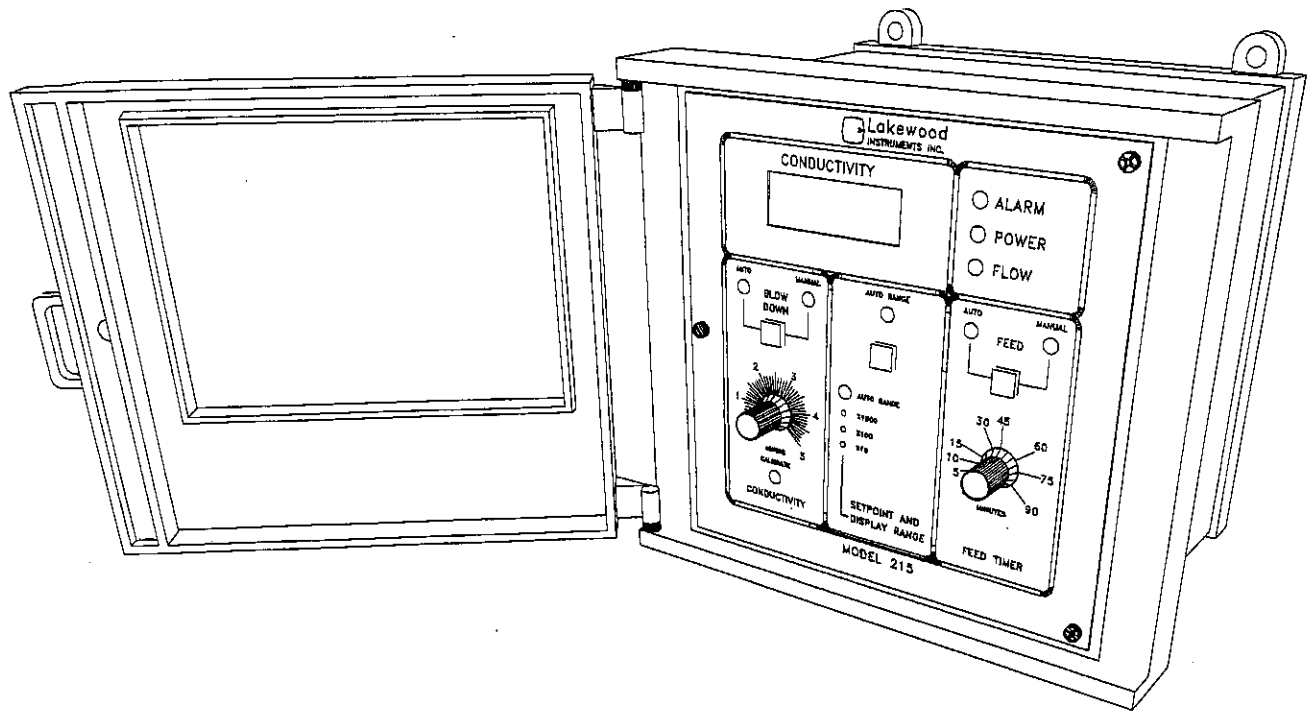


MODEL 215 CONDUCTIVITY CONTROLLER INSTRUCTION MANUAL



Serial #: _____



4857 W. Van Buren St., Phoenix, AZ 85043, (602) 272-5100, FAX: (602) 272-0400

MODEL 215 CAUTIONS

PLEASE READ THIS!

Do not feed molybdate into a sample line. Molybdate should be added directly into the cooling tower. Please ask your water treatment specialist for information and directions on proper feed methods.

Important

CAUTION CHEMICAL FEED

All electromechanical devices are subject to failure from a variety of causes. These include mechanical stress, component degradation, electromagnetic fields, mishandling, improper setup, physical abuse, chemical abuse, improper installation, improper power feeds and exposure.

While every precaution is taken to insure proper functioning, extra precautions should be taken to limit the ability of over-feeding by limiting chemical quantities available, secondary shut-downs, alarms and redundancy or other available methods.



CAUTION POWER SOURCE AND WIRING

Low voltage wiring and high voltage (110 plus) should not be run in the same conduit. Always run separately. Even shielded low voltage is not a guarantee of isolation.

Every precaution should be taken to insure proper grounding and elimination of shorting or Electromagnetic field (EMF) interference.

LAKWOOD INSTRUMENTS

MODEL 215 CONDUCTIVITY CONTROLLER

INSTRUCTION MANUAL

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1.0 GENERAL DESCRIPTION

1.1 Introduction

The cooling tower cools the water through evaporation to the atmosphere. The water that evaporates is pure. Water that remains in the basin contains salts and calcium brought in by the make up plus the salt and calcium left by the pure water that was evaporated. Therefore, the longer the tower operates, the higher the salts and calcium in the cooling water. Eventually the calcium becomes so concentrated, it will not stay in solution and plates out (scales) on the hot heat exchanger surfaces. Any film of scale on the heat exchanger surfaces makes the compressors work harder.... takes more power.....to achieve the same cooling.

Control of the calcium scale requires blowing down some of the cooling water to drain. As the cooling tower basin level drops, a float make up valve opens and brings in fresh make up water. The new make up water dilutes the saturated cooling water.

The term "Cycles of Concentration" refers to the excess salt in the cooling water divided by the salt in the make up water. If there is 80 PPM salt in the make up water, 3 cycles of concentration would be $80 \times 3 = 240$ PPM. Since the amount of the salts is proportional to conductivity,

$$\frac{\text{Conductivity of cooling water}}{\text{Conductivity of the make up water}} = \text{Cycles of concentration}$$

DESCRIPTION OF FRONT PANEL CONTROLS

Display	LCD display reads umhos times scale factor
ALARM	Alarm light - exceeded blowdown on time
POWER	Power light
FLOW	Flow switch flow
BLOWDOWN AUTO/MANUAL switch	Press in to manually open blowdown valve
SET POINT	Conductivity set point in umhos scale range
CALIBRATION	Calibrates the conductivity instrument
AUTO RANGE	Permits the controller to seek the proper conductivity range when the red LED is lighted
X10	The conductivity value times 10 umhos
X100	The conductivity value times 100 umhos
X1000	The conductivity value times 1000 umhos
FEED AUTO/MANUAL switch	Press in to manually feed chemical
ALARM TIMER	Limits the chemical feed pump run time per blowdown cycle

1.2 Conductivity Measurement

A conductivity controller measures the salt content of the cooling water by measuring the water's electrical resistance or conductivity. If the measured value is greater than the controller front panel set point, a relay turns on. As the blowdown valve lowers the water conductivity below the set point, the controller relay turns off.

