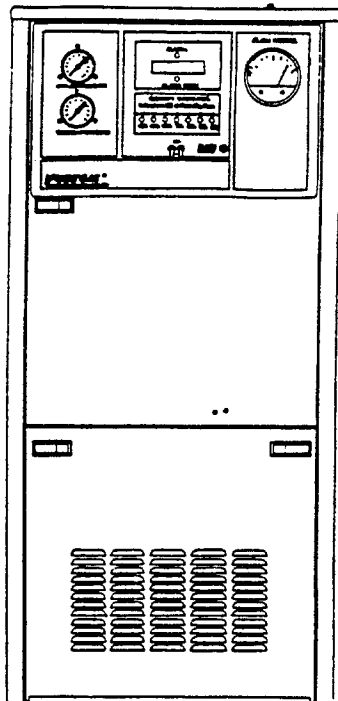


Air Dryer Instruction Manual

Model P-10000DCO/P-15000DCO

Central Office Air Dryers

(Serial Numbers 1931001 and 1931501 to Present)



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PREFACE

This instruction manual is produced for the benefit of our customers. It is intended to provide basic information which will enable our customers to install, maintain and service PUREGAS Air Dryers economically, capably and with minimum delay. Careful observation of these instructions and maintenance procedures will ensure maximum life and efficiency of the unit.

This manual should be read thoroughly before installing, operating or servicing the air dryer to familiarize the technician with the unit and the proper operating and repair procedures. This will minimize the possibility of damage to the unit due to improper operation, handling or disassembly.

**Please direct all inquiries to:
PUREGAS
5600 West 88th Avenue
WESTMINSTER, COLORADO 80030
1-800-521-5351 or (303) 427-3700**

**NO PART OF THIS TECHNICAL MANUAL
MAY BE REPRODUCED WITHOUT THE
EXPRESS WRITTEN CONSENT OF PUREGAS.**

LIMITED WARRANTY AGREEMENT

Puregas Air Dryers carry a one-year warranty against defective workmanship and material. This period starts 90 days after date of shipment. Not included are components subject to normal replacement during a year's operating time.

These parts include, but are not limited to, filters, electrical components, pressure switches, pressure regulators and air compressors.

Should a unit be held in stock and not be issued during the one-year warranty period, and providing that the unit has been stored in a manner specified by seller, the seller will warrant that, for a period of two years after buyer acceptance, the unit will start-up and operate to specification. Should the unit fail under these circumstances, it will be processed as if it were still under the standard one year warranty.

No claims for labor in replacing defective parts or for consequential damages will be allowed. Replacement parts will be invoiced in the regular way, with invoices subject to adjustment after the parts claimed defective are examined at our factory. In addition, no material or parts will be accepted at our factory for in-warranty repairs or credit without previous authorization from Puregas Division, Mobile Tool International, Inc.

Responsibility for damages incurred in transit will be borne by the user and the user in turn should file any damage claim against the carrier. All warranty items are F.O.B. our plant. Freight charges are the responsibility of the user.

This warranty shall not apply to any air dryer which shall have been repaired or altered in any way by anyone other than Puregas Division, Mobile Tool International, Inc. so as to affect, in our judgment, its proper functioning or reliability, neither will it apply to a dryer which has been subject to misuse, negligence or accident.

