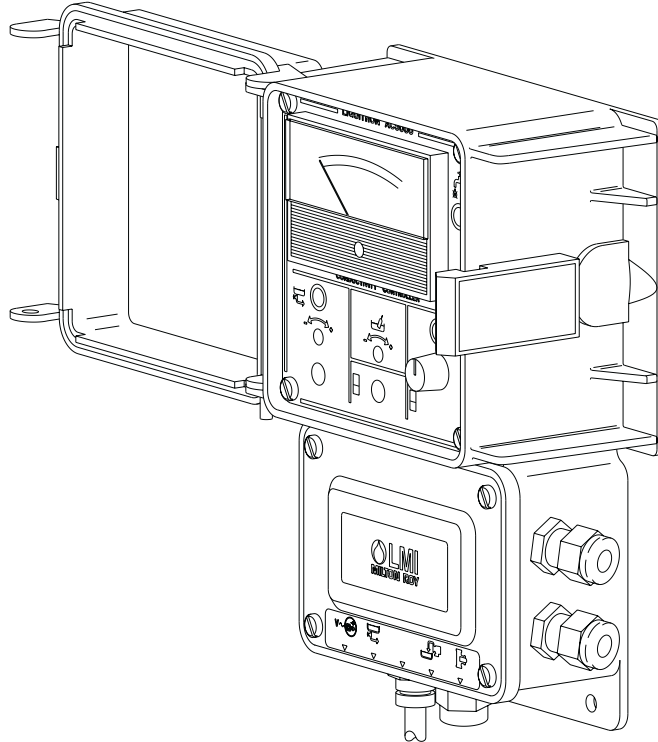


Instruction Manual

Liquitron™ AC Series Conductivity Controller



For file reference, please record the following data:

Model No: _____

Serial No: _____

Installation Date: _____

Installation Location: _____

When ordering replacement parts for your LMI Controller or accessory, please include the complete Model Number and Serial Number of your unit.



8 Post Office Square
Acton, MA 01720 USA
TEL: (978) 263-9800
FAX: (978) 264-9172
<http://www.lmipumps.com>



Replaces same of Rev. B 6/97
1833.C 3/98

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1.0 Introduction

The LMI Liquitron™ AC Series Conductivity Controllers are designed to monitor and control the conductivity of cooling tower water and offer an on/off output relay to control an LMI metering pump or other electrical device. The controllers are an analog, industrial type, measuring conductivity directly via temperature compensated carbon probe in micro-Siemens/cm units. Display of conductivity is by analog meter and control activation indicated by LED on the front panel of the controller. A 6% differential of set point value is factory set.

AC4000 Series

Analog Cooling Tower Conductivity Controller, 115 VAC 50-60 Hz \pm 15%. 0-500, 0-1000, 0-2500 or 0-5000 microSiemens/cm control range, two (2) 4 Amp control outputs accessible via two (2) 115 VAC grounded power cords. PVC bodied flat surface carbon electrode with cable and O-Ring, sealed 3/4" schedule 80 threaded PVC tee with quick disconnect.

AC5000 Series

Same as AC4000 with the inclusion of an adjustable 0-100 second pulse type timer, 0-10 minute cycle timer and 0-100 minute limit timer to facilitate solution addition.

