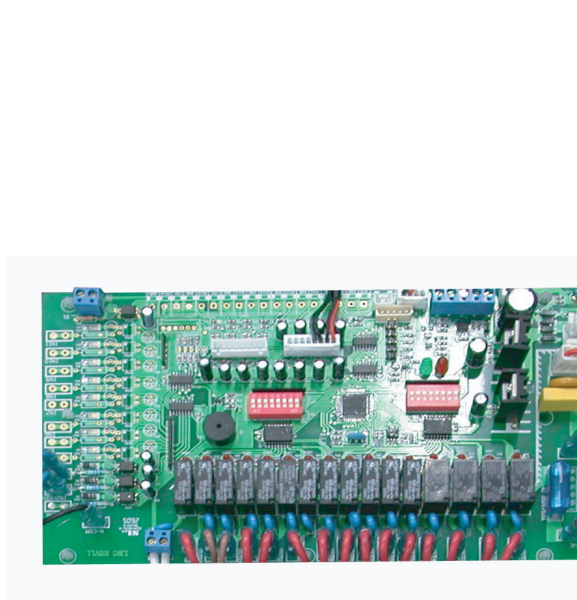


Loop Water Controller



Engineered for flexibility and performance.™

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1.0 SAFETY CONSIDERATION

Installation and maintenance should be performed by qualified technicians and installers who are familiar with local code and regulation.

1.1 Installation Recommendations

- All field wiring must be installed in accordance with the national wiring regulation.
- Ensure that the rated voltage of the unit correspond to the name plate before commencing wiring work according to the wiring diagram.
- The unit must be GROUNDED to prevent possible hazard due to installation failure.
- Never unplug any cables, printed circuit board terminal blocks, relay modules, or power plugs when power is applied.

2.0 GENERAL DESCRIPTION

2.1 General Introduction

The Water Loop Controller (LWC) is designed for Water Source Heat Pump water loop control system. This device can be operated as a stand-alone system (without Smart Manager) or a combination of networking control system (with Smart Manager). The system can operate according to 12 sets of pre-set data to open or close the heat rejection or heat addition stage for controlling the water loop operation.



Figure 1: Loop Water Controller Internal View

2.2 LWC Features

The LWC is a microprocessor-based control panel designed to provide sophisticated control and monitoring of the loop water temperature of a water source heat pump system.

Primary control features offered by the LWC are as follows:

- **Loop Circulating Pump Control**
Allows 2 loop circulating pumps with manual or auto lead lag control where pump operation is interchangeable.
- **Heat Rejection & Addition Output Stages**
There is a total of 12 sets of data output can be pre-set as heat addition or heat rejection stages.
- **Sensor:**
 - i) Outdoor (OD) Air Temperature Sensor
 - ii) Water Temperature Sensor2 types of sensors are used to sense the OD air temperature and water temperature.

- **Alarm/Indication**

An additional alarm/indication output can be used to give a signal if there is an error during the system operation. Attention is needed when the alarm/indication is activated.

A buzzer is installed in the LCD panel and will be activated when there is an error occurs.

- **Emergency Shutdown (EM1, EM2)**

The Loop Water Controller monitors the water loop pump status and high/low loop temperature conditions. Should the water loop pump fail or loop temperature exceeds the predefined limits, the LWC will close a set of contacts and put all units into the emergency shutdown mode (with network controller).

- **Remote On/Off Switch:**
 - i) On/Off Switch
 - ii) Network Controller

The LWC On/Off system is by using either i) On/Off Switch, or ii) Network Controller system, to start/stop the operation of the LWC system.

- **Remote Reset Input**

The remote reset input switch is used to reset the system when error occurred without restart the power supply of the system.

- **Water Flow Switch Input**

A water flow switch input is used to detect the availability of water supply to the system.

- **High and Low Water Temperature Protection**

A water sensor is used to measure the water temperature. It protects the system by sending error signal and shutoff the system when water temperature is too high/low.

- **Pre-heat & Pre-cool**

The system is able to provide protection for the temperature exceeding the too high/low temperature when the system is Off.

- **Outdoor (OD) Air Reset**

The heat addition On/Off limit setting of the system is able to be increased in a response to a drop in the OD air temperature.

- **LCD Panel**

The LCD panel interface consists of LCD screen and keypad. All operating conditions, system alarms and errors, water loop system setting, and test menu can be monitored and set from this LCD panel.

- **Password Protection**

Password entry is needed for authority to change the setting and configuration of the system.

2.3 Operation Condition

The operating condition of LWC is as the following:

Temperature : 0-50°C
Relative Humidity : 0-95%
Input Voltage Limits : 198~264VAC 50 Hz

2.4 Installation Site

The LWC is designed for indoor installation only (not water proof). Make sure there is sufficient space for service and maintenance.

Avoid installation at the following location:

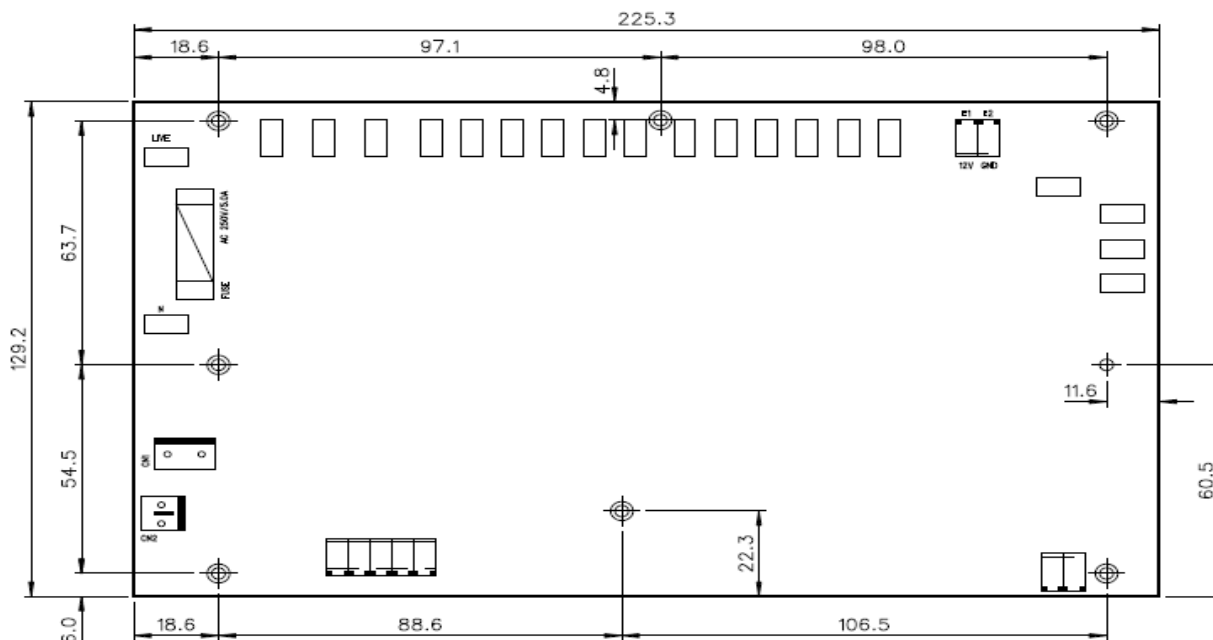
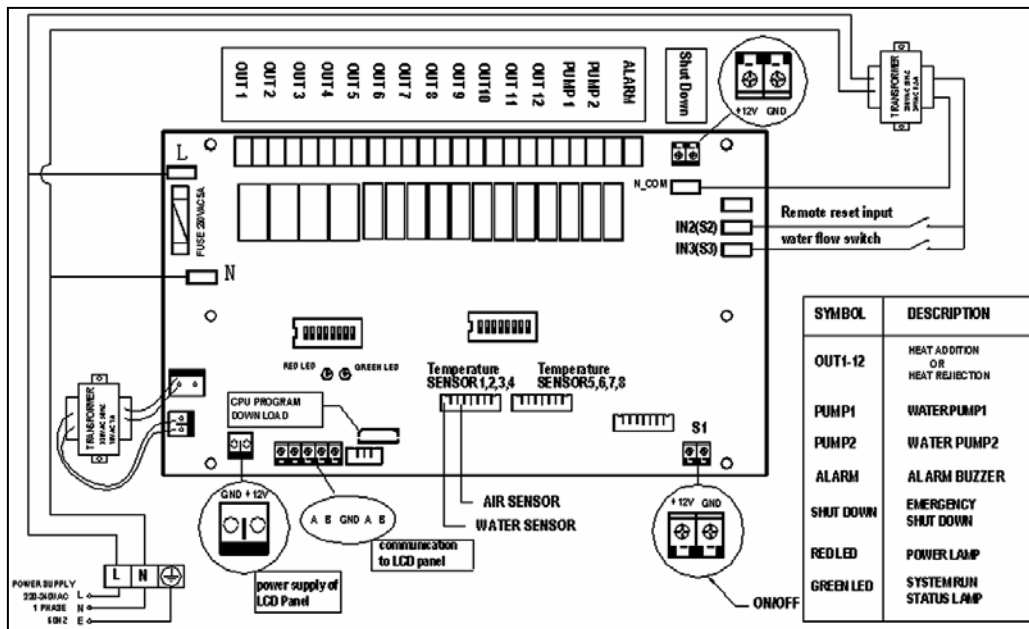
- Exposure to shocks, heat, rain, water leakage or direct sunlight
- Any source of electromagnetic pollution
- Installation on uneven vertical surface

