

WaterGard™ - LLC water level control

INSTALLATION - OPERATION

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READ AND UNDERSTAND THIS MANUAL PRIOR TO OPERATING OR SERVICING THIS PRODUCT.



contents

Note

This manual contains vital information for the proper installation and operation of the WaterGard ready LLC controls. Carefully read the manual before installation or operation and follow all instructions. Save this manual for future reference.

Description	4
Operation.....	6
WaterGard System.....	6
Configuration 1: Single WaterGard Unit, Single LLC	7
Configuration 2A: Two to Five WaterGard Units, Single LLC	8
Configuration 2B: Six to Thirteen WaterGard Units, Single LLC	9
Configuration 3: Single WaterGard Unit, Multiple LLCs	11
Configuration 4A: Two to Five WaterGard Units, Multiple LLCs	12
Configuration 4B: Six to Thirteen WaterGard Units, Multiple LLCs.....	12
Control Panel Internal Components	14
Electrode Probe Assembly	14
WaterGard and LLC Time Delay Feature	15
Water Makeup Function	15
HAND-OFF-AUTO Switch.....	15
Troubleshooting	16
Configuration Schematics	17

The following defined terms are used throughout this manual to bring attention to the presence of hazards of various risk levels, or to important information concerning the life of the product.

Warning

Indicates presence of a hazard which can cause severe personal injury, death or substantial property damage if ignored.

Caution

Indicates presence of a hazard which will or can cause personal injury or property damage if ignored.

Note

Indicates special instructions on installation, operation or maintenance which are important but not related to personal injury hazards.

introduction

These instructions are intended to assure that field connections are completed properly and the control system operates for the maximum time possible. Since product warranty may depend on your actions, please read these instructions thoroughly prior to operation. Additionally separate WaterGard and LLC user manuals are provided with additional detail for those specific products.

If you have questions about the operation and/or maintenance of this control system and you do not find the answers in this manual, please contact your Marley sales representative.

Warning

Hazard of electrical shock or burn. Be sure to turn off power to the panel before servicing. If working on equipment out of site of panel disconnect, lockout using standard lockout procedure.

Safety First

The Marley control system uses UL listed components installed in accordance with the NEC (National Electric Code). The location of the cooling tower and field installation of the control system can affect the safety of those responsible for installing, operating or maintaining the tower and controls. However, since SPX Cooling does not control the tower location, or field installation, we cannot be responsible for addressing safety issues that are affected by these items.

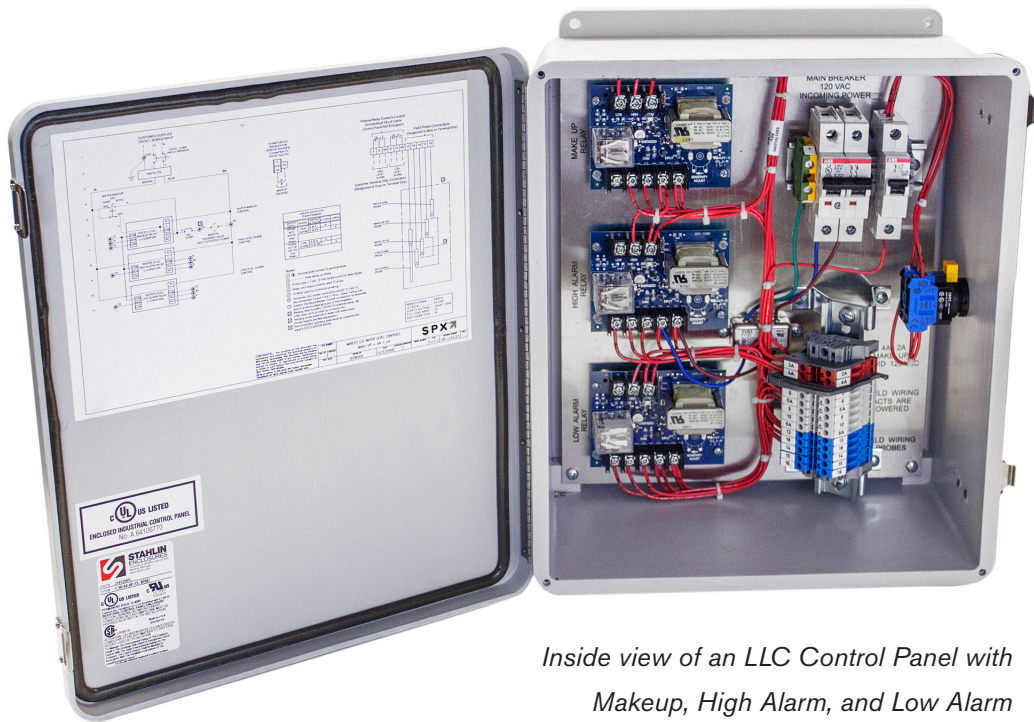
Warning

The following safety issues should be addressed by those responsible for installation, maintenance or repair of the tower and controls:

- Provide access to the control panel (including user supplied main disconnect/branch circuit protection)
- Ground all electrical control circuits to national and local electrical codes
- Sizing and protection of branch circuits feeding the control panel to national and local electrical codes
- Only qualified and trained technicians should install, maintain and service cooling tower electrical equipment

These are only some of the safety issues that may arise in the design and installation process. SPX Cooling strongly recommends that you consult a safety engineer to be sure that all safety considerations have been addressed. Other safety issues are addressed in literature supplied with your tower. You should closely review the literature prior to installing, maintaining or repairing your cooling tower.

description



Inside view of an LLC Control Panel with Makeup, High Alarm, and Low Alarm

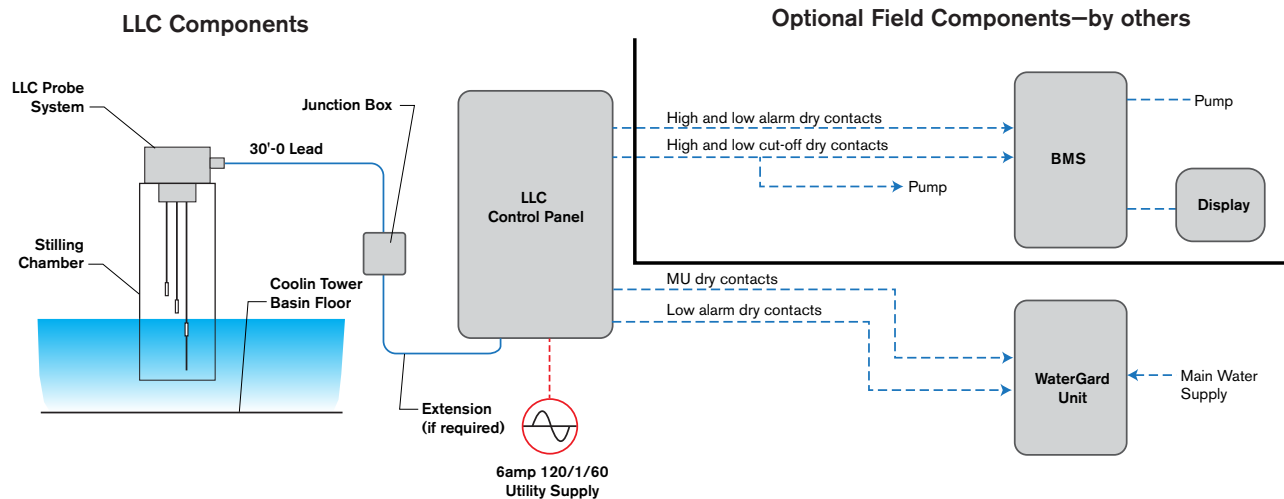
Note: If the control panel is furnished with a water makeup selector switch, the switch will be located on the right-hand side of the enclosure.