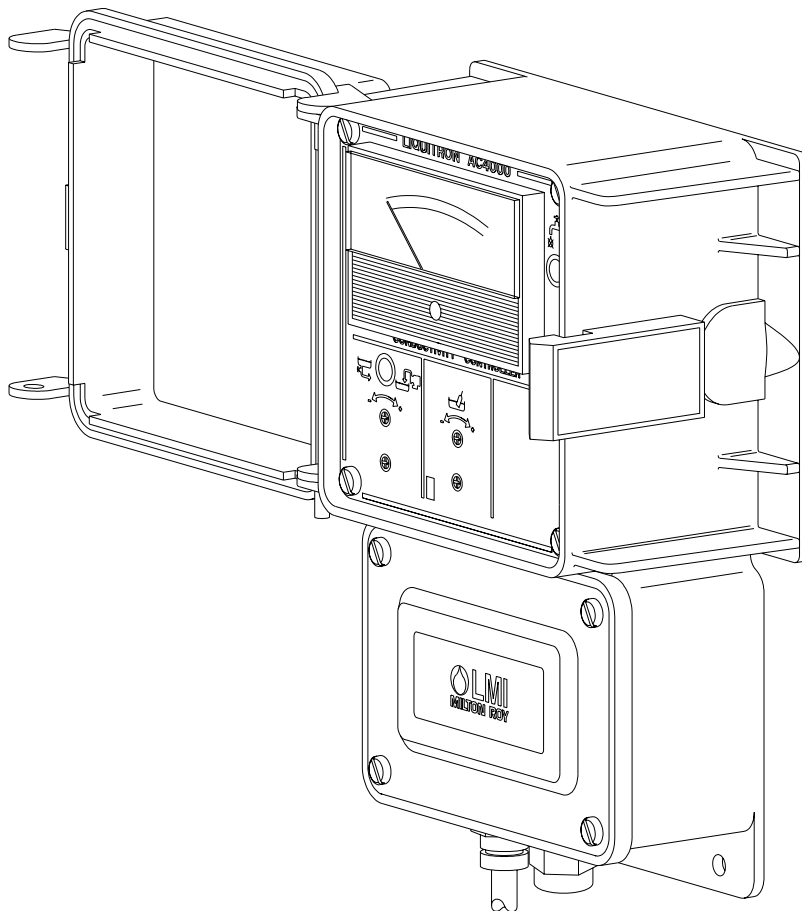


Figure 1: AC Conductivity Controller

2.0 Defining the Model Number

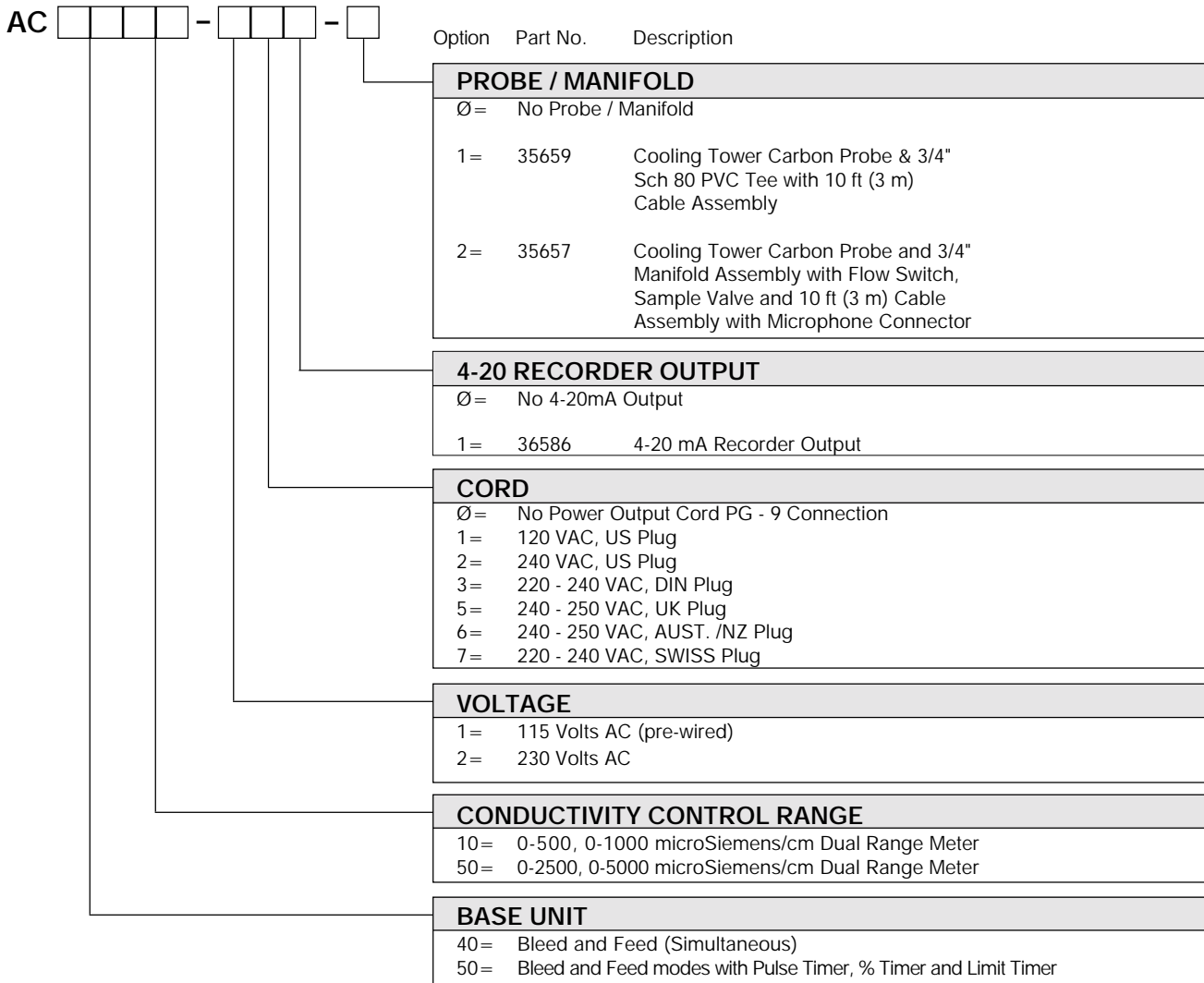
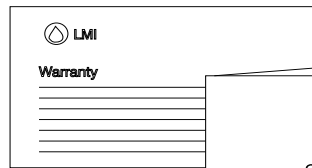


Figure 2: Numbering Scheme

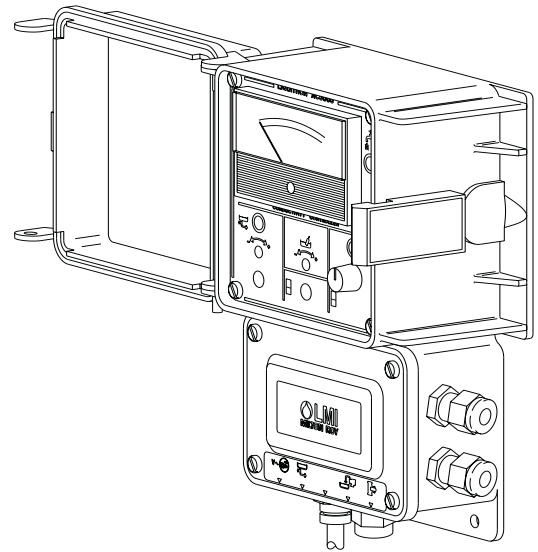
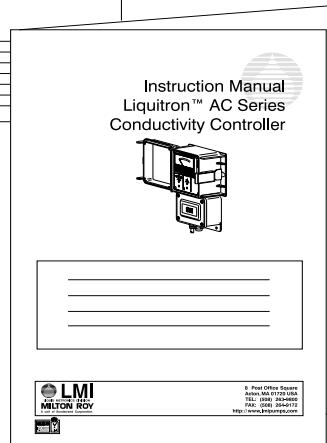
3.0 Unpacking

Your carton will contain the following items:

Warranty Card

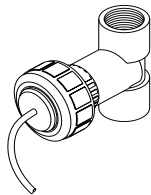


Instruction Manual

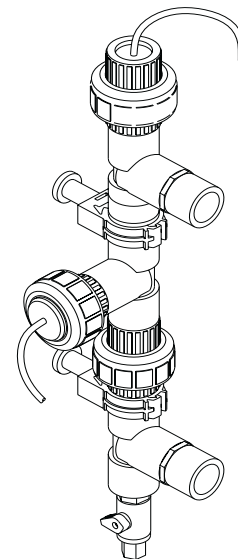


AC Controller

Optional Items May Include:



Probe and Tee



Manifold

Figure 3: Items in Box



Please notify the carrier immediately if there are any signs of damage to the controller or its parts. If any of these items are missing, contact your local LMI Distributor.

4.0 Installation

4.1 Controller Location

Locate the controller in an area convenient to electrical supply, plumbing connections and easy access by the operator for adjustment and servicing.

The controller can withstand temperatures to 140° F (60° C). An environment not exceeding 130° F (54° C) is recommended.

