WLM2 Networking

Introduction
The WLM 2 system is capable of being used to create a control network for use with multiple zone UFH installations. A single system using a WLM2 master and add on module can handle 14 temperature-controlled areas. By using a network, it is possible to control considerably more areas, up to a maximum of 1890, making this system suitable for large applications such as schools and hospitals.

Planning
When considering the use of a networked control system, attention should be given to how the heating system is to be configured, both in terms of piping and also pump circulation. In most cases the WLM 2 network can be configured to suit the system, but if the whole concept is properly planned in the early stages, then installation and set up will be much simpler for the on site contractors. The network can also change depending on whether the system is heating only or heating & cooling, and the following notes are prepared to assist in selecting the correct option.

Operation
The network is created by interconnecting the masters via a communication bus using the WLM2 NET components provided. In a network system, one master becomes the controlling, or "network master", and this is always at the start of the communication bus. Subsequent masters are added to the bus in the form of a daisy chain. Each master has two RJ14 sockets (see fig 10) for in and out plug and socket connections. The WLM 2 NET provides for the cable length between adjacent masters to be extended using CAT 5 cable. Total length of the bus should not exceed 600m using unscreened CAT 5.

Each master has two encoding dials (see fig 11) which determine how the masters shall function in relation to each other and on the system as a whole. Each master also has a series of dip switches which, on the network master, must be set as shown in the drawings. The dip switches on all slave masters are left in the OFF position, unless a special configuration has been authorised by our technical dept.

The network master will be employed to send signals to start the heating (and cooling) source, whether this is a boiler, chiller, or heat pump. This master will always have its encoders set at 0:0. This master can also control its own heating zones (up to 14 if an add-on module is used), and then further masters can be employed to cover the switching requirements of additional zones.

The network master will normally be a WLM2 1FS if the system includes an electronic 3- or 4-port mixing valve. If the system is being served by heat pumps, where mixing is not required, it is possible to use a WLM2 1BA master as the network master. Secondary masters (slaves) will almost always be of the type WLM2 1BA, unless there is a demand for localised electronic mixing of the supply water, (in addition to the mixing at the onset of the system) in which case an additional WLM2 1FS unit would be required.

The network can be used with any combination of FS and BA masters, the deciding factor is only whether there is to be any electronic mixing on the system. Where a second area of electronic mixing is required within the total network, for example within a north/south zone installation, a second FS master should be included to achieve this separate mixing. On systems using chilled water cooling, it is →→→ *page 2*

WLM 2 Networking / Operation (continued)
usually beneficial to use a WLM2 1FS as the network master because, in the event of a dewpoint condition being detected, the control action is to close the mixing valve and to maintain circulation of the system water that will then be naturally reheated by the ambient temperature.

If the WLM2 1BA is used as a network master, the dewpoint control must be done locally on each master in the system, using a WLH humidity sensor and ETF1899A return water sensor. The control action will be to close down the thermal actuators on the manifolds that are connected to that master, and not the system as a whole.

Network Cable Specification

Interconnection cable	CAT5 STP (stranded twisted pair)
Max distance between masters	300 metres
Max total network distance	600 metres
Power supply	24vDC, carried on Yellow & Black cores
Data Comms	+ (green), - (red)
Connection plug	RJ14 6P4C

The following schematic drawings and notes (over pages 4 to 14) show the configuration of WLM 2 dip switches, encoders, and switched outputs for specif applications.

Contents

1. Single Pump Systems – Heating only by Boiler

For a system using a boiler and an electronic mixing valve, with a single UFH circulating pump, creation of a network is simple. A WLM2-1FS master is set up as a network control master and each manifold can be controlled by a locally networked WLM2-1BA master, if necessary a WLM2-1AO add-on module can be added to increase the number of areas being controlled.

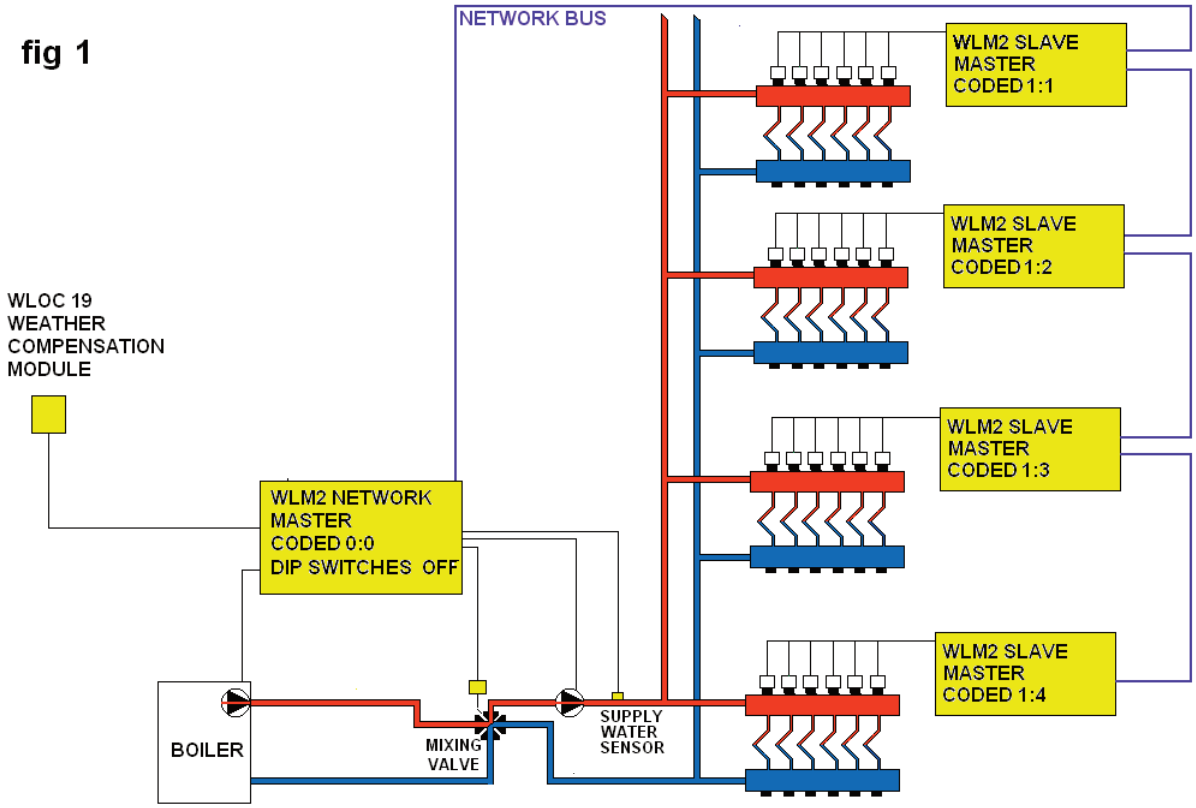
Because the system uses only a single circulation pump, the encoding of the masters is straight forward: the network master (WLM2 1FS) is coded 0:0, and the slave masters (WLM2 1BA) are encoded 1:1 through to 1:9, and then from 2:1 through to 2:9. This coding allows masters to be encoded up to 15:9, thus the possibility of utilising up to 135 masters.