HAND Position: LLC calls for makeup water **OFF** Position: The Makeup system is disabled

AUTO: Makeup will operate depending on water level

description

SYSTEM DIAGRAM



The Liquid Level Control systems are used to accomplish five different functions:

- Water Makeup
- Low Water Alarm
- Low Water Cutoff
- High Water Alarm
- High Water Cutoff

The most common application of a water level control system is water makeup. The system regulates the amount of water in the tower basin and keeps it within normal operating levels. This makeup system is used to control a remotely installed water solenoid valve. When the water level drops below a prescribed, preset level, the solenoid valve is energized by the control system to fill the basin to its proper level.

High and low water alarms can be utilized to give warnings associated with abnormal operating water levels. To provide indication of these types of alerts, the control system provides dry contacts to interface with various digital control systems or can be connected to user supplied alarm indicators to signal when corrective action is required.

Low-water cutoffs are commonly used to protect pumps from operating without sufficient water. When used in unattended operating environments, the low-water cutoff is configured to shut the pump off, thus preventing costly repairs. Dry contacts can be wired directly in series with pilot duty controls or to digital control systems to initiate the shutdown of protected equipment during low-water situations.

The Marley LLC water level system integrated with the Marley WaterGard inlet filtration system maintains healthy cooling tower water conditions by removing dissolved solids in the makeup water.

installation

Operation

The LLC (liquid level controller) water level control system consists of special purpose liquid sensing relays on one or more individual circuit cards connected to a probe assembly located in the cold-water basin. Each circuit card contains one relay and external signaling is provided by each of these special purpose cards. The individual relay provides a Form C normally open and normally closed dry contact. The circuit card activates the relay using through-the-water continuity by way of the sensor probes located in the cold-water basins.

Utilizing water's ability to conduct electricity, a circuit path can be established between one probe tip and the other. Current conducts through the water across probes of dissimilar length. One common or reference probe is present in all systems and is shared by all functions of the system. This probe can be identified by its length. It is the longest probe in the system and extends the deepest into the basin. The current path is routed between all other probe tips and this one common. When the water level reaches the shorter probe, the circuit is completed and the relay responds, opening or closing relay contacts corresponding to a fixed level. For low-level control, the ground reference probe and a slightly shorter probe provide the circuit. When the water level drops below this tip, the continuity between this probe and the reference probe is interrupted and the relay contacts transfer. The distance from the tip of the low probe to the floor of the basin determines the minimum water level that is allowed before an alarm is produced or pump operation is interrupted.

WaterGard ready LLC systems have terminal connections to communicate the makeup and low-level alarm status. The three card version of the LLC control panel has Makeup, High level alarm and Low level alarm status signals connected to the basin probes. When adjusting water event levels on LLC systems, hanging probes are manually adjusted up or down within the metal stilling chamber.

WaterGard System

WaterGard is a membrane-based dissolved-solids rejection unit. The systems are built on factory assembled skids that consist of a controller, pump, sediment filter, membrane filters and an optional granular activated carbon (GAC) fluidized bed for pre-treatment.

WaterGard units require two signals from the LLC system:

- Demand for makeup water
- Status indicator of Low-Level alarm

installation

Status signals provided on the LLC system at clearly marked terminal blocks allow for easy connection by the system installer. When the LLC generates a water makeup signal, the WaterGard system opens the water supply solenoid and activates an internal pump to filter water for the tower basin. Should the LLC system activate the low level alarm contacts, the WaterGard will activate a second solenoid that bypasses the membranes for faster water makeup capability to maintain proper water collection basin depth for the tower to run effectively. The WaterGard system offers flexibility in connecting the Makeup and Low Alarm Signal from the cooling tower LLC. This can be achieved either by connecting directly to the WaterGard terminals per **Figure 1** or by using PANDUIT connectors that extend from the water filter system panel.

Another configuration of WaterGard integration with the LLC system is with LLC instrumentation integrated into multi-function controls like the Marley All in One (AIO), CoolBoost controls without a PLC, Single Point Power Connection (SPPC) or other controls arrangements that have more functionality than a stand-alone LLC. When the WaterGard with LLC units are incorporated into multi-function controls, the panel enclosure environmental rating will be the same as the multi-function control.

Configuration 1– Single WaterGard Unit - Single LLC

Principle of operation: When a single liquid level controller is connected to a single WaterGard unit, water makeup is controlled by WaterGard control systems. Two sets of dry contacts are present in each LLC panel, one connection for makeup status to the WaterGard, a second connection for low alarm/ bypass status to the WaterGard if low alarm is activated. In a single cooling tower arrangement a basin makeup water solenoid will not be required in the water piping between the LLC and the WaterGard unit.

Wiring and plumbing connections: Refer to the **Configuration 1** schematic at the end of this manual.

Note

The solenoid terminals in the LLC panel will not be connected. The water basin supply pipe is directly connected to the WaterGard outlet.



installation

Single Cooling Tower LLC – Single WaterGard Unit

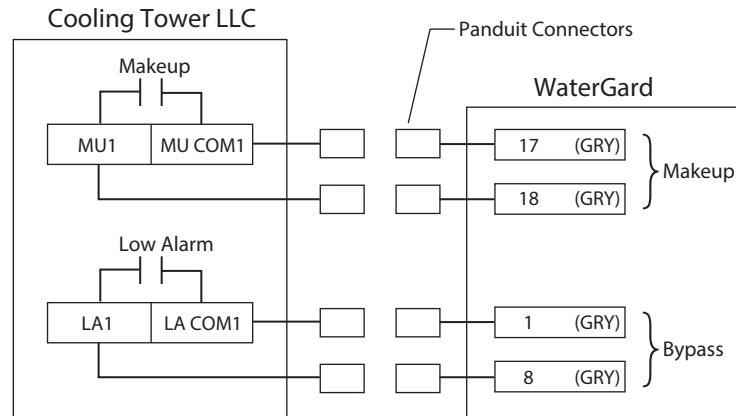


Figure 1

Note

Refer to Figure 1 for all Configuration terminal designations.