**AIR DRYER INSTRUCTION MANUAL
FOR PUREGAS MODELS P-10000-DCO/P-15000-DCO**

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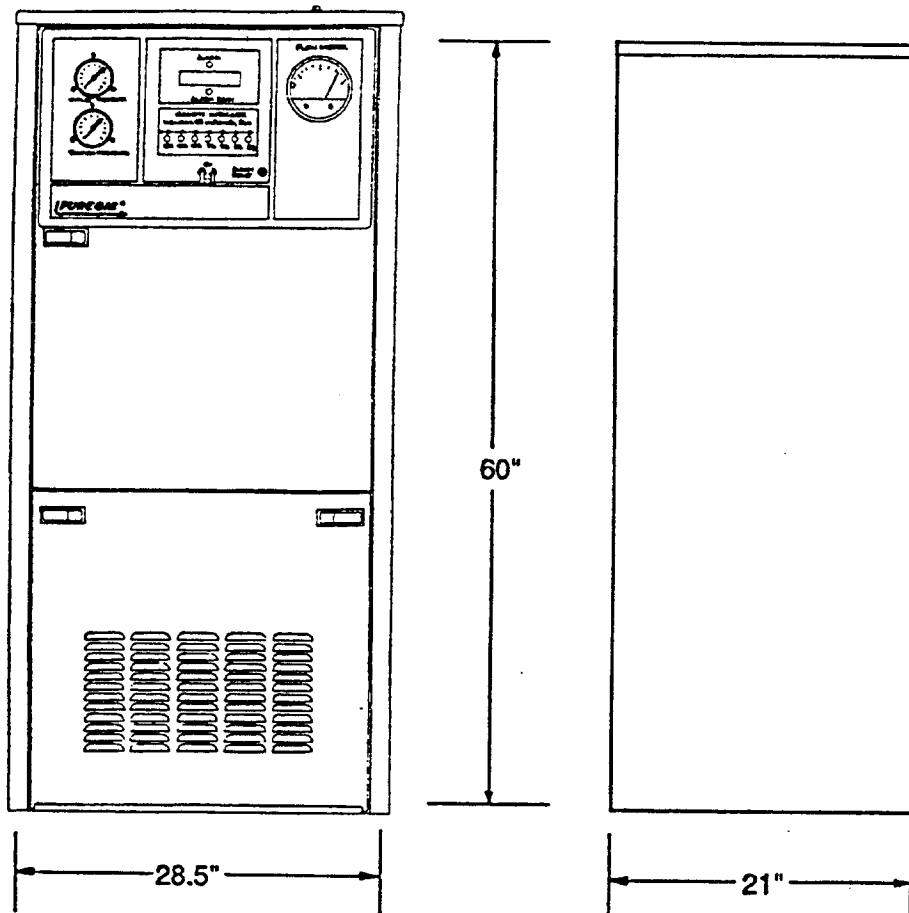
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**DESCRIPTION, OPERATION AND MAINTENANCE
OF MODEL P-10000-DCO/ P-15000-DCO AIR DRYER**

**SECTION 1
GENERAL**

- 1.1 This instruction manual covers the description, maintenance and troubleshooting techniques of the Model P-10000-DCO/P-15000-DCO Air Dryer. This dryer is designed to supply a normal continuous delivery of up to 10,000 or 15,000 SCFD of dry air at adjustable pressures of 0-15 PSIG for continuous feed pressure cables, pipe systems, or other devices requiring dry air. The Model P-10000-DCO/ P-15000-DCO is designed for indoor use.



**OUTLINE DIMENSIONS
FIGURE 1**

SECTION 2 DESCRIPTION

- 2.1 The Model P-10000-DCO/P-15000-DCO Air Dryer employs the principles of compression and physical adsorption. Operation is fully automatic and relatively maintenance free. The unit essentially consists of an oilless, water-lubricated air compressor and two heatless desiccant towers. It also incorporates the necessary gauges, controls, and automatic alarms to ensure the delivery of dry air at the proper pressure and relative humidity. The air dryer will automatically shut down in the event of low water or high humidity condition.

AIR DRYER CHARACTERISTICS		
MODEL NUMBER:	P-10000-DCO	P-15000-DCO
OUTPUT CAPACITY:	10,000 SCFD*	15,000 SCFD*
POWER REQUIREMENTS:	208 VAC ($\pm 10\%$), 1 Phase, 60 Hz 11.5 Amps (20 Amp service recommended)	208 VAC ($\pm 10\%$), 3 Phase, 60 Hz 10.5 AMPS
COMPRESSOR TYPE:	Shock Mounted, 2 HP water sealed, liquid ring type	Shock Mounted, 3 HP water sealed, liquid ring type
HEAT DISSIPATION:	6694 BTU/HR.	6126 BTU/HR.
DRYER TYPE:	Heatless desiccant type	
AMBIENT OPERATING TEMPERATURE RANGE:	+ 40°-120° F. (+ 5°-48° C.)	
OUTLET PRESSURE RANGE:	Regulated low pressure outlet 0-15 PSIG high pressure outlet -17 PSIG.	
OUTLET AIR HUMIDITY:	Below 2% R.H.	
DIMENSIONS:	21"D. x 28.5"W. x 60"H. (53.3 cm D. x 72.4 cm W. x 152.4 cm H.)	
WEIGHT:	470 lbs. (214 kg.)	
** C.O. ALARMS:	High Humidity (Shutdown air dryer), Low & High Outlet Pressure, Low Water (Shutdown air dryer), High Water, High Flow, High Temperature (shutdown air dryer)	
DRY AIR OUTLET CONNECTIONS	Low 1/2" FPT High 1/2" FPT	Low 1/2" FPT High 1/2" FPT
* Standard cubic feet per day at 70° F. (21° C.) and 14.7 PSIA (101.4 KPA)		
** Central Office Alarms		

SECTION 3 INSPECTION AND START UP

CAUTION

It is extremely important that the start-up procedure is performed in the following sequence.