A chemical pump is actuated at the same time the blowdown valve is opened. Chemical is pumped into the cooling water to replace the chemical lost due to blowdown. It is essential that cooling water treatment chemical is in the water to permit efficient operation of the cooling system. Contact your water treatment engineer for specific recommendations.

1.3 Alarm Timer

If the solenoid valve fails closed, the conductivity controller will continue to try to blowdown the cooling water indefinitely. This is because the conductivity will not be reduced without blowdown. Since the chemical is feed off of the conductivity relay, an alarm timer is needed to limit the time that the chemical pump operates continuously. After the alarm timer set point time is exceeded, the alarm locks out the chemical pump. The blowdown solenoid valve is not locked out.

If the conductivity set point is satisfied or if the flow turns off or if the conductivity set point is turned below the water conductivity, the alarm will automatically reset.

The alarm timer should not be used to limit the chemical feed as standard operating procedure. If the controller regularly goes into alarm, the chemical residual in the cooling water will not be controlled. Use it only as an alarm in case the solenoid valve fails.

1.4 Flow Switch

The flow switch locks out all chemical feed and the alarm timer if there is no sample line flow. Only 1 GPM is needed to raise the flow switch.

A flow sight assembly shows the black ball at the top of the flow switch float. When the ball is above the rim of the finger grip ring, the flow switch is on. The flow sight may be cleaned by turning off the sample flow and turning the red ring lock counter-clockwise. Then twist out the flow sight assembly. It is "O" ring sealed. Clean the flow sight insert with a cotton swab. See Figure 1.2B.

Removing the flow sight assembly permits removal of the flow switch float.

A reed switch assembly senses the position of the magnet. When it closes, it operates the flow switch relay. This assembly can be replaced. See Figure 1.5.

1.5 Output Options

One option can be plugged in to the rear circuit board.

1.5.1 -35 option. Isolated 4-20 mA output

Part number 700021 plug in circuit board provides an isolated 4 to 20 mA output to a computer or control device. The load resistance must not exceed 800 ohms.

The output is factory preset for 0 conductivity = 4 mA and the full scale = 20 mA. ZERO and SPAN adjustments permit scaling the output to another desired conductivity range. Refer to drawing 5102611 for component locations.

1.5.2 -42 option. Extra HIGH/LOW alarms for remote alarm status or computer alarm log.

To set alarms, simulate the LOW conductivity trip point. Just calibrate the controller conductivity for the desired LOW trip point. Adjust the LOW alarm on the board until the relay just pulls in. To set the HIGH alarm, make the controller read the desired HIGH conductivity trip point. Adjust the HIGH adjustment on the plug in board until the relay just pulls in.

Refer to drawing A-5102840 for component location of the set point adjustments.

1.6 Chart Recorder

The Model 21 inkless strip chart recorder requires two connections to the Model 175 back board. Refer to Figure 1.3. the chart recorder motor requires 120 VAC, 60 Hz unless specified otherwise.

The chart recorder manual is attached to this manual. Refer to the recorder manual for proper loading of the chart paper.

2.0 START UP

2.1 Checking

Check the power wiring. Make sure that the controller is powered from 120 VAC unless it is specifically set up for 220 VAC.

Check the wiring to the water meter. This is low voltage wiring and should NOT be connected to any 120 VAC circuits. Check the chart recorder wiring if used. Make sure that NO power wiring is connected to any low voltage circuits.

MAKE SURE THAT THE TWO RED LOCK RINGS ARE FULL CLOCKWISE AND LATCHED BEFORE TURNING ON THE SAMPLE LINE FLOW. THE FLOW SIGHT FITTING AND THE SENSOR WILL BLOW OUT IF NOT SECURELY LATCHED.

Check the plumbing for leaks. Check also for the proper flow direction. It takes 1' GPM to raise the float ball valve above the lip of the clear flow sight tube.

Check the chemical pump fittings. Make sure that they are safe. Not overtight but tight enough.

Make sure that the controller is piped per the suggested installation drawing.

2.2 Set Up

2.2.1 Conductivity

Determine the make up water conductivity in umhos. Multiply this number by 3 to give the conductivity set point value. This will give approximately 3 cycles of concentrations. Check with your water treatment engineer for the desired conductivity value for water conservation and good scale control.

2.2.2 Flow Switch

Turn on the water flow. The black flow indicator should rise in the flow sight indicator and the FLOW light should go on. If there is no flow, there will be no power to the chemical pump outlets of the blowdown solenoid valve. If the controller has a biocide timer also installed, make sure that the biocide feed is off. If the biocide timer is feeding biocide, the controller outputs will be disabled.

2.2.3 Alarm Timer

To check the alarm timer, set the knob full counter-clockwise and turn the conductivity set point knob full counter-clockwise. To run the test the FLOW light should be on and the biocide feed (if any) should be off. After 5 minutes (approximately) the ALARM light should turn on, the blowdown valve should still run, but the chemical pump should turn off. Turning the conductivity set point knob above the actual water set point should reset the alarm timer.

Set the conductivity set point knob for the desired value. Set the timer at 60 minutes. This should be sufficient timer for the blowdown valve to satisfy the conductivity set point.

2.2.4 Auto range

The controller will automatically seek the correct range of the instrument. After the auto range picks the correct range, press the AUTO RANGE push button to turn out the red light. This will fix the range so that the instrument will not seek other ranges while you are calibrating the instrument.

2.3 Calibration

2.3.1 Hand held conductivity meter secondary standard method.

1. Press the DISPLAY push button to make the display read conductivity.
2. Make sure that your hand held conductivity meter is calibrated accurately.
3. Measure the tower water with the hand held meter.
4. Turn the calibration screw for the conductivity until the meter reads the same as the tower water.

2.3.2 Using the controller as a standard.

1. Put a sample of the make up water in a glass beaker or jar.
2. Remove the conductivity sensor from the controller and immerse it one inch minimum from the bottom of the jar. The top should not be under water.
3. Turn the calibrate screw to make the conductivity read the approximate value of the make up water conductivity. Use 200 to 1000 umhos if this is not known.
4. Multiply the make up water by 3. Set the set point for this value.
5. Reinstall the sensor. The controller should maintain the cooling water at 3 cycles of concentration.

Note: Some hand held meters are calibrated in PPM or TDS. It is O.K. to calibrate the controller in PPM instead of umhos.

3.0 TROUBLESHOOTING

PROBLEM

CHECK

No chemical in the cooling water.

