

EcoCooling ECP Evaporative Cooler

Installation Commissioning Operation & Maintenance Manual



EcoCooling ECP Evaporative Cooler

Installation, Operation and Maintenance

Please keep this important manual in a safe place. It is the owner's responsibility to ensure that regular maintenance is carried out on this evaporative cooler. Failure to do so will void all guarantees beyond statutory and legal requirements.

Due to the EcoCooling policy of continuous product improvement, design and technical specifications are subject to change without notice.

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1. Safety

1.1. Electrical Hazard

1.1.1. Isolation when working

Whenever the unit is being worked on with the side panels removed the unit shall be electrically isolated. There are both 240V and 24V systems within the unit.

1.1.2. Hazards from capacitor

The EcoCooler contains a capacitor. This can retain power and should be discharged by a competent person prior to handling

1.1.3. RCD/RCCB installation

The installer shall protect the EcoCooler with a residual current device (RCD), or residual current circuit breaker (RCCB). It is recommended that this is fitted in an accessible location.

1.2. Safety – Moving Parts Hazard

Whenever the units is being worked on with the side panels removed the unit should be electrically isolated. If this is not complied with then the fan and other components can be started remotely.

Panel securing screws shall be replaced when work is completed.

Adequate protection shall be provided by the installer on the air discharge from the cooler. This protection shall comply will local regulations.

1.3. Installation

The installer shall comply with all local regulation including

Manual handling

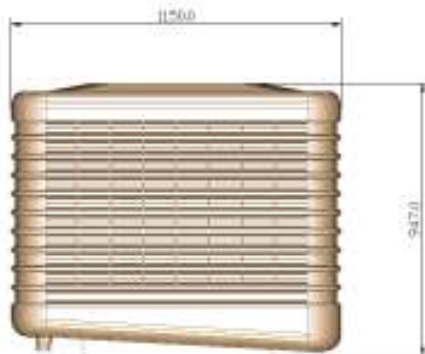
Working at heights

Permit to work systems including hot work

COSHH (including working with asbestos if appropriate)

2. Specifications

2.1. Dimensions



2.2. Weight

The EcoCooler weighs approximately 85Kg dry and has an operating weight of 110Kg

2.3. Services

2.3.1. Water

The EcoCooler shall be supplied with clean, potable water.
Supply minimum 1 bar max 7 bar. Minimum supply 500 L/hr

2.3.2. Electricity

The EcoCooler requires a 240V AC 15A single phase supply

2.3.3. Drain

This shall have a minimum capacity of 2000l/hr to an appropriate drain point in accordance with local water regulations.

2.3.4. Control Cable

A 30m 16core control cable is delivered connected to the main cooler control box coiled and fastened to the base of the cooler. This can be extended up to 250m using .75sqmm control cable. Control voltage is 12VAC. **DO NOT MAKE ANY DISCONNECTIONS OR CONNECTIONS OF THE CONTROL CABLE WHILST THE COOLER HAS POWER ON OR THE CONTROL PANEL MAY BE DAMAGED**

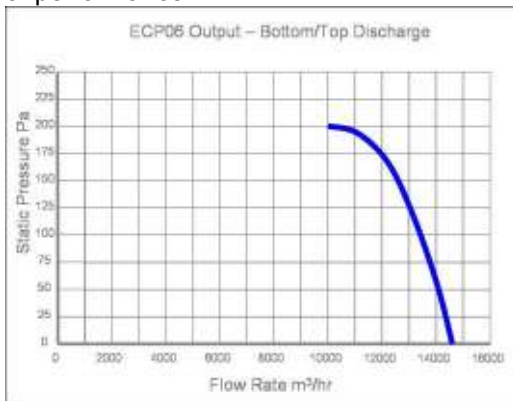
2.4. Noise

For the standard EcoCooler fan the Average LpA over 19 positions at 2 metres prescribed octave frequency bands is:

63Hz	61.9
125Hz	67.1
250Hz	71.3
500Hz	72.2
1KHz	73.6
2KHz	70.0
4KHz	63.2
8KHz	56.7

2.5. Fan performance

The EcoCooler is supplied with an axial fan. Ductwork should be designed to accommodate the fan performance shown below. Note that operating beyond the 'stall' point of the fan results in severe loss of performance.



3. Installation

All operations should be carried out by appropriated qualified personnel. All installations should comply with local regulations regarding electricity, water and drainage

3.1. Handling and Packing

The unit is delivered mounted on a pallet which is used to support the unit during installation. A protective cardboard cover is, together with internal polystyrene pads, banded to the pallet.



This is a fragile item and must be handled carefully. The maximum stacking height is 2. Once removed from the pallet take great care not to damage the drain which protruded from the bottom of the unit.

On receipt of the cooler the outer packing shall be removed and the EcoCooler inspected for damages. Claims for damages can only be accepted if damage is recorded on delivery documentation. To remove the side panel first remove the security screws. Then lift the panel and the top edge can be removed.



To replace the panel reverse the above.

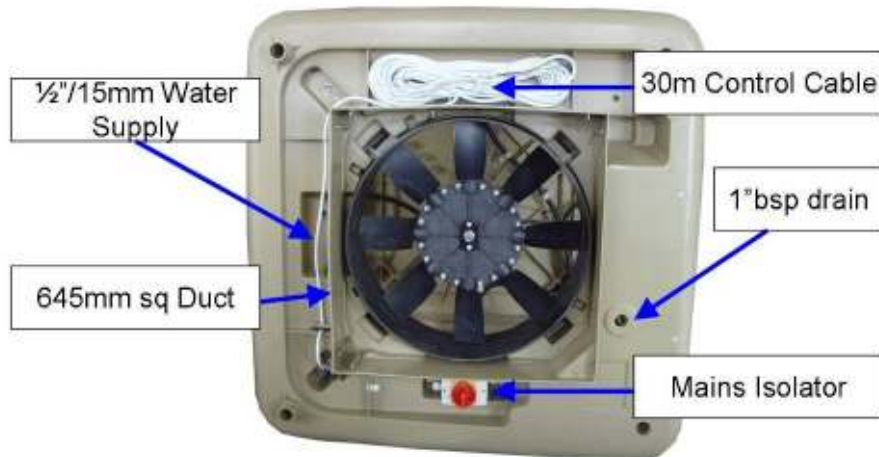
3.2. EcoCooler location

The EcoCooler should be installed in a position where the input air is free from fumes, dust particles, road traffic exhaust fumes etc.

The cooler should be installed with a minimum clearance of 300mm on all sides to enable access for maintenance.

3.3. Services

All services are fed to the underside of the EcoCooler



3.3.1. Water

The connection to the EcoCooler is 1/2" BSP. A flexible braided hose, with integral isolation valve, is provided and can be found inside the cooler on delivery. This has 1/2" BSP/15mm compression ends. It is recommended that this be used to prevent stress on the water solenoid valve fitting. It is recommended that a double check valve is fitted in the mains water supply.

3.3.2. Electricity

The EcoCooler requires a 240V AC 15A single phase supply. This is connected to the external isolator fixed to the base of the cooler. It is recommended that the cooler is protected with an RCD

3.3.3. Wall Control Cable

A 30m 16core control cable is delivered connected to the main cooler control box coiled and fastened to the base of the cooler. This control cable can be extended up to 500m using standard multi-core cable. The connections to the control box are 2.8mm x 0.5mm spade connectors. Crimp connectors can be obtained from RS Components Part No 239-4240

3.3.4. Drain

On delivery the drain valve is electrically connected but requires mechanically fitting to the base of the sump. The drain valve fitting is 1" BSP. If the drain valve requires pipe work then standard 28mm pipe components can be obtained from Wolsey Group

Part No Description

555043 C/B 28MM X 1" F.I COMPRESSION COUPLING

555012 C/B 28MM COMPRESSION ELBOW

515122 HEP20 28MMx3M P/BUTYLENE PIPE



3.4. Fitting of EcoCooler to Ductwork

A typical roof mounted installation to a plenum chamber is shown. Checks must be made that the roof structure can support the full operating weight of the system plus the ductwork and plenum chamber.