Configuration 2A—Two to Five WaterGard Units - Single LLC

Principle of operation: When a single liquid level controller is connected to multiple (five or less) WaterGard units, water makeup is provided by all of the WaterGard units at the same time. Up to five sets of dry contacts are present in each LLC control panel. One of these single sets from the LLC panel will connect with the corresponding points in one of the WaterGard units. This technique will allow for five sets of contacts for makeup water and five sets for low water level alarm. In this arrangement the cooling tower basin water makeup solenoid will not be required in the water piping between the LLC and the WaterGard units.

installation

LLC Terminal	WaterGard 1 Terminal	WaterGard 2 Terminal	WaterGard 3 Terminal	WaterGard 4 Terminal
Double end arrow indicates the connection between the two terminal blocks				
MU1	↔ Makeup			
MU COM1	↔ Makeup			
LA1	↔ Bypass			
LA COM1	↔ Bypass			
MU2	↔ Makeup			
MU COM2	↔ Makeup			
LA2	↔ Bypass			
LA COM2	↔ Bypass			
MU3	↔ Makeup			
MU COM3	↔ Makeup			
LA3	↔ Bypass			
LA COM3	↔ Bypass			
MU4	↔ Makeup			
MU COM4	↔ Makeup			
LA4	↔ Bypass			
LA COM4	↔ Bypass			

Table 1

Wiring and plumbing connections: Refer to **Table 1** and **Configuration 2A** schematic at the end of this manual.

This connection pattern can be duplicated for up to five WaterGard units.

Water basin supply is directly connected to WaterGard outlet.

Configuration 2B—Six to Thirteen WaterGard Units - Single LLC with Expansion Relay

Principle of operation: When a single liquid level controller is connected to multiple (more than five) WaterGard units, water makeup is provided by all of the WaterGard units at the same time. Five sets of dry contacts are present in each LLC control panel and an expansion relay box is available that can be powered from the primary LLC controller to support an additional four WaterGard units. Should it be necessary to control more than ten WaterGard units, a total of two additional external relay boxes can be added. Each additional relay box allows for the control of up to four additional WaterGard units. Consult your Marley Sales representative if a system requires more than thirteen WaterGard units powered from a single LLC device. In this arrangement the cooling tower basin water makeup solenoid will not be required in the water piping between the LLC and the WaterGard units.



installation

LLC Terminal	WaterGard 1 Terminal	WaterGard 2 Terminal	WaterGard 3 Terminal	WaterGard 4 Terminal	WaterGard 5 Terminal	External Relay Box	WaterGard 6 Terminal	WaterGard 7 Terminal
Double end arrow indicates the connection between the two terminal blocks								
MU1	↔ Makeup							
MU COM1	↔ Makeup							
LA1	↔ Bypass							
LA COM1	↔ Bypass							
MU2	↔ Makeup							
MU COM2	↔ Makeup							
LA2	↔ Bypass							
LA COM2	↔ Bypass							
MU3	↔ Makeup							
MU COM3	↔ Makeup							
LA3	↔ Bypass							
LA COM3	↔ Bypass							
MU4	↔ Makeup							
MU COM4	↔ Makeup							
LA4	↔ Bypass							
LA COM4	↔ Bypass							
MU5	↔ Makeup							
MU COM5	↔ Makeup							
LA5	↔ Bypass							
LA COM5	↔ Bypass							
LA COIL	↔ LA COIL							
2A	↔ 2A							
MU COIL	↔ MU COIL							
2A	↔ 2A							
						MUX1	↔ Makeup	
						MU COMX1	↔ Makeup	
						LAX1	↔ Bypass	
						LA COMX1	↔ Bypass	
						MUX2	↔ Makeup	
						MU COMX2	↔ Makeup	
						LAX2	↔ Bypass	
						LA COMX2	↔ Bypass	

Table 2

Wiring and plumbing connections: Refer to **Table 2** and **Configuration 2B** schematic at the end of this manual.

Water basin supply is directly connected to WaterGard outlet.

installation

Configuration 3—Single WaterGard Unit - Multiple LLCs

Principle of operation: When multiple cooling towers each having an individual LLC connected to a single WaterGard unit, the individual cooling tower's local water makeup solenoid valve will control the flow of makeup water into the cooling tower water basin from the WaterGard header pipe at each individual cooling tower. Makeup and low alarm/bypass status are connected in a daisy chain method to activate demand for cooling tower makeup water. Both connections will route through the closest cooling tower LLC unit to the WaterGard unit.

LLC 1 Terminal	LLC 2 Terminal	LLC 3 Terminal	WaterGard Terminal
Double end arrow indicates the connection between the two terminal blocks			
MU1	→ MU1 ←	→ MU1 ←	→ Makeup
MU COM1	→ MU COM1 ←	→ MU COM1 ←	→ Makeup
LA1	→ LA1 ←	→ LA1 ←	→ Bypass
LA COM1	→ LA COM1 ←	→ LA COM1 ←	→ Bypass

Table 3

Wiring and plumbing connections: Refer to **Table 3** and the **Configuration 3** schematic at the end of this manual.

installation

Configuration 4A—Two to Five WaterGard Units - Multiple LLCs

Table 4 includes three LLCs and four WaterGard units. This scheme can be repeated for up to five WaterGard units in the system.

Wiring and plumbing connections: Refer to **Table 4** and **Configuration 4A** schematic at the end of this manual.

LLC 1 Terminal	LLC 2 Terminal	LLC 3 Terminal	WaterGard 1 Terminal	WaterGard 2 Terminal	WaterGard 3 Terminal	WaterGard 4 Terminal
Double end arrows indicate the connection between the two terminal blocks						
MU1	←→ MU1	←→ MU1	→ Makeup			
MU COM1	←→ MU COM1	←→ MU COM1	→ Makeup			
LA1	←→ LA1	←→ LA1	→ Bypass			
LA COM1	←→ LA COM1	←→ LA COM1	→ Bypass			
MU2	←→ MU2	←→ MU2		→ Makeup		
MU COM2	←→ MU COM2	←→ MU COM2		→ Makeup		
LA2	←→ LA2	←→ LA2		→ Bypass		
LA COM2	←→ LA COM2	←→ LA COM2		→ Bypass		
MU3	←→ MU3	←→ MU3			→ Makeup	
MU COM3	←→ MU COM3	←→ MU COM3			→ Makeup	
LA3	←→ LA3	←→ LA3			→ Bypass	
LA COM3	←→ LA COM3	←→ LA COM3			→ Bypass	
MU4	←→ MU4	←→ MU4				→ Makeup
MU COM4	←→ MU COM4	←→ MU COM4				→ Makeup
LA4	←→ LA4	←→ LA4				→ Bypass
LA COM4	←→ LA COM4	←→ LA COM4				→ Bypass

Table 4

installation

Configuration 4B–Six to Thirteen WaterGard Units - Multiple LLCs

Wiring and plumbing connections: Refer to **Table 5** and **Configuration 4B** schematic at the end of this manual.

