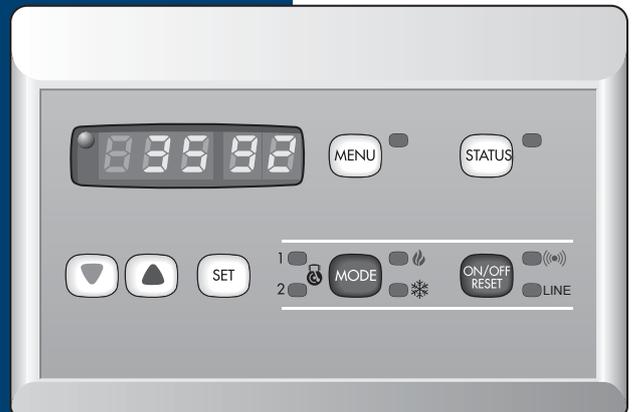


**INSTALLATION-OPERATION
&
MAINTENANCE MANUAL**



PROVIDING **GLOBAL SYSTEM** SOLUTIONS

HYDRON

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GENERAL DESCRIPTION

This equipment is an electronic device that controls packaged water cooling systems via air and reversible air/water heat pumps.

Its main characteristic is that it performs the functions normally associated with external equipment, thus eliminating the need for additional electrical connections.

The main features include water temperature control for cooling and heating, automatic defrost control (heat pump units), low water temperature protection system in the water system, compressor activation idling, constant proportional control of the condenser fan speed and a diagnostic display.

A series of alpha-numerical display parameters allows the equipment to be configured according to its specific application.

The unit is controlled via the following devices:

1.- Keypad (RC)

The keypad provides control of the system at a distance of up to ten metres from the unit.

The keypad is connected to the control module (LM) located within the unit.

2.- Control Module (LM)

This controls the operation of the unit.

3.- Fan Control Plate

FSC plate for axial fan units: allows the fan voltage to be varied in respect of the condensing temperature.

The FC plate for centrifugal fan units: switches the fans ON/OFF.

* Connection to be made by user.

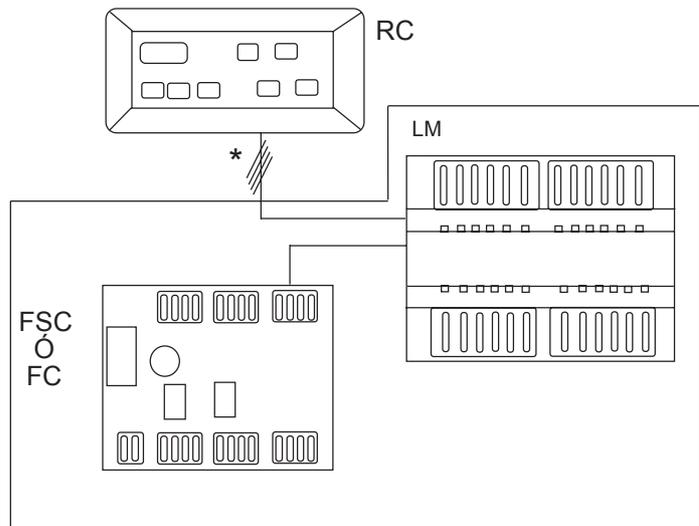
- Connect exactly as indicated in electrical diagram.

- The wire should not exceed 100 m.

- Use 4 pole coax cable with the screen mesh connected to the system chassis. Min. wire section 0.25mm².

(This is particularly necessary for long cables or where there is environmental electromagnetic interference).

- Wire the cables in a trunking or separate channel from the mains.



ELECTRICAL DIAGRAM OF UNIT COMPONENTS

Unit Commissioning

When all the instructions in the Operating, Service and Installation Manual have been carried out, the unit can be commissioned as follows:

Set the general cut-off switch to ON (1).

Press the  button on the keypad. The mains LED lights up to indicate that the line is energised.

Using the  button select cooling or heating mode (the  or  LED will light up accordingly).

The water pump will now start up and LED 1 flashes to indicate that it is pausing and the compressor start up is delayed.

After two minutes the compressor will start up providing the return water temperature is greater than the cooling set point selected on the keypad if the operating mode is set to cooling, or providing the return water temperature is lower than the heating set point if set to heating.

To switch off and disconnect the system proceed in reverse order.

KEYPAD

The keypad allows the following operations:

- Select system operating mode
- Display system status
- Change unit operating parameters

READING DISPLAY

This is the 3-digit display on the left. The return water temperature is shown in degrees (default). The following can also be displayed:

- Values of all parameters controlled by the equipment
- Alarm codes
- The status of all machine functions (operating hours, delay time etc.)