3.1 Initial Inspection

- 3.1.1 Remove the lower front panel and open the upper instrument door. Carefully inspect both the exterior and interior of the air dryer for any shipping damage, loose parts and loose wires.

NOTE:

Any damage must be brought to the immediate attention of the carrier.

- 3.1.2 The following items will be secured in the air compressor compartment accessory kit:

1 each P-1324	Conn-Cones
1 each P-03129	Elbow-Conduit, Electric
1 each P-03130	Conn-Conduit
2 each P-06658	Cabinet Air Filters
1 each P-15-453	Air Compressor Inlet Filters
1 each P-06824	Water filter - Element
1 each P-5000-8-38	Plug-Alarm-Female

- 3.1.3 Close the upper instrument door and install the lower panel before moving unit to the permanent location.

3.2 Location

- 3.2.1 The air dryer requires a clean supply of air for compression and cooling. Most central office locations are suitable since the air compressor intake filter cleans the air prior to use. However, it must be remembered that filters will clog quickly in a dirty or dusty environment, therefore, more frequent filter changes will be necessary to prevent loss of dryer capacity and higher operating temperatures. Model P-10000-DCO generates heat into the space it occupies at the rate of 6694 BTU/hr. while Model P-15000-DCO produces 6126 BTU/hr. In an air conditioned space, the 10000 would require .56 tons of refrigeration and the 15000, .51 tons for heat dissipation. In any case, adequate ventilation must be provided for heat dissipation. The air dryer should be located at least six inches from the wall to allow sufficient air circulation.

3.3 Connections

- 3.3.1** Install a suitable length of 3/8" plastic tubing for the primary water dump. The hookup is made at the compression fitting on the lower rear of the cabinet as viewed from the back. Since up to three gallons of water may be discharged per day, a drain system is recommended rather than a receptacle.

3.4 Electrical Hook-up

- 3.4.1** Turn the air dryer start-stop switch to OFF. Model P-10000-DCO operates on 208 VAC, SINGLE PHASE, 60Hz power source fused for 20 amperes. At the power junction box, connect the incoming power leads L1 to wire 1, L2 to wire 2 and ground to wire 4. Size 10 gauge wire must be used to provide electrical service to the air dryer.

Model P-15000-DCO operates on 208 VAC, THREE PHASE, 60Hz, 20 ampere service. At the power junction box, connect the incoming power leads L1 to wire 1, L2 to wire 2, L3 to wire 3 and ground to wire 4. Size 10 gauge wire must be used to provide electrical service to the air dryer.

NOTE:

On Model P-15000-DCO only: Phase sequence dictates motor rotation. Interchanging leads L1 and L2 will reverse rotation of the air compressor motor. Correct rotation can only be determined after following proper start-up procedures.

3.5 Alarm Hook-up

- 3.5.1** The alarm outputs can be monitored as discrete (individual) or as a two-wire common, depending on the capability of your alarm monitoring system.
- 3.5.2** To connect a two-wire common alarm system, attach the two wires from the monitoring system onto the female connector plug (P-5000-8-38) located in the accessory bag. Then attach the female connector plug to the male alarm socket located at the top rear of the air dryer.
- 3.5.3** For discrete alarm hook-up, proceed to the discrete alarm outputs. Refer to Figure 2. Connect the corresponding wires from the monitoring system with the individual alarm outputs at the alarm output terminal block, (located along the top of the alarm board). For further detail refer to the D.C. wiring diagram.

NOTE:

Do not use the two common alarm outputs on the alarm board when using discrete alarms.

- 3.5.4** All individual alarms are normally open dry contacts. (See Alarm Board Discrete Outputs, Figure 2, next page).