LLC 1 Terminal	LLC 2 Terminal	LLC 3 Terminal	WG 1 Terminal	WG 2 Terminal	WG 3 Terminal	WG 4 Terminal	WG 5 Terminal	Expansion Relay Box 1	Expansion Relay Box 2	Expansion Relay Box 3	WG 6 Terminal	WG 7 Terminal		
Double end arrow indicates the connection between the two terminal blocks														
LA COIL	←							→ LA COIL						
2A	←							→ 2A						
MU COIL	←							→ MU COIL						
2A	←							→ 2A						
	LA COIL	←							→ LA COIL					
	2A	←							→ 2A					
	MU COIL	←							→ MU COIL					
	2A	←							→ 2A					
		LA COIL	←							→ LA COIL				
		2A	←							→ 2A				
		MU COIL	←							→ MU COIL				
		2A	←							→ 2A				
MU1	↔	MU1	↔	MU1	←	→ Makeup								
MU COM1	↔	MU COM1	↔	MU COM1	←	→ Makeup								
LA1	↔	LA1	←	→	LA1	←	→ Bypass							
LA COM1	↔	LA COM1	↔	LA COM1	←	→ Bypass								
MU2	↔	MU2	↔	MU2	←	→ Makeup								
MU COM2	↔	MU COM2	↔	MU COM2	←	→ Makeup								
LA2	↔	LA2	↔	LA2	←	→ Bypass								
LA COM2	↔	LA COM2	↔	LA COM2	←	→ Bypass								
MU3	↔	MU3	↔	MU3	←	→ Makeup								
MU COM3	↔	MU COM3	↔	MU COM3	←	→ Makeup								
LA3	↔	LA3	↔	LA3	←	→ Bypass								
LA COM3	↔	LA COM3	↔	LA COM3	←	→ Bypass								
MU4	↔	MU4	↔	MU4	←	→ Makeup								
MU COM4	↔	MU COM4	↔	MU COM4	←	→ Makeup								
LA4	↔	LA4	↔	LA4	←	→ Bypass								
LA COM4	↔	LA COM4	↔	LA COM4	←	→ Bypass								
MU5	↔	MU5	↔	MU5	←	→ Makeup								
MU COM5	↔	MU COM5	↔	MU COM5	←	→ Makeup								
LA5	↔	LA5	↔	LA5	←	→ Bypass								
LA COM5	↔	LA COM5	↔	LA COM5	←	→ Bypass								
								MUX1	↔	MUX1	↔	MUX1	←	→ Makeup
								MU COMX1	↔	MU COMX1	↔	MU COMX1	←	→ Makeup
								LAX1	↔	LAX1	↔	LAX1	←	→ Bypass
								LA COMX1	↔	LA COMX1	↔	LA COMX1	←	→ Bypass
								MUX4	↔	MUX4	↔	MUX4	←	→ Makeup
								MU COMX4	↔	MU COMX4	↔	MU COMX4	←	→ Makeup
								LAX4	↔	LAX4	↔	LAX4	←	→ Bypass
								LA COMX4	↔	LA COMX4	↔	LA COMX4	←	→ Bypass

Table 5

installation

Control Panel Internal Components

WaterGard ready LLC control panels are built to UL and cUL standards and are designed to provide the numerous configurations needed for cooling tower applications. All panels include a main circuit breaker to protect the entire panel. When the system includes a water makeup circuit an additional circuit breaker is provided along with a HAND-OFF-AUTO to control the mode of operation. The additional circuit breaker provides an exclusive control circuit for a 120VAC water solenoid valve. High and low circuit relay cards and the appropriate terminal connections comprise the rest of the components necessary for the specific configuration. The raised terminal strip provides easy access to make the connections of the water probe assembly.

Stainless Steel Electrode Probe Assembly

The electrode probe tips are stainless steel suspended from a noncorrosive PVC enclosure box with 30 feet of wire for each probe. A galvanized or stainless steel stilling chamber is installed around the probes to calm the water for accurate readings.



installation

WaterGard and LLC Time Delay Feature

The LLC provides a bypass command to the WaterGard unit when a low water level alarm is initiated and maintains the bypass mode for 20 second after the water level is above the alarm setpoint. This technique allows the WaterGard unit to accomplish a rapid water replacement in the cooling tower basin.

Once the time delay expires the system provides makeup water until it reaches the makeup off setpoint.

Water Makeup Function

The LLC is designed with a dedicated circuit breaker for direct connection to a 120VAC makeup water solenoid valve when one exists between the WaterGard unit and the cooling tower basin. This added feature allows installation without having to provide an additional power circuit to energize the solenoid. A solenoid between the WaterGard unit(s) and the cooling tower basin is not necessary when one only one basin is receiving the filtered water as in Configurations 1, 2A and 2B. The makeup solenoid wiring should be connected to terminals 2A and 4A as represented on the control's specific wiring diagram.

Purpose and Function of the HAND-OFF-AUTO Switch

Located on the right side of the control panel is a HAND-OFF-AUTO switch. This switch is used primarily at cooling tower startup and in maintenance procedures where the tower basin is empty or has been drained. When the tower water basin needs to be manually filled, the switch is placed in the HAND position. This selection bypasses the probe assembly's feedback and directly energizes the solenoid valve connected to the water supply. Once the cooling tower basin is filled, the switch is placed in the AUTO position to allow the adjusted probe assembly to monitor and sustain the proper operating level. Placing the switch in the OFF position completely interrupts any monitoring or fill action normally provided by the LLC control panel. For normal cooling tower operation the HAND-OFF-AUTO switch must be positioned in the AUTO mode.