3.0 HARDWARE DESCRIPTION

3.1 LWC Hardware Outlook

Hardware contacts specification:

S1	: 12Vdc, Ground
S2, S3	: 24Vac
Output 1 – 12	: 220~240Vac, 3A
Pump 1&2	: 220~240Vac, 3A
Alarm	: 220~240Vac, 3A
EM1	: 12Vdc
EM2	: Ground



Note: Unit in mm

Figure 2: LWC Hardware Outlook

3.2 LWC Control Box

Figure 3 shows the outlook and dimension of LWC control box.



Figure 3: LWC Outlook

Figure 4 shows the internal structure of LWC.



Figure 4: LWC Internal View

3.3 Sensor

3.3.1 Water Temperature Sensor

Connect the 2 wires of water temperature sensor to the terminal block T1, T1.

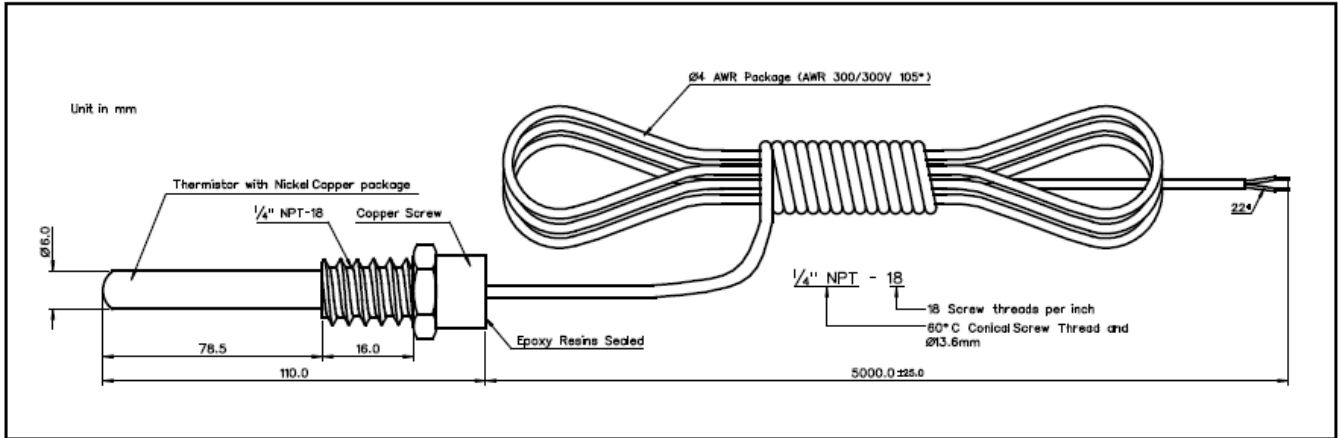


Figure 5: Water Temperature Sensor

3.3.2 Outdoor Air Temperature Sensor

Connect the 2 wires of outdoor air temperature sensor to the terminal block T2, T2.

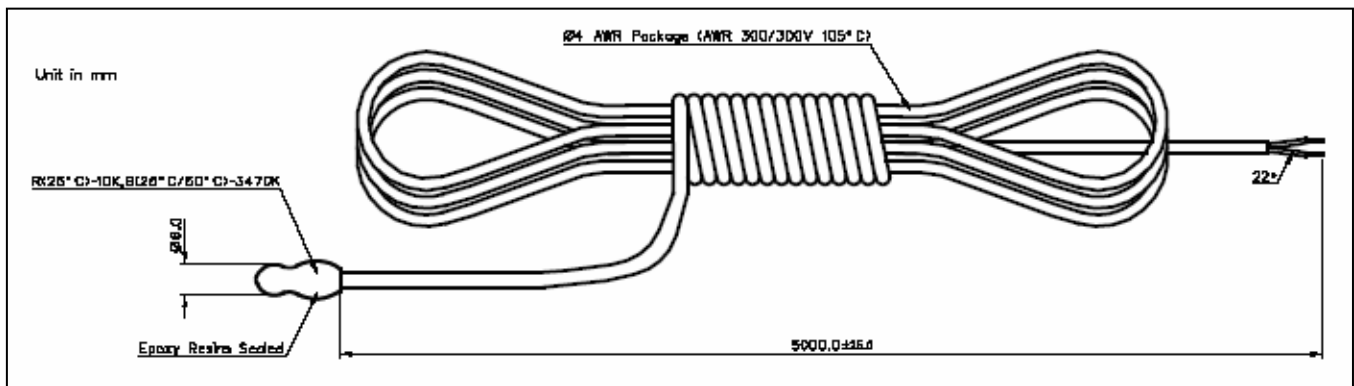


Figure 6: Outdoor Air Temperature Sensor

3.4 Default Setting Reset Switch

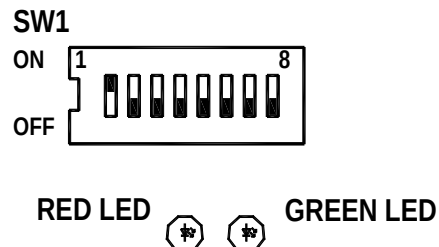


Figure 7: Dip Switch

The SW1 switch on top of the red and green led on the LWC is used to reset the system setting to the default setting. Two conditions are applied:

- After the power supply is Off, switch the switch 1 to the ON position. Turn On the power supply and it will set the system setting to the default setting.
- After the power supply is Off, switch the switch 1 to the OFF position. Turn On the power supply and it will set the system setting to the previous memory.