For a heating only system, the UFH circulating pump would be controlled by the X relay output (C1 & C2) on the network master, and this pump will run whenever there is a demand from any zone on any master on the network.

The normally volt-free X relay must be connected as shown in fig 13. The boiler output relay (B1 & B2, volt free) will also be ON whenever there is a demand for heat and the mixing valve has opened above the 20% position.

In the illustration below, where a single system pump is used, dip switch 8 on the network master should be moved to the ON position. All other dip switches remain in the OFF position.

fig 1



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

2. Single Pump Systems – Heating and Cooling by Boiler & Chiller

For a heating and cooling system using a boiler, a chiller and an electronic mixing valve, with a single UFH circulating pump, creation of a network is simple. A WLM2-1FS master is set up as a network control master and each manifold can be controlled by a locally networked WLM2-1BA master, if necessary a WLM2-1AO add-on module can be added to increase the number of areas being controlled. The boiler and chiller control is made by using the X-relay output to control a special module called the KMOD, this controls the opening and closing of number 2-port spring return valves which in turn ensure the correct delivery of either hot or chilled water to the manifolds.

Because the system uses only a single circulation pump, the encoding of the masters is straight forward: the network master (WLM2 1FS) is coded 0:0, and the slave masters (WLM2 1BA) are encoded 1:1 through to 1:9, and then from 2:1 through to 2:9. This coding allows masters to be encoded up to 15:9, thus the possibility of utilising up to 135 masters.

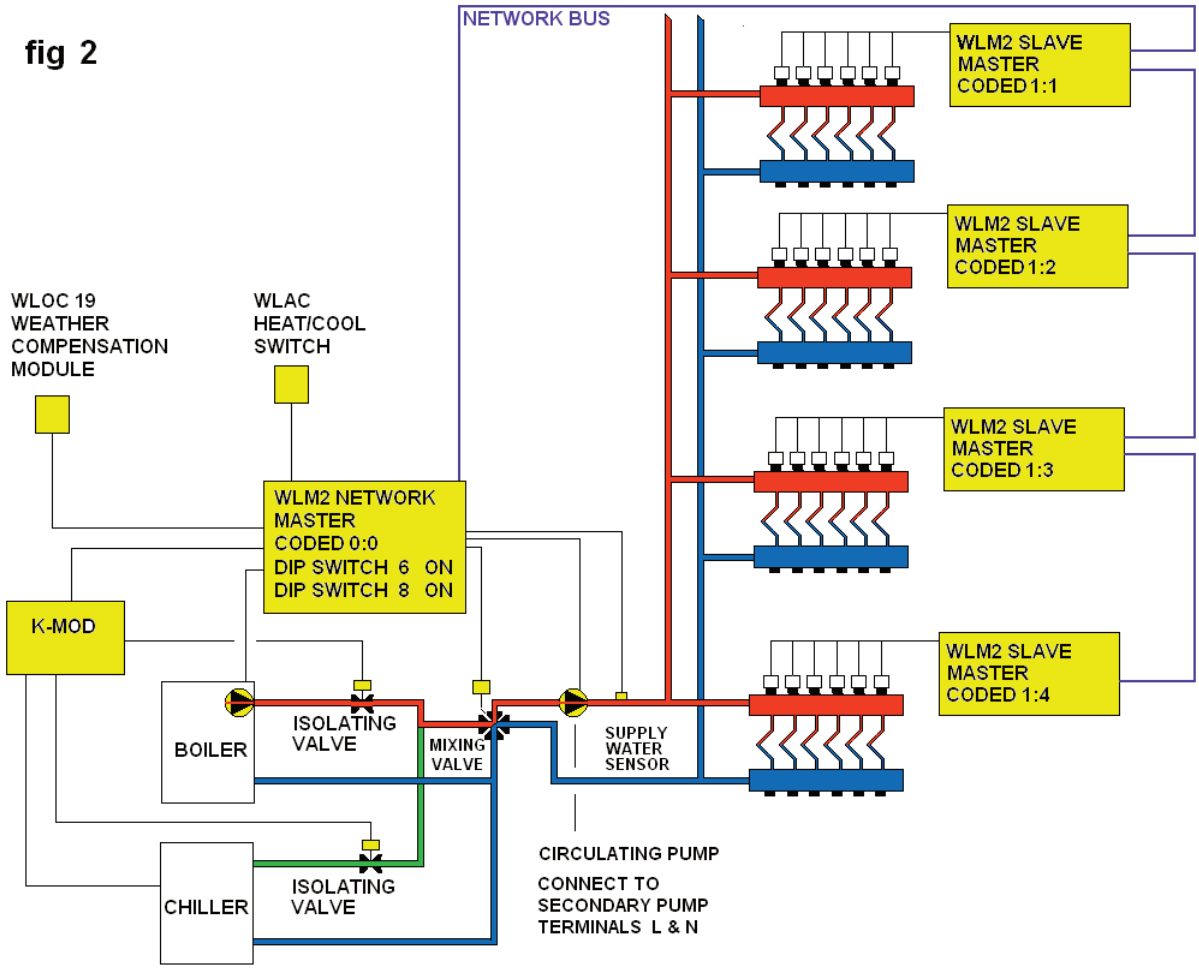
The output of the X relay (C1 & C2, volt-free) is used to perform an isolating function (closing heating valves and opening cooling valves), and to sequentially start the chiller system.

These actions can be achieved using the OJ KMOD controller. In this case, the dip switch 6 on the network master must be set to ON and the chiller will be enabled whenever a cooling demand occurs.

The single UFH circulating pump should now be connected to the secondary pump output (L & N) of the network master, and dipswitch 8 on the network master set to ON. This ensures that the pump will run whenever a demand for heating or cooling exists anywhere on the network.

For dewpoint control, see para 10 (page 13).

fig 2



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

3. Single Pump Systems – Heating only by Heat Pump

For heat pump driven systems (heating only) it is possible to use a WLM2 1BA as the network master, as an alternative to the WLM2 1FS, because usually, no mixing valve is required.