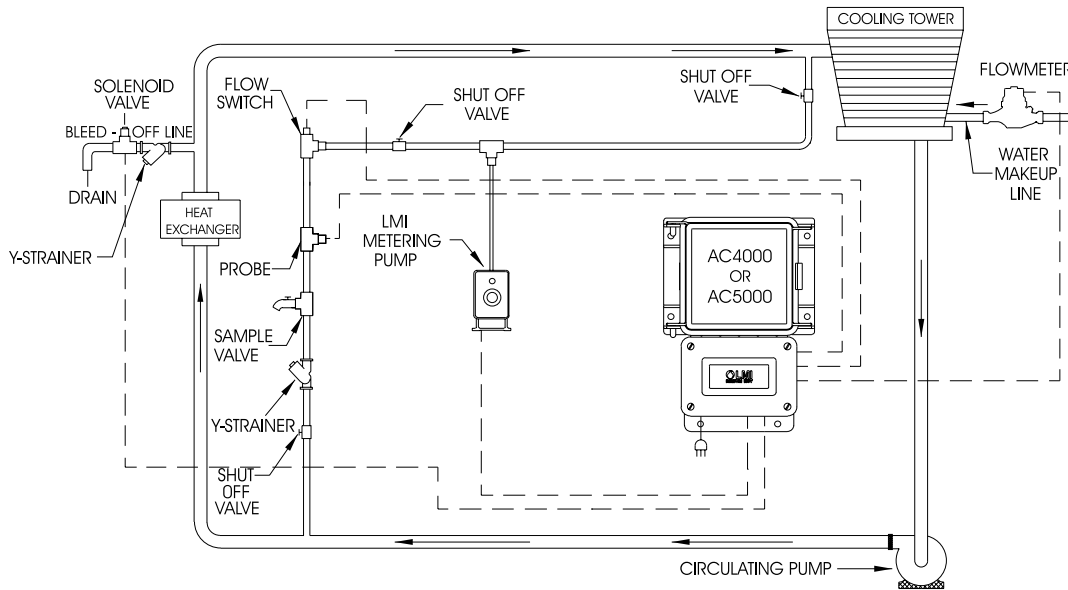


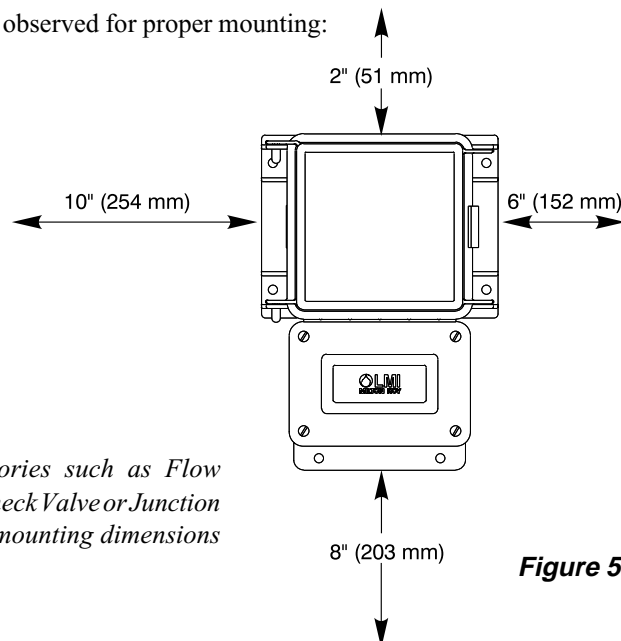
Figure 4: Typical Cooling Tower Installation

4.2 Controller Mounting

Mount the controller to the wall with the meter at eye level to avoid parallax when reading the meter. Allow 6" (152 mm) of space to the left of the controller housing to allow full opening of the clear protective cover.

The AC Series Conductivity Controller is supplied with integral wall mounting flanges. It should be mounted with the display at eye level on a vibration-free surface. All accessible mounting holes should be utilized.

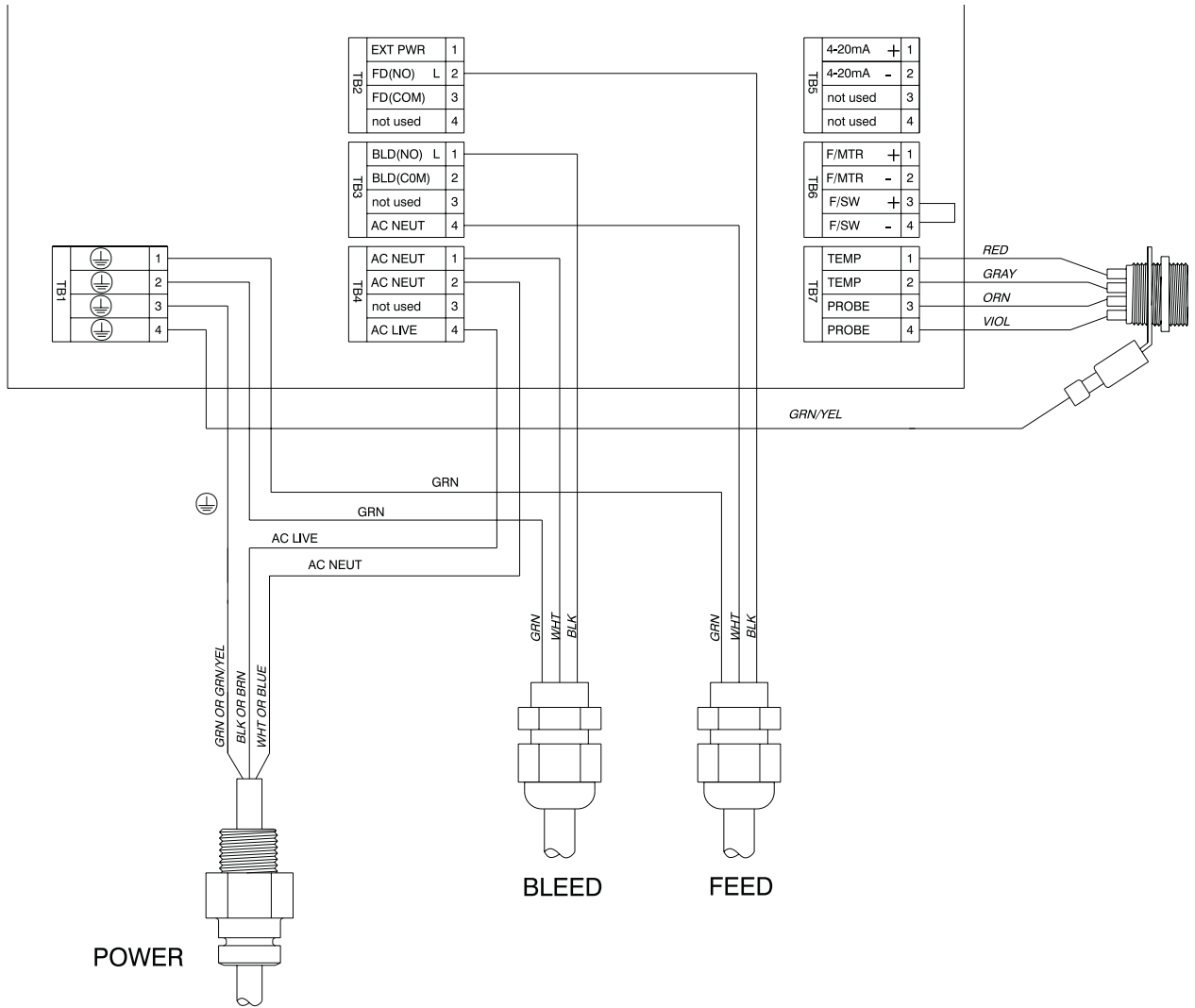
The following clearances should be observed for proper mounting:



If optional accessories such as Flow Switch with Back Check Valve or Junction Box are specified, mounting dimensions will be affected.

Figure 5: Mounting Clearance Diagram

4.3 Terminal Strip Wiring Description



AC40X0-11X

4.4 Probe Location and Installation

Locate the probe tee where an active sample of cooling tower water is available and where the probe can be easily removed for cleaning. It must be situated so that the tee is always full and the probe is never subjected to a drop in water level resulting in dryness. Refer to Figures 4 and 6 for flow direction.

The use of the optional Flow Switch / Back Check Valve is strongly recommended.

Solution injection from metering/dosing pump should be downstream from probe and Flow Switch / Back Check Valve.

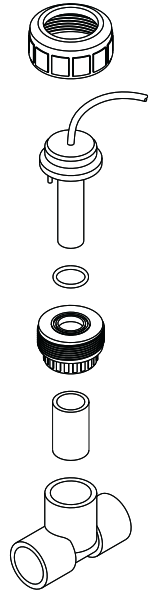


Figure 6: Detail of Probe Assembly

4.5 Connecting Probe / Solenoid Valve / Metering Pump

To connect the probe, solenoid valve and metering pump to the AC controller, plug each component into the appropriate jack on the base of the controller.