3.5 LCD Panel Key Explanations

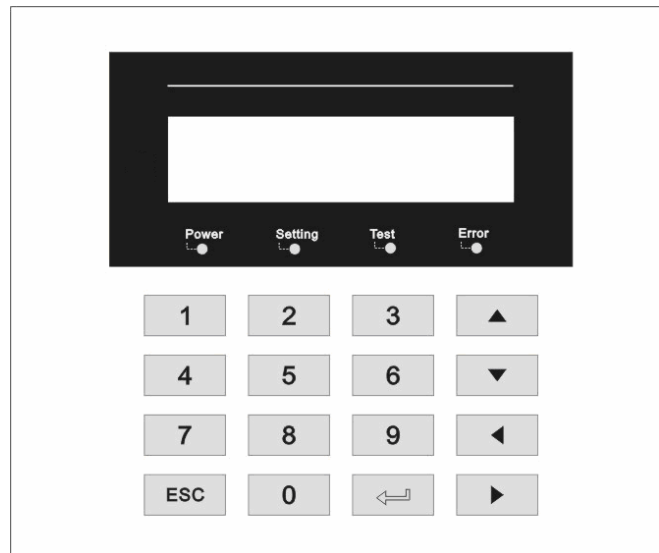
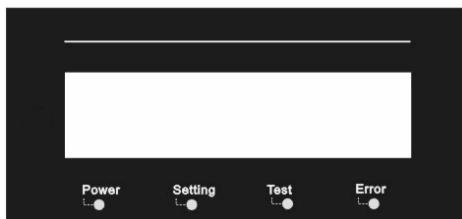


Figure 8: LCD Panel



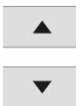
This display screen show two rows of data where each row contains 16 characters.



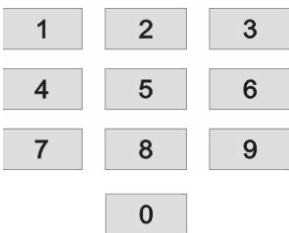
Enter key is used to execute the navigation instruction.



Esc key is used to cancel the navigation instruction/ back to previous menu.



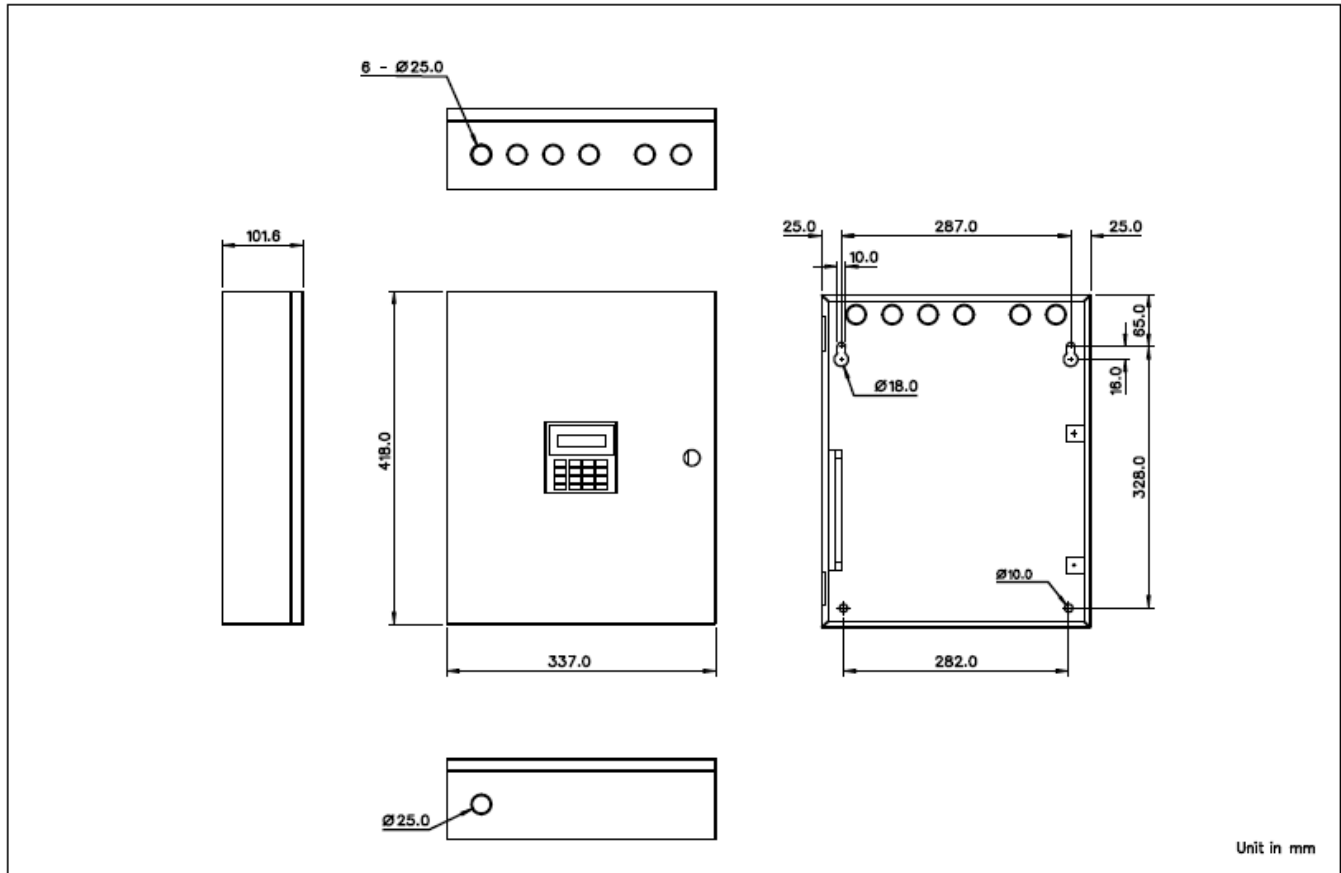
The 2 arrows keys permit page scrolling, item selection and modifying the selected value.



The numbered keys are used to change the parameter setting.

4.0 INSTALLATION/WIRING INSTRUCTION

4.1 LWC Control Box Installation



Caution

The LWC is designed for indoor installation only (not water proof). Make sure there is sufficient space for service and maintenance.

Avoid installation at the following location:

- Exposure to shocks, heat, rain, water leakage or direct sunlight
- Any source of electromagnetic pollution
- Installation on uneven vertical surface

The installation of the LWC control box:

With Smart Manager (optional)

- Connect the terminal in the control box with the necessary wires to Smart Manager according to APPENDIX A.

12Vdc Adaptor

- A 12Vdc adaptor is needed to supply the voltage to the Smart Manager if power supply (12Vdc, Ground) from LWC is not wired to Smart Manager.

4.2 Water Temperature Sensor Installation

The installation of the water temperature sensor is as the figure 10. The sensing element is at the end point of the sensor. The end point of the sensor should be placed at the center of the pipe as counter to the water flow. Do not place the end point of the sensor near or touching the pipe hose.

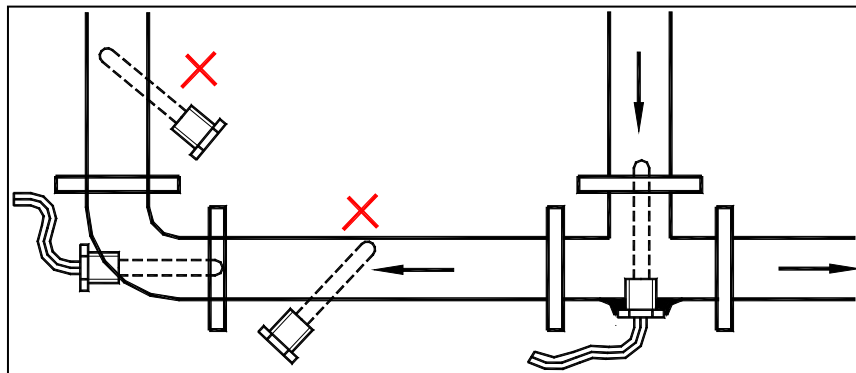


Figure 10: Water Temperature Sensor Installation

4.3 Outdoor Air Temperature Sensor Installation

The installation of the OD air temperature sensor is needed to be placed at the open space. Do not place the sensor near the heating/cooling object which will affect the reading of the sensor.

