

1 Introduction

This document describes the Cooler Controller (TEK7EC) which includes the PCB and the housing in which it is enclosed. It also includes functional descriptions, ratings - both electrical and environmental. Overviews of software and hardware operation are included.

The TEK7EC is designed to operate an evaporative cooler in conjunction with one of the Tek700 or TEK600 or Series Wall Controls.

1.1 Definitions

Term	Customer Term	Meaning
Cooler		Evaporative Cooler
Appliance		Evaporative Cooler, Gas Ducted Heater, Refrigerative Cooler or other
		HVAC device
Operating mode		Any mode where the appliances are active
TEKBus		Tekelek proprietary communication system/protocol
Simple Analogue	Basic wall control	Simple 2 switch and potentiometer wall control eg TEK602
Control	(BWC)	
Digital Wall Control	Standard (SWC) or Touchpad wall control (TWC)	Any wall control that communicates via TEKBus, eg Standard TEK612 or Touchpad TEK622
	Dump valve	Automatic hydraulically operated dump valve that depends on water pressure from the fill line. Turning off fill valve will operate the dump valve
	Manual dump	Sump bleeder arrangement that only functions when the pump is on. Used to provide water refresh and drainage. Used in models without a dump valve
	Enviroflow	Continuous sump bleeder used to provide water refresh and drainage. Used in models without a dump valve
	AUTO-COOL Mode	Temperature controlled cooling mode. Pump and fan controlled according to temperature above or below the consumers setpoint.
	MANUAL-COOL Mode	Cooling level (pump and fan level) controlled directly by the consumer.
	VENT Mode	Fan only operation. Fan level controlled directly by consumer.
SELV		Safety Extra Low Voltage
Sump fill delay	Pre-Fill	Delay before turning on the pump to allow the sump to fill. Prevents pump cavitation noise
Dump Interval	Dump Cycle	Time Interval between sump emptying during normal operation. Refreshes water quality.
	Pre-Cool	Delay before turning on the fan to allow the pads to wet. Prevents initial hot air blast and lift off of water from pads (de-wetting).
QC		Quick connect/Fast-on



2 Functional Requirements

2.1 Functional Overview

The function of the Cooler Control is to accept and interpret the user requirements and adjust the Evaporative Cooler elements (fan, pump and solenoid) in accordance with these requirements. User requirements may come via either from the higher intelligence Wall Controls (digital information) or from the simple switch/pot wall control (analogue signal). The controller is able to determine which type of Wall Control is connected automatically. Devices driven include fan (speed control thereof), pump, fill or dump valves.

Any special requirements for maintenance, startup or shutdown requirements of the cooler are handled automatically by the Controller. This is also transparent to the user. Some diagnostic, test, setup and service modes are in-built into the Controller.

Power for the Wall Controls can be supplied from the Cooler Control.

2.2 System Integration

The Cooler Controller includes the housing that contains the electronics and connections. The housing also has provision for the motor start/run capacitor. It is designed to be attached to the underside of the water distribution tray or the ceiling of the cooler but may be attached to one of the Cooler side pillars. It incorporates connection points for communications to other HVAC appliances or Wall Controls. Connection points for power cables for power and control of motors, pumps etc within the cooler are also provided.

2.3 Inputs / Outputs

All TEK7EC connectors are located on the PCB mounted in Plastic Enclosure. Access to the connectors requires opening the Enclosures Lid by undoing the Lid's locking screw. Use Philips Head screwdriver.



The PCB below shows the locations of all the connectors



2.3.1 Thermostat/Wall Control Interface

The TEK7EC Cooler control can interface to a range of different Thermostat/ Wall Controller types.

a. Digital Thermostat using proprietary TEKBus protocol.