The EcoCooler is designed to be supported from a plain square duct with nominal external dimensions 645mm x 645mm.

The cooler has plastic mouldings which fit over the ductwork.

It is normal to support the weight of the cooler on supports on the underside of the roof.



A minimum of 300mm clearance must be provided around the unit to enable the side panels to be removed.

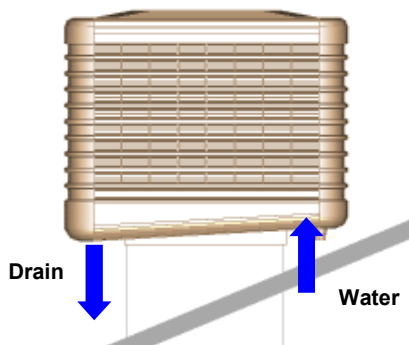
Note that due to the variation in the moulding of plastics there may be some variation in these dimensions – the final duct must be manufactured to fit the cooler. The side frames are also act as a guard for the fan. Set screws prevent their removal unless a tool is used to comply with guarding regulations.



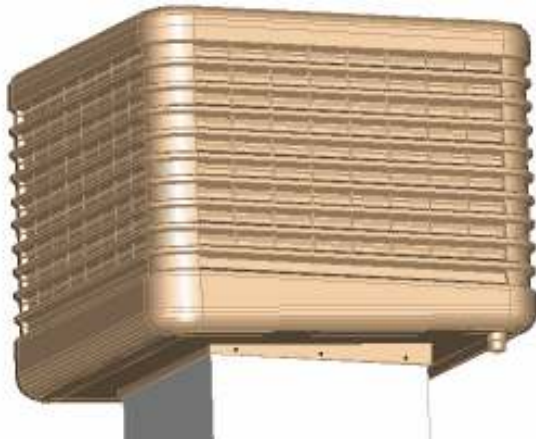
There are location points for the cooler to sit on the duct. When the cooler sits on a level duct these points ensure the cooler is level. The cooler must be installed on a level to ensure safe and efficient operations. The duct enters the cooler 30mm.

Coolers should not be placed where the intake could be contaminated with fumes, heavy dust etc. On a sloping roof the cooler is normally installed with the drain at the lowest point.

The cooler must be mounted sufficiently high so that the drain connection can be made – typically 150mm clear from the roof on the upper side



The cooler is then fixed to the ductwork using fixings appropriate for the duct material. It is recommended that a minimum of 3 fixings are made on each side.



Appropriate weather proofing should be made according to the roof structure and local weather conditions

3.5. Controls

The EcoCooler is supplied with a standard wall control. There are the options to connect the following items to the EcoCooler

- Thermostat
- Humidistat
- Fire Alarm link
- Timer

These external controls can be connected directly to the cooler control board to the wall controller. The 16 core control cable accommodates all of the above functions.

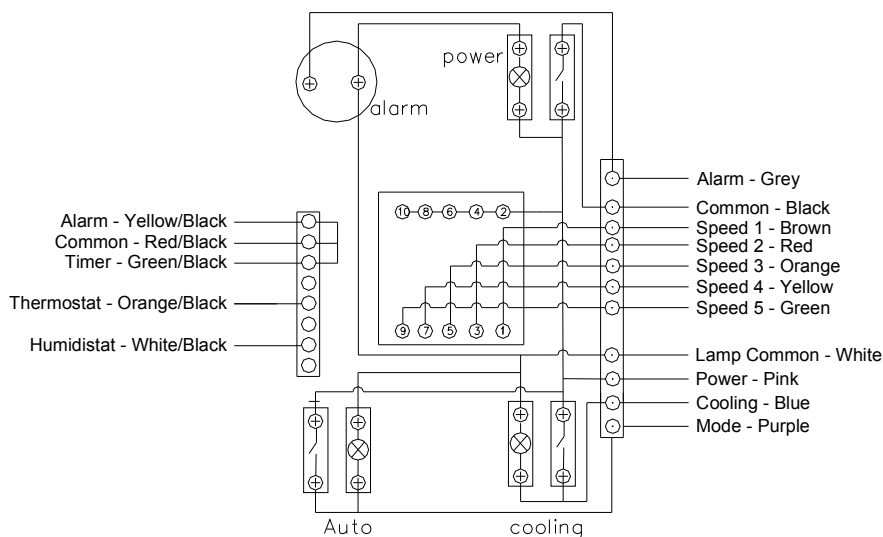
There is a further option to take a control signal to synchronise an extract fan or actuated louver with the EcoCooler fan operation as part of a balanced ventilation scheme. Additional wiring is required up to the cooler to accommodate this.

3.5.1. Wall Controller Wiring

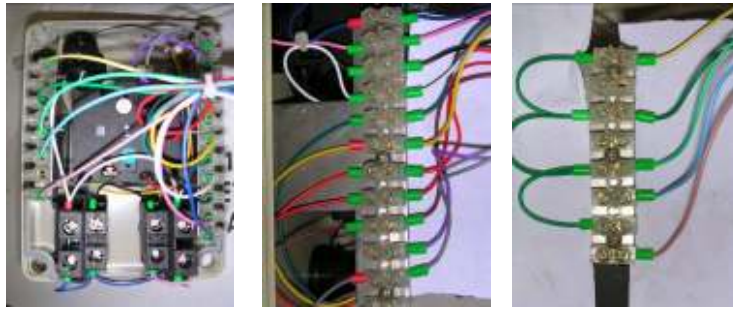
The wall control wiring is as shown below. This wiring diagram is reproduced inside the Wall Controller.



Wall Control



DO NOT MAKE ANY DISCONNECTIONS OR CONNECTIONS OF THE CONTROL CABLE WHILST THE COOLER HAS POWER ON OR THE CONTROL PANEL MAY BE DAMAGED



The control cable is 16 cores. It is connected to the wall control box by two terminal blocks.

The first terminal block is used for all of the manual controls (plus the purple automatic cable).
The second terminal block is for the Alarm, Timer, Humidistat and Thermostat

Note that the Alarm and Timer contacts must be made for the cooler to operate

3.5.1.1. No external items

If the EcoCooler will only run in Manual mode then the Auto Button is removed and replaced with the blanking plug supplied. The blanking plug is packed inside the Wall Controller.

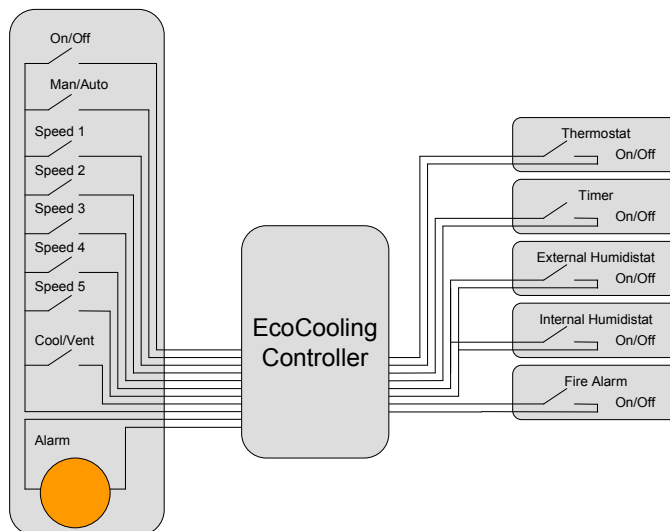
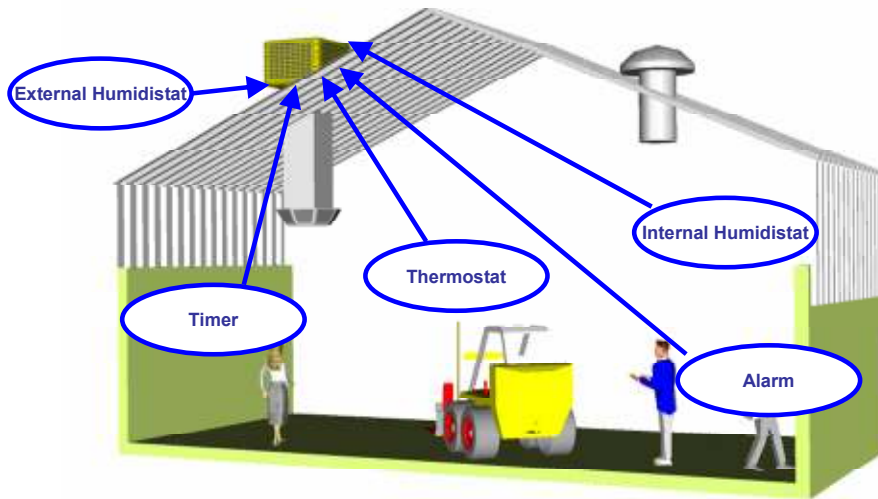


3.5.1.2. Thermostatic Operation

The EcoCooler can automatically control the temperature by connecting a volt free contact thermostat

Automatic Mode

In automatic mode the controller sets the fan speed and the cool/vent status based on the inputs shown below.