installation

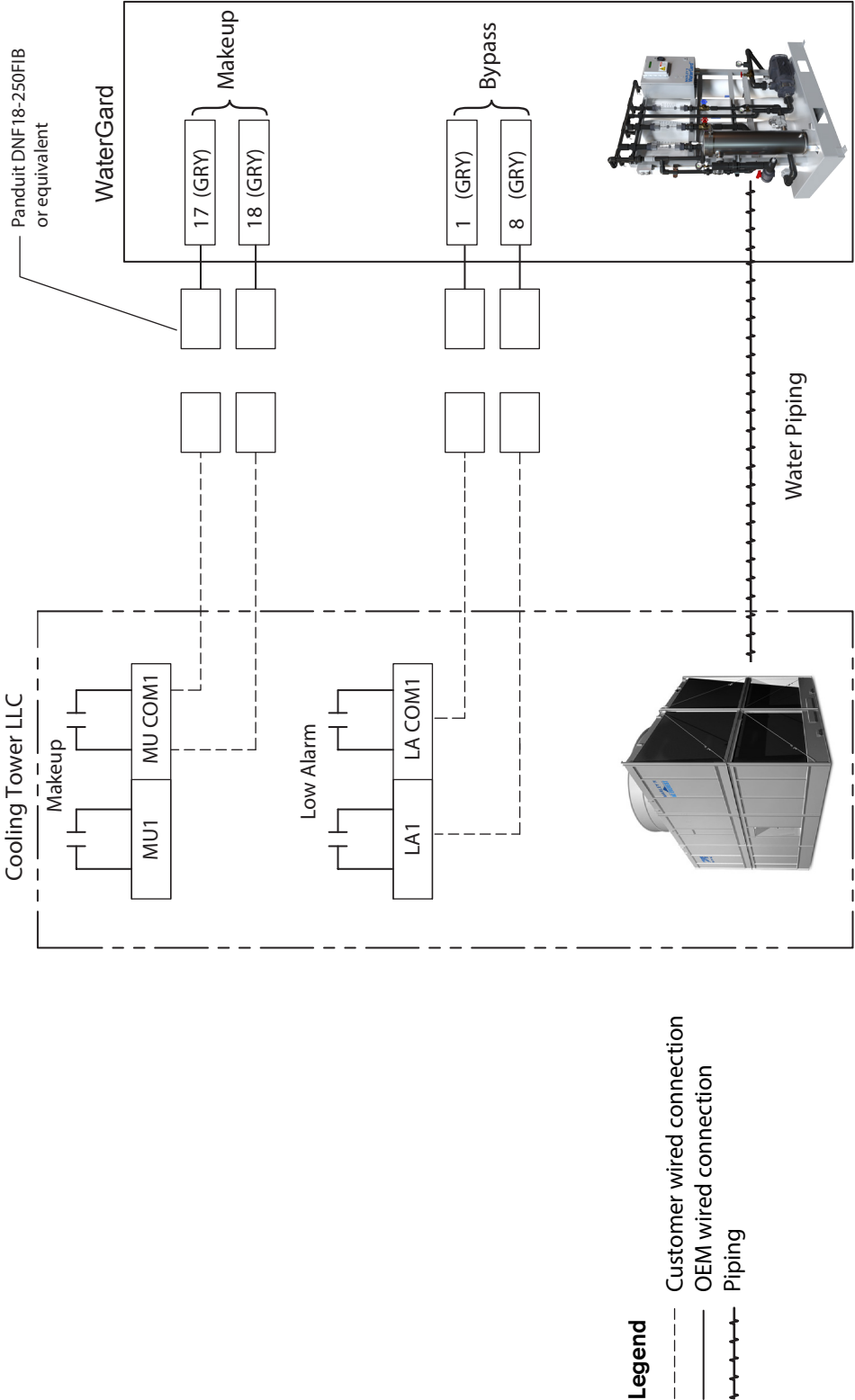
Troubleshooting

LLC control panels are tested before shipment to guarantee smooth installation and operation. Any potential issues outside of the control panel should be investigated prior to troubleshooting the control panel. Typically most issues are found in field wiring connections in the control panel. When troubleshooting the LLC controls, please verify the following:

- Both circuit breakers in the panel must be energized with the switches in the UP position (ON).
- Check the HAND-OFF-AUTO selector switch position to verify proper position.
- Confirm the two sensor wires are installed correctly and properly connected at terminal points in the control panel. To properly verify the terminal connection, be sure the terminal connections does not land on the insulation of the sensor wire. Strip back just enough wire insulation so you can see some copper wire exposed assuring a metal-to-metal connection. Additionally, once the terminal connection is tightened on a wire, conduct a pull-test on the wire.
- The sensor wire is a shielded four conductor cable. The red and black wires connect to terminal points +24 and 13. Do not to cut back the shield wire. The shield wire connects to ground to eliminate potential noise for the sensor reading. Improper grounding of the shield wire may result in improper LLC operation. Always refer to the as-built wiring diagram on the inside control panel door for current connection points. Tape back the white and green wires that are not used.
- Check that the extension wires are numbered correctly and connections secure.
- If there are issues with sensor readings, moving any external power wiring so that it does not run parallel with the sensor wiring will help to reduce noise. Follow best-practice wiring for power and instrumentation wiring.
- Rotate the HAND-OFF-AUTO switch to the HAND position. The solenoid should energize allowing makeup water to flow directly to the cooling tower. The single-pole circuit breaker should be in the UP or ON position to energize the makeup solenoid.

Configuration 1 — Single Cooling Tower LLC — Single WaterGuard Unit

Makeup and Low Alarm signal wires from dry contacts connected to a dedicated single WaterGuard. Only two pairs of wire (four wires in total) connect to the dedicated single WaterGuard. The basin makeup solenoid is internal on the WaterGuard unit.

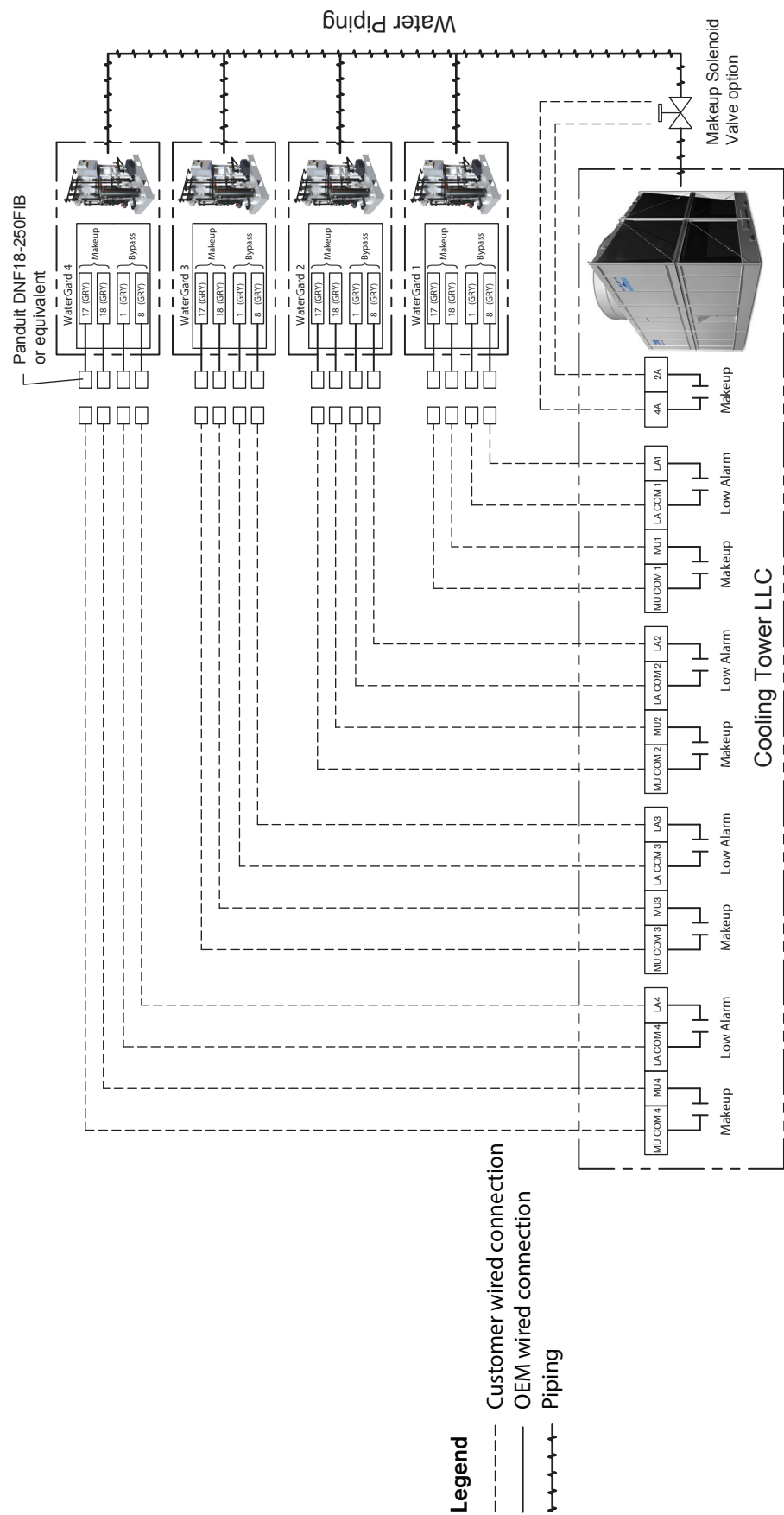


Note

- 1 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

Configuration 2A – Single Cooling Tower LLC – Two to Five WaterGard units

Makeup and Low Alarm signal wires from dry contacts connected directly to each LLC.
Only two pairs of wire (four wires in total) connect to the each WaterGard unit.
An optional basin water makeup solenoid valve may be included.