1. Other sources of blowdown that prevent the concentrations from rising.
2. tower overflow.
3. Chemical pump lost prime.
4. Alarm is on. Too short an alarm time.
5. Power on the chemical pump outlet with A-O-M switch in manual.

Blowdown valve does not open.

1. turn A-O-M switch to manual.
2. check power at the outlet.
3. Is FLOW light on? No flow?
4. Check out the valve solenoid. Is it burned out?
5. Look at the blowdown relay. If it is very black inside, the rear circuit board must be repaired.

The above checks out O.K. but the valve will not operate in the AUTO position.

1. Remove the front panel at the hinges and return to the factory for repair. Note the ribbon cable polarity for re- installation.

All of the above O.K. but the alarm turns on at each blowdown cycle.

1. Increase the blowdown rate if possible.
2. Increase the alarm timer setting.

The alarm timer is on all the time.

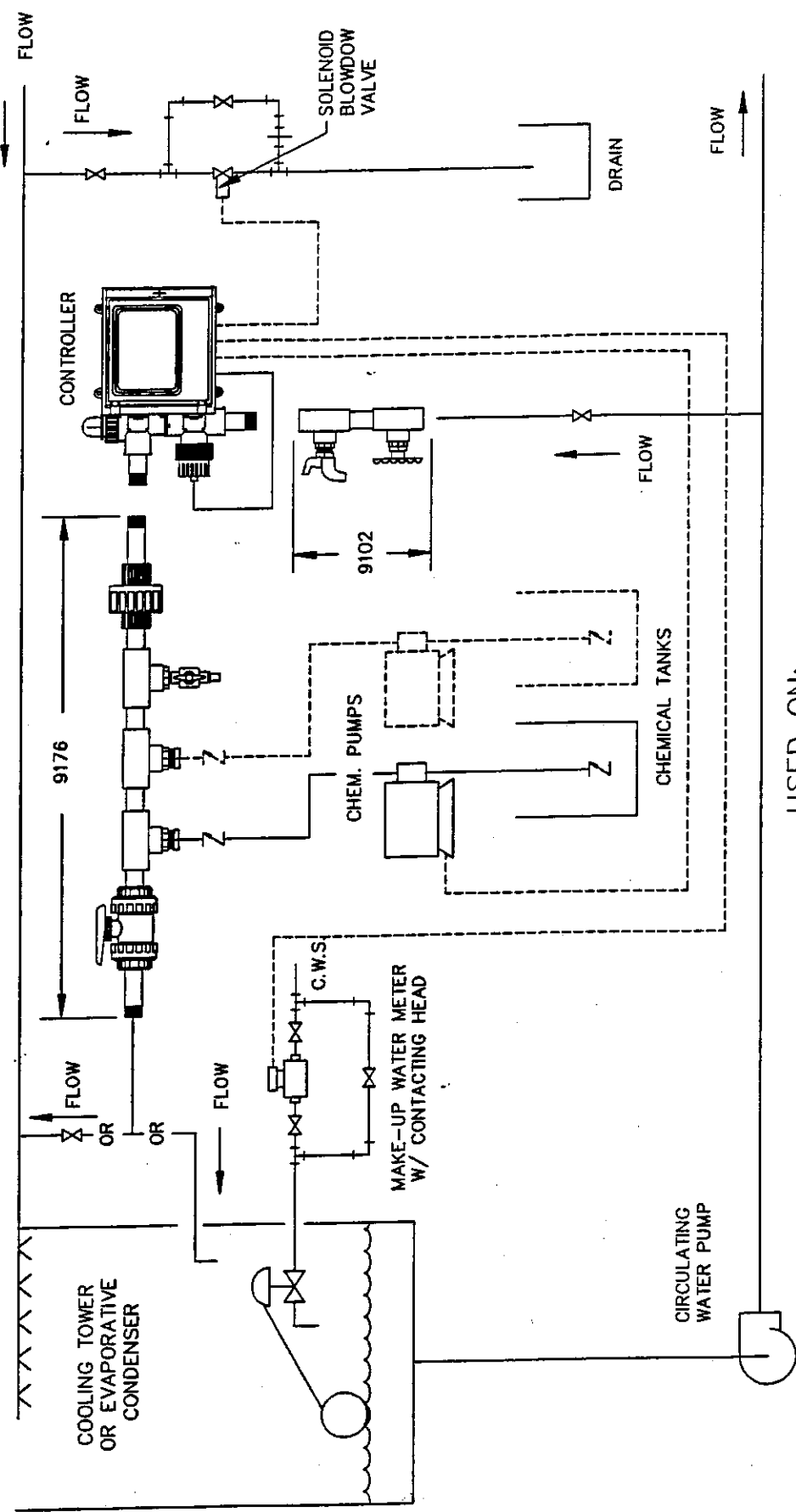
1. Send the front panel to the factory for repair.

4.0 PARTS LIST

<u>PART NUMBER</u>	<u>DESCRIPTION</u>
700185	Conductivity sensor
700314	Plumbing assembly including flow switch
700413	Front panel with circuit board and display
700367	Rear circuit board
WA 1/2	Replacement chart paper for chart recorder. 6 rolls

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
	NEW	NEW ISSUE	DH 12/90	



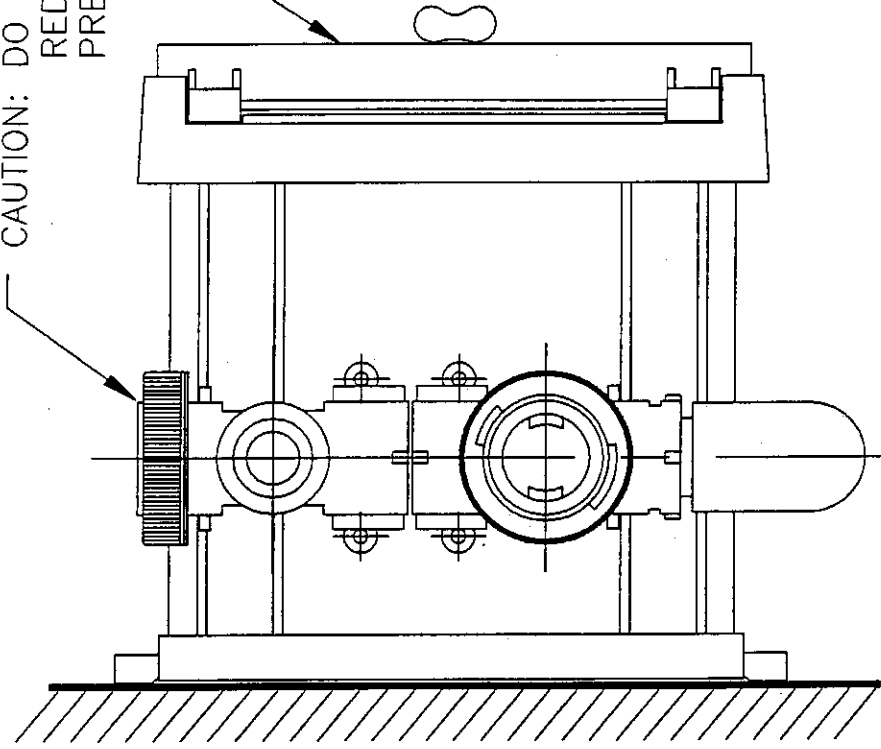
USED ON:

CONTRACT NO.		Lakewood INSTRUMENTS INC.	
APPROVALS	DATE	RECOMMENDED INSTALLATION	
DRAWN BY: DH	12/90	COOLING TOWER CONTROL SYSTEM	
CHECKED BY:		SIZE	CAGE CODE
ENGR:		A	
DESIGN ACTIVITY:		DRAWING NUMBER:	5101424
ACCEPTED BY:		SCALE:	NONE
		MODEL NUMBER:	173, 174, 175
		SHEET:	1 OF 1

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
	NEW	NEW ISSUE	JY 6/86	

CAUTION: DO NOT ATTEMPT TO OPEN RED RING IF SYSTEM IS UNDER PRESSURE



KEEP OUT OF DIRECT SUNLIGHT IF POSSIBLE. CONTROLLER RUNS COOLER IN THE SHADE

USED ON:

1. INSTALL ON AN EVEN VIBRATION FREE SURFACE.
2. USE #6 OR #8 BOLTS/SCREWS STUDS.
3. DO NOT OVER TIGHTEN. SNUG IS ENOUGH.

CONTRACT NO.	DATE
APPROVALS	6/86
DRAWN BY: JY	
CHECKED BY:	
ENGR:	
DESIGN ACTIVITY:	
ACCEPTED BY:	



DIAGRAM - INSTALLATION
INSTALLATION NOTES

SIZE	CAGE CODE	DRAWING NUMBER	REV.
A		5101439	
SCALE: NONE	MODEL NUMBER:	SHEET: 1 OF 1	

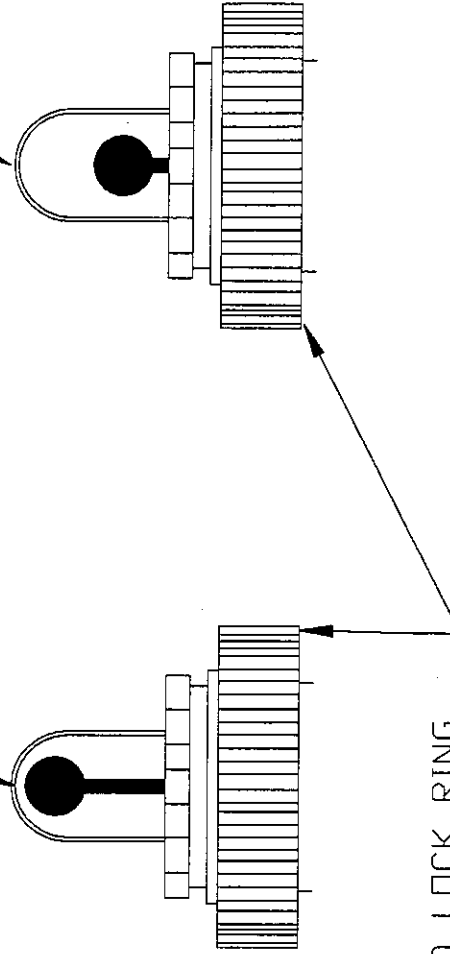
NOTES: UNLESS OTHERWISE SPECIFIED;

1. TO REMOVE CLEAR FLOW SIGHT TUBE FOR CLEANING, TURN LOCK RING CCW, TWIST OUT TUBE.
2. CLEAN IN SOAP AND WATER.
3. PUT A SMALL AMOUNT OF "O"-RING LUBE ON THE "O"-RING.
4. REINSTALL.
5. TURN LOCK RING CW UNTIL IT SNAPS ON DETENT.
6. LOCK RING OPERATION: CLOCKWISE TO DETENT TO OPEN COUNTERCLOCKWISE TO OPEN

