ENGINEERING BULLETIN No. EB 57

Product: 3-Probe and 5-Probe Electronic Water Level Control **Date:** October 2011

Introduction

Evaporative cooling equipment such as cooling towers, closed circuit coolers and evaporative condensers require a means to control the make-up water supply. The standard EVAPCO make-up offering consists of a mechanical valve and float assembly. This mechanical assembly is limited to 50 psig inlet water pressure. Many customers desire an electronic offering which allows for precise control of factory-recommended basin levels without the need for field adjustment. In addition, the Electronic Water Level Controller (EWLC) utilizes a slow closing electric solenoid valve and wye strainer with positive closure to prevent water hammer, allows for 5-125 psig inlet water pressure, and virtually eliminates freeze-up that may occur with the mechanical float valves. EVAPCO has two EWLC offerings for upgrading from the standard mechanical level control.

1. **3-Probe Electronic Water Level Control (EWLC)**
   The EVAPCO 3-probe EWLC package contains a stilling chamber, a Y-strainer, an ASCO slow closing solenoid valve and a 3-probe assembly consisting of a ground probe, a make-up water cut-in probe and a make-up water cut-out probe. The stilling chamber helps balance the water level, removing such factors as splashing water. All components are shipped loose for field mounting in pre-punched holes. Wiring of the controller and solenoid valve is “by others”.

2. **5-Probe Electronic Water Level Control (EWLC)**
   The EVAPCO 5-probe EWLC contains the same features as the 3-Probe with an additional high level alarm probe and a low level alarm probe. This feature allows the user to trigger alarms and offers the ability for integration into a Building Automation System, providing an extra level of monitoring. All components are shipped loose for field mounting in pre-punched holes. Wiring of the controller and solenoid valve is “by others”.

Figure 1: EWLC Assembly

Figure 2: Mechanical Float Valve Assembly

Electronic Water Level Control Troubleshooting

In the event that a problem is encountered with the electronic water level control, the following part of this bulletin will address specific troubleshooting methods that should be utilized to resolve the issue. Please refer to the appendices of this document for a quick troubleshooting table and wiring diagrams.

Testing

It should not be necessary to test every EWLC. However, if a problem occurs the testing procedure below will help to pinpoint the cause of the issue and identify a solution.

NOTE: Common electrical wiring practices dictate the convenience of a pig-tail loop in the wiring and flex conduit leading to the EWLC junction box to allow removal of the probe assembly without completely disconnecting wiring and conduit.

Before testing a 3-probe or 5-probe EWLC, **confirm power is disconnected** and remove the enclosure cover. Check that all connections are tight, that there are no signs of water infiltration and no apparent damage to the circuit boards. Verify the seal embedded in the enclosure lid is intact and not torn. Make sure there is no scale build-up on the ends of the probes by removing the controller from the standpipe. If scale is present, remove this buildup by gently rubbing with an emery cloth or scotch-brite pad.

To test the 3-probe and 5-probe EWLC, disconnect all existing wiring and use a 120 Volt AC power cord that can be wired to the two power terminals. On a 3-probe EWLC there is one terminal on each side of the transformer labeled L1 and L2 (Figure 3). The 3-probe EWLC contains one circuit board which controls the make-up valve. There are jumper wires between the transformers on the three boards of the 5-probe EWLC, so only one set of power connections are needed (Figure 4). The circuit board closest to probes is for make-up control and the other two are for the low and high alarms.