Connect via TEK698 Wire Loom to either – 4Pin HEADER friction Lock (J16, J17) marked [DIG STAT], TYPE :OUPIIN 4071-4TS or equiv

Pin 1	5V
Pin 2	Analog Fan i/p
Pin 3	RX-TX / Analg Pump i/p
Pin 4	0V

b. 4 Pin Analogue Wall Control

Connect via TEK698 Wire Loom to either – 4Pin HEADER friction Lock (J16, J17) marked [DIG STAT], Details refer a. above.

c. 5 Pin Analogue Thermostat/Wall Control

Connect via TEK400 Wire Loom to – 5Pin HEADER friction Lock (J23) marked [ANALG STAT] TYPE : TE CONN 171825-6 or equiv

Pin 1	0V			
Pin 2	Analog Pump i/p			
Pin 3	Analog Fan i/p			
Pin 4	5.6V			
Pin 5	Not connected			

The TEK7EC software automatically detects whether a Digital or Analogue Control is connected to either of the [DIG STAT] Headers or if an Analogue Control is connected at the [ANALG STAT]. Only 1 Thermostat/ Wall Control can be connected to the TEK7EC at one time.

The Wire Loom interfacing the Thermostat/ Wall Controls must be routed through the Enclosure entry slot adjacent the Enclosure mounted Power On/Off switch and around the smaller plastic ribs forming the second tortuous path before connection to the appropriate Headers. Again, this is to ensure compliance with lead pull-test requirements.

The TEK7EC Wall Control Supply output shall be capable of supplying 50mA maximum at a voltage of $5V\pm5\%$. All connections on the Wall Control Interface are SELV.

2.3.2 Mains AC Input

AC MAINS Connections - 6.35mm QC TAB connectors mounted on the PCB.

ACTIVE Wire plugs into QC TAB (J1) marked [MAINS , ACTIVE]

NEUTRAL Wire plugs into QC TAB (J2) marked [MAINS , NEUTRAL]

EARTH Wire plugs into QC TAB (J22) marked [MAINS , E]. For additional info refer Sect 2.3.7

The MAINS AC lead must be routed through the Enclosure entry slot adjacent the Motor Capacitor chamber and around plastic ribs forming the tortuous path before connection to the associated QC Tabs, to ensure compliance with lead pull-test requirements.

2.3.3 User Interface

An LED is used to indicate that mains power is applied to the Tek7EC. It may not be illuminated for very low line voltages.

No other direct user interface is included or required. See



Thermostat/Wall Control Interface 0 above

2.3.4 Fan Outputs

The TEK7EC allows for Single phase PSC Motor connections either with an integrated Start Capacitor or Motors requiring external Start Motor Capacitors. External Motor Capacitors can be mounted into the chamber within the TEK7EC Enclosure next to PCB assembly.

FAN MOTOR Connections - 6.35mm QC TAB connectors mounted on the PCB.

FANMotor Common lead plugs into QC TAB (J7) marked [FAN , COM]

FANMotor Run Winding lead plugs into QC TAB (J8) marked [FAN, RUN]

FANMotor Start Winding lead plugs into QC TAB (J9) marked [FAN, START]. This QC TAB (J9) also connects directly to QC TAB (J15) marked [CAP 2]. This allows for an easy connection of the Motor Capacitor to the Start Winding of FANMotor when there is no integrated Capacitor.

BYPASS QC TAB (J11) marked [FAN, BYPASS] is connected to ACTIVE via TEK7EC Power On/Off Switch and main Fuse (F1). Connect Start lead here when using a FAN Motor with integrated Start Capacitor.

FANMotor EARTH Wire plugs into QC TAB (J20) marked [FAN, EARTH]. For additional info refer Sect 2.3.7

External Start Capacitor lead plugs into QC TAB (J15) marked [CAP 2]. This QC TAB (J15) also connects directly to QC TAB (J9) marked [FAN , START]. This allows for an easy connection of the Motor Capacitor to the Start Winding of FANMotor when there is no integrated Capacitor.

The other External Start Capacitor lead plugs into QC TAB (J12) marked [CAP] which is connected to ACTIVE via TEK7EC Power On/Off Switch and main Fuse (F1).

The FAN lead must be routed through the Enclosure entry slot adjacent the Motor Capacitor chamber and around plastic ribs forming the tortuous path before connection to the associated QC Tabs, to ensure compliance with lead pull-test requirements. External Motor Capacitor, if used, and mounted within the Enclosure should have the leads routed around the rib wall to the PCB connection points or through the square cutout at top of rib wall.