ALARM BOARD DISCRETE OUTPUTS		
PIN (TB1)		LED
24 NO	} Common Alarm 1	1
23 COM		
22 NC		
21 NO	} Common Alarm 2	1
20 COM		
19 NC		
18 } 17 }	HIGH FLOW	2
16 } 15 }	SPARE	3
14 } 13 }	HIGH PRESSURE	4
12 } 11 }	LOW PRESSURE	5
10 } 9 }	HIGH WATER	6
8 } 7 }	HIGH HUMIDITY	7
6 } 5 }	LOW WATER	8
4 } 3 }	HIGH TEMPERATURE *	9
2 } 1 }	POWER FAIL	-

***Optional**

ALARM BOARD DISCRETE OUTPUTS
Figure 2

3.6 Start Up

- 3.6.1 A plastic orifice plug is located in the low pressure outlet port at the rear of the air dryer. This plug will permit the unit to operate in a simulated "on-line" condition.

NOTE:

Have 1 gallon of clean water available.

- 3.6.2 Place the Control Power switch to the ON position.

- A) The logic scan LED will start flashing.
- B) The air compressor and heat exchanger fan motor will start.

NOTE:

On Model P-15000 -DCO Only - Upon initial start-up, if the air compressor will not accept water and within 30 seconds the system pressure gauge does not indicate rising pressure, Stop Unit Immediately and refer to Paragraph 3.4.1 to correct the phase sequence.

- C) Add water to the accumulator until the water level is stabilized below the center sensor. (During this time the air dryer may see a high water alarm or low water alarm, causing the air dryer to shut down. If this occurs, toggle the reset switch and continue this procedure until the proper water level is achieved.)
- D) A HUMIDITY ALARM may appear at the alarm display and shut down the air dryer. If this occurs, toggle the reset switch and the air dryer will continue to operate again until the time delay elapses. This condition may occur during the first 30 minutes of operation. Continue resetting the alarm as needed.
- E) The seven humidity level LEDs will begin to energize as dry air passes over the humidity sensor. This again should take less than 30 minutes of operation.
- F) Soap Check for pressure leaks that may have occurred during shipment.

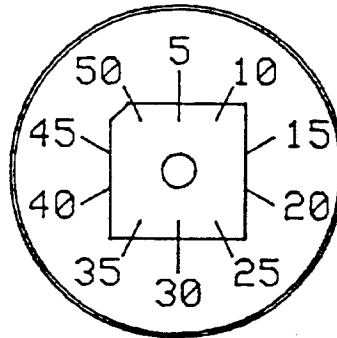
SECTION 4 TEST ROUTINE

DANGER

Avoid contact with energized circuits when access doors are open.
REMOVE ALL JEWELRY before performing maintenance checks.

4.1 Time Delay Switch

- 4.1.1 The Time Delay Switch (SW3, Figure 8, Page 19), controls the selectable delay time between the initialization of the alarm condition and the activation of a central office alarm output.
- 4.1.2 This delay can be adjusted between 0-50 seconds (Figure 3).
- 4.1.3 Before proceeding with the test routine, verify that the time delay switch is set at 20 seconds.



TIME DELAY ADJUSTMENT

Figure 3.

4.2 Alarm Latching Switch

- 4.2.1 The Alarm Latching Switch (SW1, Figure 8, Page 19), has two positions. The first position is the latch-on mode. This mode requires the alarms to be reset manually.
- 4.2.2 The latch-off mode allows the alarms to clear automatically.
- 4.2.3 Before proceeding with the test routine, set the latch switch to ON.

NOTE:

If using a P-08033G Cycle Kit, the alarms are automatically in the latch mode.

NOTE:

The common alarm, LED 1 (green), will always be energized when any alarm condition is present. Refer to Figure 8, Page 19.

4.3 Low Pressure Alarm Test (LED 5 on the alarm board)

- 4.3.1 Open the front door.
- 4.3.2 Locate the outlet pressure regulator (Figure 14, Page 27).
- 4.3.3 Rotate the knob counterclockwise and reduce the pressure on the outlet pressure gauge until alarm occurs.
- 4.3.4 At this point, LOW PRESSURE will appear at the alarm display, and LD15 will energize. Wait 20 seconds and verify that LD 1 and LD 5 energize. Turn the handle clockwise and increase the pressure on the outlet pressure gauge to 10 PSIG. Toggle the reset switch and LOW PRESSURE will disappear from the alarm display.