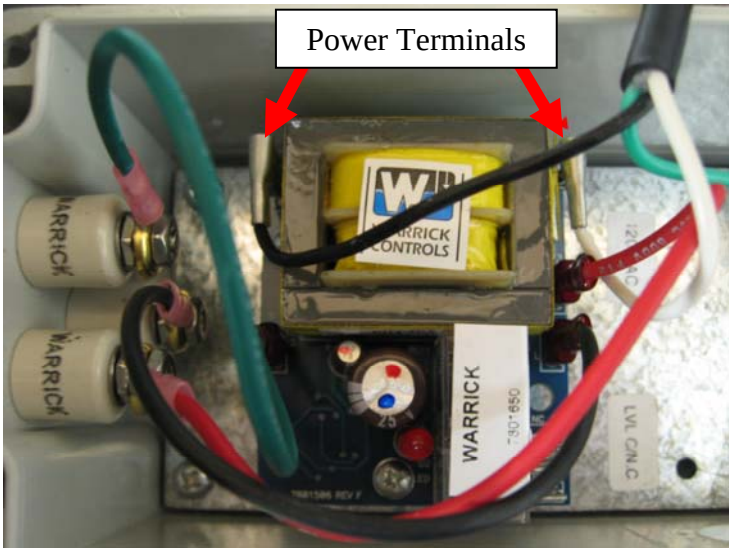

Figure 3: Make Up Board on 3-Probe EWLC

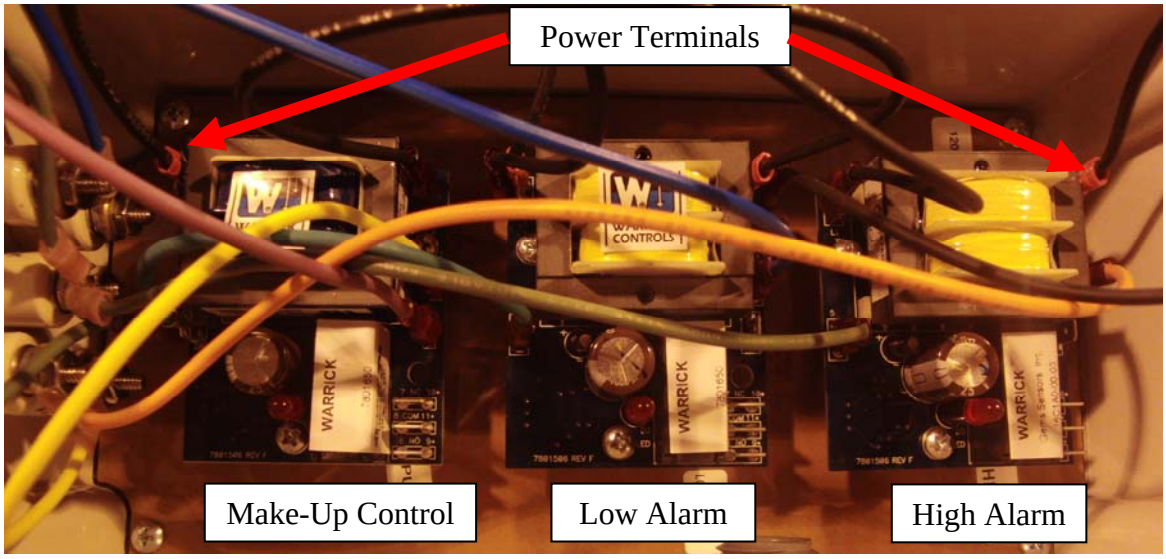

Figure 4: Make up, Low Alarm and High Alarm Board on 5-Probe EWLC

The probes of the EWLC can be either submerged in and out of a reservoir of water or the water level can be simulated using a short length of wire. To simulate a high water condition, the ground probe (longest) and the make-up cut-out probe need to be wired together (Figure 5). The cut-out probe will be the shortest probe on a 3-probe and the second shortest probe on a 5-probe. NOTE: There is not a shock hazard using this method as there is minimal current flowing through the probes.

After a short time delay, the red LED light will turn on (Figure 6). This indicates that the relay has changed from the normal state. Since the valve is wired to the normally closed contact for the make-up control, the **light on** indicates the solenoid valve should be **closed**. Alternately, the red **light off** would indicate an **open** solenoid valve.