When the automatic contact is made the system looks at the thermostat contact and the humidistat contact.

The thermostat is open when the temperature is below the set point.
 The internal humidistat is open when the humidity is below the set point
 The external humidistat is open when the humidity is below the set point

When the Automatic function is enabled the cooler reacts according to the thermostat setting and dip switch 8 setting

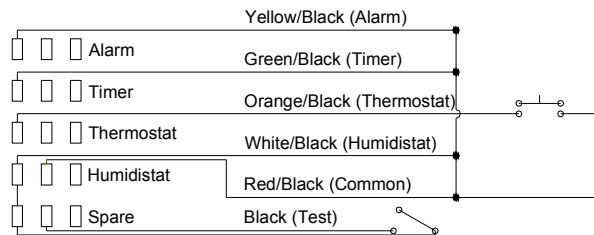
- Thermostat contact closed (over set point – room hot)
 - Cooler will start in speed 3 cool mode
 - Thermostat contact open (under set point – room cool)
 - Dip switch 8 down – cooler will start in speed 1 vent
 - Dip switch 8 up – cooler will stay off
- The thermostat is monitored every 10 minutes:

If thermostat is open then speed increases by 1 until a maximum of 5.
 If thermostat is closed then the speed decreases by one until a minimum of 1 and then cool is disabled. If dip switch 8 is activated the cooler will then shut down completely. The cooler

Off	Off
Vent	Speed 1
Cool	Speed 1
Cool	Speed 2
Cool	Speed 3
Cool	Speed 4
Cool	Speed 5

If either humidistat contact is made then the cool circuit is disabled and the cooler will operate in vent mode.

Thermostat Only



Alarm - Closed to Run in both Manual and Auto

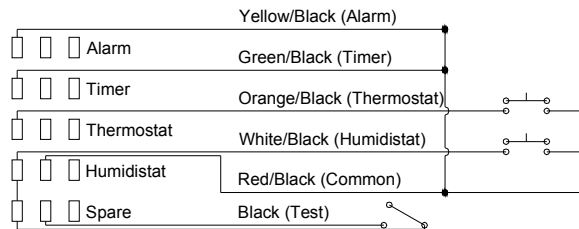
Timer - Closed to run in both Manual and Auto

Thermostat - Closed when temperature is greater than set point

Humidistat - Closed when humidity is below set point (must be bridged if thermostat only is used in Auto mode)

3.5.1.3. Thermostatic/Humidistat Operation

Thermostat and Humidistat



Alarm - Closed to Run in both Manual and Auto

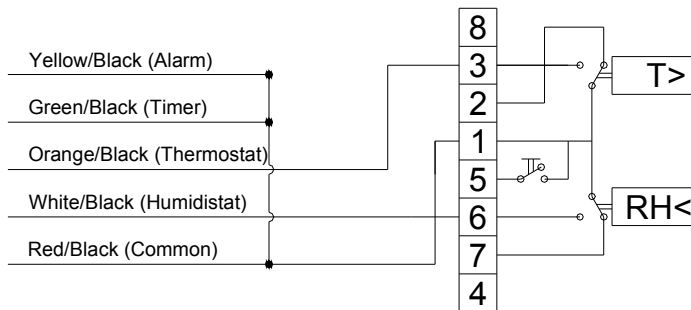
Timer - Closed to run in both Manual and Auto

Thermostat - Closed when temperature is greater than set point

Humidistat - Closed when humidity is below set point (must be bridged if thermostat only is used in Auto mode)

3.5.1.4. Connection of Eberle 7000

Connection of Eberle 7001



3.5.1.5. Alarm

This connection is intended to be used to shut down the cooler in a controlled manner and show an alarm condition at the Wall Control Box and the LED in the Main Controller.

This has to be closed for the cooler to operate.

Typical applications are:

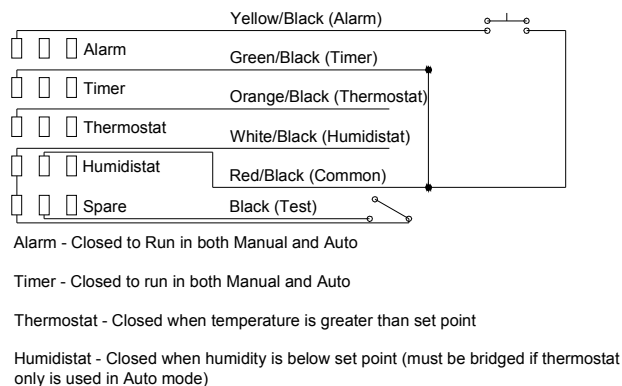
- Connection to a fire alarm system
- Connection to a smoke detector

When the connection is broken the cooler fan stops and the cooler drains if it is in cool mode. The Alarm light on the wall controller will flash with a 6 times sequence and the Main Control Panel will show 6 on the LED

If only the Alarm contact is used the Timer must be bridged.

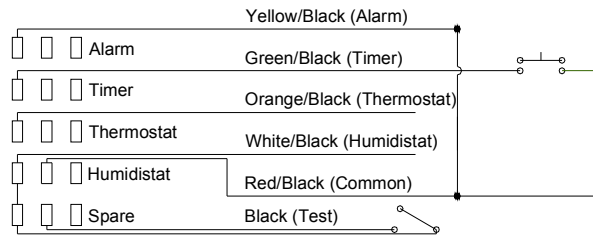
The Alarm function operates in both Manual and Automatic Mode.

Alarm



3.5.1.6. Timer

Timer



Alarm - Closed to Run in both Manual and Auto

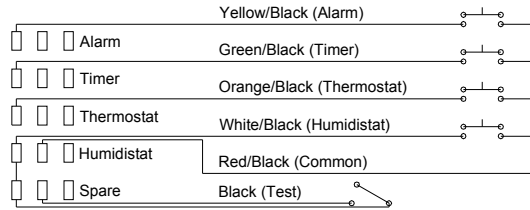
Timer - Closed to run in both Manual and Auto

Thermostat - Closed when temperature is greater than set point

Humidistat - Closed when humidity is below set point (must be bridged if thermostat only is used in Auto mode)

3.5.1.7. All Functions

All Functions



Alarm - Closed to Run in both Manual and Auto

Timer - Closed to run in both Manual and Auto

Thermostat - Closed when temperature is greater than set point

Humidistat - Closed when humidity is below set point (must be bridged if thermostat only is used in Auto mode)

4. Commissioning

The EcoCooler comes fully operational and ready for use. There are a number of options which are enabled using the dipswitches mounted on the main control board inside the machine. These are described in the previous section.

4.1. Commissioning Sequence

A commissioning sequence is built into the control system.

To initiate this sequence operate the test switch located on the control panel for 3 to 8 seconds



The cooler then follows the following sequence.

Stage 1- Fan Test

The fan runs at all five speeds commencing at speed 1 and ending at speed 5 and then stops. Each speed is retained for approximately 4 seconds. The spare contact closes during this sequence.