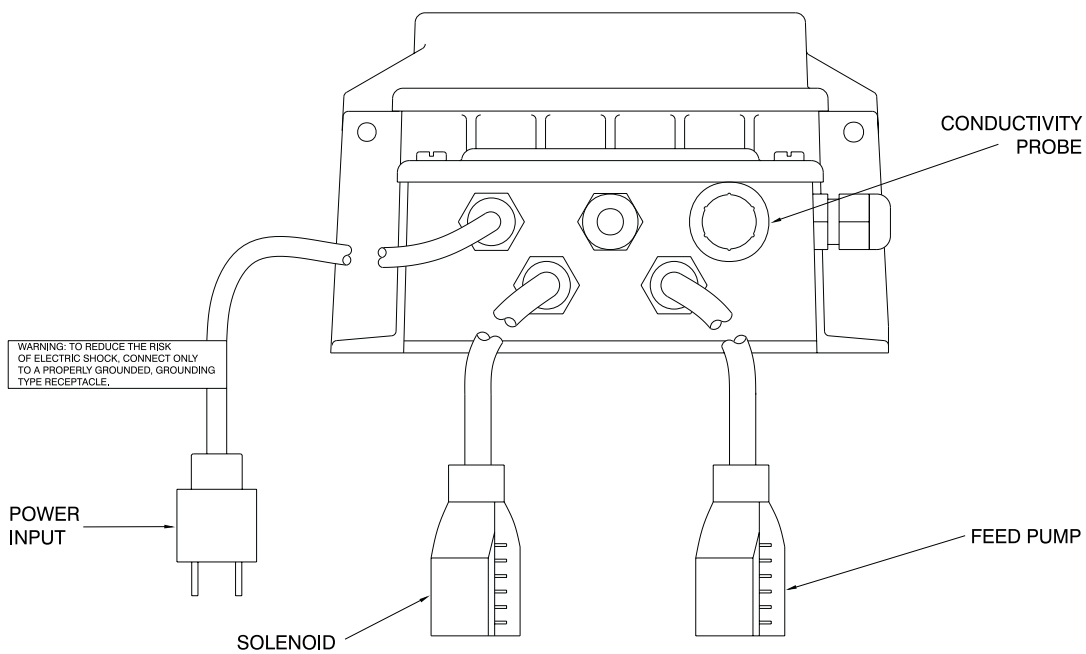


Figure 7: Controller (Bottom View)

5.0 Description of Controls

5.1 AC4000

The AC4000 Analog Conductivity Controller provides an adjustable bleed set point, meter test circuit, calibration adjust, a bleed/feed indicator, a power and flow indicator, and bleed and feed power output cords. The power outputs for both bleed and feed are (simultaneous) control.

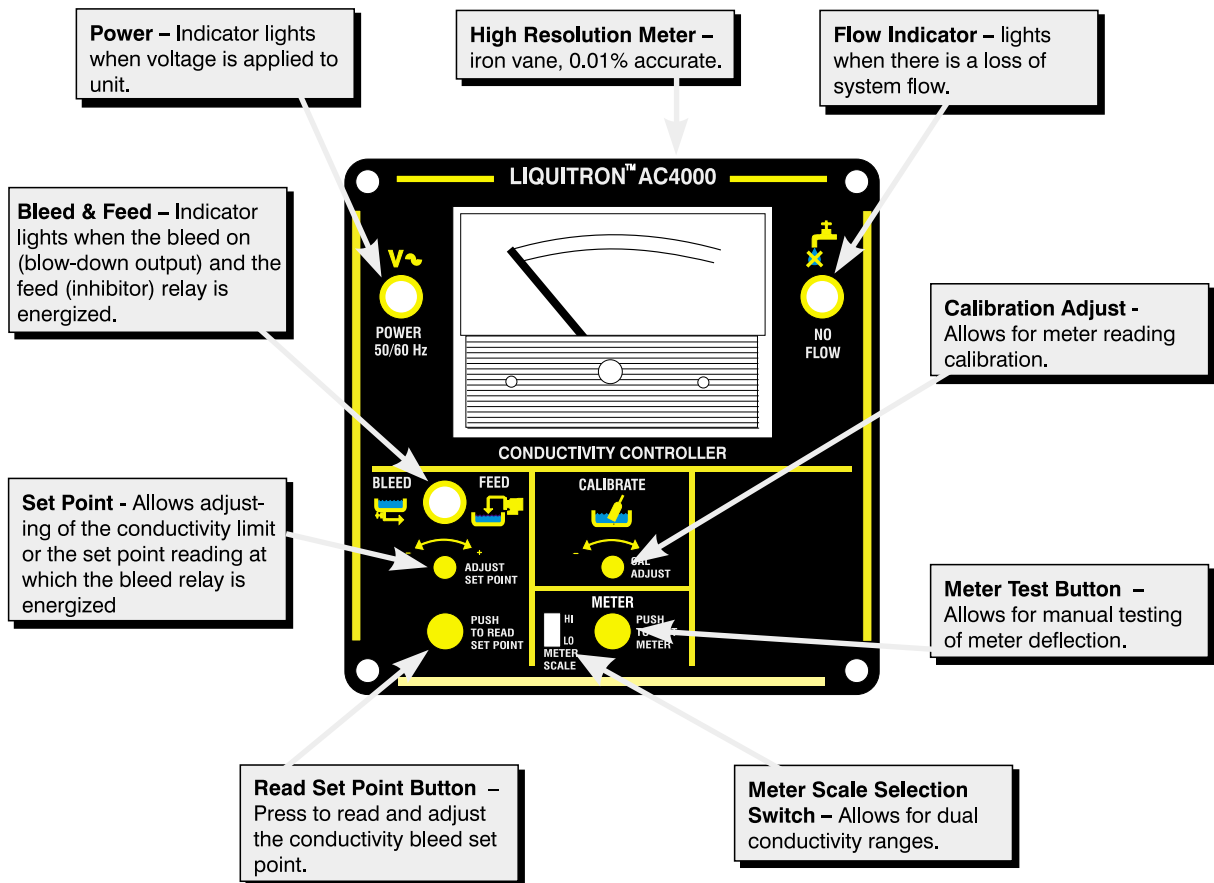


Figure 8A: AC4000 Front Panel

5.2 AC5000

The AC5000 include all of the specifications as stated for the AC4000 and include a 3 mode Feed Control Selector Switch. This switch allows selection of one of 3 modes (a water meter pulse, a % repeating time cycle and a feed limit).

The **Pulse Timer** provides an adjustable 0-100 second pulse type timer for addition of solution in proportion to makeup water volume. The timer shall be activated by an external switch closure and energize the solution feed relay and corresponding LED indicator. Adjustment of the timer is made via a labeled, graduated knob on the front panel of the controller.

The **Limit Timer** provides an adjustable 0-100 minute lock-out timer for the controlled addition of solution. The timer shall be activated at the conductivity set point and energize the solution feed relay and corresponding LED indicator. If the lockout timer will de-energize the solution feed relay. Adjustment of the timer is made via a labeled, graduated knob on the front panel of the controller.

The **% Timer** provides a repeating cyclical feed on time. The timer shall be energized based on a % setting knob on the front panel. This % setting is the % of feed pump ON time during each 10 minute cycle. The LED indicator shall display when the output is energized.