4.4 Sticker Control Box

The sticker of wiring diagram and external wires connection guidelines are placed inside the LWC control box in order to have the correct guidance for installation. Both of the diagrams are shown in APPENDIX B.

5.0 SYSTEM SPECIFICATION

5.1 System On/Off

Using remote On/Off switch (S1):

- i) Standard Switch (without Smart Manager)
- ii) Smart Manager

to start or stop the operation of the LWC.

The LWC shall function as:

- System On if the remote On/Off switch (S1) is in closed circuit.
- System Off if the remote On/Off switch (S1) is in opened circuit.

5.2 Pump control function

In automatic mode:

Once the system is On, the LWC will initialize the lead pump when there is a requirement for heat rejection or addition output to operate and also during pre-cool or pre-heat operation. 10 seconds after the lead pump is On, checking will be done on water flow switch. This checking is done for 15 seconds (adjustable). If the water flow switch detects no water flow, the lead pump will be Off, error is shown on display, alarm output is triggered and buzzer will be activated. Then the lag pump will be On. 10 seconds after the lag pump is On, the checking on the water flow switch will be done for 15 seconds (adjustable). If after 15 seconds the water flow switch still cannot detects water flow, the system will be Off, error is shown on display, alarm output is triggered and buzzer will be activated. Then, the emergency shut down (EM1, EM2) will be activated.

The lead pump-lag pump sequence is automatically changed based on pump switch cycle time (adjustable).

In manual mode:

Only one pump can operate if the pump is set as manual mode. Either one of the pump can be set to operate when the system is On. The checking on the water flow is the same as the lead pump in automatic mode. This mode will not have lead – lag cycle.

If the water problem is verified and fixed, user can reset the remote switch (S2) and the pump will resume operation. Alternatively it can be reset by power supply.

5.3 12 stages of heat rejection and heat addition control

A total of 12 stages of heat rejection and heat addition control can be established according to pre-set temperature range. The heat rejection and heat addition temperature setting shall be distributed in sequence and continuous (difference by 1°C). The Table 1 and Table 2 below show an example of stages temperature setting.

Condition of the following example setting:

- i. 4 heat addition output stages (adjustable) and 8 heat rejection output stages (adjustable).
- ii. Heat reject and add stage temperature differential of 3°C (adjustable)
- iii. Heat addition stage temperature: 20 °C (adjustable)
Heat rejection stage temperature: 30 °C (adjustable)

Table 1: System setting temperature (°C)

Output Stages	On Limit Setting (°C)	Off Limit Setting (°C)	Function
1# (OUT1)	17	20	Heat add stage 4
2# (OUT2)	18	21	Heat add stage 3
3# (OUT3)	19	22	Heat add stage 2
4# (OUT4)	20	23	Heat add stage 1
5# (OUT5)	30	27	Heat reject stage 1
6# (OUT6)	31	28	Heat reject stage 2
7# (OUT7)	32	29	Heat reject stage 3
8# (OUT8)	33	30	Heat reject stage 4
9# (OUT9)	34	31	Heat reject stage 5
10# (OUT10)	35	32	Heat reject stage 6
11# (OUT11)	36	33	Heat reject stage 7
12# (OUT12)	37	34	Heat reject stage 8

Table 2: System setting temperature (°F)

Output Stages	On Limit Setting (°F)	Off Limit Setting (°F)	Function
1# (OUT1)	59	64	Heat add stage 4
2# (OUT2)	61	66	Heat add stage 3
3# (OUT3)	63	68	Heat add stage 2
4# (OUT4)	65	70	Heat add stage 1
5# (OUT5)	85	80	Heat reject stage 1
6# (OUT6)	87	82	Heat reject stage 2
7# (OUT7)	89	84	Heat reject stage 3
8# (OUT8)	91	86	Heat reject stage 4
9# (OUT9)	93	88	Heat reject stage 5
10# (OUT10)	95	90	Heat reject stage 6
11# (OUT11)	97	92	Heat reject stage 7
12# (OUT12)	99	94	Heat reject stage 8

Example of description:

From the Table 1 above, if OUT4 is set as Heat addition stage1, OUT3 – OUT1 will be automatically recognized as Heat addition stage2 – Heat addition stage4. In the mean time, OUT5 – OUT12 will be automatically be set as Heat reject stage1 – Heat reject stage8.

The temperature differential (3 °C) will determine the On and Off limit setting by 3 °C difference.

On and Off limit setting shall be arranged in the form from the lowest to the highest.

Every changing (On/Off) of stages will have a delay time of 15 seconds (adjustable), before the next changes.

This system setting applied the same for, temperature unit: degree Celsius (°C) and degree Fahrenheit (°F).

5.4 Pre-heat & Pre-cool

This pre-cool & pre-heat operates when the system is Off (S1 open circuit). This function is activated according to the too high/low temperature set. The operation and setting of this function is described as the following:

Pre-cool/heat temperature differential: 5°C (fixed)

When S1 is open circuit

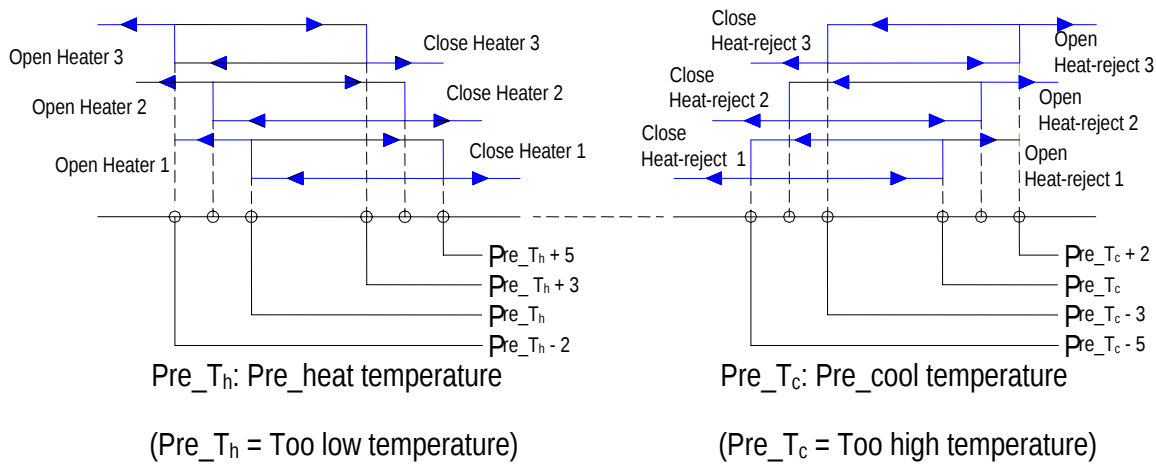


Figure 11: Pre-heat & Pre-cool

When the temperature reaches the too high/low temperature (adjustable), this function will be activated, the pump and output stages will On accordingly. The output stages will Off accordingly as well with reference to the temperature differential of 5°C (fixed). The table below shows an example of this function.

For example:

Too high temperature: 43°C (adjustable)

Too low temperature: 10°C (adjustable)

No. of heating stage: 3 (adjustable)

No. of cooling stage: 3 (adjustable)

Stage	On Temp (°C)	Off Temp (°C)
Heating stage 3	8	13
Heating stage 2	9	14
Heating stage 1	10	15
Cooling stage 1	43	38
Cooling stage 2	44	39
Cooling stage 3	45	40

5.5 Outdoor (OD) Air Reset

Outdoor air reset will be incorporated into the current LWC. It will increase the heat addition stages set point to increase the unit performance in heating mode. The heat addition set points shall be able to be increased in a response to a drop in outside air temperature. The set point increase shall be operator defined from 1°C (2°F) to 5°C (10°F) in response to a drop in outside air temperature from 16°C (61°F) to -17°C (1°F). This ramp shall be linearly proportional.