Stage 2 - Drain test

The drain valve opens for 7 seconds and then closes. Note that the Scavenge Pump operates at the same time as the drain

Stage 3 – Water valve test

Water valve open for 17 seconds

Stage 4 – Water level probe test

The water valves stay open and the cooler fills to level H (the third level)
The water valves then close

Stage 5 – Circulation pump test

When level probe H is reached the circulation pump runs for 10 seconds

Stage 6 – Overflow check

The HH level is manually lifted and the sequence is stopped. The cooler then drains down. Alarm 2 is shown and retained.

By performing the above all of the key components are validated in sequence.

Note that the sequence can be started with the timer and alarm contacts open and in other alarm conditions.

The only other points to check are:

1 – Are the pads fully seated in the side frames? They can work loose in transit and must be correctly located to ensure efficient and leak free operation.

2 – Is the cooler level? The cooler is designed to sit on a duct which is finished with a horizontal plain edge. If it is not level the water controls may not operate correctly.

- Check all of the wall control buttons function

It is recommended that a record is kept of commissioning. A sample commissioning record is shown later in this section.

Test Sequence

Seconds	Speed 1	Speed 2	Speed 3	Speed 4	Speed 5	Spare	Drain	Scavenge Pump	Valve	Level LL	Level L	Level H	Circulation Pump	Level HH
1	▼					▼								
2	▼					▼								
3	▼					▼								
4	▼					▼								
5		▼				▼								
6		▼				▼								
7		▼				▼								
8		▼				▼								
9			▼			▼								
10			▼			▼								
11			▼			▼								
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56									▼					
Water fills to LL										▼				
Water fills to L											▼			
Water fills to H												▼		
1													▼	
2													▼	
3													▼	
4													▼	
5													▼	
6													▼	
7													▼	
8													▼	
9													▼	
0													▼	
Manually operate HH														▼
Cooler drains								▼						▼

4.2. Commissioning Record



EcoCooler Commissioning Record

Cooler Model	
Project Description	
Company	
Location	

Installation

The cooler(s) should be installed horizontally and be securely fastened to the ductwork. All electrical services, water supply and drainage should conform to local installation regulations and fitted by an appropriately qualified person.

Is the cooler level?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Is cooler securely fitted to ductwork?	Yes <input type="checkbox"/> No <input type="checkbox"/>
Are all pads correctly fitted and secure?	Yes <input type="checkbox"/> No <input type="checkbox"/>

Configuration

The dip switches, located in the main control panel, should be checked to ensure they comply with, unless special configuration is required, factory settings.

Switch	Default	Function	Actual
1	Off	Pre Cool Cycle	Off <input type="checkbox"/> On <input type="checkbox"/>
2	Off	Salinity 1	Off <input type="checkbox"/> On <input type="checkbox"/>
3	On	Salinity 2	Off <input type="checkbox"/> On <input type="checkbox"/>
4	On	Salinity 3	Off <input type="checkbox"/> On <input type="checkbox"/>
5	Off	24 hr dry cycle	Off <input type="checkbox"/> On <input type="checkbox"/>
6	Off	Off speed 1390 On max speed 1200	Off <input type="checkbox"/> On <input type="checkbox"/>
7	Off	Off speed 1390 On max speed 1000	Off <input type="checkbox"/> On <input type="checkbox"/>
8	Off	Enables complete stop in Auto	Off <input type="checkbox"/> On <input type="checkbox"/>

Operation

Check the operation of the following items by using the test function switch.

Five fan speeds	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water feed solenoid valves	Yes <input type="checkbox"/> No <input type="checkbox"/>
Circulation pump	Yes <input type="checkbox"/> No <input type="checkbox"/>
Drain valve	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water level probes	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water level 4 high level manual check	Yes <input type="checkbox"/> No <input type="checkbox"/>

Commissioning Engineer	
Installation Company	
Date	

5. Maintenance

It is recommended that an evaporative cooler is regularly maintained. The frequency of maintenance is dependent upon the quality of water, the cleanliness of the air and the frequency of use. In normal conditions a 6 monthly service will maintain the reliability, efficiency and hygienic operation of the cooler.

5.1. Procedure

5.1.1. Preparing the cooler for maintenance

Ensure the cooler is fully drained by switching the cooler off at the wall control. Any water will then be automatically drained.

Electrically isolate the cooler by using the external switch mounted on the underside of the cooler

Remove the side panels by first removing the securing screws and then, by lifting the frame slightly and moving it outwards, the side frame holding the pad can be removed. Take care not to damage the top surface of the pad.

5.1.2. Cleaning the cooler

Clean all surfaces to remove any deposits.

Use the 'Clean Cycle' to aid cleaning

Note on salinity setting: If there is evidence of scaling then the bleed rate should be increased.

5.1.3. Pad inspection

The pads should be replaced if

- They are mechanically damaged
- They are contaminated by airborne products so badly they cannot be cleaned using a low pressure water pipe
- They have salt or scale build up
- Their efficiency has reduced to an unacceptable point

5.1.4. Pad Replacement

Remove pad by lifting out of the side support frames.

Clean side frame thoroughly

Place new pad in side frame with distribution layer to the top.

5.1.5. Insect Screen Cleaning

Remove insect screens carefully by lifting from the side frames

Clean using low pressure water

Inspect and replace if damaged

Replace in side frame.

5.1.6. Validation of Configuration

Record dip switch settings on maintenance record sheet

Validate any changes from default

Re-starting of cooler

Switch on mains power

Run test sequence to check the cooler operation.

Replace side frames and securing pins

Check the wall control operation

5.2. Maintenance Record

 <p>EcoCooling</p>	<p>EcoCooling Limited</p> <p>Maintenance Record</p>
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Company	
Location	
Cooler Description	
Cooler Serial Number	

Pad Inspection:

Pad quality	Very Good <input type="checkbox"/> Good <input type="checkbox"/> Poor <input type="checkbox"/> Very Poor <input type="checkbox"/>
Recommendation	

Configuration: The dip switches, located in the main control panel, should be checked to ensure they comply with factory settings.

Switch	Default	Function	Actual
1	Off	Pre Cool Cycle	Off <input type="checkbox"/> On <input type="checkbox"/>
2	Off	Salinity 1	Off <input type="checkbox"/> On <input type="checkbox"/>
3	On	Salinity 2	Off <input type="checkbox"/> On <input type="checkbox"/>
4	On	Salinity 3	Off <input type="checkbox"/> On <input type="checkbox"/>
5	Off	24 hr dry cycle	Off <input type="checkbox"/> On <input type="checkbox"/>
6	Off	Off speed 1390 On max speed 1200	Off <input type="checkbox"/> On <input type="checkbox"/>
7	Off	Off speed 1390 On max speed 1000	Off <input type="checkbox"/> On <input type="checkbox"/>
8	Off	Enables complete stop in Auto	Off <input type="checkbox"/> On <input type="checkbox"/>

Operation: Check the operation of the following items by using the test function switch.

Five fan speeds	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water feed solenoid valves	Yes <input type="checkbox"/> No <input type="checkbox"/>
Circulation pump	Yes <input type="checkbox"/> No <input type="checkbox"/>
Drain valve	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water level probes	Yes <input type="checkbox"/> No <input type="checkbox"/>
Water level 4 high level manual check	Yes <input type="checkbox"/> No <input type="checkbox"/>

Notes

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Signature below acknowledges that the EcoCooler has been serviced in accordance with EcoCooling Limited procedures

Servicing Engineer			
Company			
Date	___/___/___	Signed

6. Fault Finding

The Alarm Light on the Wall Control flashes when an alarm is present. The number of flashes indicates the Alarm Condition.

6.1. 1 flash Slow fill

Run test routine, check water supply pressure, check inlet water filter

6.2. 2 flashes Overflow

Run test routine to check probe operation and water solenoid valves

6.3. 3 flashes Probes out of sequence

Run test routine to check probes, clean probes

6.4. 4 flashes Slow evaporation

Run test regime to check circulation pump operation

6.5. 5 flashes Slow drain

Run test routine to check drain valve operation, water level probes and water inlet solenoid valve.