Maximum FanMotor Rating recommended 240VAC 50Hz, Current 7A (Cos φ =0.4)

The control algorithm shall assume the motor has a linear speed and airflow correlation as per an axial fan. Whilst note limited to these the following motors have been performance tested

425W as per Fasco performance specification SP85189-01 RevA, Model 855BNVA-A15

625W as per Fasco performance specification SP85190-01 Rev A, Model 855BPVA-A11

750W as per Fasco performance specification SP85178-03 Rev A, Model 855BQVA-A16

900W as per Brook Crompton Betts P/L Test Results DT 85198-04 Mod 98WX054, Model 855BRVA-A11

2.3.5 Pump Output

PUMP Connections - 6.35mm QC TAB connectors mounted on the PCB.

PUMP ACTIVE Wire plugs into QC TAB (J6) marked [PUMP, ACTIVE] PUMP NEUTRAL Wire plugs into QC TAB (J5) marked [PUMP, NEUTRAL] PUMP EARTH Wire plugs into QC TAB (J21) marked [PUMP, E]. For additional info refer Sect 2.3.7

The PUMP lead must be routed through the Enclosure entry slot adjacent the Motor Capacitor chamber and around plastic ribs forming the tortuous path before connection to the associated QC Tabs, to ensure compliance with lead pull-test requirements.

Maximum Pump Rating recommended

240VAC 50Hz, Current 3A ($\cos\varphi=0.4$)



2.3.6 Auxiliary Output (Fill/Dump Valve)

FILL Water VALVE Connections – 4.75mm QC TAB connectors mounted on the PCB. Water Valve lead plugs into QC TAB (J13 or J14) marked [DUMP VALVE]. Polarity is not important.

The FILL VALVE leads must be routed through the Enclosure entry slot adjacent the Enclosure mounted Power On/Off switch and around the smaller plastic ribs forming the second tortuous path before connection to the QC Tabs. Again, this is to ensure compliance with lead pull-test requirements.

The FILL VALVE drive is designed to operate with

NYMET Water Valve : Model C202, 8VA @ 24VAC, 50Hz, typ Coil R=41ohms & L= 80mH @ 120Hz, or equivalent Valve Open Pressure Rating : 2000Kpa @ 60°C max. Valve Hold Open Voltage Ratings : 8VDC±2V@ 230mA min. Valve Open – Pull-In Voltage Pulse rating : 50VDC, 1A for 100mS.

2.3.7 Earth Connection

Earth Connections - 6.35mm QC TAB connectors mounted on the PCB. AC MAINS Earth Wire plugs into QC TAB (J22) marked [MAINS, E] PUMP Motor Earth Wire plugs into QC TAB (J21) marked [PUMP, E] FAN Motor Earth Wire plugs into QC TAB (J20) marked {FAN, EARTH]

All Earth connection QC TAB's on PCB are connected together and rated for 25A



2.4 Software Description

2.4.1 Wall Control Interface

There is provision in the software to automatically detect whether Digital Wall Control units (TEKBus) or simple analogue Wall Controls are connected to the communication lines.

If an 4Pin or 5Pin Analogue wall control is detected, the controller operates in 4 mode: Off, Pump only, Pump and Fan or Fan only as determined by the switch settings on the Analogue Wall Control. These switches impose a voltage on the Pump/Fan Control Input line of the communications cable. The fan speed is determined by the voltage measured on the Fan Input line on the communications cable as set on the Wall Control.

Pump only mode with the Analogue Wall control will operate for a minimum of 20 minutes.

Only one Analogue Wall Control can be connected, and only one Cooler Controller may be connected to an Analogue Wall Control. No other Wall Controls may be used on the same system with an Analogue Wall Control.

When connected to the Digital TEKBus based wall controls, the cooler interprets commands from these controls and adjusts the cooler devices appropriately.

2.4.2 Output Controlled Devices

2.4.2.1 Fan On/Off

This is a relay output to control the power to both fan motor start winding and phase controlled run winding via the connection to the FanMotor Common Winding connection. This is controlled from the microcontroller either from the appropriate analogue level from the Analogue Wall Control, corresponding to the fan switch or from an appropriate signal from the TEKBus, such as a Digital Wall Control.