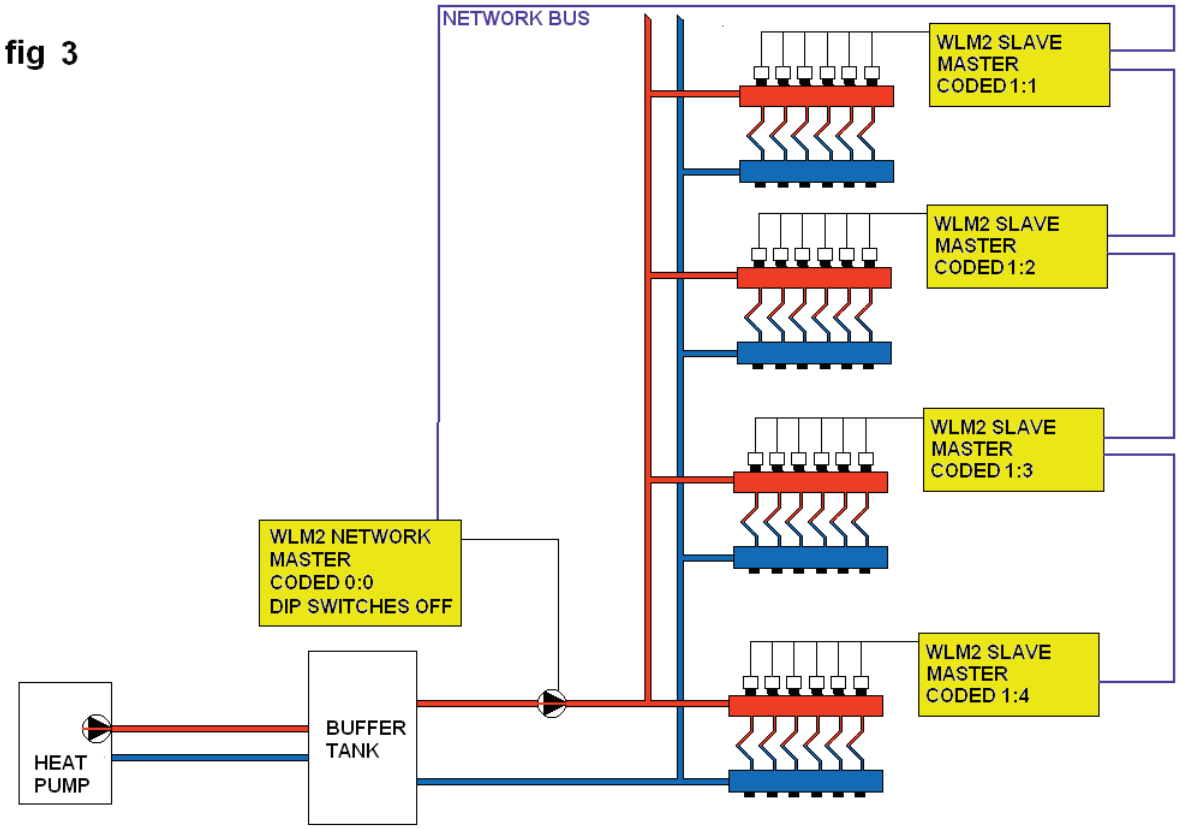
Because the system uses only a single circulation pump, the encoding of the masters is straight forward: the network master (WLM2 1FS) is coded 0:0, and the slave masters (WLM2 1BA) are encoded 1:1 through to 1:9, and then from 2:1 through to 2:9. This coding allows masters to be encoded up to 15:9, thus the possibility of utilising up to 135 masters.

The boiler relay output (B1 & B2) on the network master can signal to the heat pump, although if a buffer tank is used, the heat pump is usually started by the temperature demands of that buffer.

The X relay (C1 & C2), connected as per figure 13, can be used to start the single ufh circulating pump which will be taking water from the buffer. All dip switches must be set to OFF on the network master.

In the illustration below, where a single system pump is used, dip switch 8 on the network master should be moved to the ON position. All other dip switches remain in the OFF position.

fig 3



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

4. Single Pump Systems – Heating & Cooling by Reversible Heat Pump

For a heating and cooling system using a reversible heat pump with a single UFH circulating pump, creation of a network is simple. A WLM2-1FS master is set up as a network control master and each manifold can be controlled by a locally networked WLM2-1BA master, if necessary a WLM2-1AO add-on module can be added to increase the number of areas being controlled. The reversible heat pump control is made by using the X-relay output to control the GO signal for reversing the heat pump into cooling mode.

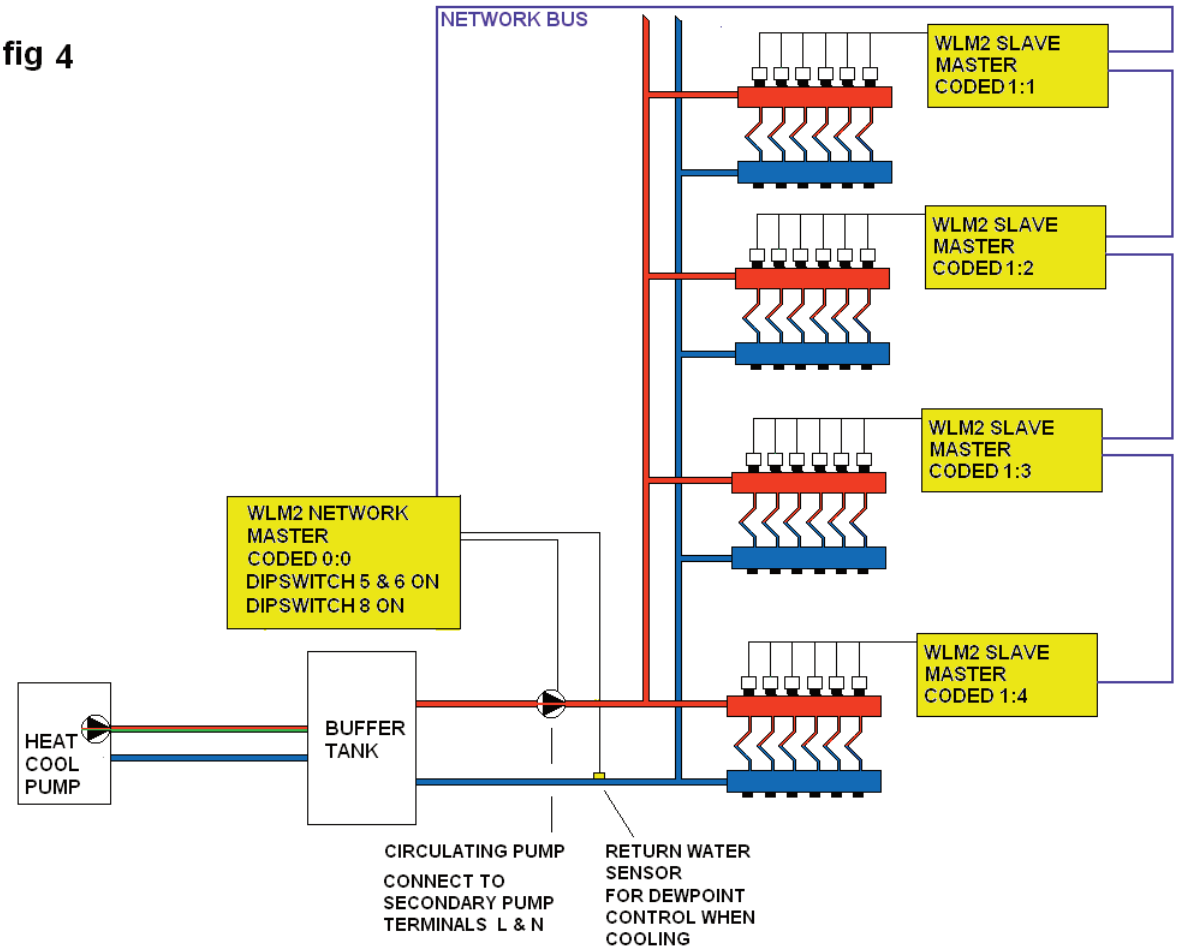
Because the system uses only a single circulation pump, the encoding of the masters is straight forward: the network master (WLM2 1FS) is coded 0:0, and the slave masters (WLM2 1BA) are encoded 1:1 through to 1:9, and then from 2:1 through to 2:9. This coding allows masters to be encoded up to 15:9, thus the possibility of utilising up to 135 masters.

