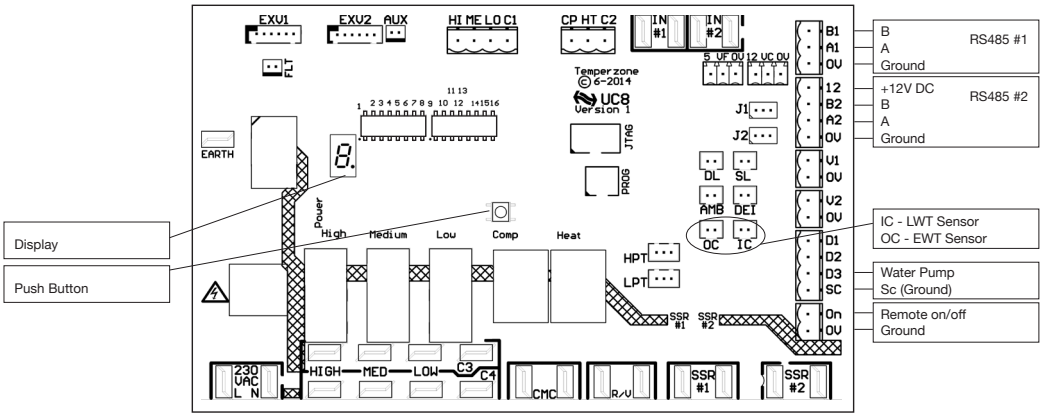
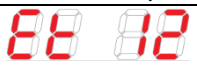
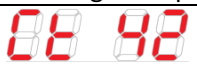


Table 1, Information available on the UC8 display.

Item	Unit	Abbreviation	Examples
Compressor suction line pressure	kPa	SLP	 Suction line pressure 1034 kPa
Evaporating temperature	°C	Et	 Evaporating temperature 12°C
Compressor suction line temperature	°C	SLt	 Suction line temperature 18°C
Compressor suction side superheat	K	SSH	 Suction side superheat 6K
Compressor discharge line pressure	kPa	dLP	 Discharge line pressure 2447 kPa
Condensing temperature	°C	Ct	 Condensing temperature 42 °C
Compressor discharge line temperature	°C	dLt	 Discharge line temperature 70°C
Compressor discharge side superheat	K	dSH	 Discharge side superheat 28K
De-ice sensor temperature (located on fins of the outdoor coil)	°C	ICEt	 De-ice sensor temperature 39°C
Capacity	%	CAP	 Capacity 100%
Expansion valve 1 opening	%	EE1	 Expansion valve 1 75% open
Expansion valve 2 opening	%	EE2	 Expansion valve 2 75% open

Refer Commission Sheet (p.11) for additional display items.

APPENDIX II – PROTECTION FUNCTIONS

The UC8 implements system protection functions such as indoor coil frost, extreme high and low pressures, rapid on-off cycling of the compressors, loss of refrigerant and more.

The following applies to all protection functions except where otherwise indicated:

Unit operating capacity may automatically be reduced before a protection function is activated. Such a reduction may be sufficient to prevent an actual trip from occurring.

When a compressor is stopped by a protection function it is held off for a period of 3 minutes, after which it is allowed to restart (provided the cause of the trip has cleared).

When a protection function is active and when a unit is locked out the alarm relay output “FLT” is active.

More detailed information about protection functions and troubleshooting refer to document “UC8 troubleshooting information”, available for free download from www.temperzone.biz.

1 High pressure protection (HP)

Units are fitted with high pressure transducers connected to UC8 input HPT. A compressor is switched off when the discharge line pressure reading exceeds 4351 kPa.

The display shows the letters ‘HP’ when protection is active. 

2 Low pressure protection (LP)

Some units may be fitted with low pressure switches. These switches connect to UC8 inputs IN#2. When a low pressure switch activates (the electrical circuit opens) then the compressor is stopped.

Some units are fitted with low pressure transducers connected to UC8 input LPT. A compressor is switched off when the suction line pressure reading falls below 133 kPa.

The display shows the letters ‘LP’ when protection is active. 

3 High discharge line temperature protection

The controller monitors the compressor discharge line temperature via a sensor connected to input ‘DL’ (red wires). The compressor is stopped when:
• The temperature rises above 105°C (<2400rpm) or 120°C (>2400rpm), for longer than 5 minutes.
• The temperature rises above 125°C (immediate action).
The display shows the message ‘Hi-t’ when protection is active. 

4 High discharge superheat protection

Discharge superheat is defined as the difference between the compressor discharge gas temperature and the condensing temperature. When this temperature differential becomes very high it is an indication that the compressor is being starved of refrigerant gas. Common reasons for this could be a lack of refrigerant (under-charged or loss-of-charge) or a problem with the expansion device (for example a stuck accurator or loose wiring to an EEV).

The protection is activated when discharge superheat exceeds 60K for longer than 30 minutes.

The display shows the message ‘Hi-dSH’ when protection is active. 

6 Low discharge superheat protection

Discharge superheat is defined as the difference between the compressor discharge gas temperature and the condensing temperature. When this temperature differential stays very low it can be an indication that the compressor is being flooded with liquid refrigerant. Common reasons for this could be an excess of refrigerant (over-charged) or a problem with the expansion device (for example loose wiring to an EEV).

The protection is activated when discharge superheat remains below the threshold for longer than 15 minutes. The threshold varies linearly from 0K at standard mode minimum capacity (40%) to 10K at nominal capacity (100%).

This protection function is disabled when a compressor operates at less than standard mode minimum capacity (< 40%).