Hard start is initiated by the Cooler Controller if the fan was off prior to the request for fan operation. After the Hard start has completed, the controller will adjust the fan to the appropriate speed as defined by the Wall Control. During Hard start, the fan will be supplied with a voltage that ramps to full or near full voltage for approximately 400 milliseconds.

A fan "Off" request from the wall control will turn off the phase control (setting speed = 0) approximately 2 seconds before turning off the fan relay.

Fan operation is delayed if Pre-Cool is required. See Pre-Cool: 2.4.2.5.2 below. There is also an additional delay if the sump requires filling. See Sump Fill Delay or Pre-Fill: 2.4.2.5.1 below.

2.4.2.2 Fan Phase Control

This output provides a phase chopped mains voltage to the fan motor run winding. The amount of phase control is adjusted according to the settings from the Wall Control. Motor speed varies in accordance with the amount of phase control applied as the effective RMS voltage applied to the fan motor is altered. The phase control output is set to zero whenever the Fan On/Off output is changed.



2.4.2.3 Dump Function

This is for those models with a dump valve (automatically operating). For other models the dump interval is set to 0 – see below. This operates by shutting the fill valve solenoid OFF. The mechanical dump valve then operates in slave fashion due to lack of hydraulic pressure in the line after the fill valve. This drains the sump of water. If the cooler is in use the sump is refilled by turning the fill valve ON after the dump time

Pump operation is suspended during the dump function and until the Sump Fill time has occurred. See the section



Pump 0 below.

Refer to 2.4.5 Installer and Service Technician Mode for default setting and modification for Digital Wall Controls.

2.4.2.3.1 Dump Time

The operation time (Dump Time) to dump the water is 60^{±1} seconds. This cannot be modified in Service or Installer Modes.

2.4.2.3.2 Dump Delay after Shutdown

The dump function operates after a period of non-use of the cooler or after a period since the pump was in use (Pump OFF time). This time delay can be modified in Installer mode to either 0^{-0+1} or $60^{\pm 1}$ minutes.

The dump function will operate, even if the fan is still in use or the cooler is in AUTO-COOL mode with both fan and pump off (temperature below setpoint). It is dependent on the time the pump has been OFF.

Refer to 2.4.5 Installer and Service Technician Mode for default setting for Digital Wall Controls.

The dump delay function does not operate when the simple analogue wall controller is connected, it is always 0⁻⁰⁺¹ minutes.

During this delay the fill valve is ON. The sump is not refilled after dumping.

2.4.2.3.3 Dump Interval or Dump Cycle

During normal cooler operation, the dump function will also operate after the selected time interval of pump operation. The Dump Interval can be selected as 0 (no dump function for those models without a hydraulic operated dump valve), 1, 2, 4, 8, 12 or 24 hours of pump operation. Tolerance of this time is ± 15 min for the first dump, and ± 1 min for subsequent dumps during continuous operation.

This time is adjusted in Installer mode to suit the local water quality.

Refer to 2.4.5 Installer and Service Technician Mode for default setting for Digital Wall Controls. The dump function does not operate when the simple analogue wall controller is connected, it is always off (dump interval is zero).

The sump is refilled after dumping to continue normal cooler operation.

2.4.2.4 Fill Valve

This operates whenever the pump is in use as controlled via the Wall Control. For exceptions on coolers with automatic dump valves see 0 above.

The Fill valve output is on by default for all coolers without the dump function option selected (models without automatic dump valves such as Enviroflow or manual dump valves) whenever the cooler is in use and the pump is required. This will allow fill valve solenoids to be fitted to these models.



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2.4.2.5 Pump

The pump operates whenever the command from the Wall Control indicates that it should be used.

2.4.2.5.1 Sump Fill Delay or Pre-Fill:

Pump operation is delayed after the fill valve first opens to allow the sump to fill with some water. This prevents pump cavitation noise.

The Sump Fill Delay duration is $60^{\pm 1}$ seconds.