In this case, dip switches 5 & 6 should be set to ON, and the go signal for heat pump cooling will be made whenever the WLAC heating/cooling switching module is set to cooling. This will then be a permanent signal and not a demand signal, but this is preferable when the heat pump is pumping into a buffer store.

As the X relay has been utilised for this purpose it is necessary to connect the single UFH circulating pump to the secondary pump output (L & N) of the network master, and to set dipswitch 8 to ON.

For dewpoint control, see para 10 (page 13).

fig 4



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

5. Multiple Pump Systems – Heating only by Boiler

For a heating only system using a boiler and electronic mixing valve, with separate circulating pumps for each of a group of manifolds, the network should be configured as follows.

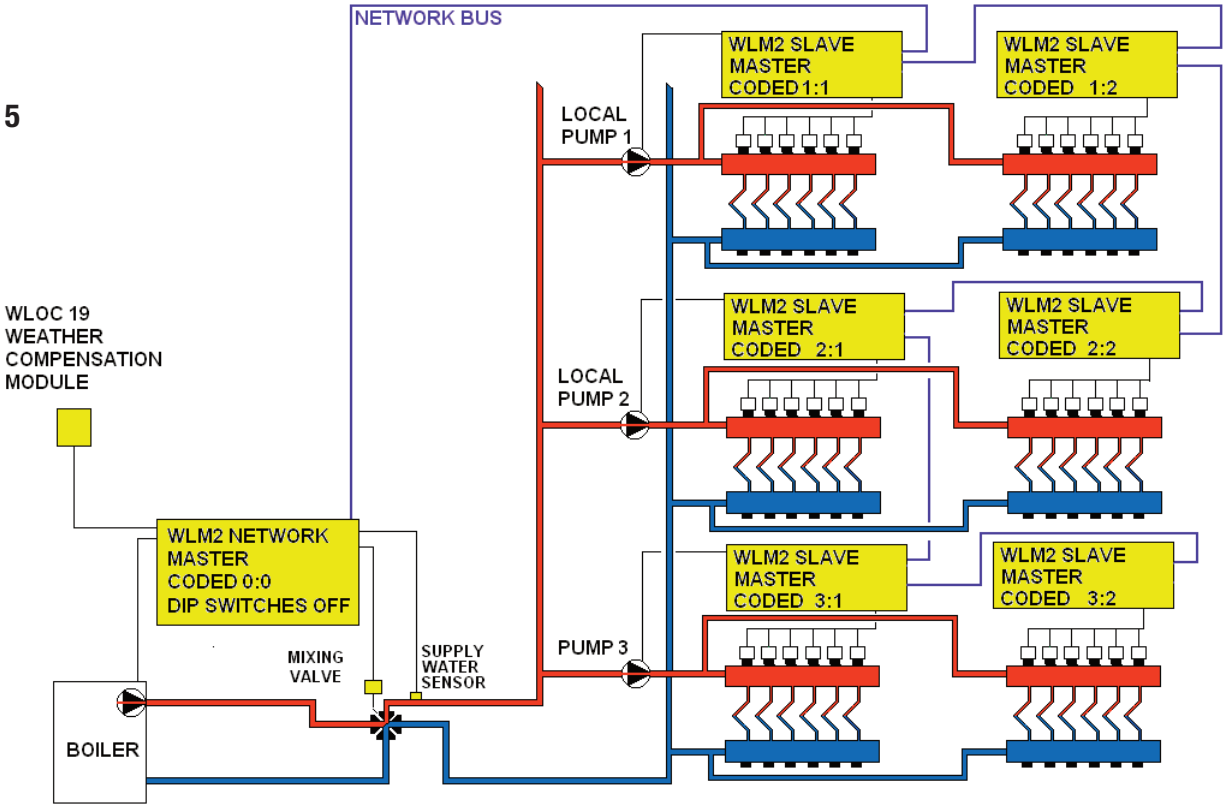
The network master (WLM2 1FS) is coded 0:0. The masters (WLM2 1BA) serving the first circulating pump should be coded from 1:1 to 1:9 (maximum of 9). Masters serving a second circulating pump should be encoded 2:1 to 2:9, and for a third pump, 3:1 to 3:9, etc. Up to 15 separate pumps can be connected in this way.

Any heat demand from a zone served by any master having the left hand encoder set 1 will cause all the secondary pump outputs (L & N) to be enabled on all masters with encoders set 1:x. This allows the pump to be connected to the master which is most conveniently situated. Similarly, all masters with encoders set 2:x will simultaneously bring on their pump outputs when a demand occurs from anywhere in that group.

The heat demand requirement will be transmitted through the network to the network master which will enable the boiler whenever there is a demand for heat and the mixing valve has opened above the 20% position. The X relay (C1 & C2) can be used to start a primary pump, if required, and should be connected as per figure 13.

All dip switches on the network master should be set to off for normal operation.

fig 5



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

6. Multiple Pump Systems – Heating & Cooling by Boiler & Chiller

For a system heating and cooling system using a boiler, a chiller and an electronic mixing valve, with separate UFH circulating pumps for each of a group of manifolds, creation of a network is simple. A WLM2-1FS master is set up as a network control master and each manifold can be controlled by a locally networked WLM2-1BA master, if necessary a WLM2-1AO add-on module can be added to increase the number of areas being controlled. The boiler and chiller control is made by using the X-relay output to control a special module called the KMOD, this controls the opening and closing of number 2-port spring return valves which in turn ensure the correct delivery of either hot or chilled water to the manifolds.