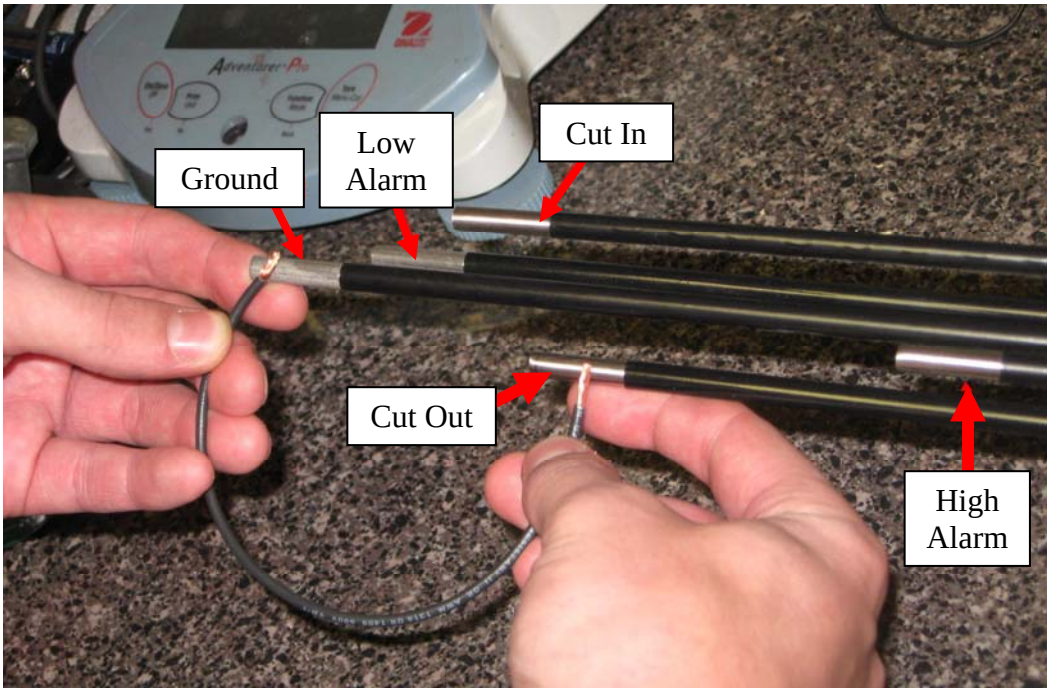

Figure 5: Jumper Test Wire on 5-Probe EWLC

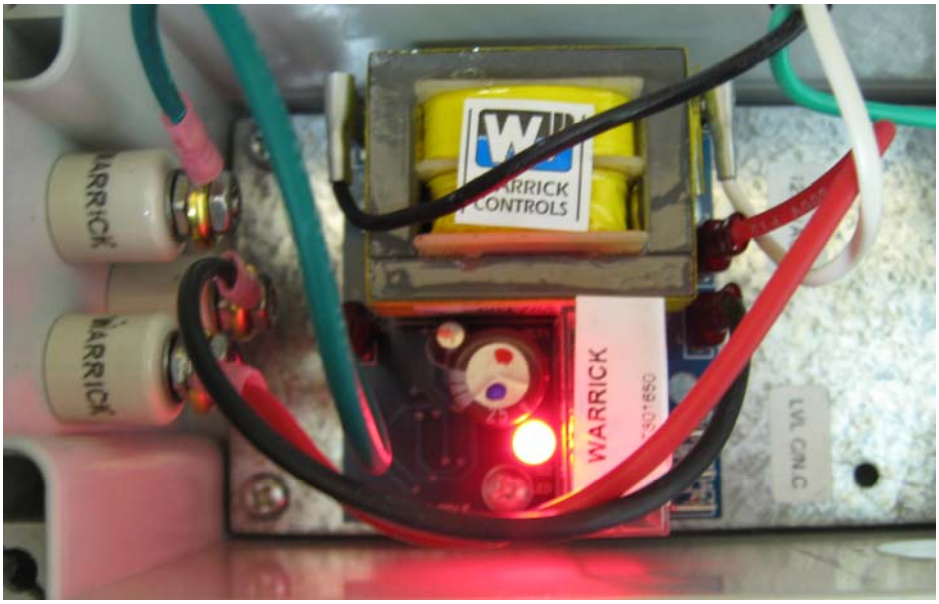

Figure 6: Light On (Closed Solenoid Valve)

To test the function of the relay contacts on the make-up circuit board, hook up an electrical multi-meter to the normally closed (NC) and common (C) terminals (Figure 7). These terminals are labeled on the circuit board. The meter should be switched to read circuit resistance indicated by the ohm (Ω) symbol on the meter (Figure 8).

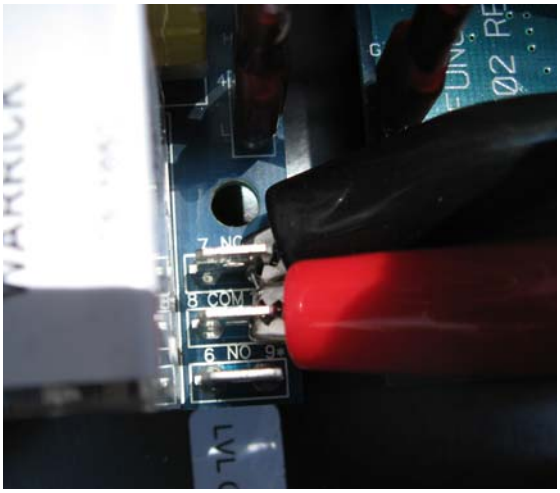

Figure 7: Relay Test Setup

Figure 8: Multimeter Set to Ohms

When a low water level is simulated, the meter will read a closed circuit or minimal resistance (Figure 9). In a high water simulation, the meter will read an open circuit or infinite resistance (Figure 10). If the red light turns on, but the relay contacts do not change state, then the relay is most likely defective. If the light does not turn on when a high water level is simulated, unplug the power cord and check to make sure there are no loose wiring connections inside the enclosure at the ends of the probes.

Figure 9: Low Water Simulation Reading

Figure 10: High Water Simulation Reading

Once the red light is on, quickly move the wire from the make-up cut-out probe to the make-up cut-in probe. The cut-in probe is the middle length probe on both the 3- and 5-probe controllers (Figure 5). The light should stay on while there is connection between the ground and cut-in probes. The light will not turn off until the wire is removed because the relay is latched between the make-up cut-out and cut-in probes.