This applies to when the controller thinks the sump is empty eg:

This is divided into two cases:

- Sump Fill Delay after Dumping : if the dump valve has been operated during normal running operation. This will happen automatically if the Dumping Function is enabled (Dump Interval not equal to zero). This cannot be modified in Service or Installer Modes, except inherently by enabling/disabling the Dump Function.
- Sump Fill Delay after the cooler is first switched on, before Pre-Cool. This Delay can be enabled or disabled regardless of whether Pre-Cool is enabled or not. The Sump Fill Delay can be bypassed by the consumer at the same time as the Pre-cool function is bypassed. See below. This can be modified in Service or Installer Modes, independently of the Pre-Cool or Dump Functions.

Pre-Fill will occur if the cooler had the fan running prior eg a change from vent to MANUAL-COOL or AUTO-COOL, or the water was dumped as a result of Dump after Shutdown (Pump OFF time exceeding the limit). This Pre-Fill is the same as that before pre-cool in normal operation. It is the modifiable Pre-fill in Installer mode.

The sump fill delay function does not function when the simple Analogue Wall Control is connected. Refer to 2.4.5 Installer and Service Technician Mode for default setting for Digital Wall Controls.

2.4.2.5.2 Pre-Cool:

Pre-cool (pre-wet) function operates the pump with the fan off before allowing the fan to start at the desired speed. This is after the delay to begin filling the sump as defined above.

This function is initiated by the Cooler Control

- if the cooler was previously in the "Off" state with the pump off for longer than $30^{\pm 1m}$ minutes,
- the pump and fan had not been operating for longer than $30^{\pm 1m}$ minutes or .
- the controller does not know how long since the cooler was operated (eg after power failure).

The Pre-cool function operates for $90^{\pm 1}$ seconds.

If the cooler is operating with the pump off (fan only) then the pre-cool function is not implemented, even if the pump has not been operated for longer than the maximum time of $30^{\pm 1}$ minutes.

For Digital Wall Controls, this Pre-cool function can be bypassed by the user by changing the cooler mode of operation from AUTO-COOL or MANUAL-COOL to VENT, and back to AUTO-COOL or MANUAL-COOL. Alternatively, by de-selecting AUTO-COOL or MANUAL-COOL, and then re-selecting (or turning OFF then ON again, depending on the wall control connected). This also bypasses the sump fill delay. This user operation of changing from AUTO-COOL or MANUAL-COOL and then back again must be performed within 10^{±1}seconds, or the cooler will assume it has been running on vent mode or turned off previously.

Refer to 2.4.5 Installer and Service Technician Mode for default setting for Digital Wall Controls. It can be set to 0 seconds (turned off) in Installer mode

The pre-cool function does not function when the Analogue Wall Control is connected.



2.4.3 Temperature Profile for AUTO-COOL Mode

This table shows the temperature profile of differential temperature, around setpoint, versus cooler controller response to the fan and pump control.

Value	Temperature	Fan Speed ⁽¹⁾	Pump	Temperature	Fan Speed ⁽¹⁾	Pump
from	Differential			Differential		
Wall	Decreasing			Increasing		
Control	_			_		
255	>+5.0	Max	On	>+5.0	Max	On
231-254	>+4.5	$Min + (Max-Min)^{*}(9/10)$	On	>+4.5	Min + (Max-Min)*(9/10)	On
210-230	>+4.0	Min + (Max-Min)*(8/10)	On	>+4.0	Min + (Max-Min)*(8/10)	On
189-209	>+3.5	Min + (Max-Min)*(7/10)	On	>+3.5	Min + (Max-Min)*(7/10)	On
168-188	>+3.0	Min + (Max-Min)*(6/10)	On	>+3.0	Min + (Max-Min)*(6/10)	On
147-167	>+2.5	$Min + (Max-Min)^{*}(5/10)$	On	>+2.5	Min + (Max-Min)*(5/10)	On
126-146	>+2.0	Min + (Max-Min)*(4/10)	On	>+2.0	Min + (Max-Min)*(4/10)	On
105-125	>+1.5	$Min + (Max-Min)^*(3/10)$	On	>+1.5	Min + (Max-Min)*(3/10)	On
84-104	>+1.0	Min + (Max-Min)*(2/10)	On	>+1.0	Min + (Max-Min)*(2/10)	On
63-83	>+0.5	$Min + (Max-Min)^{*}(1/10)$	On	>+0.5	Min + (Max-Min)*(1/10)	On
42-62	>+0.0	Min	On	>+0.0	Min	On
1-41	>-1.0	Min	Off	>-1.0	Off	Off
0	<-1.0	Off	Off	<-1.0	Off	Off