The threshold for a variable speed compressor operated in boost mode (capacity above 100%) is fixed at 10K.

The display shows the message ‘LO-dSH’ when protection is active. 

7 High evaporation temperature / high suction line temperature protection

The unit has a low pressure transducer connected to the compressor suction line. The controller calculates the evaporating temperature from the suction line pressure reading. Additionally the controller monitors the compressor suction line temperature via a sensor connected to input ‘SL’ (white wires).

The protection function stops the compressor when:

- The evaporating temperature remains above 27.5°C for longer than 15 minutes.
- The suction line temperature remains above 30°C for longer than 15 minutes.

The display shows the message ‘Hi-SL’ when protection is active. 

8 Other alarms

The controller performs many other protection functions. For example:

- Signals from sensors and transducers must remain inside normal operating range.
- Modbus RTU communications with connected devices (e.g. TZT-100 or SAT-3 thermostat, a Carel Power+ inverter) must continue uninterrupted.
- Modbus RTU communications with a controller such as a BMS that is controlling the unit must continue uninterrupted.

Refer to document ‘UC8 Troubleshooting Guide’ for details.

9 Lock-out

Each protection function has a trip counter. A trip counter is reset to 0 whenever the compressor run request is removed. Any trip that has occurred more than 12 hours ago is removed from the trip count.
For some protection functions, when the trip counter reaches value 3 (i.e. three consecutive trips occur) then the unit is “locked out”.

When a unit is locked out the compressor is not allowed to start. Lock-out is designed to protect the compressor from repeatedly starting when a serious fault exists that requires the attention of a service technician.

The display shows the code of the fault that caused the

lock-out condition.

A unit that is locked out can be unlocked using any one of the following methods:

- Remove mains power from the unit for at least 3 seconds, then restore power.
- Issue an 'unlock' command via Modbus RTU serial communications.
- Reset the controller via Modbus RTU serial communications.

If a unit has locked out and has been unlocked twice, then locks out for a third time without having managed at least once to stop once under normal control, then the controller will no longer allow the unit to be unlocked by the method described.
The controller display will show the message "Lockout".

If this has happened the following steps must be taken to unlock the unit:

i) Remove power, then restore power.

ii) Press push button SW3 on the controller.

iii) Start the unit heating as normal.

iv) Stop the unit by means of a normal off-command (e.g. via the thermostat, remote on/off signal or Modbus control).

Ensure the unit does not stop on yet another trip by identifying and remedying the cause of the fault.

Refer to Temperzone (page 6) if assistance is required.

INSTALLER TO COMPLETE

Commissioning Check List

Site Name/address: .....

Installing Company ..... Date: .....

Serviceperson: ..... Tel: .....

Model: ..... Serial No: ..... Unit Site Ref: .....

Unit is installed level?	Y / N	All electrical terminals are tight?	Y / N
Does unit have adequate safe access?	Y / N	Certificate Of Compliance issued?	Y / N
Compressor shipping blocks removed?	Y / N	Refrigerant leak checked?	Y / N
Water drains tested okay?	Y / N	Has client had controls demonstrated?	Y / N
Water connections checked?	Y / N	Backflow preventer & pressure reducer in water loop?	Y / N
Water pressure checked?	Y / N	External expansion tank installed?	Y / N
Controller type:	BMS / Schneider M172 / Other? (name):		
External system pipe size and length			

Mark UC8 dip switch positions with an 'X'

	SW1							
	1	2	3	4	5	6	7	8
On								
Off								

	SW2							
	9 (1)	10 (2)	11 (3)	12 (4)	13 (5)	14 (6)	15 (7)	16 (8)
On								
Off								

Record the following UC8 monitored conditions, at least 10 minutes after compressor starts, using push-button SW3 (or WiFi Service Utility). Push repeatedly to scroll through list:

Heat Cycle:

Low Pressure:	SLP	kPa
Evaporating temperature:	Et	°C
Suction Line temperature:	SLt	°C
Suction Superheat:	SSH	K
Discharge Line Pressure:	dLP	kPa
Condensing temperature:	Ct	°C
Discharge Line temperature:	dLt	°C
Discharge Superheat:	dSH	K
De-ice Sensor temperature:	ICEt	°C
Required Capacity:	CAP	%
Expansion Valve 1:	EE1	%
Expansion Valve 2:	EE2	%

Address: (Modbus slave)	Add	
Entering Water temperature*:	in	°C
Leaving Water temperature: (35 – 55 max.) (default 45)	out	°C
Pump voltage (0–10)	Pu	V
Water Flow Rate	Flr	l/min.
Compressor amps:		A
Total amps:		A
Input voltage:		A

* Note: Water temp. difference should be > 5°C at rating conditions

MWR only:-:

Cool Cycle:

Low Pressure:	SLP	kPa
Evaporating temperature:	Et	°C
Suction Line temperature:	SLt	°C
Suction Superheat:	SSH	K
Discharge Line Pressure:	dLP	kPa
Condensing temperature:	Ct	°C
Discharge Line temperature:	dLt	°C
Discharge Superheat:	dSH	K
De-ice Sensor temperature:	ICEt	°C
Required Capacity:	CAP	%
Expansion Valve 1:	EE1	%
Expansion Valve 2:	EE2	%

Address: (Modbus slave)	Add	
Entering Water temperature*:	in	°C
Leaving Water temperature: (3 – 25 max.) (default 7)	out	°C
Pump voltage (0–10)	Pu	V
Water Flow Rate	Flr	l/min.
Compressor amps:		A
Total amps:		A
Input voltage:		A

* Note: Water temp. difference should be > 5°C at rating conditions

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