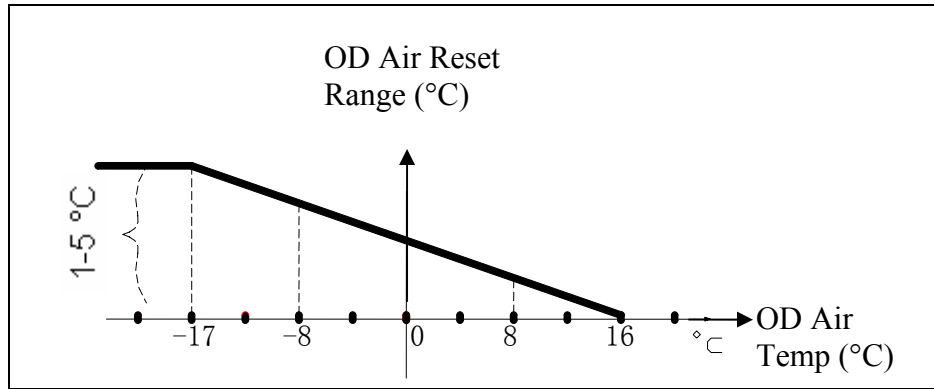


Figure 12: Outdoor Air Reset

5.6 Emergency Protection

1) Low/Too Low temperature

If the water flow temperature is lower than 13°C (adjustable), the alarm will be activated for 20 times/minute; if the water flow temperature is lower than 10°C (adjustable), the alarm will be activated for 100 times/minute, the emergency switch, EM1 and EM2 signal will be sent out. The alarm/buzzer will activate continuously.

2) High/Too High temperature

If the water flow temperature is higher than 40°C (adjustable), the alarm/buzzer signal will be activated for 20 times/minute; if the water flow temperature is higher than 43°C (adjustable), the alarm/buzzer signal will be activated for 100 times/minute, the emergency switch, EM1 and EM2 will send signal to Off the system, with the alarm activates 100 times/minute continuously.

3) Loss of Flow

For automatic mode pump control, the lead pump is On first. The water flow switch will start to check for water flow after 10s. If it gives an error signal after checking of 15 seconds (adjustable), the lead pump will be Off with the alarm activates 20 times/minute, and the lag pump will On. If the water flow switch give an error signal after another checking of 15 seconds (adjustable), the lag pump will be Off and the emergency switch, EM1 and EM2 will send signal to Off the system, with the alarm activates 100 times/minute continuously.

4) Sensor Error

If either the Water Supply sensor or OD Air sensor or both of them gives an error signal (due to disconnection or not in function) during the system operates, the alarm will activate 20 times per minute. The unit will be Off. All heat rejection and heat addition stages shall be shut down.

5.7 Error Description:

ERR Description	LCD Panel Code
Water Sensor Error	Water Sensor ERR
Low Water Temperature	Water Low Temp
High Water Temperature	Water High Temp
Water Pump1 Flow Failure	Flow Error Pump1
Water Pump2 Flow Failure	Flow Error Pump2
Too High Water Temperature Shutdown	Hi Temp Shutdown
Too Low Water Temperature Shutdown	Lo Temp Shutdown
Outdoor Sensor Failure	OD Sensor ERR

The table above shall be referred when there is any errors occur during the operation of the system. Error code will be shown differently at different hardware display whenever there is an error occurs. The “Error” LED on the LCD panel will blink when there is any error occurs.

Water Sensor Error/Outdoor Sensor Failure

– There will be an error signal and unit will be Off when the water sensor and OD sensor fail to operate during the system On. The alarm will Off and unit will return to normal operation once the water sensor and OD sensor error is fixed.

Low Water Temperature/High Water Temperature

– There will be an error signal when the water temperature is in the *warning temperature (adjustable). The unit is still in normal operation with the alarm signal on. Once the water temperature is falls in the preset range again, the alarm is Off and unit will operate normally.

Too High Water Temperature Shutdown/Too Low Water Temperature Shutdown

– The LWC will send out the emergency shutdown (EM1, EM2) and alarm signal when the water temperature is in the **maximum allowable temperature (adjustable). The unit is still in normal operation with the alarm signal on. Once the water temperature falls in the preset range again, the alarm and EM1, EM2 will be Off. The unit will operate normally. Too High temperature must be higher than High temperature setting and Too Low temperature must be lower than the Low temperature setting.

Water Pump1 Flow Failure/Water Pump2 Flow Failure

– The error can be eliminated by the reset On/Off switch and system will be reset. The alarm signal can be Off by pressing any button on the LCD panel, but error code will keep appearing on the hardware display until reset On/Off switch is set.

* Warning temperature is the water temperature between the low water temperature (adjustable) and the too low water temperature (adjustable); and the temperature between high water temperature (adjustable) and too high water temperature (adjustable).

** Maximum allowable temperature is the water temperature lower than the too low water temperature (adjustable); and the temperature higher than the too high water temperature (adjustable).

6.0 OPERATION USER MANUAL

6.1 Starting

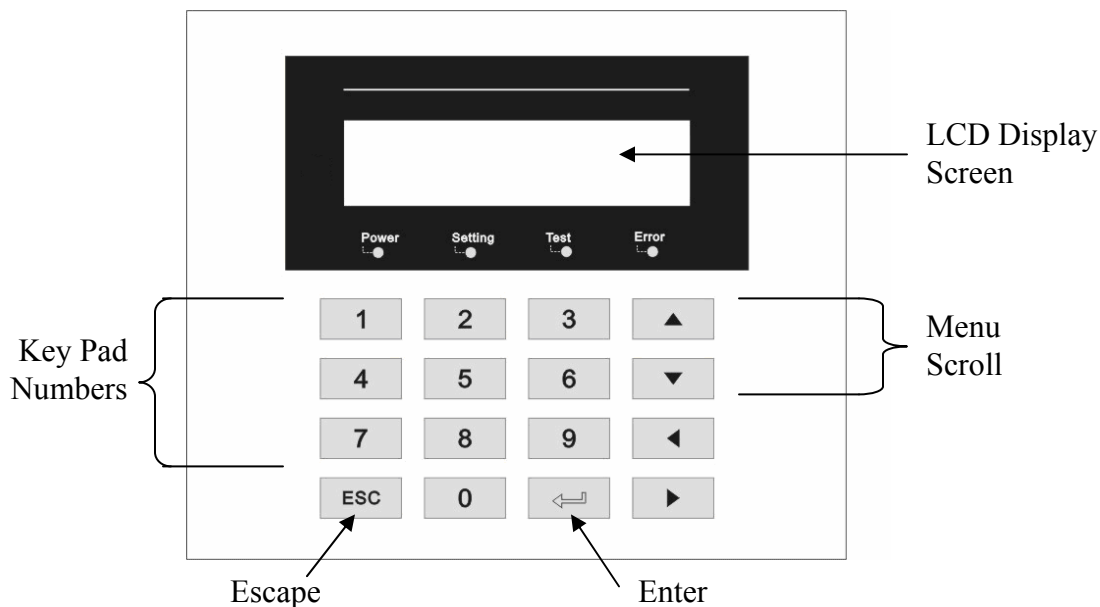


Figure 13: LCD Panel Description

When the power supply is On, "Power" LED (green) is lighted.
Start-up screen for 3 second, the information shown in display screen:

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LWC Controller

After showing the start-up screen, the screen proceeds with the default display. The default display is the water temperature and the highest stage of heat rejection or addition. User can enter into the main menu and 4 sub menus. The menu display will return to default display if it remained idle for 30 seconds.
The default display shows:

Water Temp: xx °C
Cooling Stage xx (or Heating Stage xx)

6.2 Operation Menu

6.2.1 Main Menu

By pressing the  button, the display screen will shows main menu item, as below.