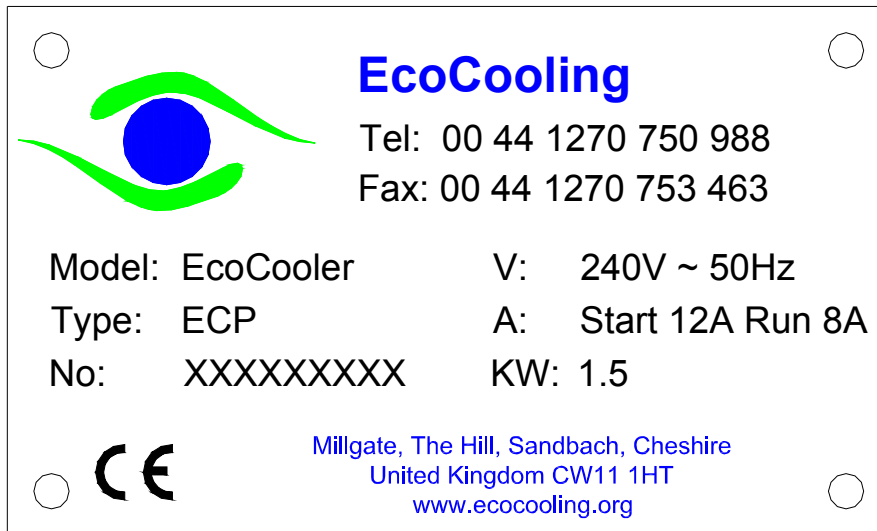
6.6. 6 flashes External Alarm

This is normally linked to a fire alarm. Check continuity

Problem	Cause	Remedy
Cooler will not start	No external alarm fitted but still fault	Check bridge is in place of main control panel
.	Pre-cool cycle enabled	Fan will not start until water has circulated for 5 minutes – no action required
	Electrical supply interrupted	Check RCD Check that power is supplied to control board
	Cooler still in test mode	Operate test switch once on power down
	Cooler still in cleaning mode	Operated test switch once on power down
Cooler is not efficient	Pads dirty	Clean pads and replace as appropriate
Air from cooler smells	Pads dirty	Clean pads and replace as appropriate
	Stagnant water	Mains power is being turned off and water not automatically drain Resume use of full control system continuously
Fan touching venturi	Venturi is incorrectly located	Make sure venturi is correctly located in cooler
	Fan is incorrectly located	Adjust fixing points on fan
Motor does not start or runs with vibration	Capacitor	
	Motor	
	Transformer	
	Control board	

7. Spare Parts

The details for an EcoCooler are specified on the Name Plate which can be found on the outside of the cooler adjacent to the external isolator.



Description

Sump
Lid
Post
Side Frame
PAD675X860X100(mm) (Munters CeIDEK 5090) Boxed set of 4
1.5W MOTOR
Motor Support Frame
Motor Support Bolts - Motor
Motor Support Bolts - Venturi
FAN (45 Degree Angle)
Fan Nut, washer and locking washer
Venturi
Hose from Pump to five way distributor (2006 black hose)
Long Hose from five way distributor to water distribution (2006 black hose)
Short Hose from five way distributor to water distribution (2006 black hose)
Water Level Probe (2006 Four float stainless steel)
Water Distributor
Circulation Pump (2006 Model Brown)
Water Inlet Valve (single valve 2007)
Water Inlet Valve fixing Kit 2007
Five Way Distributor
Water Connector 90 Degrees
Drain Valve (Brown) with 2 seals and nut

Part N0

ECP01-01
ECP02-01
ECP03-01
ECP04-01
ECP06-02
ECP07-01
ECP08-01
ECP08-02
ECP08-03
ECP09-01
ECP09-02
ECP10-01
ECP11-02
ECP11-03
ECP11-04
ECP12-02
ECP13-01
ECP14-03
ECP15-02
ECP15-03
ECP16-01
ECP17-01
ECP18-01

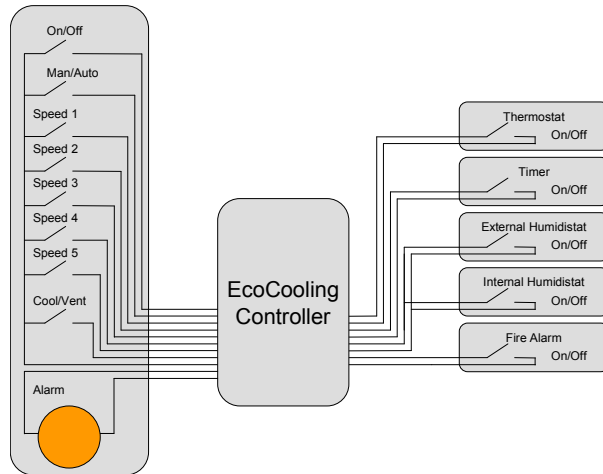
External Isolator complete with support bracket and glands (2007)	ECP19-02
Control Box - single piece 2007 design complete with all glands	ECP21-06
Control Box lid 2007 (With wiring diagram on lid)	ECP21-07
5 Speed Control board 2007	ECP21-08
Test Button	ECP21-09
Control Box Transformer	ECP21-10
5 Speed Wall Control (2007)	ECP22-02
Blanking plug (for removal of Auto Button)	ECP22-03
5 Speed Control Cable Numbered 2007 (30m complete with connections)	ECP24-03
Earth Lead	ECP25-01
Cable Tidy	ECP25-02
Capacitor Box	ECP26-01
Capacitor cable complete with two glands	ECP26-02
Capacitor 50 uF 1.5KW motor	ECP27-01
Hook	ECP31-01
Support for Pad Post	ECP32-01
Pad Brace	ECP33-01
Flexible Water Inlet Hose (with integral isolation valve)	ECP34-02
Fly Screen	ECP35-01
Power Cable	ECP51-01
Name Plate	ECP52-01
Fixing Screws - Stainless Steel	ECP53-01
Back Guard	ECP54-01
EcoCooling Logo Sticker	ECP55-01

8. Control System

EcoCooling 5 Speed Control System

8.1. Overview of System

The control system comprises of a main control panel which controls the above components by communicating with a wall mounted control box and a set of external inputs.



The purpose of the control system in EcoCooling evaporative coolers is to control the following functions which are accessible by the operator:

On/Off

Turns the cooler on - starts the fan and operates in cool or vent as selected

Turns the cooler off – stops all functions and cooler drains automatically

Man/Auto

In manual mode the cooler follows the set fan speed and cool/vent mode

In Auto the fan speed and cool/vent mode are automatically set according to the status of the thermostat and humidistat.

Fan Speeds 1 to 5

Manual setting of fan speed

Cool or Vent mode

Vent mode

Water circuit is disabled

Sump drains automatically

Cool mode

Water circuit is enabled

Fill cycle enabled

Bleed control enabled

Alarm

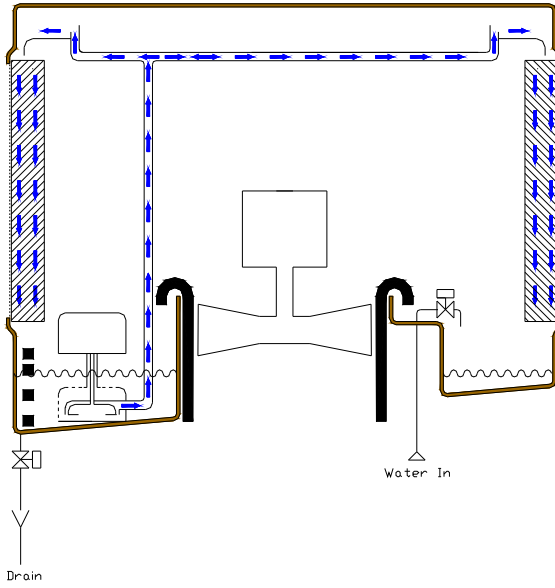
Highlights the system has an error

The number of pulses indicates the fault present.