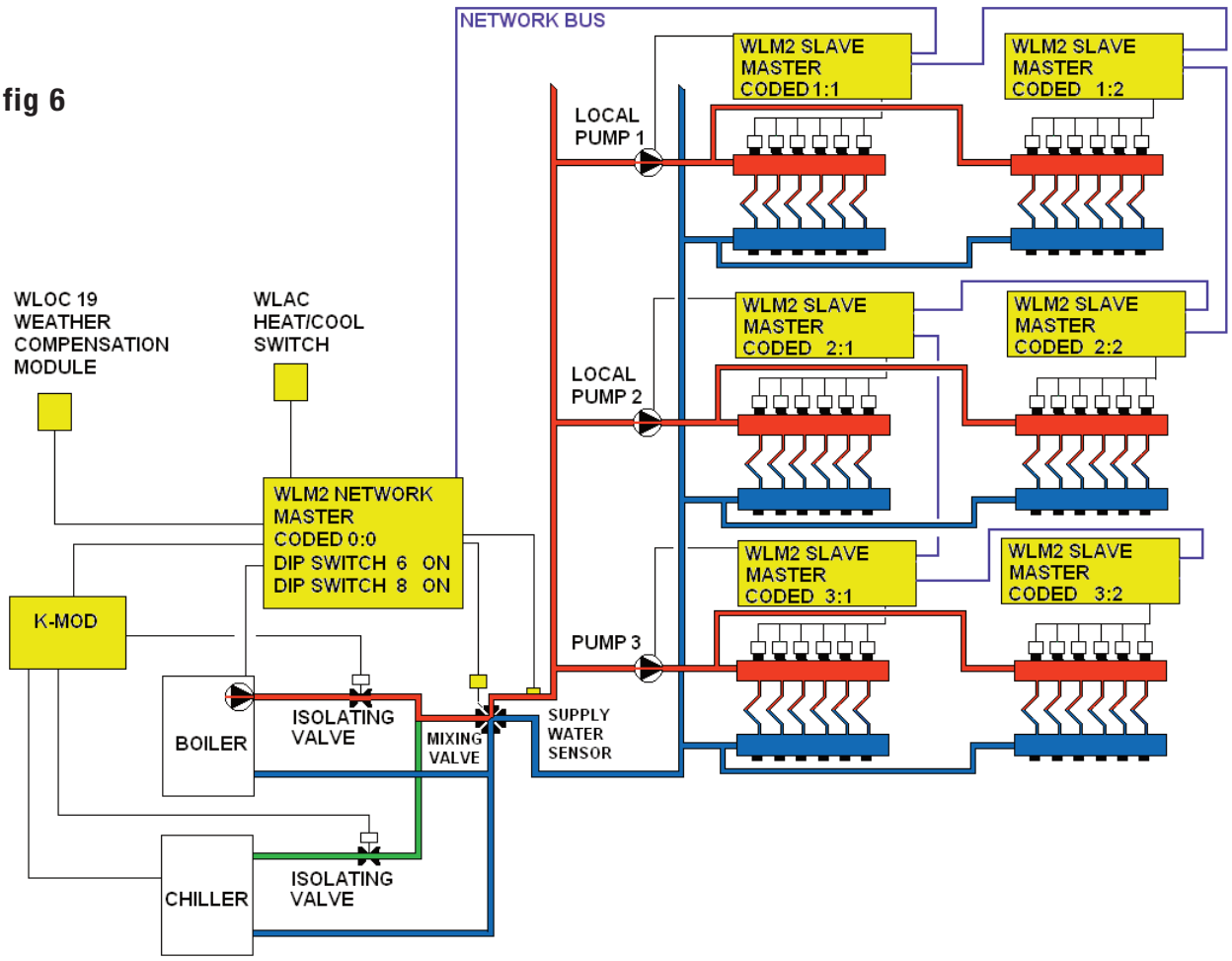
The network master (WLM2 1FS) is coded 0:0. The masters (WLM2 1BA) serving the first circulating pump should be coded from 1:1 to 1:9 (maximum of 9). Masters serving a second circulating pump should be encoded 2:1 to 2:9, and for a third pump, 3:1 to 3:9, etc. Up to 15 separate pumps can be connected in this way.

In this case, the dip switch 6 on the network master must be set to ON and the chiller will be enabled whenever a cooling demand occurs.

If a primary pump output is also required, then use the secondary pump output of the network master for this purpose, and set dipswitch 8 to ON. This pump will now run whenever a cooling demand exists on the network.

For dewpoint control, see para 10 (page 13).

fig 6



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

7. Multiple Pump Systems – Heating only by Heat Pump

For heat pump-driven systems (heating only), with separate circulating pumps for each of a group of manifolds, the network should be configured as follows.

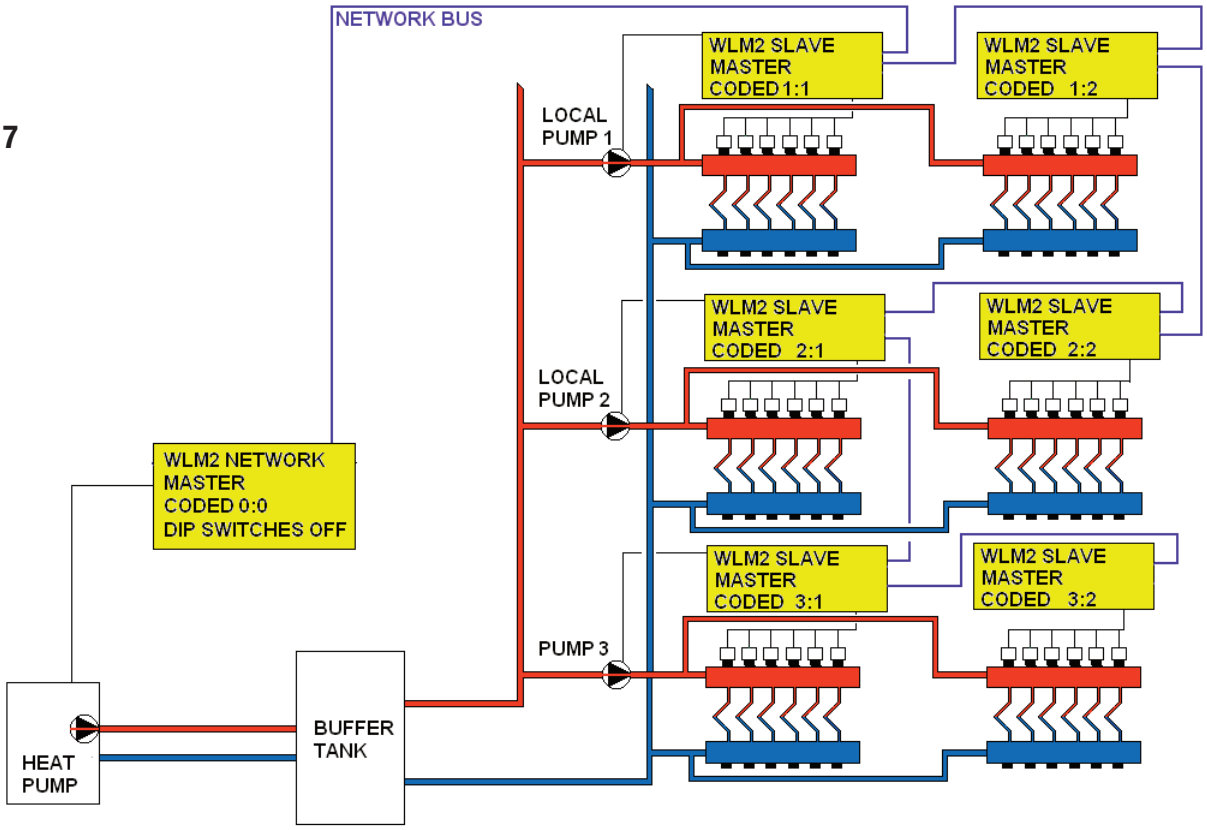
The network master (WLM2 1BA or WLM2 1FS) is coded 0:0. The slave masters (WLM2 1BA) serving the first circulating pump should be coded from 1:1 to 1:9 (maximum of 9). Masters serving a second circulating pump should be encoded 2:1 to 2:9, and for a third pump, 3:1 to 3:9, etc. Up to 15 separate pumps can be connected in this way.