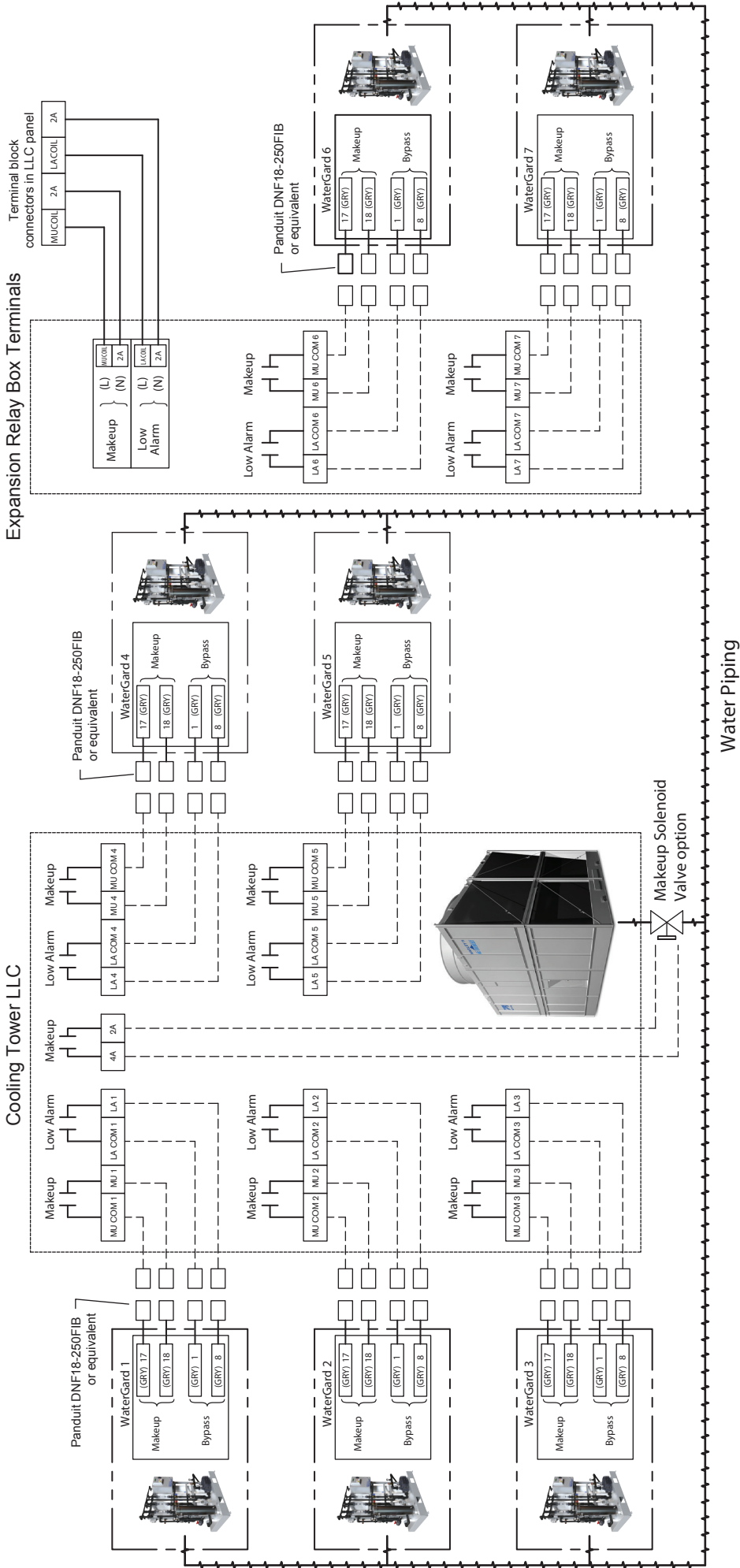


Note

- 1 A water makeup valve is optional at the water makeup connection to the cooling tower in this arrangement.
- 2 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

Configuration 2B – Single Cooling Tower LLC – Six to Thirteen WaterGard units with Expansion Relay

Makeup and Low Alarm signal wires from dry contacts in one LLC unit to dry contacts in the next LLC unit. Only two pairs of wire (four wires in total) connect to the WaterGard unit. An optional basin water makeup solenoid valve may be included.