REVISIONS


ZONE	REV	DESCRIPTION	DATE	APPROVALS
	NEW	NEW ISSUE	JY 6/86	

FULL FLOW WILL HOLD BALL AT TOP OF DOME ABOUT 1 G.P.M. AT THIS POSITION



DO NOT ATTEMPT TO OPEN RED LOCK RING IF SYSTEM IS UNDER PRESSURE

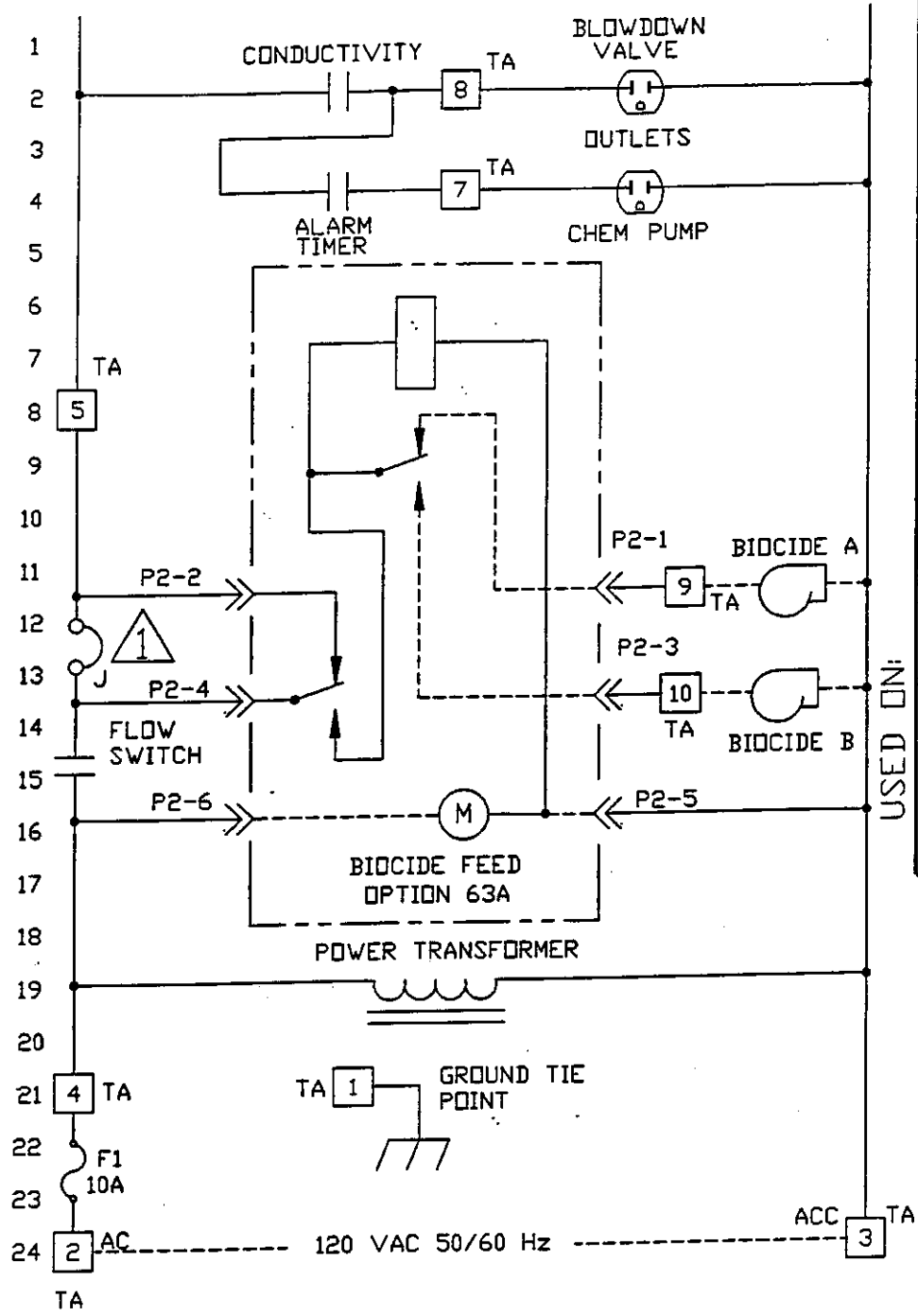
USED ON:

CONTRACT NO.		 Lakewood INSTRUMENTS INC.	
APPROVALS	DATE	DRAWING - ASSEMBLY	
DRAWN BY: JY	6/86	FLOW SWITCH NOTES	
CHECKED BY:		SIZE	CAGE CODE
ENGR:		A	
DESIGN ACTIVITY:		DRAWING NUMBER:	5101440
ACCEPTED BY:		SCALE:	NONE
		MODEL NUMBER:	
			REV.
			SHEET: 1 OF 1

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
		NEW ISSUE	JY 9/86	

NOTES: UNLESS OTHERWISE SPECIFIED;
 REMOVE JUMPER FOR BIOCIDE FEED.



Lakewood INSTRUMENTS INC.

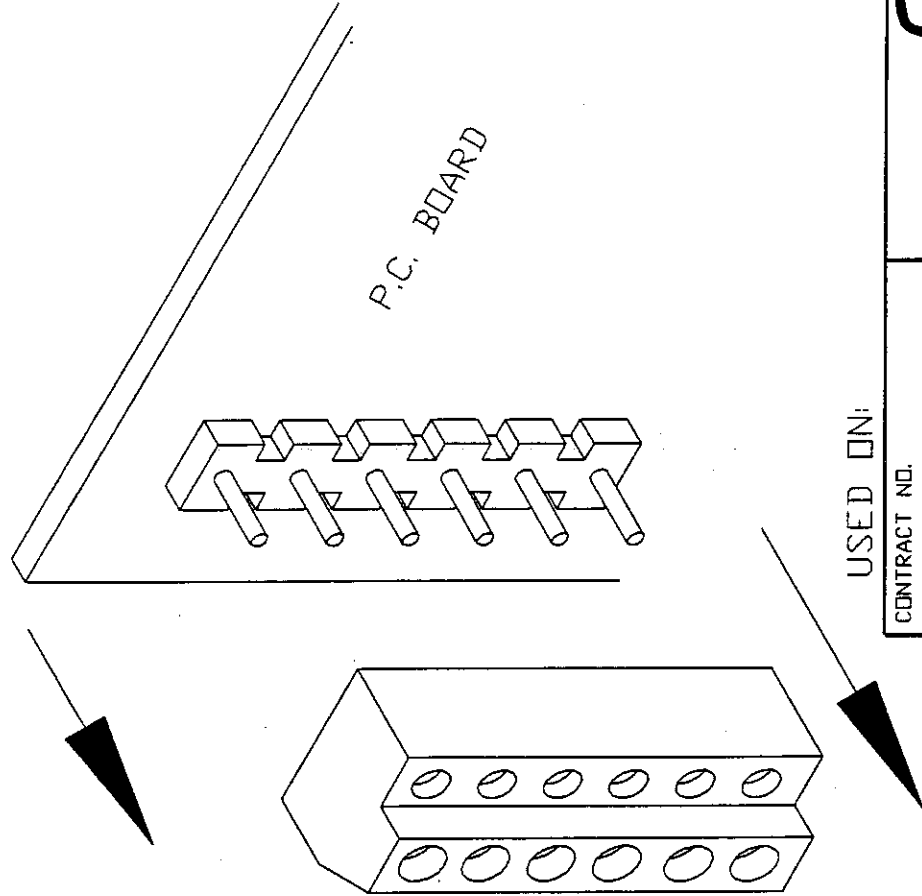
DIAGRAM - LADDER
 200 SERIES BACKBOARD

CONTRACT NO.	APPROVALS	DATE	REV.
	DRAWN BY: JY	9/86	
	CHECKED BY:		
	ENGINEER		
	DESIGN ACTIVITY:		
	ACCEPTED BY: **		
SIZE	CAGE CODE	DRAWING NUMBER	REV.
A		5101513	
SCALE: NONE	MODEL NUMBER		SHEET 1 OF 1

- NOTES: UNLESS OTHERWISE SPECIFIED;
1. PULL ON TERMINAL BLOCK WITH PLIERS FOR EASE OF WIRING.
 2. INSTALL WIRES, THEN PUSH TERMINAL BLOCK ON PIN HEADER.