(1) The actual fan speed will depend on the cooler model, ie size and characteristics of motor. The algorithm only controls the phase controlled voltage level to the motor to achieve the desired speed. The voltage/power/speed curve then depends on the load and the motor characteristics.

The Max and Min values will depend on the factory or Service modified values. The method of correlating the temperature differential and fan control is a combination of both the Cooler Control and the Digital Wall control.



2.4.4 Service Technician Only Mode

Methods to access Service mode –

2.4.4.1 Digital Wall Controls.

See the product specification documents for Digital Wall Controls.

All service modes will last a maximum of $2^{\pm 1}$ minutes without a button press before the cooler resets back into normal user operating mode

2.4.4.2 Analogue Wall Control Access

Service Mode is accessed using the simple Analogue Wall Control using the following sequence :

Initial	state. Fan Off
	Pump Off
	Speed setting MAXIMUM
1	Set speed setting at MINIMUM, count 3 seconds.
	Leave Fan off
	Press pump ON
2	Set speed setting at MAXIMUM, count 3 seconds.

- Leave Fan off Press pump OFF
- 3 Set speed setting at MINIMUM, count 3 seconds. Pump off Press fan ON

Minimum fan speed setting mode:

The cooler is now in **minimum** fan speed setting mode. The Fan LED intensity will change in a pseudo flashing mode. (Slow flash). Fan will then commence running at the speed according to the speed control dial. When the service technician is satisfied with the setting, the Pump button is pressed to enter maximum fan speed mode, OR the Fan button is released to exit to normal user mode. The minimum fan speed is now stored.

Maximum fan speed setting mode:

The Fan and Pump LEDs pseudo flash to indicate the cooler is now in **maximum** fan speed setting mode. Fan will then commence running at the speed according to the speed control dial. When the service technician is satisfied with the setting, the FAN button is released. The Pump LED stops pseudo flashing. The maximum fan speed is now stored.

If the Pump button is released before the Fan button, the cooler returns to the minimum fan speed setting mode, and the dial will have to be rotated to set the appropriate minimum speed before releasing the FAN button.

The cooler returns to normal user mode without the Pump operating (The Pump switch is still depressed and the Pump LED is on).

		Wall (Control Default Values	
Parameter	Function	Analogue	Digital	Possible Values
1	Fan Minimum Speed	See Above	Adjustment of Factory Setting	> Preset Min (20 _d or 14 _h) and
		(54h or 84d)	(54h or 84d)	< Preset Max (120 _d or 78 _h)
2	Fan Maximum Speed	See Above	Adjustment of Factory Setting	< Preset Max (254 _d or FE _h) and
		(E6h or 230d)	(E6h or 230d)	> Preset Min (168 _d or A8 _h)
3	Fan Law	1	1	0 or 1

2.4.4.3 Service Mode Modifiable Parameters

The parameters are presented to the technician in this order, and parameter number displayed if the digital wall control is capable (refer to the digital wall control product specifications – see **Error! Reference source not found.**).

Parameters with possible values of 0 and one other option are either effectively Enabled or Disabled.

The "Preset" maximum and minimum fan speeds are stored in the cooler control at time of manufacture and cannot be altered. "Factory" settings of maximum and minimum fan speeds are stored separately in memory. The "Factory" values can be adjusted in Service mode, but never beyond the "Preset" values.