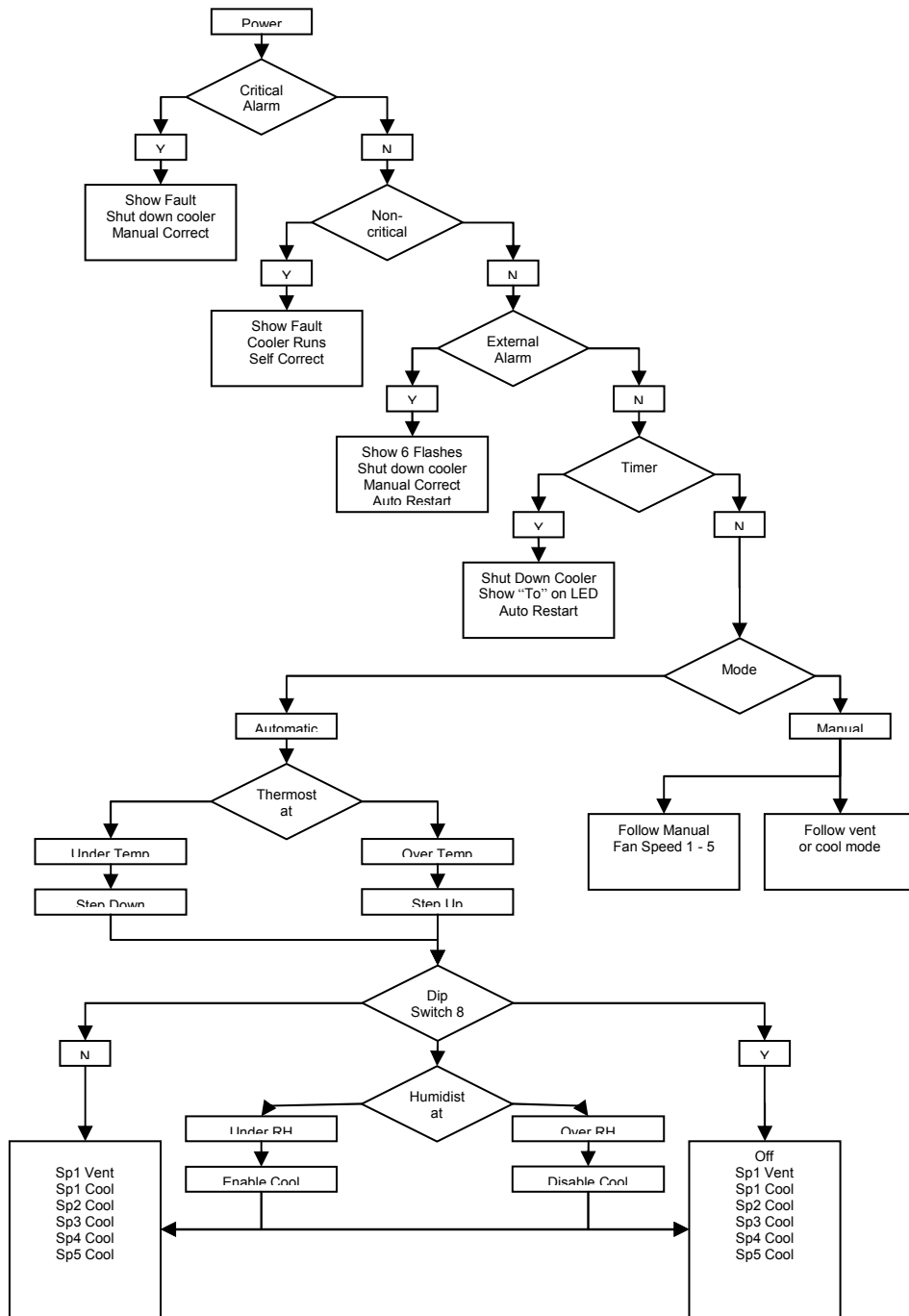
The purpose of the system is to control the following components

- Water inlet valve – controls the water into the cooler
- Drain valve – controls the drain from the cooler
- Level Probe – controls the water levels in the cooler
- Level Probe – controls the water levels in the cooler
- Level Probe – controls the water levels in the cooler
- Level Probe – controls the water levels in the cooler
- Circulation Pump – circulates the water onto the cooling media
- Fan – double wound single phase fan motor