In addition, the equipment contains a rectangular LED which is lit during adverse temperatures, and another LED located at the top left which indicates when lit that the compressor operating hours displayed should be multiplied by 100).

INDEX DISPLAY

This is the 2-digit display on the right. It shows the parameter (or device) number, the value (or status) is indicated in the reading display.

MENU BUTTON, 1 LED

This provides access to the parameter list shown on the index and reading display, and allows them to be changed.

STATUS BUTTON, 1 LED

By pressing this button, the status of the various system components are shown in the index and reading displays.

ALARM LED

This indicates a continual alarm condition when continually lit.

MODE BUTTON, 2 LEDS

This offers a choice of 3 operating modes:

- Standby - both LEDS off
- Cooling - ❄️ LED lit
- Heating - 🔥 LED lit.

ON / OFF / RESET BUTTON - 1 mains LED

This powers up and switches off the equipment if there is an alarm with manual reset. By pressing this key the normal operating conditions are reset if there is no alarm condition and the equipment switches off. The mains LED remains lit to indicate that the line is still energised.

COMPRESSOR LED

When this LED is continually lit it indicates that the compressor is operating (in heating or cooling mode, depending on the key); however, when it flashes this indicates that pausing is taking place which is delaying the compressor start.

SET BUTTONS, ▼ and ▲

These allow the readings controlled by each of the parameters to be changed. When the user starts to program parameters (MENU key) both displays show a reading and remain lit. When the SET key is pressed for the first time the index display starts to flash. Via the ▼ and ▲ keys the display reading can be changed until the user find the required parameter. When the SET key is pressed again the reading display flashes. With the ▼ and ▲ keys the user can also control the required reading. When the SET key is pressed again the two displays return to their original position.

Likewise, by pressing the ▼ and ▲ keys the STATUS button will display the operating status of each component.

WHAT IS A PARAMETER?

A parameter is an internal program reference containing important values which can be set to allow the user or installer to ensure proper operation of the unit.

HOW TO PROGRAM PARAMETERS

- To program parameters, press the  key. The MENU LED will light up to acknowledge and the two index and reading values will appear.
- Press the  button once, the index display (parameter number) will start to flash. Use the ▼ or ▲ buttons to select the parameter to be changed.
- When the parameter to be changed has been selected, press the  button again. The respective parameter reading will start to flash. Use the ▼ or ▲ buttons to change the reading and press SET again to validate.
- To exit the programming mode press the  button again.
It is always advisable to disconnect the power supply.

USER ADJUSTABLE PARAMETERS

- Parameter No. 2

Cooling control set point

Set the return water temperature between min. 12°C and max. 16°C

This setting is used in the cooling mode.

- Parameter No. 3

Heating control set point

Set the return water temperature between min. 30°C and max. 43°C

This setting is used in the heat pump mode.

- Parameter No. 92

This is a control code.

- Parameter No. 93

This control code has no effect.

DEVICE STATUS TABLE

WHAT IS A DEVICE?

The system comprises various unit status.

The  key enables the user to obtain a status list for the unit's devices. This can be used to read the probe temperatures or the operating hours, for example. To access this list, press the  key and then press the  and  keys to display each device.

Code or device number	Function	Description
01	Compressor	01 Cooling mode 02 Heating mode 03 Defrost mode 04 Pausing 06 Not used
02	Compressor Counter	Displays: Number of hours since last reset If the top left LED is lit multiply the hours x 100
03	Fan	01 Operating 02 Shut down during defrosting 04 Pausing 06 Not used
04	Defrost	--- Not present 01 In operation 02 Delay between defrosting intervals 03 Defrost time calculation 04 Pause during active defrost 06 Not used
05	Fan output	Displays number from 0% - 100%
21	Not used	
22	Not used	
23	Not used	
24	Not used	
25	Not used	
40	Return water temperature	Displays probe reading to nearest tenth of a degree ERR Probe Error
41	Not used	
42	Supply water temperature	Displays probe reading to nearest tenth of a degree ERR Probe Error
43	Not used	
44	Buffer tank	Displays probe reading to nearest tenth of a degree ERR Probe Error
45	Not used	
46	Water pump	01 Operating 06 Idle

DEVICE STATUS TABLE

Code or device number	Function	Description
47	Pump hours	--- Pump unavailable Displays number of hours since last reset If the top left LED is lit multiply the hours x 100
48	Low temperature resistance status	---Resistances not present 01 Resistances operating 06 Resistances not operating
49	Not used	

ALARM CODES

If any of the system components show an alarm the controller will display it in the reading display via error codes which are listed below. The alarm is identified by a code starting with the letter E followed by a number. The alarm flashes on the reading display. If there was more than one alarm the alarm with the lowest digital value is displayed and by resetting the equipment using the ON/OFF RESET button normal operation can resume, providing the cause of the alarm / alarms has been cleared.