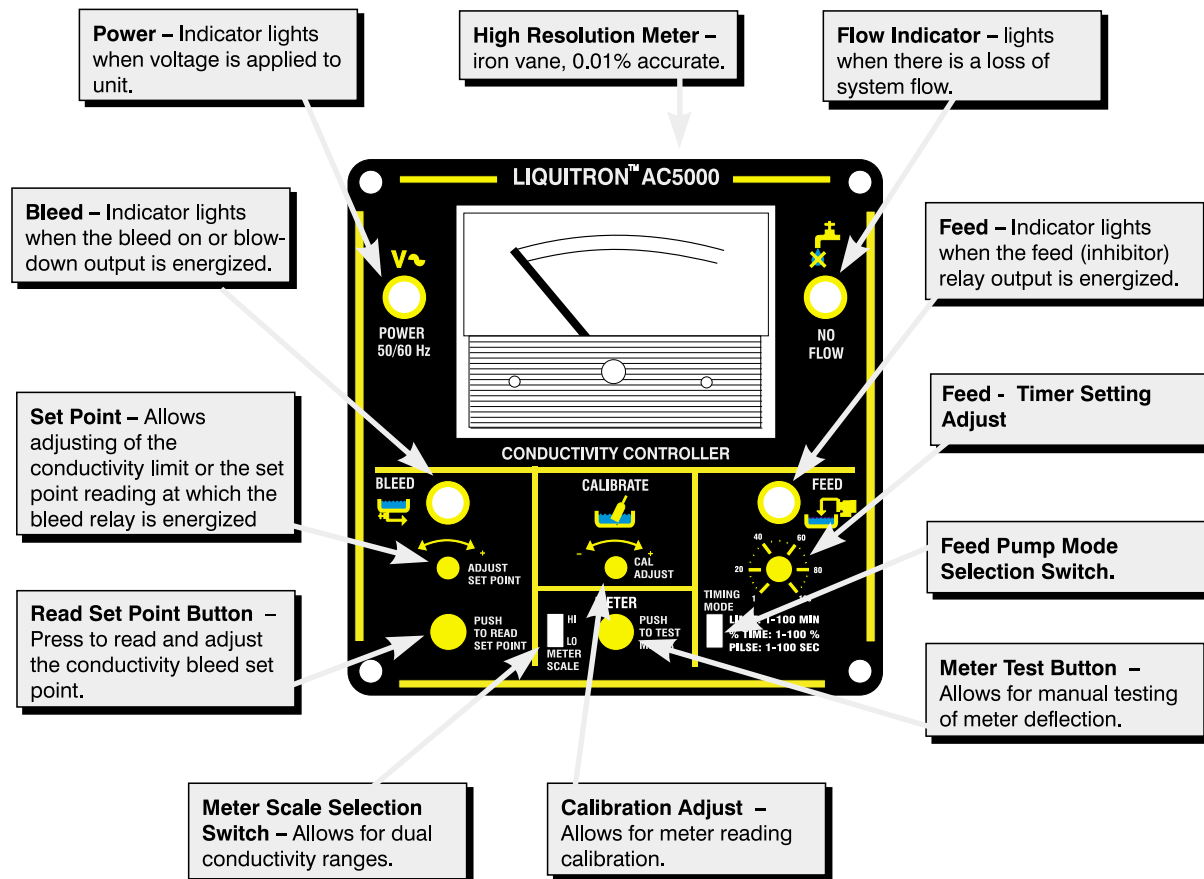


Figure 8B: AC5000 Front Panel

6.0 Start-Up and Adjustment



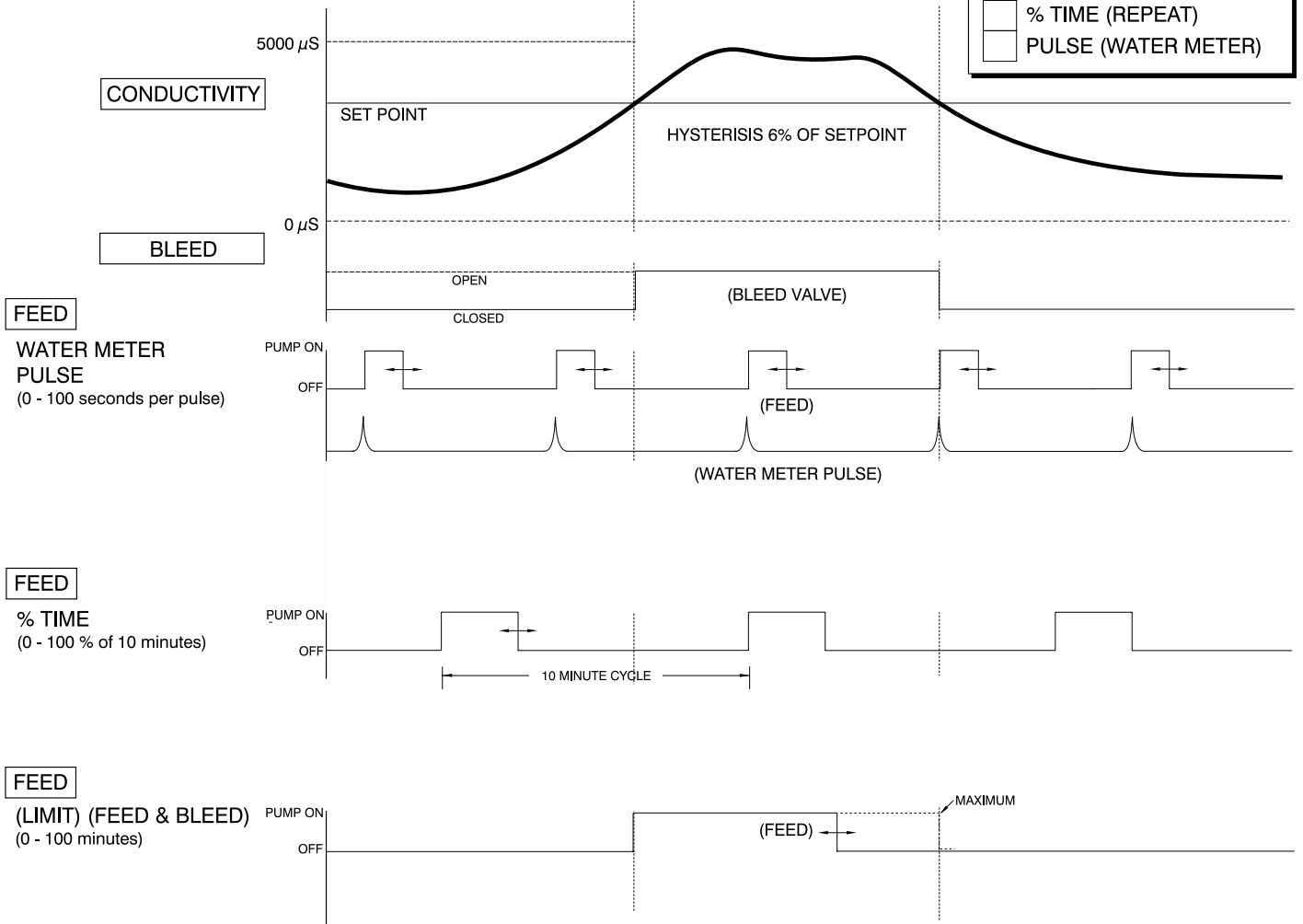
Be sure power is supplied to the Controller and power light is on.
Output relays are at line voltage when Bleed (set point) or Feed light is on.