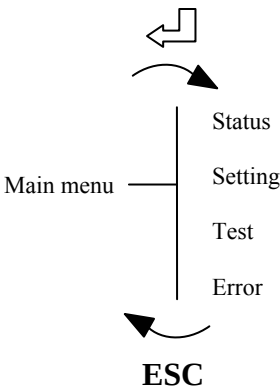


Figure 14: Main Menu Display

In all the menu structure, press the  button to proceed with the next level of menu, press “ESC” button to return to the previous menu.

Press  button when there is a setting condition for the item, press the ▲ or numbers button to select the item. Press the  button again to set the changes.

The setting menu can only be modified when the system (S1) is Off.

When the specific parameter to be set is out of the range, the panel will notify the operator by popup message.

The following pages show the structure of every main menu.

6.2.2 Status Menu

In “Status” menu the screen displays the following:

“Power” LED (green colour) is On;

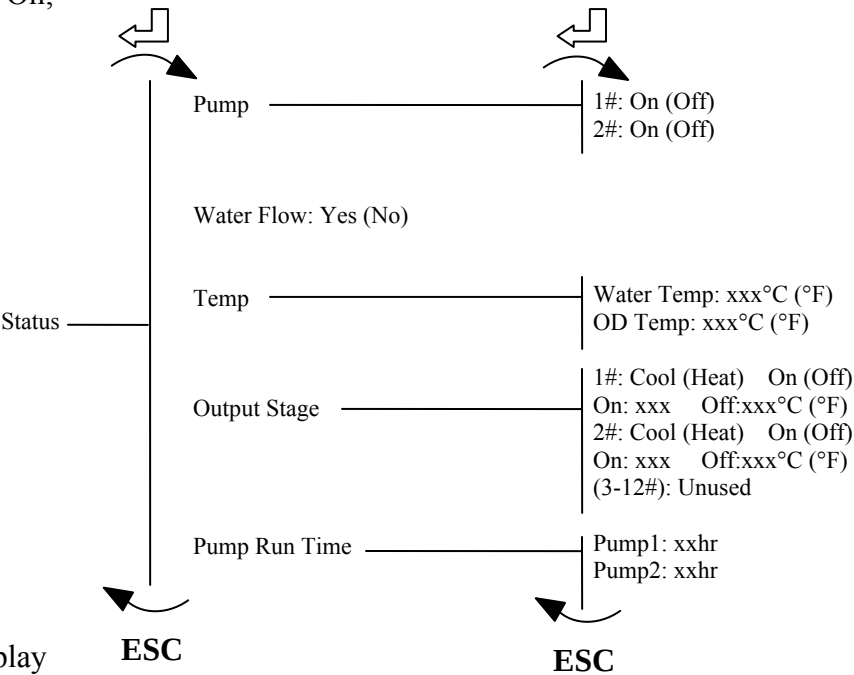


Figure 15: Status Menu Display

User can view the system condition according the structure shown in the figure 15.

6.2.3 Password Protection:

4 digits password entry is needed to enter and change “Setting” and “Test” menu. The default password is 8888. Password access is denied when there is more than 3 times of invalid password keyed in. It will automatically return to the default display after pressing the “Enter” button or after 3 seconds. It will also prohibit the user from accessing the “Setting” and “Test” menu for 10 minutes. If user forgets the password, the password can be reset by pressing the button behind the LCD panel. Password recovered to default 8888.

6.2.4 Setting Menu

When LWC system is operating, user can only view the detail setting but cannot made changes in this sub menu.
In “Setting” menu the screen displays the following:
“Setting” LED (red colour) is On;

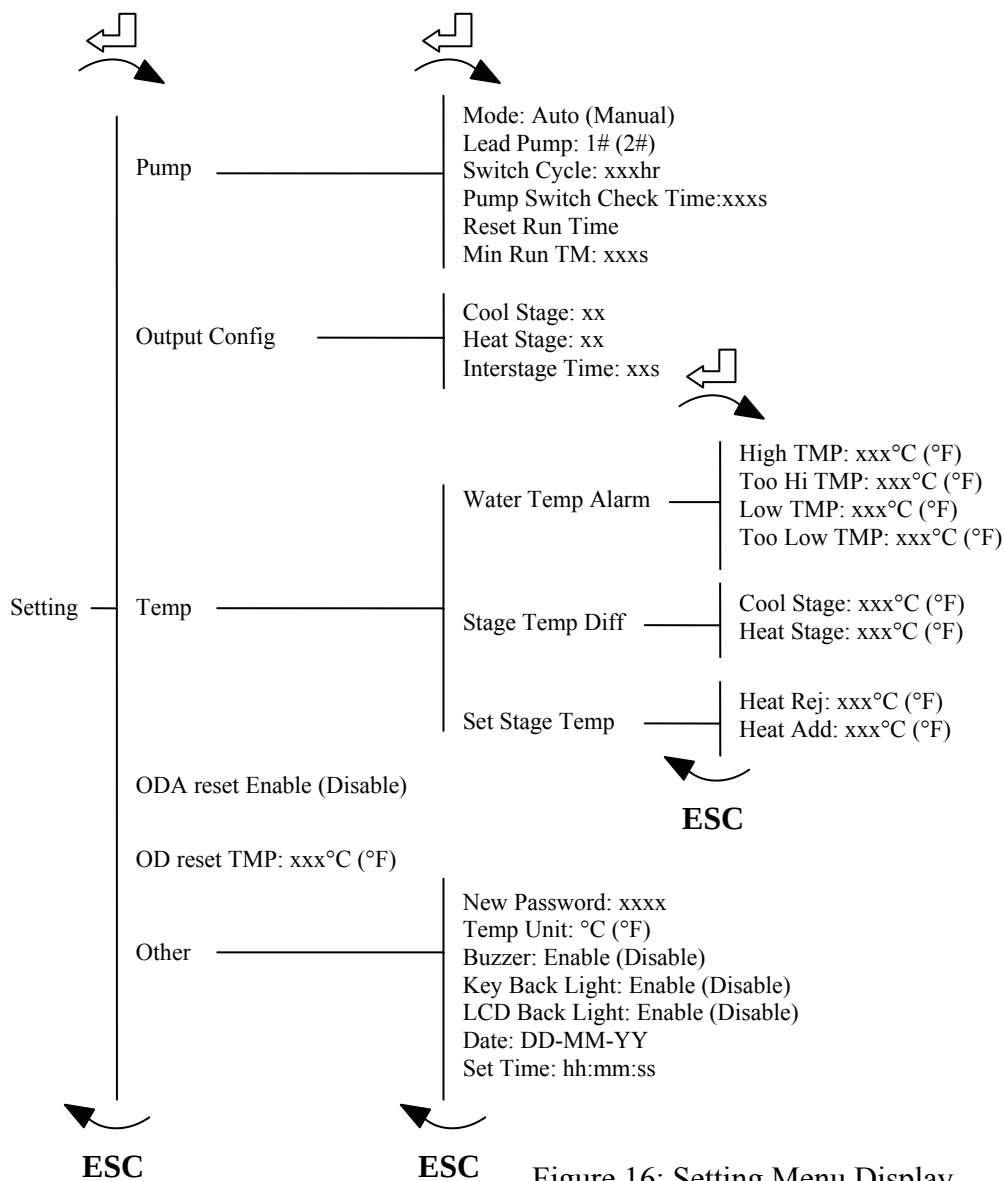


Figure 16: Setting Menu Display

Description of the “Setting” menu structure:

Setting

>Pump

- >Mode:Auto The lead lag cycle of the lead and lag pump operation is activated.
- >Mode: Manual
Only the lead pump is activated in the operation.
- >Lead Pump: 1#/2#
The first or second pump can be set as lead pump in the operation.
- >Switch Cycle: xxxhr
The time period for a pump to operate until another pump switch to operate.
- >Pump Switch Check Time:
The time to check the water flow after pump is On for 10s.
- >Reset Run Time
To reset the record of the total pump run time to 0 hour.
- >Min Run TM: xxxs
The minimum time required for a pump to operate.