EcoCooler Circulation System

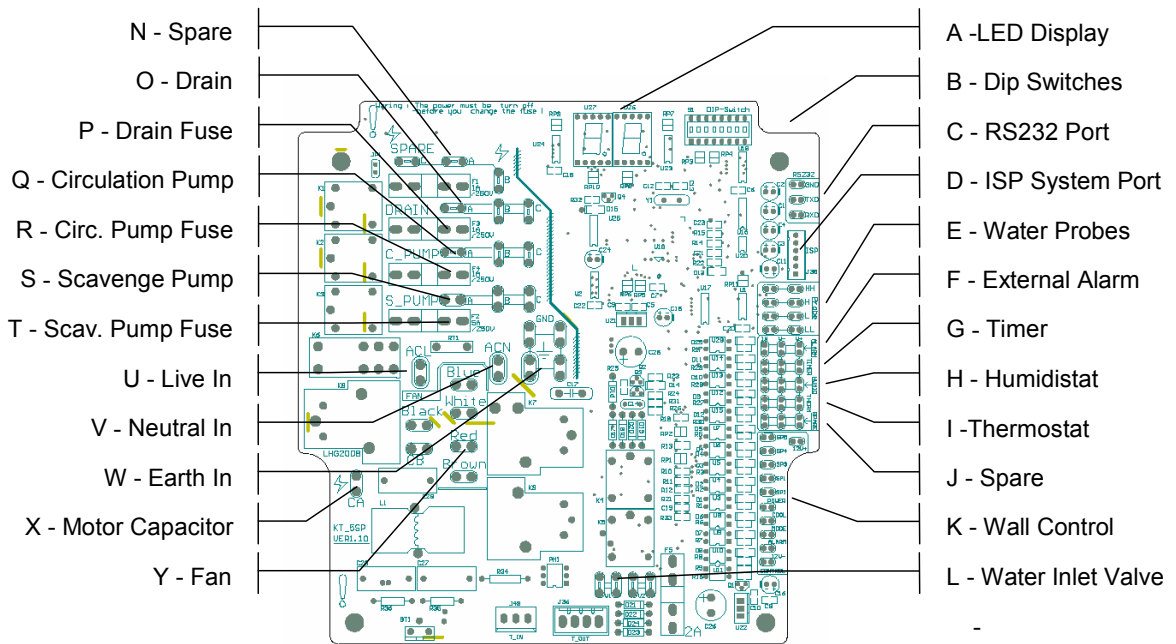


8.2. Process control flow chart



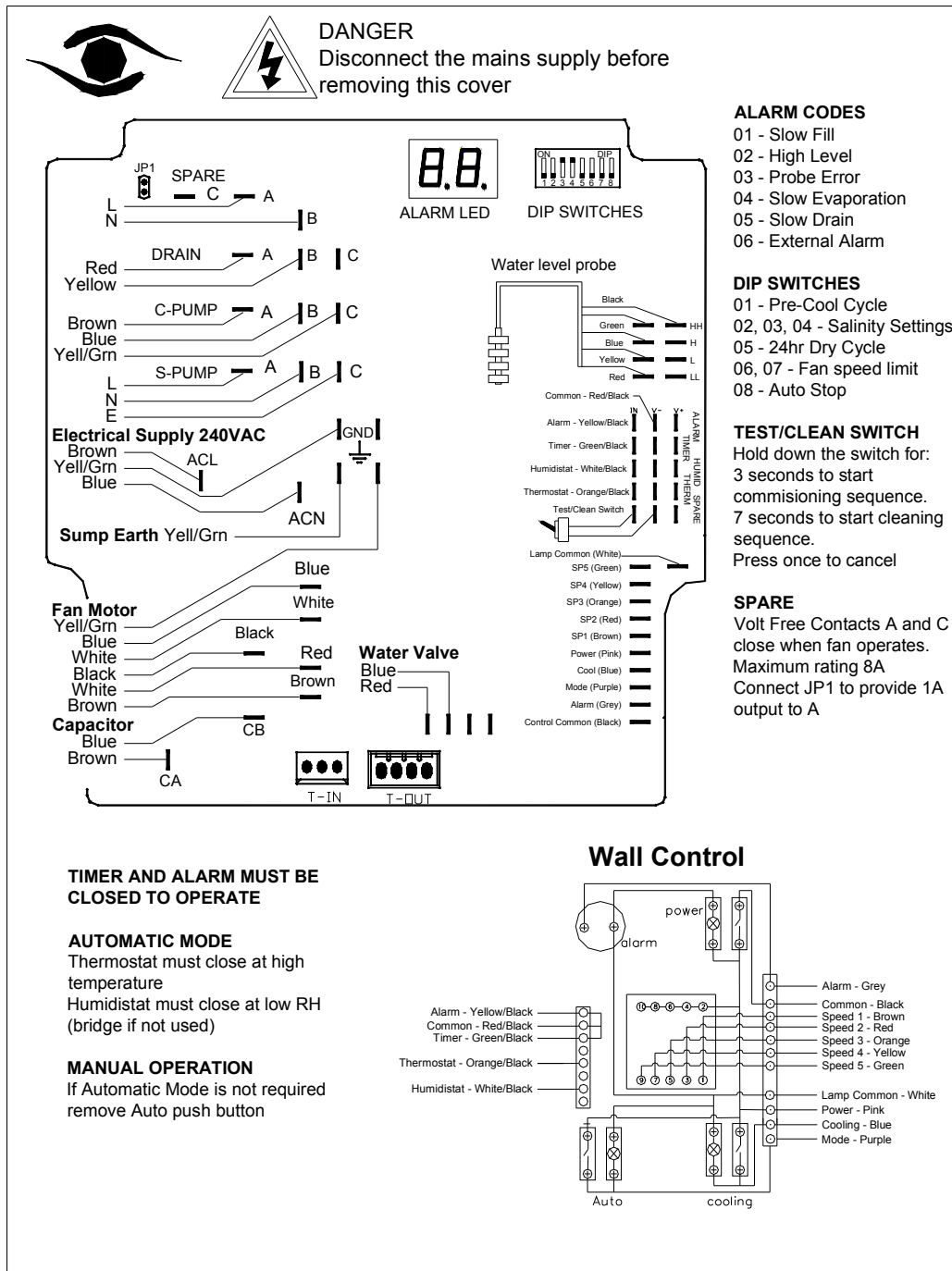
8.3. The Control Board

The heart of control system is a printed circuit board. The layout with the key input/output locations is shown below



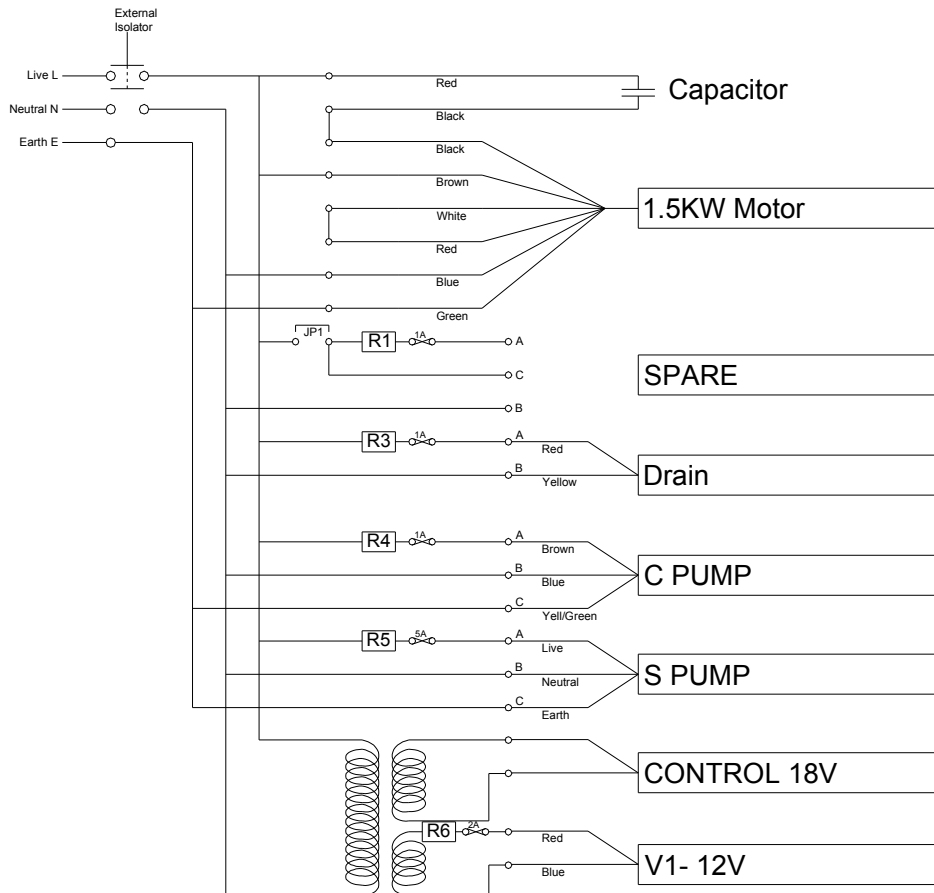
The wiring diagram for the board and the wall controller is

8.4. Control Board Wiring Diagram



8.5. Electrical Diagram

240V Distribution



8.6. Detailed Description of Input and Outputs

A - LED Display

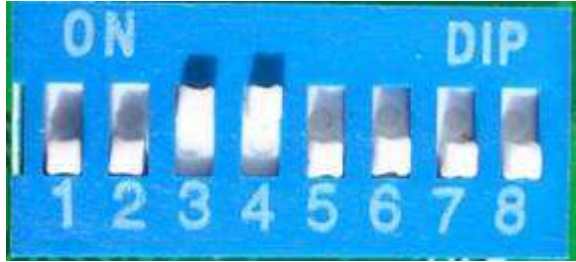
On power-up this displays the salinity setting for 3 seconds. During normal running this shows a single red dot at the lower right hand corner unless an alarm has occurred and this is retained. In an alarm condition it shows the following codes:

01	-	Slow fill	Auto Reset
02	-	Overflow	Manual Reset
03	-	Probes out of sequence	Manual Reset
04	-	Abnormal evaporation	Manual Reset
05	-	Slow Drain	Auto Reset

A detailed explanation of these faults and possible causes are detailed in the fault finding section.

B - Dip Switches

All variable parameters are set by changing the positions of the dip-switches located on the main control board. These changes can only be made during mains power off for a minimum of 5 seconds.



Switch	Default	Function
1	Off	Pre Cool Cycle
2	Off	Salinity 1
3	On	Salinity 2
4	On	Salinity 3
5	Off	24 hr dry cycle
6	Off	Off speed 1390 On max speed 1200
7	Off	Off speed 1390 On max speed 1000
8	Off	Enables complete stop in Auto

1 – Pre cool cycle: If this is enabled the fan does not start until after 5 minutes of water circulation.

2, 3, 4 – Salinity settings

As the water evaporates the scale forming salts increase in concentration. To control this function the cooler drains the sump completely when a set concentration is reached. This is determined volumetrically using the level probes. These dip switches determine the number of fill cycles prior to this drain.

The concentration factor should be calculated based on the analysis of the water used. The default setting from the factory is: 2 off, 3 on, 4 on which is 30% bleed rate

Note that the set number of fill cycles is displayed by the control board LED for 3 seconds when power is first applied.