The operator can use this data to help the Service Engineer with fault-finding.

ALARM CODES

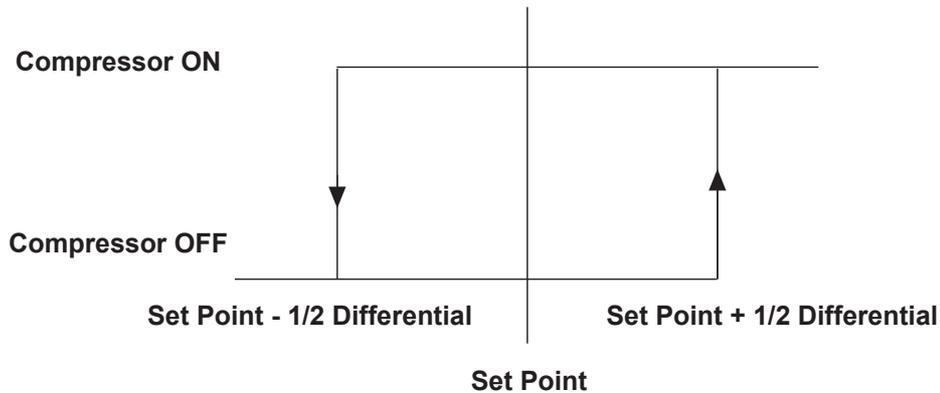
CODE	ALARM TYPE
E01	Overpressure alarm
E02	Low system pressure alarm
E03	Compressor thermal protection alarm
E04	Condenser thermal fan alarm
E05	Low water temperature alarm
E06	Outlet water probe alarm
E07	External exchanger probe alarm
E40	Outlet water probe alarm
E41	Flow detector alarm

E00 This signal is not an alarm. It indicates that the equipment has been stopped by the remote-controlled ON/OFF button.

THERMOSTAT FUNCTION

The water temperature is thermostatically controlled via a set point and a tolerance range. The operation of these parameters is shown in the following diagram.

COOLING MODE OPERATION

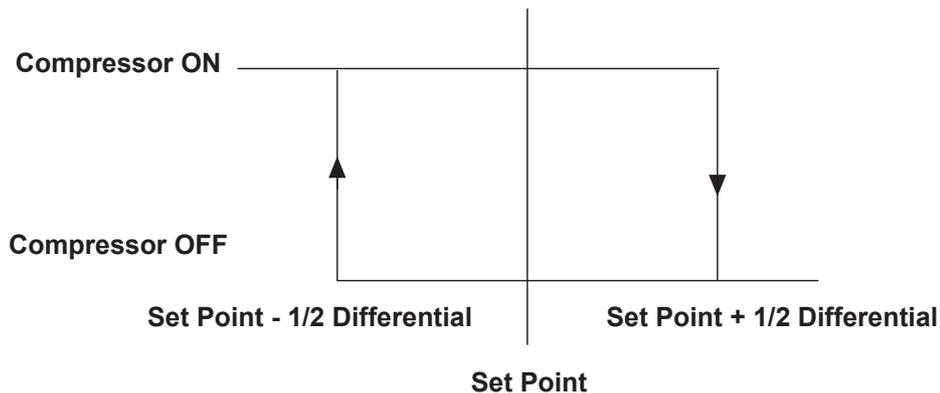


During the cooling mode the key readings are the following:

PARAMETER 02. Cooling Control Set Point

Operation is as shown in the diagram taking into account that the temperature above which the controller takes over is the return water temperature. When this temperature exceeds the set point + $\frac{1}{2}$ tolerance range the compressor starts to produce cool water. For example: if set point = 12°C and tolerance range = 3°C, the compressor will operate when the return water temperature exceeds 13.5°C and switch off when it returns at 10.5°C. The operator can adjust the cooling control set point, parameter 02, between 12 and 16°C. The cooling tolerance range is factory set to 3°C.

HEATING MODE OPERATION



During the heating mode the key readings are the following:

PARAMETER 03. Heating Control Set Point

Operation is as shown in the diagram taking into account that the temperature above which the controller takes over is also the return water temperature. When this temperature drops below the set point - $\frac{1}{2}$ tolerance range the compressor starts to produce warm water. When the return water temperature increases beyond the set point + $\frac{1}{2}$ tolerance range for the compressor it switches off. For example, if set point = 43°C and tolerance range = 3°C, the compressor will operate when the return water temperature drops below 41.5°C and switch off when it returns at 44.5°C. The operator can set the heating control set point, parameter 03, to between 30 and 43°C. The heating tolerance range is factory set to 3°C.