Setting

>Output Config

- >Cool Stage:xx
- >Heat Stage:xx
To set the number of heat rejection (cool) or addition (heat) stage for the system operation
- >Interstage Time:xxx
The time delay between each stage before is start to operate.

Setting

>Temp

- >Water Temp Alarm
 - >High TMP: xxx°C/°F
Water temperature point to warn the user (system still On) of high water temperature.
 - >Too Hi TMP: xxx°C/°F
Maximum allowable water temperature before EM1,EM2 and Alarm output is triggered.
 - >Low TMP: xxx°C/°F
Water temperature point to warn user (system still On) of low water temperature.

>Too Low TMP: xxx°C/°F

Minimum allowable water temperature before system shut EM1,EM2 and Alarm output is triggered.

>Stage Temp Diff

>Cool Stage: xxx°C/°F

>Heat Stage: xxx°C/°F

The temperature difference between On and Off of a particular stage.

>Set Stage Temp

>Heat Rej: xxx°C/°F

>Heat Add: xxx°C/°F

It is the first heat/cool stage temperature 'On' setting. (Refer to Appendix C for commissioning sheet)

Setting

>ODArsetEnable/Disable

To enable/disable the Outdoor Air Reset function.

Setting

>ODresetTMP: xxx°C/°F

The range of temperature to be set for heat addition that refers to the outdoor air temperature. It can only be set when the 'ODArset' is enable.

Setting

>Other

>New Password: xxxx

To set a new password (4 digits).

>Temp Unit: °C/°F

To set the temperature unit.

>Buzzer: Enable/Disable

To enable/disable the buzzer on LCD panel.

>Key Back Light: Enable/Disable

To enable/disable the LCD panel key back light.

>LCD Back Light: Enable/Disable

To enable/disable LCD panel screen back light.

>Set Date: DD-MM-YY

To set the date for the LWC system.

>Set Time: hh:mm:ss

To set the time for the LWC system.

6.2.5 Test Menu

In “Test” menu the screen displays the following
“Test” LED (orange colour) is On;

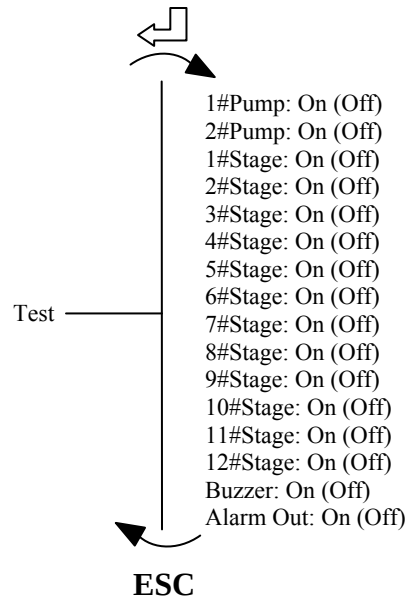


Figure 17: Test Menu Display

The LWC provides the Test menu to check on the operation of the system. The Test menu must be operated only when the system is Off or dry run. Under the testing menu, the operation of the system is prohibited. The display returns to default display when it is idle for 3 minutes or by pressing the ESC button.

6.2.6 Error Menu

In “Error” menu the screen displays the following
“Error” LED (red colour) is On;

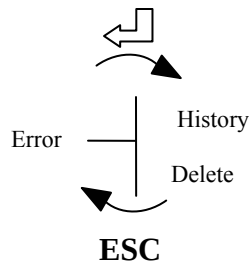


Figure 18: Error Menu Display

In the “Error” menu, a maximum of 10 errors is recorded. User can delete all the errors recorded in this menu.

6.3 Operation Limits

Description		Lower Limit		Default		Upper Limit	
Pump: Auto/Manual		NA		Auto		NA	
Lead Pump		NA		1#		NA	
Pump Switch Cycle (Auto)		8hr		88hr		168hr	
Water flow detection check time after 1st pump On (Pump Switch Check Time)		15s		15s		60s	
Pump Minimum Run Time		30s		40s		240s	
Number of Heat Reject Stage		0		8		12	
Number of Heat Add Stage		0		4		12	
Heat Add/Reject Interstage Time		10s		15s		200s	
Password		NA		8888		NA	
Temperature Unit		NA		°C		NA	
Buzzer		NA		Disable		NA	
Key Back Light		NA		Disable		NA	
LCD Back Light		NA		Disable		NA	
		Temp unit (°C)			Temp unit (°F)		
		Lower Limit	Default	Upper Limit	Lower Limit	Default	Upper Limit
High Temperature		30°C	40°C	44°C	86°F	104°F	111°F
Too High Temperature (emergency shutdown)		31°C	43°C	45°C	87°F	109°F	113°F
Low Temperature		6°C	13°C	18°C	42°F	55°F	64°F
Too Low Temperature (emergency shutdown)		5°C	10°C	17°C	41°F	50°F	62°F
Stage Temperature Differential		1°C	3°C	5°C	2°F	6°F	10°F
Stage Temperature	Heat Add Stage	7°C	20°C	43°C	44°F	64°F	109°F
	Heat Reject Stage	7°C	30°C	43°C	44°F	86°F	109°F
OD Air Reset Temperature		1°C	5°C	5°C	2°F	10°F	10°F

7.0 SERVICE AND TROUBLESHOOTING GUIDE

7.1 Service

Service should be performed by authorized dealer or qualified contractor.

Caution

- Do not attempt to do any service or maintenance when the unit is operating.
- Off the main power supply before doing maintenance.
- Unauthorized modification of the unit is not allowed.