2.4.5 Installer and Service Technician Mode

All Installer and Service Technician modes will last a maximum of $2^{\pm 1}$ minutes without a button press before the cooler resets back into normal user operating mode

Modifiable Parameters:

		Wall Control Default Values		
Parameter	Function	Analogue	Digital	Possible Values
1	Dump Delay after shutdown	0 - Not Adjustable	$60^{\pm 1}$ minutes	$0, 60^{\pm 1}$ minutes
2	Pre-Cool	0 - Not Adjustable	90 ^{± 1} seconds	$0, 90^{\pm 1}$ seconds
3	Dump Interval	0 - Not Adjustable	0 hours (no dump)	0 (never) ,1,2,4,8,12,24 $^{\pm 15m}$ hours
4	Sump Fill Delay (Pre-Fill)	0 - Not Adjustable	$60^{\pm 1}$ seconds	$0,60^{\pm 1}$ seconds
	before Pre-Cool	_		

The parameters are presented to the Installer/Technician in this order, and parameter number displayed if the digital wall control is capable (refer to the digital wall control product specifications – see **Error! Reference source not found.** Section **Error! Reference source not found.**).

Parameters with possible values of 0 and one other option are either effectively Enabled or Disabled.

No Installer adjustments are available with the analogue wall control.

Access to installer mode is described in the digital wall control product specifications – see Error! Reference source not found. Section Error! Reference source not found.

2.4.6 Diagnostic Mode

Diagnostic mode will last a maximum of $30^{\pm 1}$ minutes without a button press before the cooler resets back into normal user operating mode

This mode is to allow installers or service technicians to operate individual functions of the cooler normally automatically controlled.

No diagnostic functions are available with the analogue wall control. The pump and fan are operated as the switches dictate. Access to diagnostic mode is described in the digital wall control product specifications – see **Error! Reference source not found.** These functions may be the next key or button operations after the parameter adjustments in Installer Mode above. See the appropriate wall control specifications.

This table describes the functions that can be controlled. The method or sequence of control is defined by the wall control.

Parameter	Function	Cooler Control Response
1	Fill Valve	Operate for $10^{\pm 1}$ minutes before operating function 2
2	Fill Valve and Pump	Operate for $20^{\pm 1}$ minutes and revert to normal user mode

Operating function 2 terminates function 1 and progresses immediately to function 2. The fan is operated using the "Vent" function as per normal user operation.



2.5 Hardware Description

2.5.1 Power Switch

This isolates power from the controller, and the outputs driven by the controller (fan, pump,valves etc) This switch is to have a rating sufficient to isolate the fan if operating. The power switch is clearly accessible from the outside of the housing. The switch rating shall be a minimum of 7A inductive load.

2.5.2 Over-current Protection

Over-current protection of the line input supply is provided by a fuse. The fuse rating is 8A slow-blow. Due to the large range of motor loads the fuse can not provide protection under all conditions. The fuse will protect against fault currents greater than 12A. The motors must be rated for continuous fault currents of up to 12A.

2.5.3 Under-voltage Protection

The controller will shutdown if the voltage level is determined to be insufficient to operate the relays.

2.5.4 Over-voltage Protection

Protection against over-voltage spikes of limited energy and duration is provided by X2 rated noise suppression capacitors and a MOVaristor. Extended time at over-voltage will result in fuse and possibly MOV rupture. No protection is provided for likes of lightning strike or supply authority voltage supply failure.

Refer to general specification and Error! Reference source not found., section Error! Reference source not found. and Voltage Range, section 3.1 below.

3 Electrical Requirements

3.1 Voltage Range

204 - 264VAC (guaranteed continuous operation) The controller will remain safe for voltages < 204VAC

3.2 Frequency

50Hz

3.3 Other

Brown out - lock out - see Under-voltage Protection section 2.5.3 above

4 Environmental Requirements

4.1 Temperature

0-60° C ambient operational

The maximum allowed temperature rise of components shall not be exceeded at an ambient temperature of 40°C 0-85° C ambient storage

4.2 Humidity

10-95% RH, non condensing

4.3 Location

Vertically mounted, with cable entry pointing down.

4.4 Other

Dust/mechanical penetration and moisture resistance to IP23. PCB contact with water is not permitted during operation.



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5 Wiring Diagram