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
	NEW	NEW ISSUE	JY 9/86	

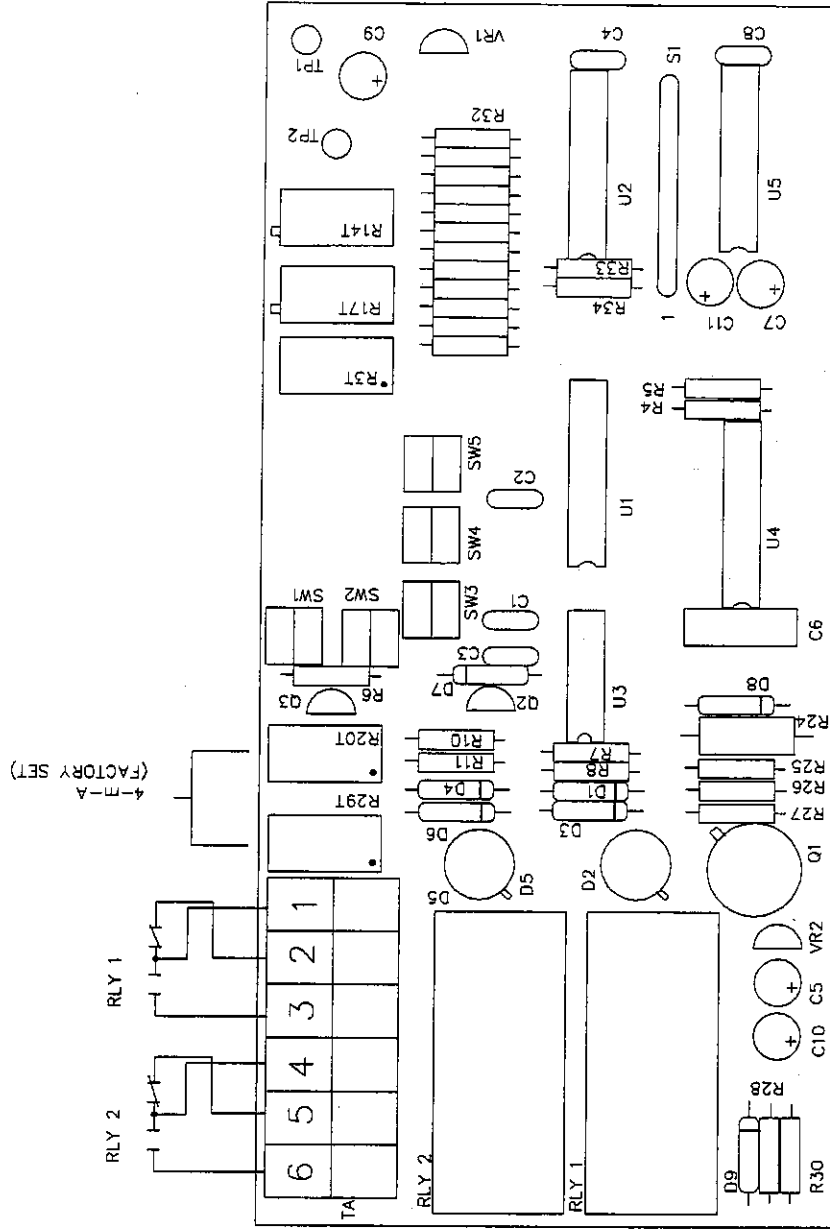


USED ON:

CONTRACT NO.		Lakewood INSTRUMENTS INC	
APPROVALS	DATE	DIAGRAM - REMOVAL	
DRAWN BY: JY	9/86	TERMINAL BLOCK	
CHECKED BY:		P.C. BOARD	
ENGR:		SIZE	DRAWING NUMBER
DESIGN ACTIVITY:		A	5101519
ACCEPTED BY:		SCALE: NONE	MODEL NUMBER: SHEET 1 OF 1

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
	NEW	NEW ISSUE	DH	



NOTES:

- SW 1 --- HIGH RELAY 1
- SW 2 --- LOW RELAY 1
- SW 3 --- HIGH RELAY 2
- SW 4 --- LOW RELAY 2

USED ON:

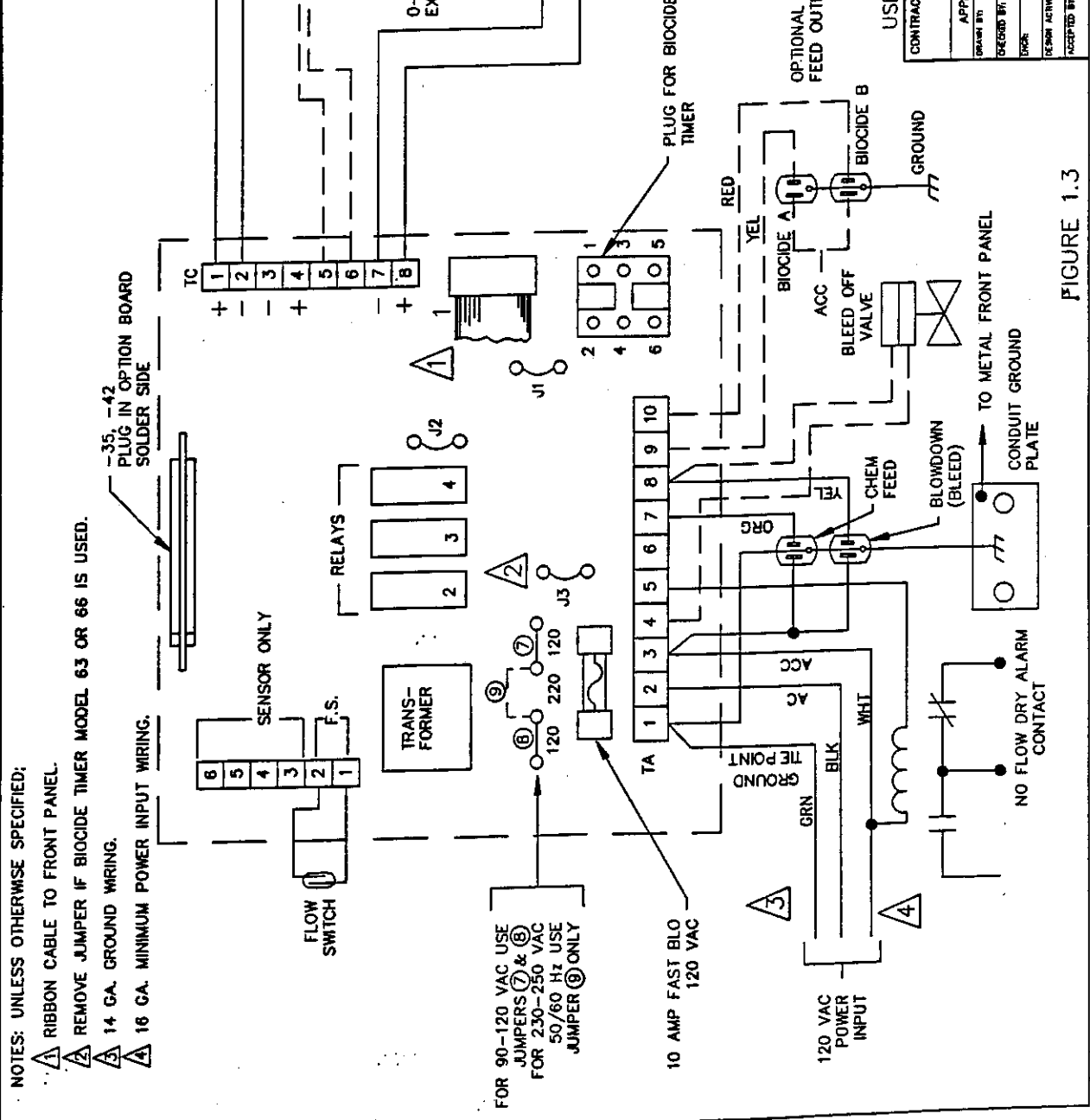
CONTRACT NO.	APPROVALS	DATE
	DRAWN BY: DH	12/89
	CHECKED BY:	
	ENGR:	
	DESIGN ACTIVITY:	
	ACCEPTED BY:	