The other two boards in the 5-probe enclosure are for the low and high level alarms (Figure 4). The relay contacts should be labeled with stickers near the circuit board. The high alarm will be the set of contacts furthest away from the probes. The procedure to test the make-up relay is also used to test the high and low alarms. Connecting a wire from the ground probe to the low or high alarm probe will cause the corresponding red light to turn on and the relay to change state. There is a short delay between the removal/connection of the wire and the relay changing state. The alarm relays are not latched and should go back to a normal state after the wire is removed.

Appendix A: Electronic Water Level Control Troubleshooting Table

Problem	Test	Possible Cause	Correction
Solenoid Valve Stuck Open	If make-up light is on in the controller	Foreign body stuck in valve	Inspect valve, make sure y-strainer is working with no holes
		Wiring issue	Voltage is supplied to valve independent of the make-up relay. Compare wiring to wiring diagram (Appendix B)
		Relay not switching	See below
	If make-up light is off in the controller	Normal	Valve should be open if make-up light is off
Solenoid Valve Stuck Closed	If make-up light is off in the controller	Wiring issue	Voltage is not being supplied to the valve. Compare wiring to wiring diagram and take a voltage measurement (Appendix B)
		Relay not switching	See below
	If make-up light is on in the controller	Normal	Valve should be closed if make-up light is off
	Apply voltage directly to solenoid	Solenoid defective	If valve will not open, replace valve
Water Level Too High	If make-up light is off in the controller	Probes dirty	Clean probes with emery cloth
		Basin knockout in wrong location	Verify with location drawing in submittal
	If the make-up light is on in the controller	Valve stuck open	See above
Water Level Too Low	If the make-up light is off in the controller	Water usage is greater than make-up rate	Reduce bleed rate and/or increase make-up rate
		Valve stuck closed	See above
	If the make-up light is on in the controller	Basin knockout in wrong location	Verify with location drawing in submittal
Alarms Not Working	Site specific	Wiring Issue	Consult wiring diagram (Appendix B)
		Relay not Switching	See below
Relay Not Switching	Relay not energizing (see test procedure)	Defective relay	Replace controller
		Defective board	Replace controller

Appendix B: Wiring Diagrams

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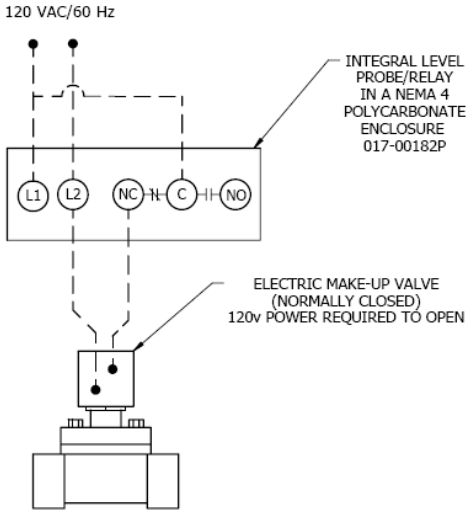
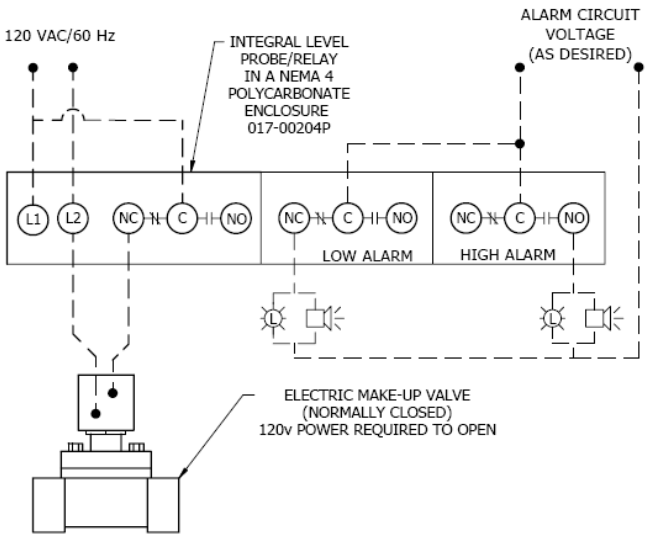
TITLE	DESCRIPTION:	DWG. #
ELECTRIC WATER LEVEL CONTROL WIRING	INDUCED DRAFT - 3 PROBE, 1 VALVE	C1AI0000-A



NOTES:
1. DASHED LINES INDICATE WIRING BY OTHERS.
2. TYPICAL WIRING PER PROBE.

EVAPCO, INC.

TITLE	DESCRIPTION:	DWG. #
ELECTRIC WATER LEVEL CONTROL WIRING	INDUCED DRAFT TOWER - 5 PROBE, 1 VALVE	D1IX0000-A



NOTES:
1. DASHED LINES INDICATE WIRING BY OTHERS.
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