6.1 Feed Operation

FEED MODE SELECT SWITCH

- LIMIT (FEED AND BLEED)
- % TIME (REPEAT)
- PULSE (WATER METER)



6.2 Conductivity Reading Test

Using a small screwdriver, turn ADJUST SET POINT slot fully clockwise. The Bleed (set point) light should go out.

Slowly turn ADJUST SET POINT slot counter-clockwise until the Bleed (set point) indicator lights up. The solenoid valve and pump being controlled are now energized via the output relay (AC4000).

Very slowly turn ADJUST SET POINT slot clockwise until the Bleed (set point) light *just* goes out. The meter should read the conductivity of the water in the area of the probe.

From a source as close to the probe as possible, secure a sample of the water and measure its conductivity using a reliable conductivity meter. If the test conductivity meter reading is the same as the reading on your conductivity controller meter, your controller is ready for operation. If it is not, calibration is necessary (see Section 7).

6.3 Set Point Adjustment

Press and hold in the READ SET POINT button. It will cause the meter reading to vary momentarily and to drop slightly. Wait until the meter reading is steady.

With your other hand, using a small screwdriver, slowly rotate the ADJUST SET POINT slot until meter reads your desired conductivity set point. Your controller is now ready for operation.

6.4 Setting (Feed) Feed and Bleed with Feed Limit/"Lockout Timer" (AC5000 only)

The purpose of the limit timer is to limit the duration of solution feed should a problem develop in the system. If system conductivity does not drop below the set point less the differential in the amount of time set (due to a plugged bleed line, faulty solenoid valve, etc.), the timer will de-energize the feed relay and stop the feed pump from pumping chemical.

The lockout timer is activated at the conductivity set point. The timer energizes the solution feed relay and the corresponding LED indicator. The relay stays powered until the conductivity drops below the set point plus the differential, or the amount of time set on the timer dial elapses, whichever happens first.

The front panel dial is used to adjust the timer setting from 1-100 minutes. Turn the knob to the desired amount of minutes that the feed pump will be allowed on. The Feed LED will be lit while the pump is running. If the conductivity does not fall below set point plus differential in that amount of timer the pump will de-energize and lockout will occur. **A lockout condition exists if the Bleed LED is illuminated, but the Feed LED is not.** The timer will not reset until the conductivity drops below the set point, or if power is removed and re-applied to the unit.

6.5 Setting Feed Water Meter "Pulse Timer" (AC5000 only)

The purpose of the pulse timer is to facilitate the addition of solution in proportion to make-up water volume. This timer is activated when triggered by an external switch closure, such as from a contacting head water meter. Timer activation energizes the solution feed relay and corresponding "pump on" LED indicator for the amount of time set on the front panel dial. This timer operates totally independent of conductivity.

The front panel dial is used to set the timer run time 1-100 seconds. Turn the knob so that each external switch closure will give you the desired amount of pump on time. **Example:** Setting the knob to 6 will cause the pump to run for six seconds each time the unit receives an input pulse from a water meter.



The pulse timer does not accumulate pulses.

6.6 Setting Feed Repeating "% Cycle Timer"

The purpose of the percentage cycle timer is to turn the chemical feed pump ON for a percentage of a ten (10) minute cycle.

Example: If the % timer is set to 50% – The pump will be turned ON for 50% of the ten (10) minute cycle and then turned OFF, or the pump will be energized for five (5) minutes and then de-energized for five (5) minutes.

The ten (10) minute cycle repeats continuously. When the output is energized, the feed indicator will be illuminated.

7.0 Calibration



- IMPORTANT -

***Probe MUST be clean before calibrating the controller.
Probe MUST be in the tee while calibrating the controller.***

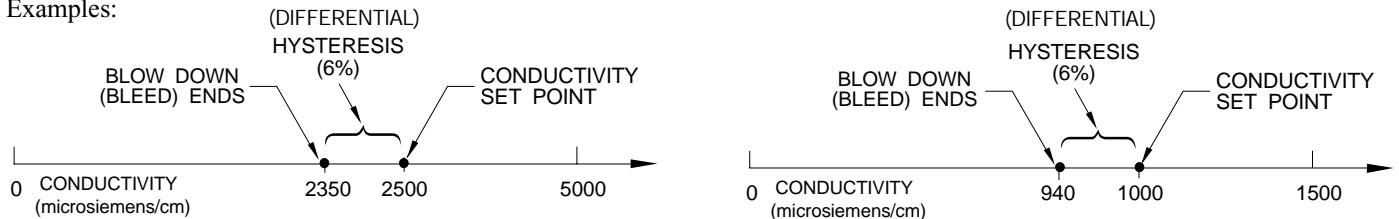


1. Using a small screwdriver, rotate the ADJUST SET POINT slot clockwise all the way. The BLEED (set point) light will go out.
2. From a source as close to the probe as possible, secure a sample of the water and measure its conductivity using a reliable conductivity meter.
3. Slowly adjust “CAL ADJUST” until meter reading corresponds to the test conductivity meter.
4. *Set point must be readjusted.* Repeat steps 6.1 and 6.2 for set point readjustment.

8.0 Control Differential

All AC Series Cooling Tower Conductivity Controllers are factory set with a differential (or hysteresis) of approximately 6% of set point value. This is necessary to prevent relay chatter or rapid on/off switching when conductivity hovers near the set point value. Blowdown starts at set point and stops when conductivity falls below set point minus hysteresis (differential).

Examples:



9.0 Flow Switch With Back Check Valve

The purpose of the flow switch is to lock out all chemical feed and blow down (bleed) in case water is *not* flowing past the probe. Minimum sample line flow to activate the flow switch is 0.75 GPM (170 L/H) through the flow switch.

9.1 Mounting

The flow switch should be mounted within 8 ft (2.5 m) of the controller, oriented vertically as shown in Figures 4 and 5.

Connect (hard wire) flow switch electrical wiring to the terminal connections. These terminal connections are accessed inside the bottom junction box of the controller. They are terminals TB6 #3 and #4.

10.0 Maintenance

10.1 Probe Cleaning



The Controller must be recalibrated after cleaning the probe. See Section 7.0.

Frequency

The probe should be cleaned periodically. The frequency required will vary by installation. In a new installation, it is recommended that the probe be cleaned after two weeks of service. To determine how often the probe must be cleaned, follow the procedure below.

1. Read and record the conductivity.
2. Remove, clean and replace the conductivity probe.
3. Read conductivity and compare with the reading in step 1 above.

If the variance in readings is greater than 5%, increase the frequency of probe cleaning. If there is less than a 5% change in the reading, the probe can be cleaned less often.

Cleaning Procedure

The probe can normally be cleaned using a cloth or paper towel and a mild cleaning solution such as 409™ cleanser. Occasionally, a probe may become coated with various substances which require a more vigorous cleaning procedure (usually the coating will be invisible, but not always). To clean a coated probe, use a fine grit abrasive, such as emery paper. Lay the paper on a flat surface and move the probe in a back and forth motion as shown in the illustration.