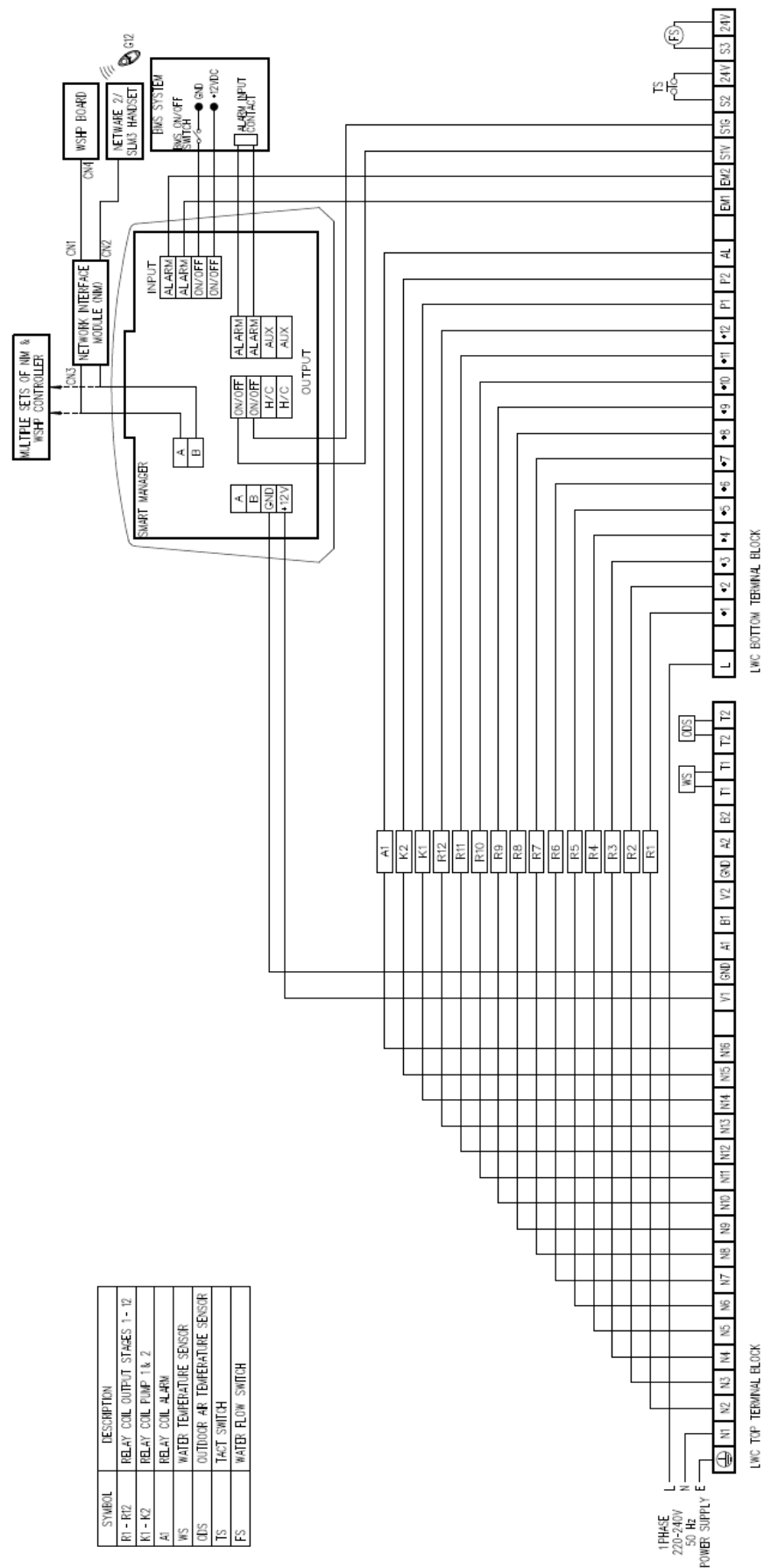
7.2 Troubleshooting Guide

Trouble shooting must be performed by authorized dealer or qualified contractor.

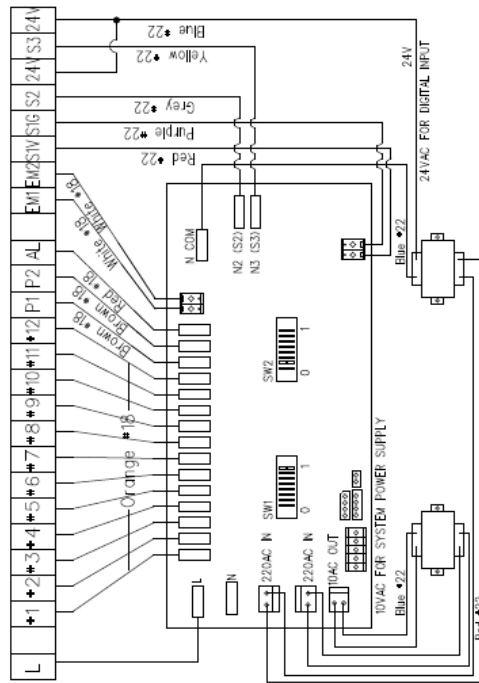
Fault	Check Point
LWC cannot start	• Check power supply plug • Check wiring and S1 contact connection • Circuit breaker or fuse tripped/blown
No display on LCD screen or LCD keypad not in function	• Check wiring and contact connection • Restart power supply
Alarm is not in function	• Check wiring and contact connection • Check alarm condition
Sensor Error	• Check wiring and contact connection • Check sensor condition
Sensor temperature not accurate	• Wiring length (resistance) affects the reading
Pump not in operation	• Water temperature too high/low • Check water flow switch & water supply valve • Check piping condition • Check pump internal wiring connection
Pump not switching	• Check pump setting: Set pump in Auto mode
Heat add/reject stages not in function or Operation not according to system setting	• Check wiring and contact connection • Check output configuration setting: Set output configuration accordingly • Check cooler/cooling tower and heater/boiler condition
OD Air Reset not in function	• Check OD Air Reset setting: • Enable the OD Air Reset item

Kindly contact the dealer if none of these checks solve the problem.

APPENDIX A

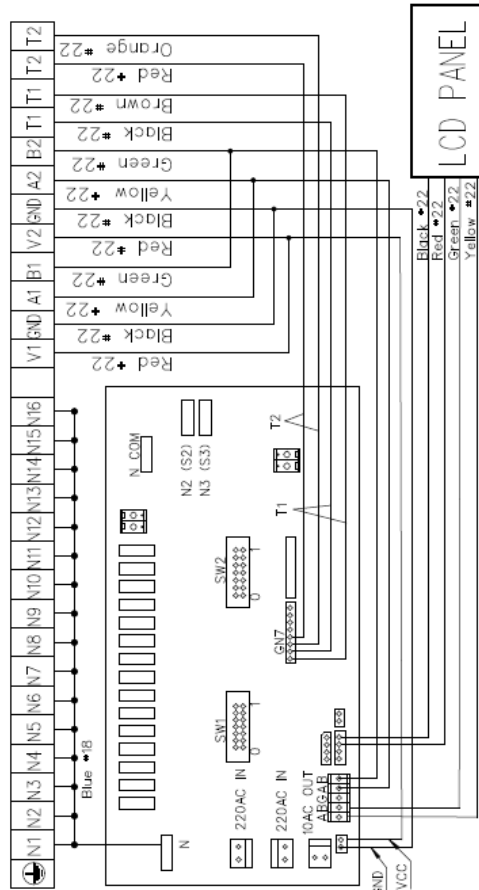


APPENDIX B



The operating condition of LWC is as the following :

Temperature : 0 - 50°C
 Relative Humidity : 0 - 95%
 Input Voltage Limits : 198-264Vac 50Hz



OUTPUT			
Symbols	Description	Voltage	
#1- #12	Output stages 1-12	220-240 Vac, 3A	
P1, P2	Pump 1 & Pump 2	220-240 Vac, 3A	
AL	Alarm	220-240 Vac, 3A	
EM1	Emergency contact 1	12Vdc	
EM2	Emergency contact 2	Ground	
INPUT			
Symbols	Description	Voltage	
S1	ON/OFF	12Vdc, Ground	
S2	Reset Switch	24Vac	
S3	Water Flow Switch	24Vac	
SENSOR			
Symbols	Description		
T1, T1	Water Temperature Sensor		
T2, T2	Outdoor Air Temperature Sensor		

APPENDIX C

LWC Commissioning Sheet

Date: _____

Person Incharge: _____

Pump	Mode:	Auto / Manual
	Lead Pump:	1 / 2
	Switch Cycle:	hr
	Switch Check Time:	s
	Min Run Time:	s

Output Configuration	Heat Add:	stages
	Heat Reject:	stages
	Interstage Time:	s

Temperature Unit: °C / °F

Stage Temperature	Heat Add:	
	Heat Reject:	

Temperature Differential	Cool Stage:	
	Heat Stage:	

Temperature Differential	Cool Stage:	
	Heat Stage:	

Output Relay	Heat Add Stage	Heat Reject Stage	Temperature differential	
			On Limit Setting	Off Limit Setting
1				
2				
3				
4				
5				
6				
7				
8				
9				

Setting Range:

Low Temp	High Temp
Too Low Temp (Shutdown)	Too High Temp (Shutdown)

OD Air Reset: Enable / Disable

OD Air Reset Temp: _____