DEFROST SYSTEM DESCRIPTION (HYDRON B and HYDRON BC UNITS)

For the heat pump units, during the winter (heating) mode, the condenser converts the cooling system into an evaporator. Consequently, at low outside temperatures frost forms in inside it. The frost prevents the exchanger from operating efficiently. It is therefore necessary, when in heating mode to activate an automatic defrost function.

This mode operates as follows. When a probe located in the condenser detects low temperatures (-3°C) pausing takes place (30 minutes) during which the operating mode is reversed, de-energising the return valve without stopping the compressor. In this way the outside exchanger acting as an evaporator also acts as a condenser. The outside fan stops in order to prevent the condensation temperature from dropping too low and to reverse all the condensation heating by melting the frost. This mode ends when the outside exchanger probe detects the final defrost temperature (13°C) or exceeds a safety interval (5 minutes). At the end of the defrost mode the compressor stops and begins an anti-cycle pause period (2 minutes). When this is complete, the compressor starts again in heating mode, generating more warm water at a more efficiently due to the absence of frost.

During defrost mode the low pressure is at minimum level, consequently the manometer is disabled in this mode.

The manufacturer uses default control settings which apply to most installations. The set parameters determine the following:

Initial defrost temperature

The outside exchanger (condenser) temperature is set so that if the temperature drops below this set point the defrost mode is validated.

Final defrost temperature

The outside exchanger temperature condenser is set so that if the temperature rises above this point the defrost mode is invalidated.

Interval between defrost modes

This defines the time during which the initial defrost temperature must be maintained. When this time has elapsed the unit starts to defrost. If the initial defrost temperature drops before this time has elapsed, pausing is blocked, and only starts to count when the temperature returns below a set value. This pausing prevents the unit from carrying out continual defrost patterns.

Max. defrost time

This defines the max. defrost period if the temperature has not exceeded a set limit. This idling avoids excessive defrost modes.

CONDENSATION CONTROL SYSTEM DESCRIPTION

The purpose of the condensation control system is to avoid excessive low condensing temperatures in the cooling mode for operation at ambient conditions below 19°C and cooling requirement for internal charges. The control system achieves this via the probe located in the outside exchanger (condenser). It is important to distinguish between two control types used depending on the fan system.

AXIAL FANS (HYDRON F and HYDRON B units)

In this case, condensation control is proportional, varying the current entering the fan. The parameters which control this operation are as follows:

Min. temperature fan speed

Until the exchanger temperature reaches this limit the fan rotates at min. speed or is stopped. Over this temperature the current supply entering the fan starts to drop.

Max. temperature fan speed

When the exchanger temperature reaches this limit and for higher values, the fan rotates at max. speed.

CONDENSATION CONTROL SYSTEM DESCRIPTION

Fan low threshold output

This is the percentage of current which enters the fan control when the latter is rotating at min. speed.

Fan high threshold output

This is the percentage of current which enters the fan control when the latter is rotating at max. speed.

Cooling fan set point cut-off

If the temperature drops below this value even with the control, the fan will stop to prevent it from dropping excessively, starting when it drops below this value with a small tolerance range.

CENTRIFUGAL FANS (HYDRON FC and HYDRON BC units)

In this case, condensation control all or nothing, stopping and starting the fans. The parameters are as follows:

Min. temperature fan speed

If the fan is operating and the exchanger temperature is below this limit the fan will stop.

Max. temperature fan speed

If the fan has stopped and the exchanger temperature is above this limit the fan will start up.

REVERSE MODE EVAPORATION CONTROL (HYDRON B and HYDRON BC units).

For the heat pump units, during the heating mode, the unit performs a similar function with the sole aim of avoiding high pressure, caused when the outside temperature is excessively high. The fan speed varies in accordance with the evaporation temperature which is the temperature detected in the outside exchanger, producing reverse control at a higher temperature and a lower speed.

ALARM AND LOW WATER TEMPERATURE DEVICE DESCRIPTION

This unit contains safety devices to prevent the water temperature from falling too that it may cause damage to the system.

The parameters are as follows:

Low temperature alarm set point

Low temperature tolerance range alarm.

This is the set point which restricts the supply water temperature so that if the temperature of the supply water is below this value, the unit shuts down setting off an alarm. This alarm is manual which means that in order for the unit to restart the ON/OFF Reset key on the keypad has to be pressed when the water temperature has exceeded the low temperature alarm set point plus the low temperature tolerance range. These parameters are factory set to 4°C for the low temperature alarm and 7°C for the tolerance range.

Low temperature protection set point

Low temperature protection tolerance range

The low temperature protection system operates by heating the exchanger with water and thus preventing it from freezing up. This device acts in such a way that if the water temperature in the exchanger is less than the parameter value the protection system starts.

WATER TEMPERATURE INDICATOR

This gives the temperature in °C and °F. It is factory set to °C.

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