4.4 High Pressure Alarm Test (LED 4 on the alarm board)

- 4.4.1 Rotate the pressure regulator knob clockwise until the outlet pressure gauge reads approximately 15 PSIG. HIGH PRESSURE will now appear at the alarm display, and LD14 will energize.
- 4.4.2 Wait 20 seconds and verify that LD 1 and LD 4 energize and reduce the pressure to 10 PSIG. Toggle the reset switch and HIGH PRESSURE will disappear.

4.5 High Flow Alarm Test (LED 2 on the alarm board)

- 4.5.1 Locate the flow meter on the front panel.
- 4.5.2 The flow meter consists of two separate alarm set points, low and high.
- 4.5.3 The adjustment knob located on the left side of the flow meter adjusts the low flow alarm set point; however, this set point is not needed and can be adjusted completely counterclockwise.
- 4.5.4 The adjustment knob located on the right side of the flow meter adjusts the high flow alarm set point.
- 4.5.5 To test the high flow alarm system, rotate the knob counterclockwise until the red needle drops below the black flow needle. HI FLOW will now appear at the alarm display, and LD12 will energize.
- 4.5.6 Wait 20 seconds and verify that LD 1 and LD 2 energize. Turn the adjustment knob clockwise until the red needle exceeds the black flow needle, toggle the reset switch and HI FLOW will disappear.

4.6 Humidity Sensor Test

4.6.1 Locate the humidity test switch on the alarm board (upper left).

4.6.2 Press the humidity test switch.

4.6.3 While pressing the humidity test switch, monitor the humidity indicators on the front panel to verify that indicators de-energize. It may take up to one minute for the LED's to de-energize.

Note: This switch should only be used to test the humidity sensor and not humidity alarm test. Excessive sensor saturation should always be avoided.

4.7 Humidity Alarm Test (LED 7 on the alarm board)

4.7.1 Locate the red switch (SW1) on the humidity alarm board, (Figure 10, Page 22).

4.7.2 Hold the switch down.

4.7.3 While holding the switch down, monitor the humidity indicators. The four green LEDs will de-energize, HUMIDITY will appear on the alarm display, and LD12 will energize. After 20 seconds, LD 1 and LD 7 will energize. Continue holding the alarm set switch down for 40 more seconds (1 minute total), and verify the air dryer shutdown. After shutdown occurs, toggle the reset switch and the air dryer will start.

4.8 Low Water Alarm Test (LED 8 on the alarm board)

4.8.1 Have at least a quart of clean water available to add to the accumulator after the low water test.

4.8.2 Locate the drain valve on the bottom side of the air compressor.

4.8.3 Attach one end of a length of 1/4" OD plastic tubing into the drain valve. Run the other end into a bucket or drain.

4.8.4 Slowly open the valve and allow the water to drain from the air compressor. When the water level drops below the Low Water Sensor LO WATER will appear at the alarm display, and LD18 will energize.

4.8.5 Immediately close the compressor drain valve and wait 20 seconds to verify that LD1 and LD8 energize. Wait 40 more seconds (1 minute total) and verify the air dryer shutdown. After shutdown occurs, remove the air filter housing from the inlet accumulator.

4.8.6 Toggle the reset switch and the air dryer will start.

- 4.8.7 IMMEDIATELY begin pouring the clean water into the inlet accumulator until the primary dump solenoid valve begins ejecting water. A high water alarm may appear. Toggle the reset switch to clear this alarm.