2	3	4	Concentration	Bleed
Off	Off	Off	No drain	0%
Off	Off	On	2.2	46%
Off	On	Off	2.8	36%
Off	On	On	3.4	30%
On	Off	Off	3.9	25%
On	Off	On	4.5	22%
On	On	Off	5.1	20%
On	On	On	5.7	18%

5 – 24hr Dry Cycle: The cooler will dry out for 30 minutes during every 24 hours of continuous operation. This can be applied to in certain circumstances to improve the hygiene of the cooler

6, 7 – Maximum speed settings

This enables the top speed of the fan to be limited. This may be used to either reduce overall capacity or reduce noise. The standard motor used is a double wound 4 pole/6pole motor.

Speed	Winding	Control Method	Default 6 off 7 off	6 on 7 off	6 off 7 on
5 (A)	Winding A	4 pole operation	1390	1200	1000
4	Winding A	4 pole electronic control	1220	1090	960
3	Winding A	4 pole electronic control	1050	980	910
2 (B)	Winding B	8 pole operation	870	870	870
1	Winding B (Min)	8 pole operation	600	600	600

8 – Auto Stop Conditions

In 'AUTO' mode the default condition is the cooler remains at Speed 1, 'VENT' mode when the set point has been achieved. If this switch is enabled then the cooler will shut down completely.

C - RS232 Port

This is not used with standard wall controller

D - ISP System Port

This port is used for chip programming and is only for use by the factory

E - Water Probes

The four water level probes are base on magnetic floats which operate reed switches. They provide the input for the following functions:

At start-up the low level probe is checked – if it is covered then the cooler drains fully prior to starting the water cycle.



When in 'COOL' mode water enters the sump until the high level probe is covered. The water Inlet valve then closes. The water then evaporates until the Low Level probe is uncovered and the cooler refills with water.

This cycle continues according to the dip switch 2, 3&4 settings. When the set point is reached the water is then drained until Low Level probe is uncovered. When the low level probe is uncovered the system then waits for 2 minutes and then runs the water for 6 seconds to drain to clean the sump... The drain then stays open for a further 20 seconds and the recommence the fill cycle.

During drainage the scavenge pump is enabled. This scavenge pump is typically used in the SDU internal cooler to pump away drain water where it impossible to use a gravity fed drain.

The cooler drains down completely when stop or vent is selected. If low level probe is covered during this then the drain valve opens and scavenge pump runs as described above.

On the control board they are marked:

- HH The shortest probe
- H
- L
- LL The longest probe

F - External Alarm

This contact must be made at all times. This can be used to stop the machine when linked to:

- Fire alarm system
- Smoke detectors
- Etc

G - Timer

This switches the cooler on and off. This contact must be made at all times for the cooler to run. The cooler will re-start at the previous settings.

H – Humidistat

In automatic mode this disables the cool function and water circulation in Automatic mode. This is typically used to limit the relative humidity in a building or to disable the cooling when the external humidity exceeds a specified value.

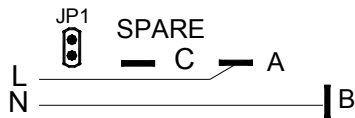
I - Thermostat

In automatic mode the control system monitors the thermostat every 10 minutes. When 'AUTO' mode is selected the cooler starts at speed 3 in cool mode. The thermostat contact is then monitored. If the thermostat shows a closed contact then the cooler will increase the speed of the fan by one increment up to the maximum speed 5 with cool. If the thermostat shows an open contact then the cooler will decrease the speed of the fan by one increment until it either stays at VENT/Speed 1 or shuts down completely.

Off*	Off*
Vent	Speed 1
Cool	Speed 1
Cool	Speed 2
Cool	Speed 3
Cool	Speed 4
Cool	Speed 5

Note the OFF/OFF status is only enabled by using dip switch 8. Default is the cooler will slow down to a minimum of VENT/Speed 1

J – Spare



This is used for a control signal to synchronise an auxiliary fan or actuated vent as part of a balanced ventilation system. There are two options

- A volt free contact
- A 240V output

Volt free contacts A and C close whenever the fan operates. This contact is fused at 1A but the fuse can be up rated to 5A.

When JP1 jumper is moved C becomes a 240V output synchronised with the fan. The maximum output in this mode is 1A and the fuse MUST NOT be up rated.

K - Wall Control

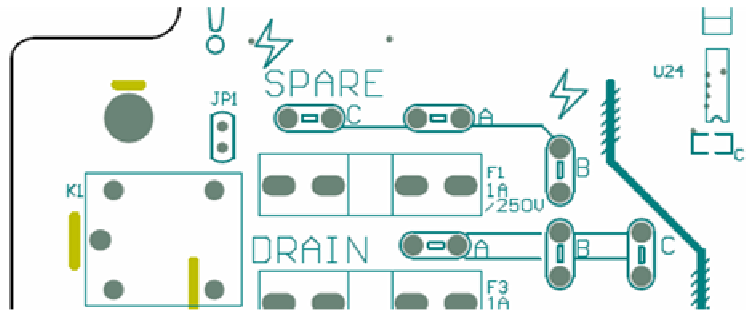
L – Water Inlet

This controls the flow of water into the sump

N&O – Spare output/fuse

This is a contactor which closes when the main fan runs. It can be used to provide the control input for an auxiliary fan, separate ventilation fan or to operate other vents. Note that the maximum rating for this contact is 8A.

It is possible to take a 240V supply directly from the main board. If 'jumper' JP1 is connected then 240V output becomes available from the connection A. The maximum rating when JP1 is used is 1A.



P - Drain

This controls the main drain valve located in the sump. The output is 240V AC.



Q&R – Circulation Pump

This powers the circulation pump. Note that the pump only runs when the water level is above the second L probe. The output is 240V AC.



R&S – Scavenge Pump (Optional)

The scavenge pump is used when there is no suitable gravity drain. The output is 240V AC



U, V & W – Mains Power In

The cooler requires a single phase 220 – 240V supply. Start current is 12A and running load is 8A on full speed for the 1.5KW 4 pole/8 pole motor.

Y - Fan

All coolers are supplied with a 4 pole/6 pole 1.5KW 1380/810 rpm double winding motor as standard (@220v). The fan starts in 6 pole for 10 seconds and then moves to the set speed to provide a soft start. The starting current is 12A with a normal maximum running load of 8A at speed 5.

The speed is controlled by a combination of using the two windings and electronic control. The five speeds are achieved by using the electronic control to slow down the four pole winding by two increments and then use the second winding. This is then electronically controlled down to its minimum on speed 1

Speed	Winding	Speed	Control Method
5 (A)	Winding A	1390	4 pole operation
4	Winding A	1220	4 pole electronic control
3	Winding A	1050	4 pole electronic control
2 (B)	Winding B	870	8 pole operation
1	Winding B	600 (minimum possible)	8 pole electronic control

The maximum speed is also limited by use of the dipswitches

9. Operating Instructions

ECP Evaporative Cooling Operating Instructions

All controls are accessed from the wall mounted control box using the inputs shown below:



1 flash – Slow fill Auto Reset
If the high level probe is not covered within 20 minutes this means there is a water supply problem. Either the water has not been switched on or there is a problem with the inlet valves.

2 flashes – Overflow Manual Reset
This is activated when the Very High Level probe is covered.

3 flashes – Probes out of sequence Manual Reset
If any probe is covered out of sequence this alarm is activated. This is either a fault with the probe or the float sticking on its support.

4 flashes – Abnormal evaporation Manual Reset
In 'COOL' operation if a fill cycle is not activated in a 6 hour period this alarm is activated. This is typical of a circulation pump failure.

5 flashes – Slow Drain Auto Reset
In a drain operation if the Very Low Level probe is not uncovered in 10 minutes this alarm is activated

6 flashes - External Alarm Auto Reset
In the control panel there are a set of contacts which can be connected to an external alarm switch. If this is activated this alarm is operated.

In Auto Reset the alarm will automatically clear when the fault clears. A manual reset alarm requires the cooler to be turned off at the wall box after the fault has been cleared.

10. Contact Information

EcoCooling Contact Information:

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