Legend

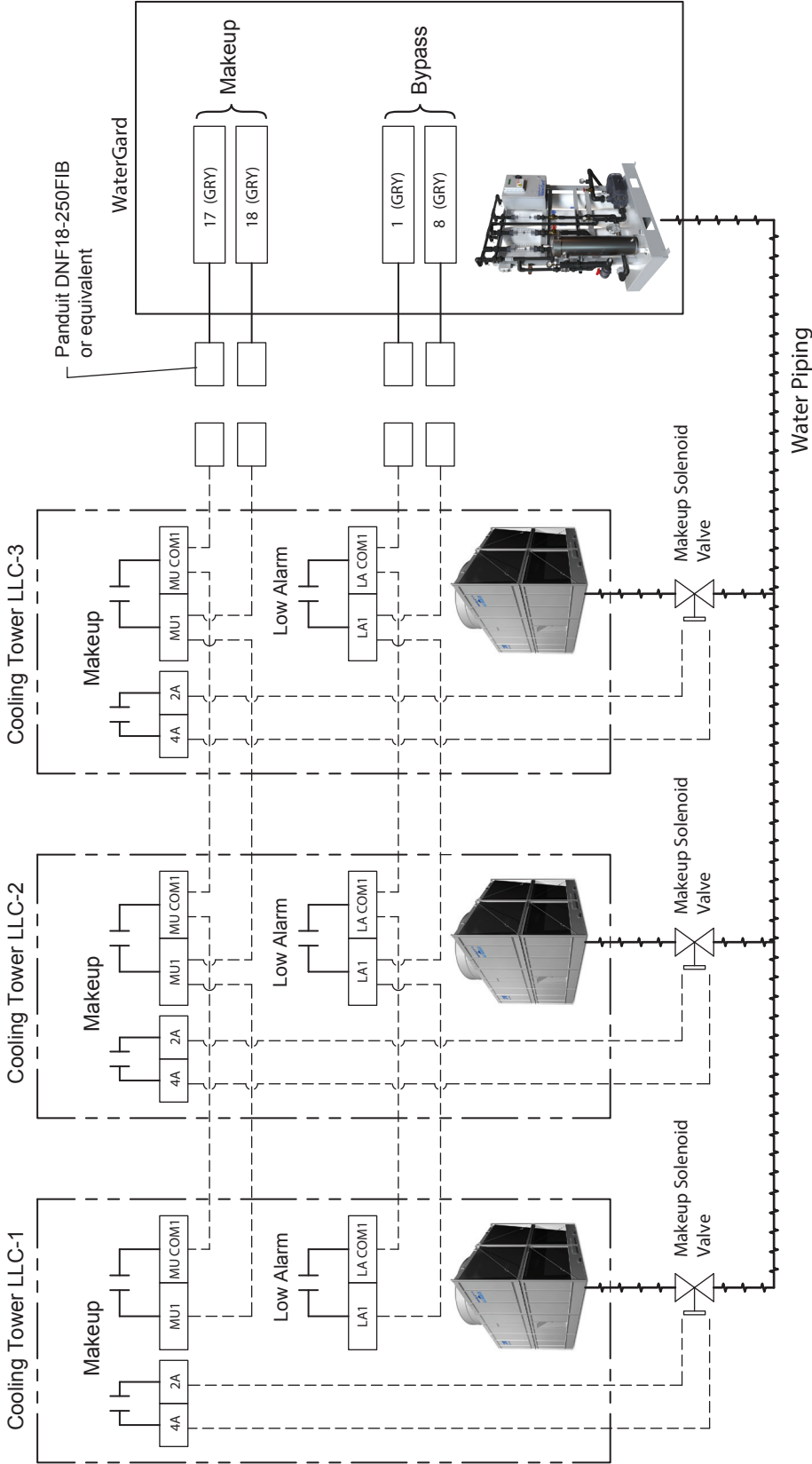
- Customer wired connection
- OEM wired connection
- Piping

Note

- 1 A water makeup valve is optional at the water makeup connection to the cooling tower in this arrangement.
- 2 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

Configuration 3 – Multiple Cooling Tower LLC units – Single WaterGard unit

Makeup and Low Alarm signal wires are daisy chained in parallel from dry contacts in one LLC unit to dry contacts in the next LLC unit. Only two pairs of wire (four wires in total) connect to the WaterGard unit. The basin makeup solenoid valve on each LLC must be connected as illustrated for proper operation.



Legend

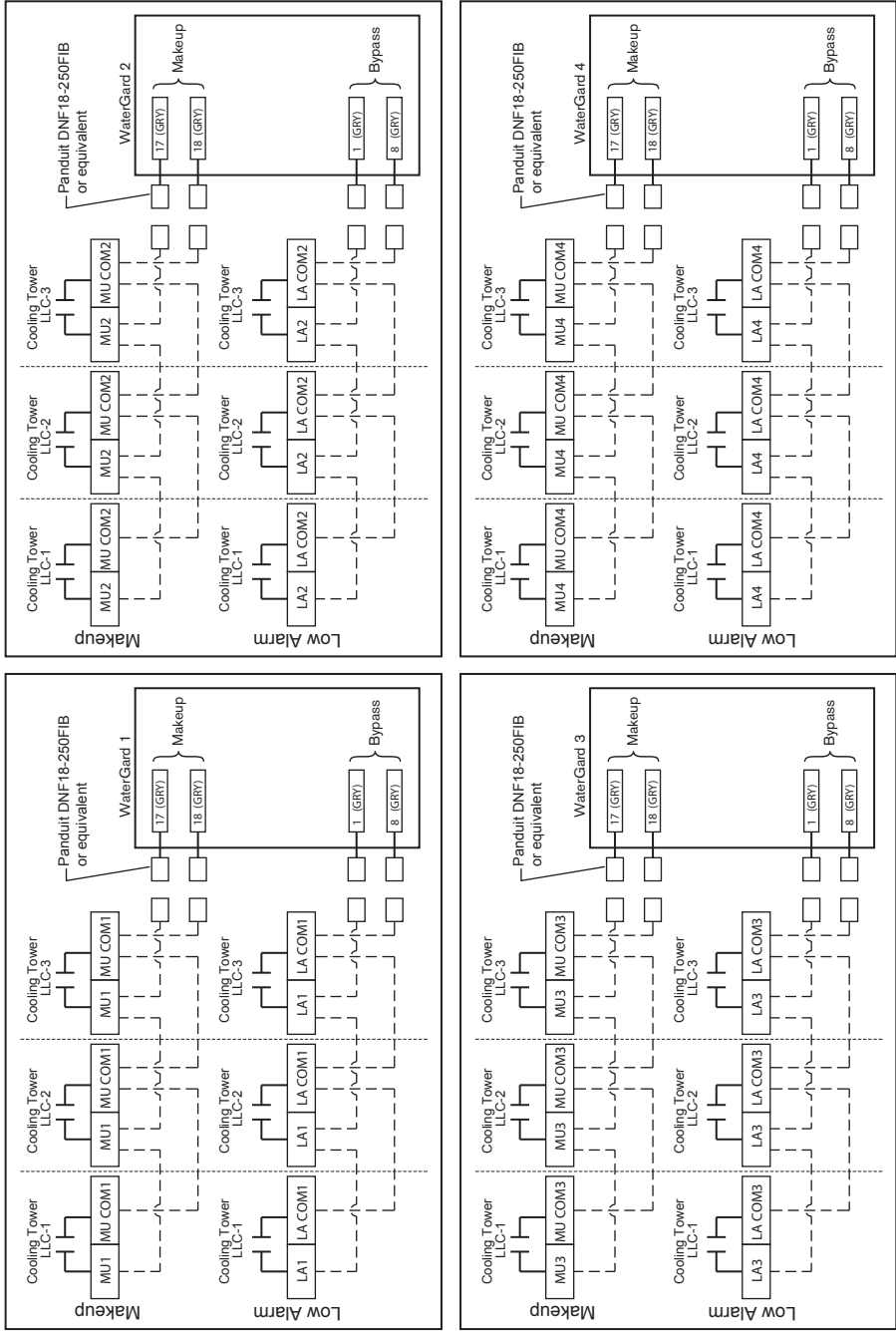
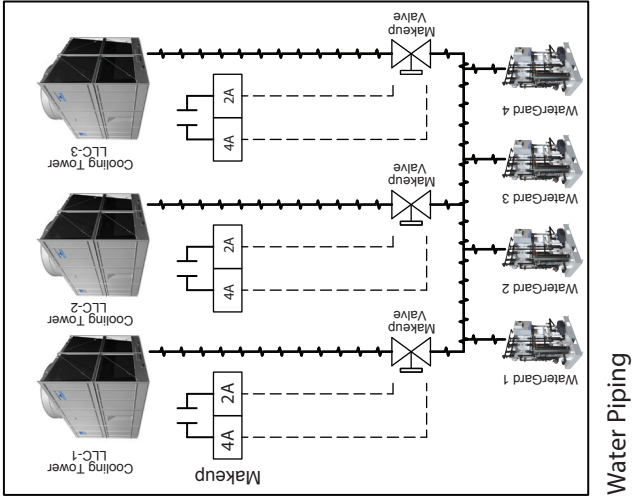
- Customer wired connection
- OEM wired connection
- Piping

Note

- 1 A water makeup valve is required at the water makeup connection to the cooling tower in this arrangement.
- 2 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

Configuration 4A – Multiple Cooling Tower LLC units - Two to Five WaterGard units

Makeup and Low Alarm signal wires are daisy chained in parallel from dry contacts in one LLC unit to dry contacts in the next LLC unit. Only two pairs of wire (four wires in total), connect to the WaterGard. The basin makeup solenoid valve on each LLC must be connected as illustrated for proper operation.