The probe should be cleaned parallel to the carbon electrodes, *not* perpendicular.

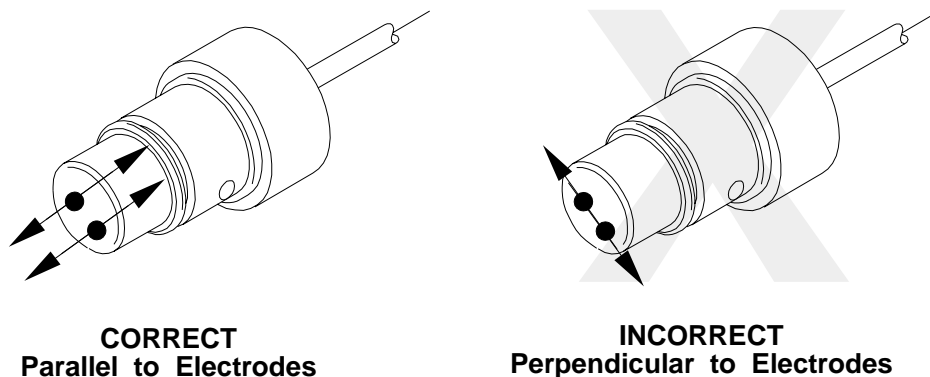
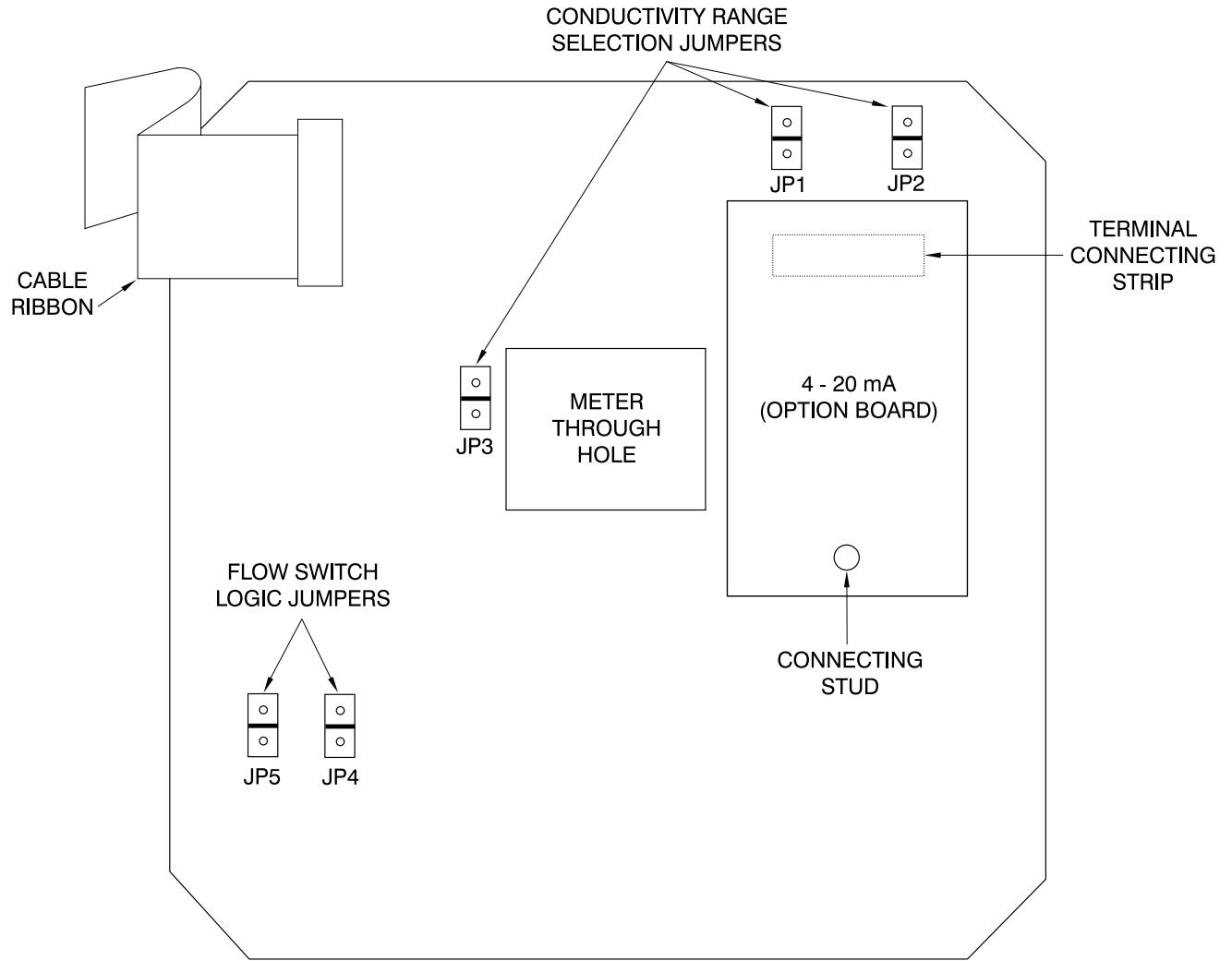