DRAWING - ASSEMBLY
M-35 CARD 4-20mA
OUTPUT

SIZE	CAGE CODE:	DRAWING NUMBER:	REV.
A		5102611	
SCALE:	MODEL NUMBER:	SHEET: 1 OF 1	
NONE	M-35		

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVALS
	E	SEE ECN 0077 MAG 2/92		



- NOTES: UNLESS OTHERWISE SPECIFIED;
- ▲ RIBBON CABLE TO FRONT PANEL.
 - ▲ REMOVE JUMPER IF BIOCIDE TIMER MODEL 63 OR 66 IS USED.
 - ▲ 14 GA. GROUND WIRING.
 - ▲ 16 GA. MINIMUM POWER INPUT WIRING.

CONTRACT NO.

APPROVALS	DATE
DRAWN BY GOLDIS	1/87
DESIGNED BY	
CHECKED BY	
DESIGN ACTIVITY	
ACCEPTED BY	

USED ON: 175-CI-AL-66-35

DIAGRAM - CONNECTION

RELAY BOARD EXTERNAL CONNECTIONS

REV.	E
REV. NO.	5101514
SCALE	NONE
MODEL NUMBER	175/175
SHEET	1 OF 1

FIGURE 1.3

A) INPUT AC VOLTAGE:

- >115 VAC USE J8 & J7
- >250 VAC USE J9

B) BIOCIDES: (66)

- >TO USE WITH 66 OMIT J3
- >TO USE WITHOUT 66 USE J3

C) MODELS:

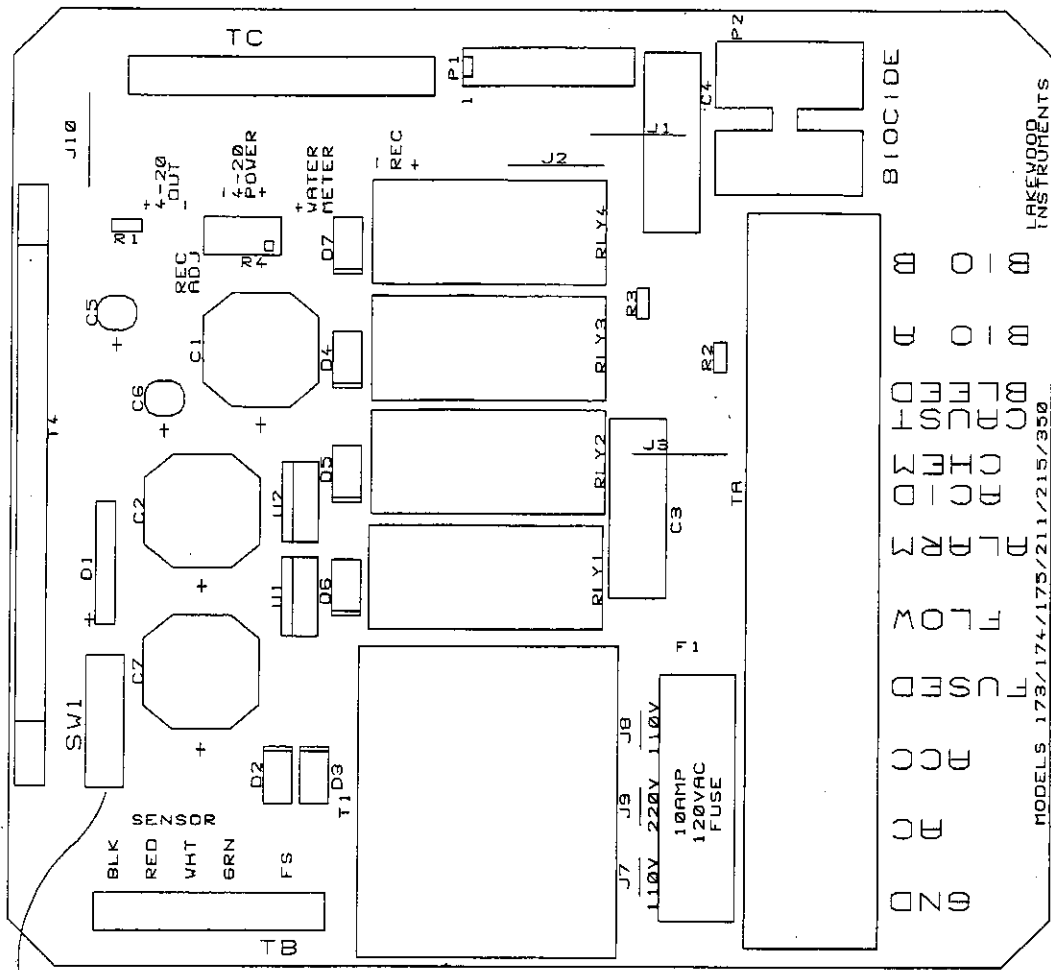
- >173/174/175 USE J1 & J2
- >211/215 USE J2
- >350 USE J1

D) SENSOR OPTIONS:

- >350-RS/STANDARD:
USE SW1 S1A-S2A
S3A-S3B
- >350-RP:
USE SW1 S2A-S2B
S4A-S4B
S6A-S6B
- >173/175/211-RP:
USE SW1 S2A-S2B
S5A-S5B
S7A-S7B
- >173/175/211/215 STANDARD:
USE SW1 S1A-S2A
S3A-S3B
S4A-S4B
S6A-S6B