Any heat demand from a zone served by any master having the left hand encoder set 1 will cause all the secondary pump outputs (L & N) to be enabled on all masters with encoders set 1:x. This allows the pump to be connected to the master which is most conveniently situated. Similarly, all masters with encoders set 2:x will simultaneously bring on their pump outputs when a demand occurs from anywhere in that group.

The boiler output (B1 & B2) on the network master can be used to signal the heat pump, although if a buffer tank is used, the heat pump is usually started by the temperature demands of that buffer. The X relay (C1 & C2) can be used to start a shunt or "run around" pump, if required, and should be connected as per fig 13.

All dip switches on the network master should be set to off for normal operation.

fig 7



NB: The schematic drawing is designed to show the configuration of a WLM2 network system. It is not a recommendation as to how heating & cooling systems should be assembled. In all cases, local regulations and industry standards must be observed.

8. Multiple Pump Systems – Heating & Cooling by Reversible Heat Pump

For systems where a reversible heat pump is used to provide both the heating and cooling, and where separate pumps for each of a group of manifolds, the network should be configured as follows:

The network master (WLM2 1FS) is coded 0:0. The masters (WLM2 1BA) serving the first circulating pump should be coded from 1:1 to 1:9 (maximum of 9). Masters serving a second circulating pump should be encoded 2:1 to 2:9, and for a third pump, 3:1 to 3:9, etc. Up to 15 separate pumps can be connected in this way.

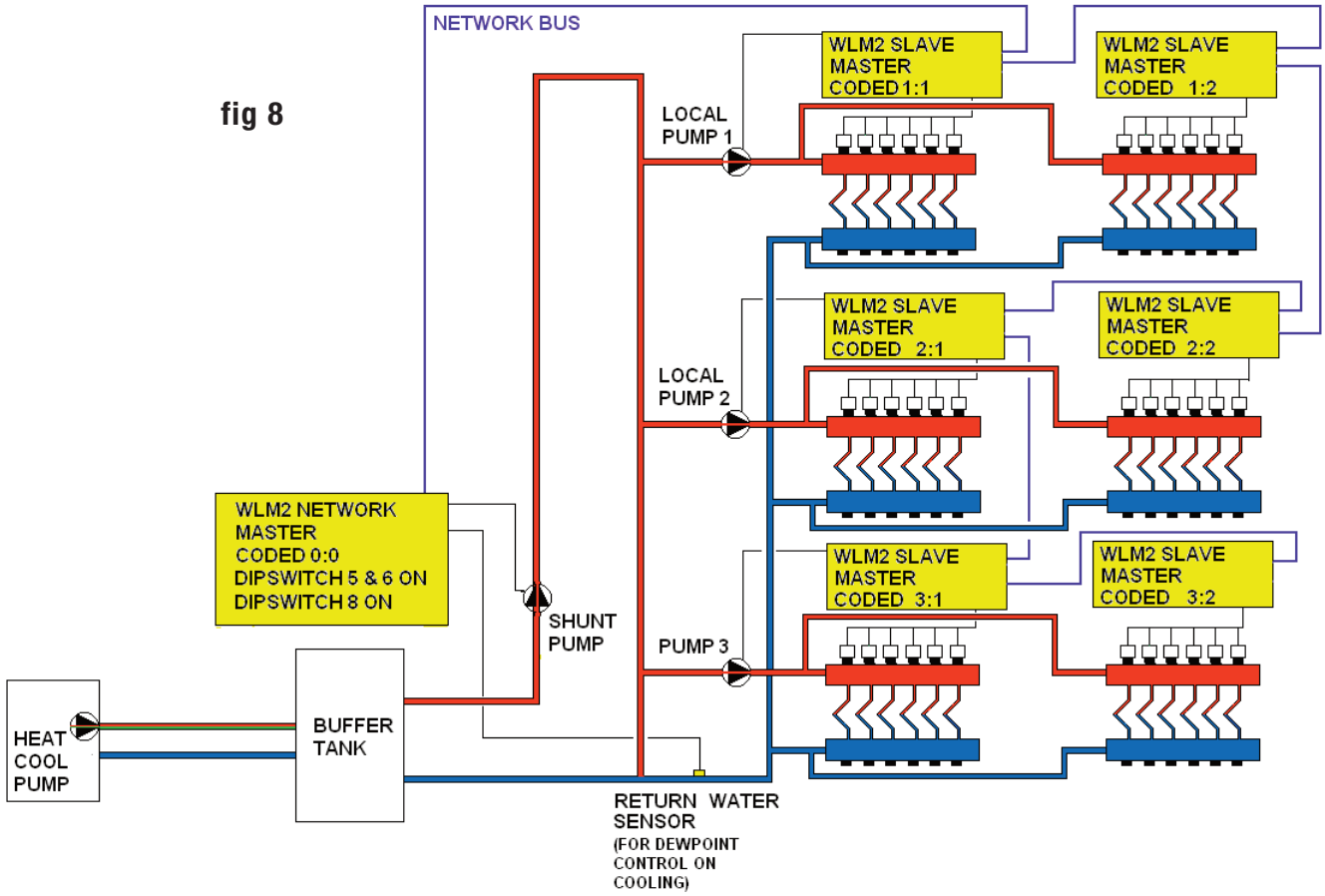
If a go signal for reversing the heat pump to cooling is required, then the X relay (C1 & C2) on the network master can be used for this purpose.

In this case, dip switches 5 & 6 should be set to ON, and the go signal for heat pump cooling will be made whenever the WLAC heating/cooling switching module is set to cooling. This will then be a permanent signal and not a demand signal, but this is preferable when the heat pump is pumping into a buffer store.

If a shunt or primary pump is required to be started, then this can be connected to the secondary pump relay on the network master, and dip switch 8 set to ON. This pump will now run whenever there is a demand for heating or cooling from anywhere on the system.