Figure 9

11.0 Description of Analog Circuit Board Options



Back of AC Series Analog Circuit Board

Conductivity Range Selection

	5000/2500	1000/500	
JP1	On	Off	Test
JP2	On	Off	Test
JP3	On	Off	Gain

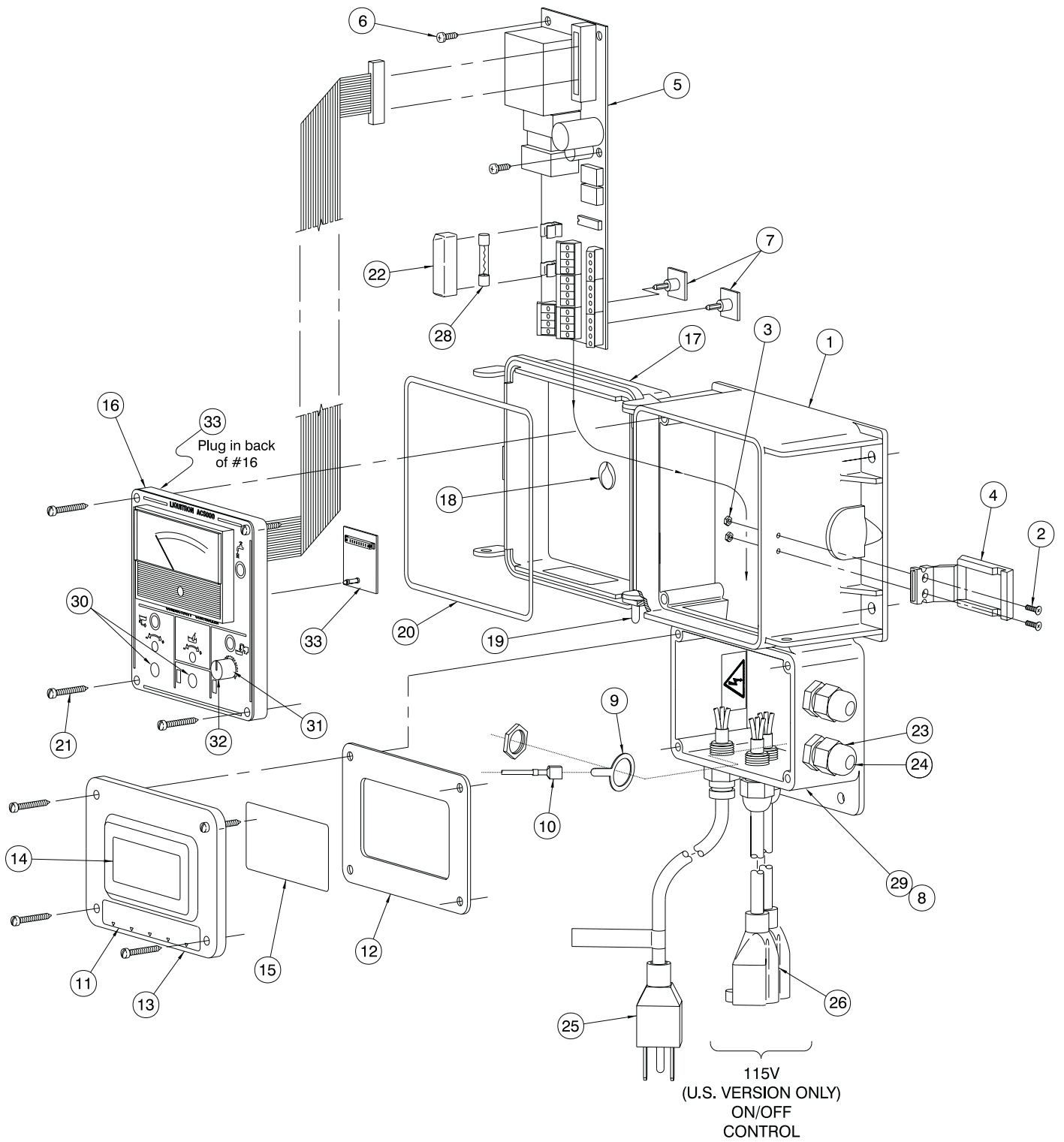
Flow Switch Logic

	Relay Closed = Flow	Relay Open = Flow
JP4	Off	On
JP5	On	Off

12.0 Spare Parts List - AC4000/AC5000

KEY NO.	PART NO.	DESCRIPTION
1	34675	Housing, AC4000, AC5000
	34736	Housing, AC4000 - 100, and AC4000 - 200
	34736	Housing, AC5000 - 100, and AC5000 - 200
2	32186	Screw, 4-40 x 0.37
3	32187	Nut, 4-40 flush
4	32209	Latch, machined
5	36174	I/O Board Assembly, AC5000
	36676	I/O Board Assembly, AC4000
6	31632	Screw, #6 x 0.38
7	34716	Standoff, adhesive
8	36739	Connector Assembly, 4 PIN
9	33566	Solder lug terminal
10	34735	Ground Wire Assembly
11	34931	Label, terminal cover, AC5000
12	34074	Gasket, foam
13	34088	Cover, utility box
14	32094	Label
15	36410	Label, AC4000/AC5000
16	36295	Front Panel Assembly, AC5050
	36815	Front Panel Assembly, AC5010
	36677	Front Panel Assembly, AC4050
	36830	Front Panel Assembly, AC4010
17	31617	Cover, Liquitron™
18	30588	Label
19	32211	Cap, 0.125 x 0.38
20	32352	O-Ring sponge
21	32395	Screw, self-tapping
22	34911	Cover, fuse
23	25957-1	Cord clamp
24	36810	Dowel
25	30749	Power Cord, 115 V
	30751	Power Cord, 230 V US
	30752	Power Cord, DIN
	30783	Power Cord, UK
	30754	Power Cord, AUST
	30784	Power Cord, SWISS
26	35711	Power Cord, 115 V, NEMA 15-R
27	31571	Cord Clamp
28	35712	Fuse, 4A, time delay
29	25930	4-pin jack cap
30	36300	Cap push button
31	36412	Knob, AC5000
32	36426	Cap, Knob
33	36586	4-20 mA Option PCB, AC4000/AC5000
34	36300	Push Button Caps

13.0 Exploded View - AC4000/AC5000



14.0 Statement of Limited Warranty

LMI TERMS AND CONDITIONS OF SALE:

1. Seller warrants that the equipment delivered by it to the Buyer is in accordance with the Seller's published specifications and is of the kind and of the description contained in seller's invoice.

THIS WARRANTY IS IN LIEU OF AND TO THE EXCEPTION OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING BUT NOT BY WAY OF LIMITATION, WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. DISTRIBUTOR IS NOT AUTHORIZED TO BIND THE COMPANY FOR ANY OTHER WARRANTY. THE FOREGOING STATES THE COMPANY'S ENTIRE AND EXCLUSIVE LIABILITY, AND DISTRIBUTOR AGREES TO HOLD THE COMPANY HARMLESS FROM AN IMPROPER APPLICATION OF PRODUCTS.

2. Seller's liability for breach of the foregoing warranty is expressly limited to the repair or, at Seller's option, replacement of such equipment FOB factory, or Acton, MA. Such obligation to repair or replace such equipment shall terminate 24 months after the delivery to such equipment to the Buyer. In no event shall the Seller be liable for any consequential damages resulting from any breach of warranty.

The Company warrants the Products in accordance with the statement of warranty policy included herein except that pump Product series designated as "A," "B," "C," "E," "G," "P," "H" and controller series designated as AC, DC, DP, DR, DT, and FS shall be warranted for a period of two (2) years from the date of delivery from Company; and except replacement elastomeric expendable parts which are not covered by any warranty either express or implied.

If the Buyer claims that the warranty contained herein has been breached, it shall immediately notify the Seller of such claimed breach in writing at Seller's address contained herein. The Buyer shall render necessary assistance to Seller, and it shall furnish adequate means for operating and testing such equipment.

The SOLE PURPOSE of the foregoing stipulated exclusive remedy shall be to provide to the Buyer free repair or at Seller's option replacement of non-conforming equipment in the manner provided herein. This EXCLUSIVE REMEDY shall not be deemed to have failed of its essential purpose so long as the Seller is willing and able to repair or at its option replace non-conforming equipment in the prescribed manner.

3. Seller shall not be liable for any loss or damage for delays in delivery or compliance with any warranty provision contained herein due to acts of God, acts of civil or military authorities, fires, floods, wars, riots, labor strikes or actions, accidents or delays in transportation or any other cause beyond the Seller's control.

4. All Shipments by Company to Distributor shall be made F.O.B. Factory, Acton, Massachusetts 01720, U.S.A. unless special arrangements are agreed to by both Company and Distributor.

5. The within terms and conditions constitute the entire agreement of the Buyer and Seller. Such terms and conditions may not be modified, altered or amended except by a writing signed by both parties. Such terms and conditions shall be binding upon the parties hereto, their successors and assigns. In the event that any term or condition shall be held to be invalid or unenforceable, all other terms shall remain in full force and effect. Such terms and conditions shall be governed and construed in accordance with the laws of the Commonwealth of Massachusetts.



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