D) 4-20mA OUTPUT:

- >REMOVE J10 FOR EXTERNALLY
POWERED 4-20mA LOAD



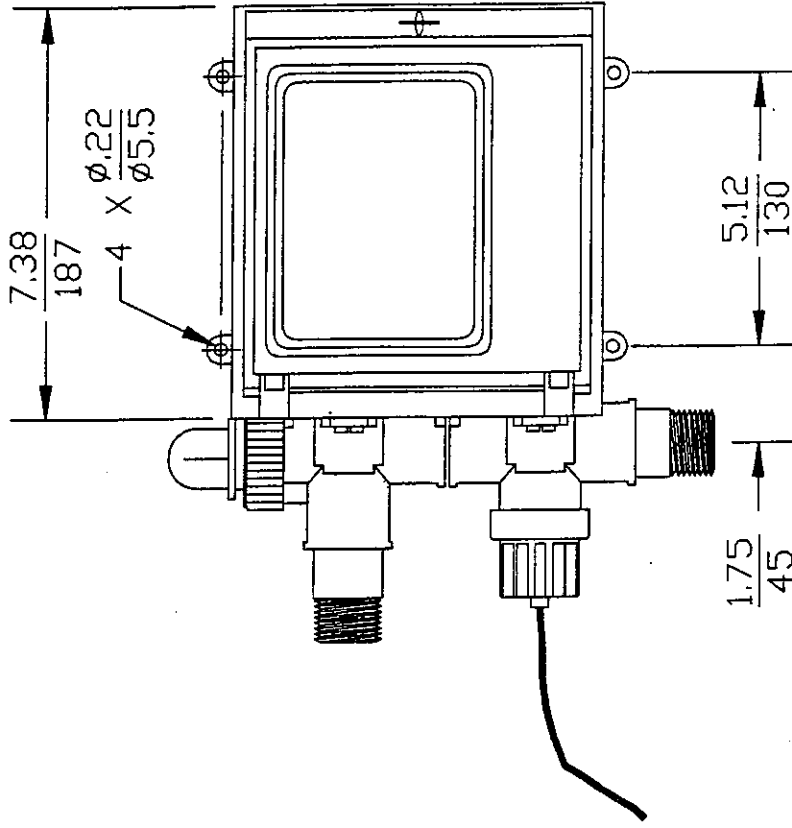
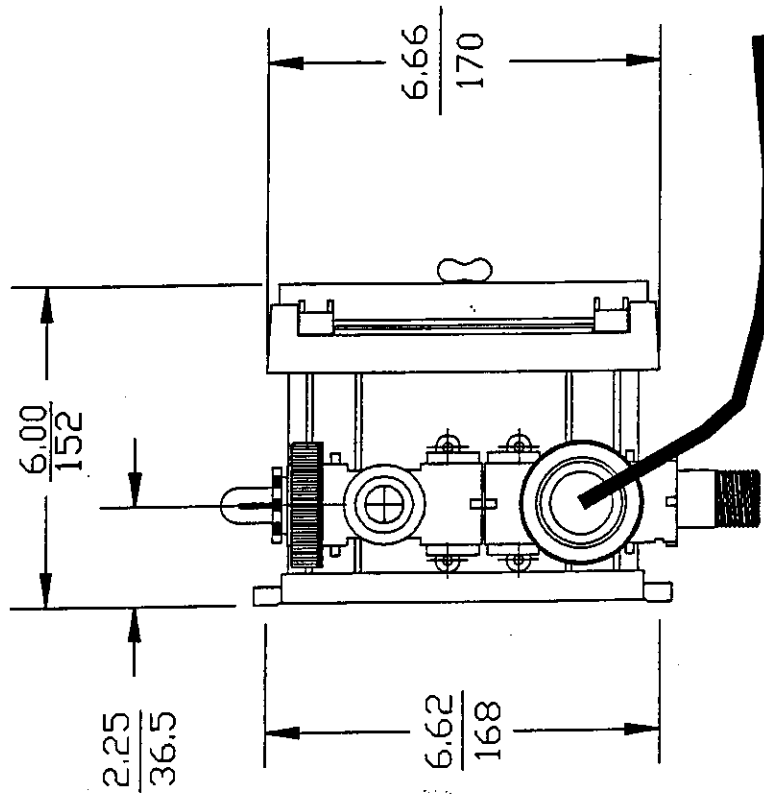
DATE	1/7/91	APPROVED	REV. E	2/25/91
DR. BY.	JH			
SCALE	1:1			
MODEL NO.	173, 174, 175, 211, 215, 350	DWG. NO.	A-5101409	

BACKBOARD COMPONENT LAYOUT

NOTES: UNLESS OTHERWISE SPECIFIED;
DIMENSIONS ARE IN INCHES
MM

REVISIONS

ZONE	REV	DESCRIPTION	DATE	APPROVALS
	B	NEW ISSUE	JY 6/86	
	A	CHANGED DIMS	JY 6/86	
	B	REVISED	DH 6/90	



USED ON: 101, 151, 173, 175, 211, 215, 222, 224

CONTRACT NO.



DRAWING - ASSEMBLY
SENSOR & PLUMBING
CONFIGURATION

APPROVALS DATE

DRAWN BY: JY 6/86

CHECKED BY:

ENGR.

DESIGN ACTIVITY:

ACCEPTED BY:

SIZE

CAGE CODE

A

DRAWING NUMBER

5101423

REV.

B

MODEL NUMBER

SCALE: NTS

SHEET: 1 OF 1



ATTENTION!!

CAUTION

When the auto-ranging feature of the Model 215 Conductivity Controller is manually locked out with the AUTO RANGE switch on the front panel, the controller may lock into the lowest range during power brown-out or loss of power. This will, in most applications, cause the controller to try and blowdown the process to the setpoint established on the dial on the front panel, but at a X1 multiplier, instead of the X10 or X100 originally established.

Any brown-out or loss of power will require operator attention to verify that the proper range is re-established on the controller to prevent excessive blowdown and possible chemical overfeed.

If the controller is not in the proper range on restart, press the AUTO RANGE button to place the controller into the autoranging mode, illuminating the AUTO RANGE light. When the proper range is established, press the AUTO RANGE button to lock the controller into the proper range and turn off the AUTO RANGE light.

NOTE!! This procedure **MUST** be followed every time there is a brown out or a loss of power to the controller.