For dewpoint control see para 10 (page 13).

fig 8



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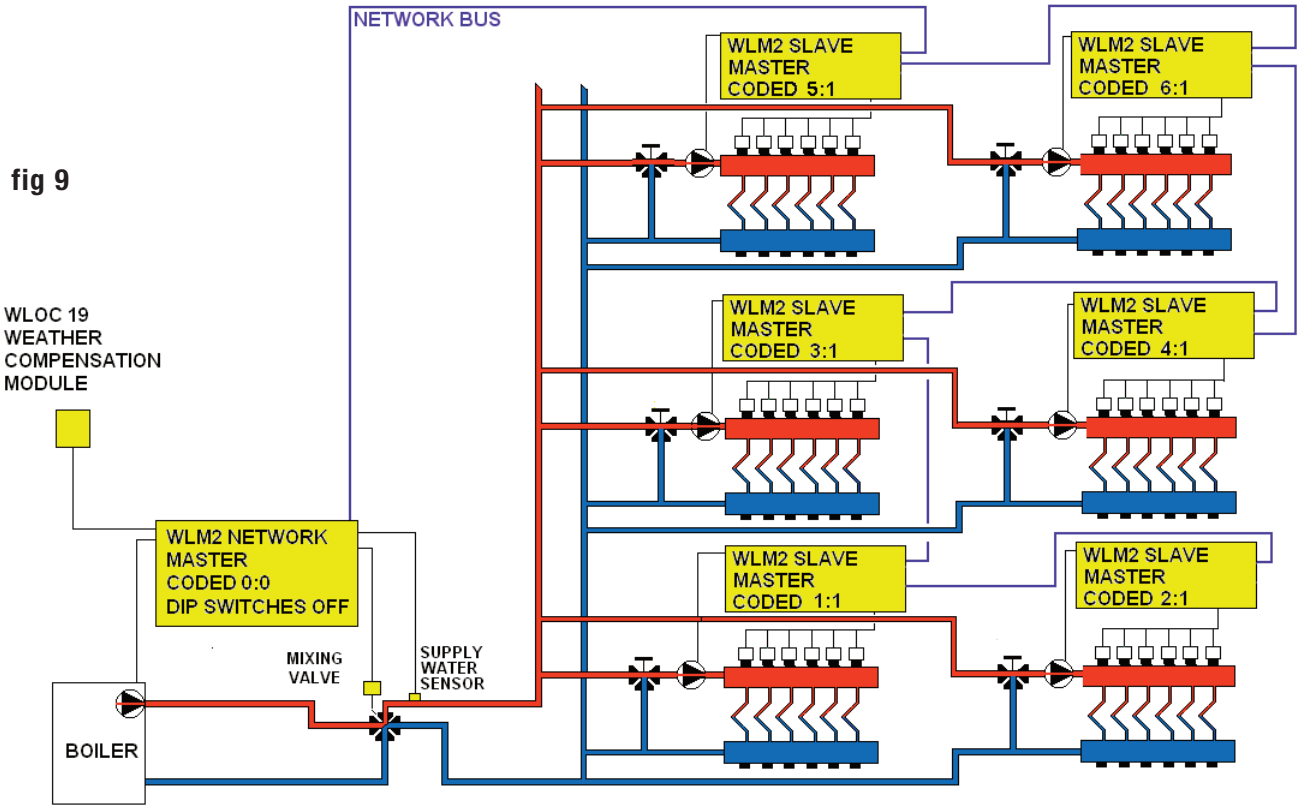
9. Systems with Pumped Manifolds

Where heating or heating & cooling underfloor heating installations use manifolds with integral pumps and manual water temperature control, the preferred network master would be the WLM2-1BA, due to the fact that no mixing valve control is required. It is very important in these types of installation that each slave master must have a different setting on the left encoder as detailed below.

On these systems the network master is still set 0:0 on the encoder, the slave units need to be set as 1:1, 2:1, 3:1 and so on. Due to this configuration only a maximum of 16 masters in total can be used on these installation types. Each pump must be connected to the appropriate master using the secondary pump (L & N) terminals.

The setting of the primary plant control and internal dipswitch settings should be made as per sections 5 and 7 for heating only installation and 6 and 8 for heating & cooling installations.

fig 9



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10. Dewpoint Control with WLM2-Networks

Systems using WLM2 1FS controllers as "network masters" can use any number of WLH room humidity sensors attached to the sensor bus of any of the slave masters as well as the network master. Ideally, they should be placed where condensation, due to a dewpoint condition is likely to exist. A minimum of one is required.

The dewpoint protection works on the total system and the control action will be for the network master to close the mixing valve and reduce the cooling output to allow the floor to reheat via ambient temperature in the room(s). In the case of multiple humidity sensors, the worst case scenario is taken for the dewpoint calculation.

Where a WLM2 1BA is used as the network master, the humidity control is different. In this case, each master on the system must control its own outputs based on a humidity reading taken from a sensor connected to its own sensor bus. Therefore humidity sensors should be placed in any area prone to possible condensation due to high humidity in the space. This may not require every master on the network to have a humidity sensor, but masters without sensors, will not limit cooling when high humidity exists.

Wherever a humidity sensor is employed, a return water sensor (ETF1899A) should also be connected to terminals 49 & 50 of that master. The control action from that master will be to reduce the cooling output by closing its thermal actuators when high humidity is detected, so that the floor served by those actuators is allowed to reheat naturally to reduce the humidity level.

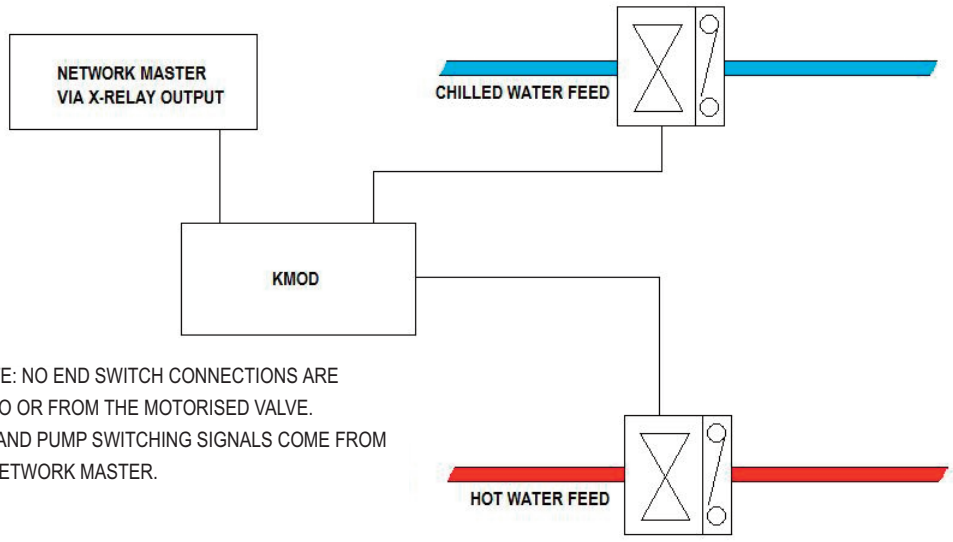
NB: On some heat pump systems, dewpoint control is incorporated within the control circuit of the heat pump. In this case, no humidity sensors are required on the WLM system, which will not be responsible for maintaining temperatures at which the formation of condensation is possible.