Electrical Wiring

Legend

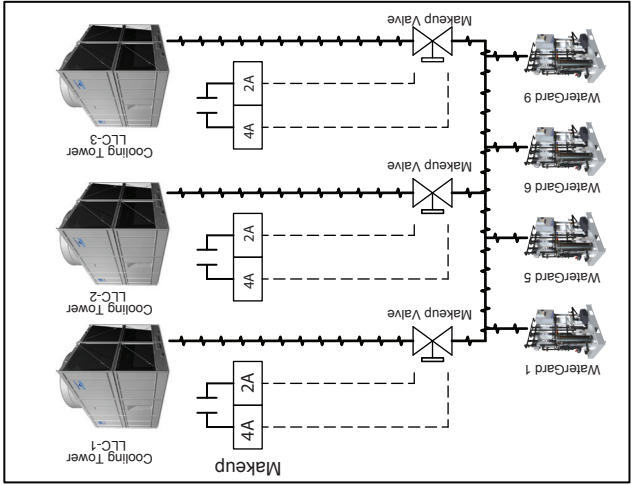
- Customer wired connection
- OEM wired connection
- Piping

Note

- 1 A water makeup valve is required at the water makeup connection to the cooling tower in this arrangement.
- 2 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

Configuration 4B – Multiple Cooling Tower LLC units - Six to Thirteen WaterGard units

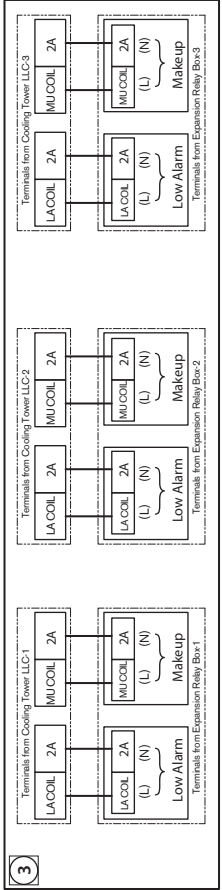
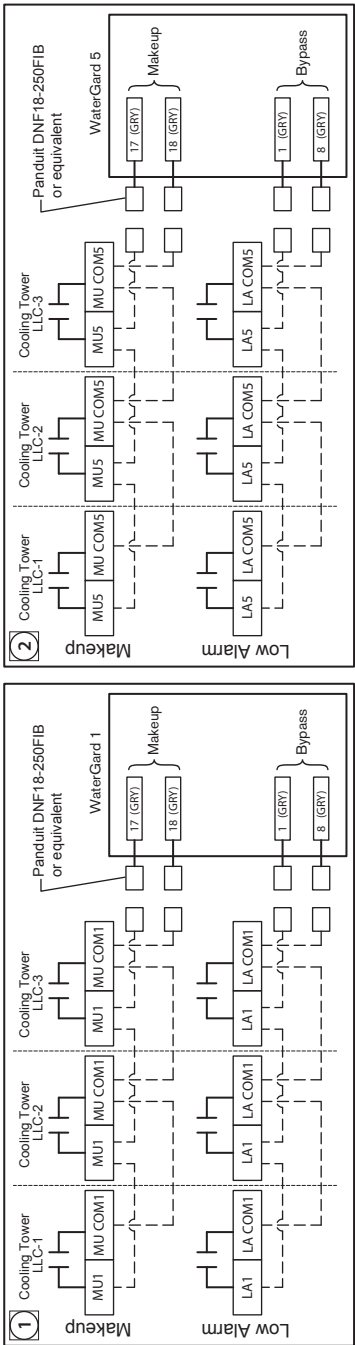
Makeup and Low Alarm signal wires are daisy chained in parallel from dry contacts in one LLC unit to dry contacts in the next LLC unit. Only two pairs of wire (four wires in total) connect to the WaterGard. The basin makeup solenoid on each LLC must be connected as illustrated for proper operation.



Water Piping

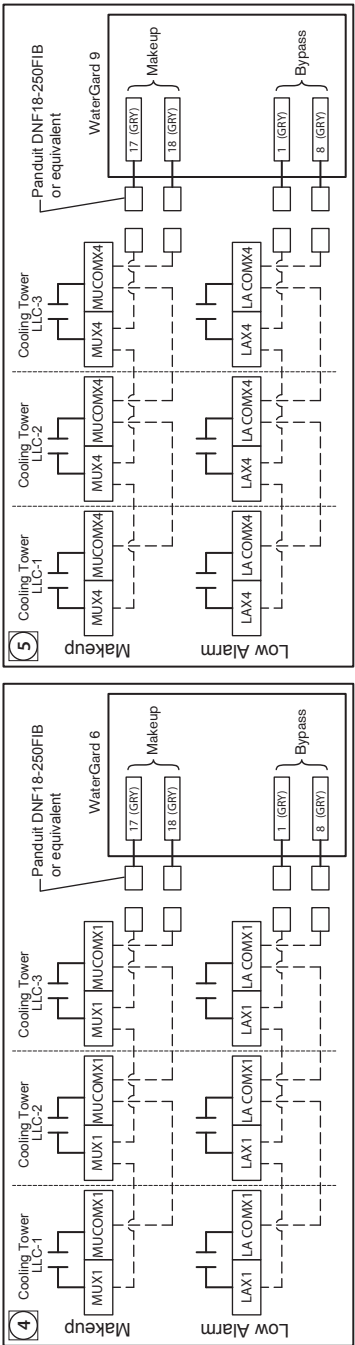
Note

- 1 These sections represent connections from WaterGard 1 and 5, the same connections follow for WaterGard 2, 3 and 4.
- 2 These sections represent the relay coil connections from Cooling Tower LLC to expansion relay box.
- 3 These sections represent connections from WaterGard 6 and 9, the same connections follow for WaterGard 7 and 8.



Legend

- Customer wired connection
- OEM wired connection
- Piping



Electrical Wiring

Note

- 1 A water makeup valve is required at the water makeup connection to the cooling tower in this arrangement.
- 2 Makeup and Low Alarm relays are shown in a de-energized state. Makeup NO contact will close when makeup water is being requested. Low Alarm NO contact will close when water level is below the Low Alarm water level.

WaterGard - LLC water level control

USER MANUAL

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