11. KMOD Valve Control System

The OJ Electronics KMOD valve control system has been specifically designed for underfloor heating & cooling installations to facilitate the easy and reliable control of both heated and chilled water by means of opening and closing 2-port spring return valves in sequence to ensure the heated and chilled water are never supplied at the same time.

The KMOD is connected to the X-relay output from the network master and by setting the appropriate dip switches the X-relay will energise and de-energise the KMOD, the internal firmware of the KMOD unit will then open and close the correct valves in a timed sequence.

KMOD- SHOWN CONTROLLING 2 x 2 PORT SPRING RETURN MOTORISED VALVES



PLEASE NOTE: NO END SWITCH CONNECTIONS ARE REQUIRED TO OR FROM THE MOTORISED VALVE.
ALL BOILER AND PUMP SWITCHING SIGNALS COME FROM THE WLM2 NETWORK MASTER.

12. Reversible Heat Pump Operation

When reversible heat pumps are used, it will often be found that the heat pump control system will determine when the system is switched from heating to cooling and vice versa. In this case it is also necessary for the WLM2 control system to be switched to heating or cooling simultaneously.

To achieve this, a volt-free output from the heat pump should be taken to the WLAC switching module remote input terminals. The action should be to close the contact for cooling. The WLAC should be set in the heating mode, and now, when the heat pump decides that cooling is required, this signal will ensure that the WLM2 room control network is also switched to cooling.

13. Using the X Relay for Pump Duty

On all WLM 2 masters, the X relay (C1 & C2) is a volt-free output. This relay can be used for a cooling enable output, or alternatively for a primary pump output. These alternatives are selected by the positions of the dip switches under the front cover, as per the chart below (fig 12). To change the X relay to create a 230v powered output, (max duty 4 A resistive load) make connections as per fig 13.

14. Checking the Network System

It is very important that the integrity of the network bus is maintained, and therefore correct continuity between the extension cables is imperative. On WLM2 xFS masters, it is possible to see the slave masters via the display screen.

Use the down arrow to scroll to the service menu (spanner). Press ✓ (tick), and again scroll down to the network indicator diagram, as illustrated below, press ✓ again and the status of the visible masters connected to the network can be seen.

On WLM2 xBA masters, where there is no display, and error connection in the network will be indicated by the power LED on the network master showing a red/green flash.

ILLUSTRATION OF NETWORKING ICON
SHOWN ON WLM2 MASTER MENU

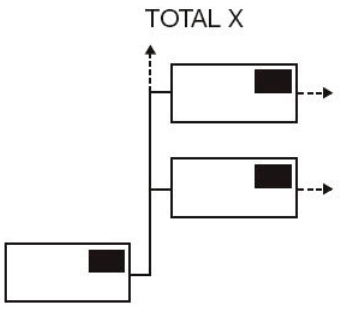


fig 10

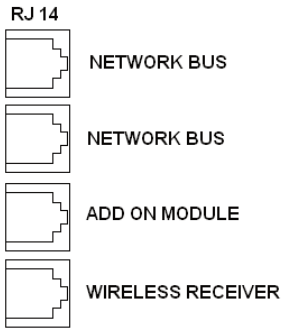
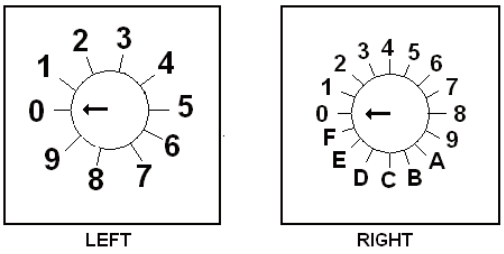


fig 11



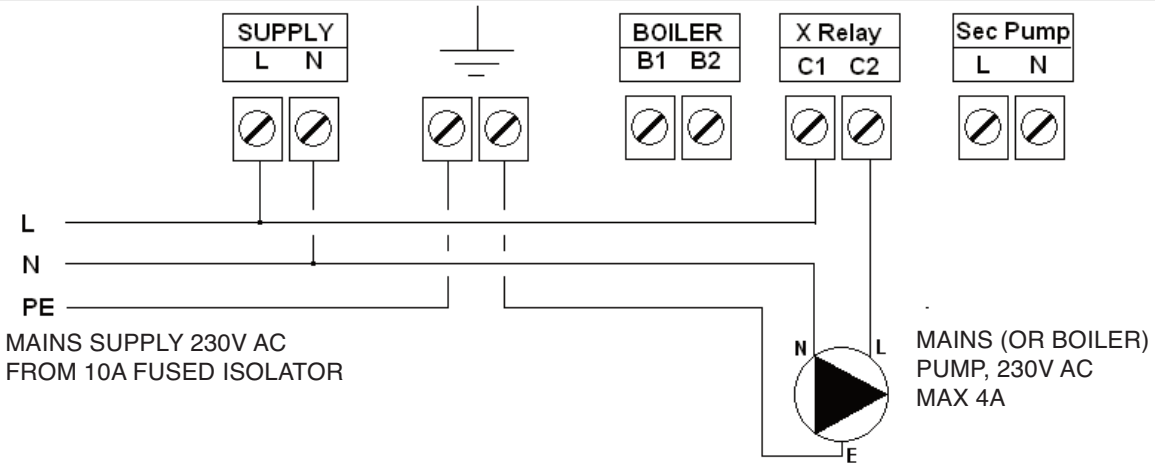
COMMUNICATION ENCODERS

fig 12

To control X output for:	Dip 5	Dip 6	Dip 7
Boiler pump	Off	Off	Off
High limit zone valve	On	Off	Off
Cooling device / module	Off	On	Off*
Cooling device / module (alternative)	On	On	Off*
Differential action	Off	Off	On

* Set to ON, to use dehumidification switching

fig 13



CONNECTIONS SHOWING X-RELAY USED AS A 230V PUMP OUTPUT

Founded in 1964, OJ Electronics develops and manufactures specialized solutions for under floor heating and HVAC controls and power. Today, OJ Electronics is one of the world's leading manufacturers of controls for electric underfloor heating.
Combining in-house R&D with state-of-the-art production and quality assurance technologies, OJ's products are acclaimed for functionality, design and ease of installation. The reliability of OJ products is considered as being the best on the market. Head quartered in Denmark, OJ Electronics products are available through distributors worldwide.

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