WARNING

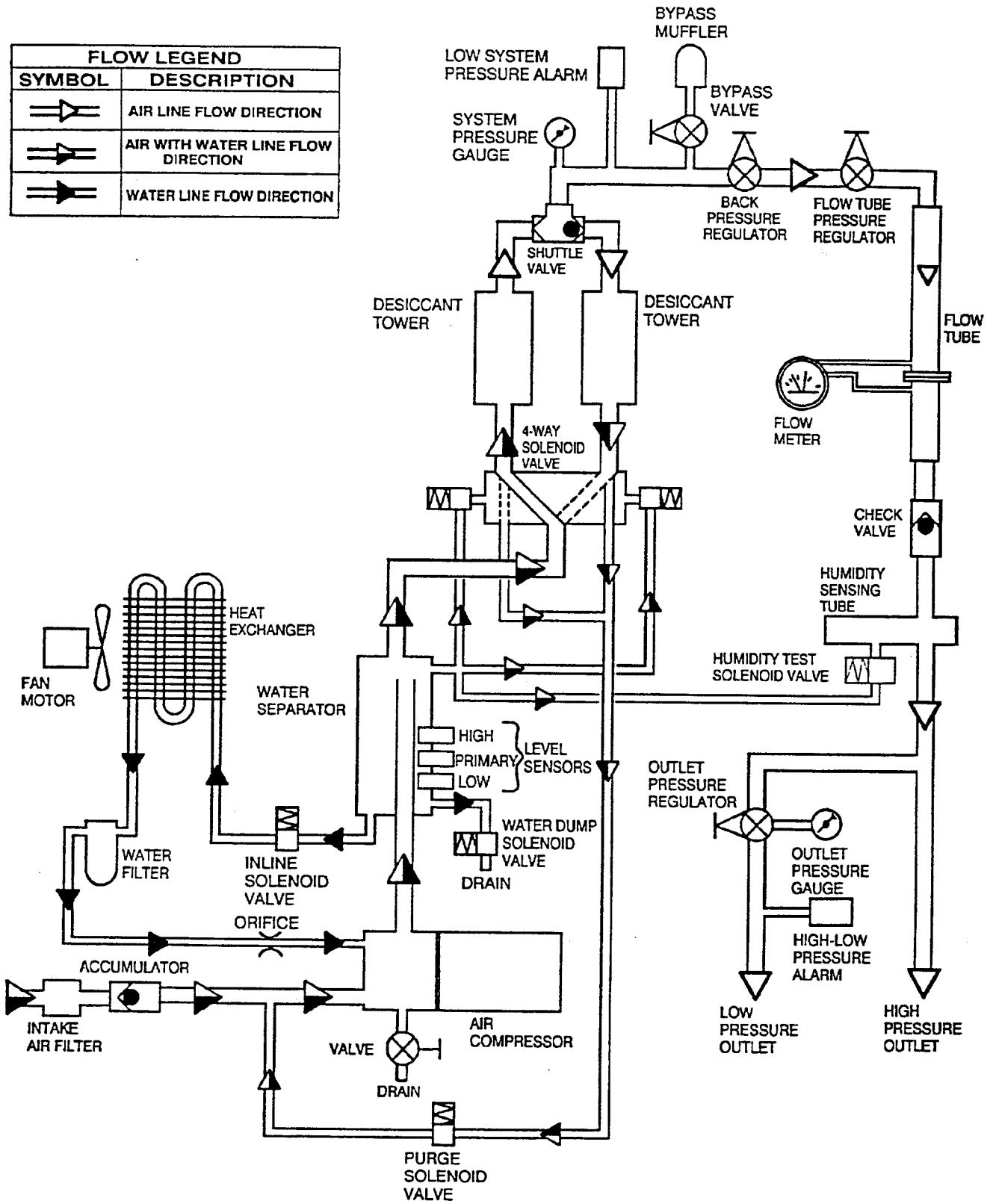
The air compressor is water lubricated. Running the compressor without SUFFICIENT WATER SUPPLY may result in bearing seal damage and will void the compressor warranty.

4.9 High Water Alarm Test (LED 6 on the alarm board)

4.9.1 Observe the water level sensor housing.

4.9.2 Add water to the inlet accumulator until the water level rises above the top sensor. In order to achieve a HIGH WATER condition, it is essential to reach the top sensor within 15 seconds or the center dump sensor will activate and automatically dump excess water. When the water reaches above the top sensor, LD21 and LD16 (located at the control board) will energize briefly and water will be ejected. Wait 20 seconds and verify that LD1 and LD6 energize. At this time HI WATER will appear on the display. Toggle reset switch and HI WATER will clear.

FLOW LEGEND	
SYMBOL	DESCRIPTION
	AIR LINE FLOW DIRECTION
	AIR WITH WATER LINE FLOW DIRECTION
	WATER LINE FLOW DIRECTION



AIR FLOW DIAGRAM
Figure 4

SECTION 5 THEORY OF OPERATION

5.1 Air System

5.1.1 Figures 13-15 are drawings of a Puregas Model P-10000-DCO/P-15000-DCO Air Dryer. The model number corresponds to the maximum air outlet capacity of the unit, 10000 or 15000 SCFD (standard cubic feet per day) of dry air. Model P-10000-DCO uses a two-horsepower air compressor and requires a 208 volt, single phase power supply. Model P-15000-DCO uses a three-horsepower air compressor and requires a 208 volt, three phase power supply. The operating principles of both models are identical. Figure 4 is a flow diagram which applies to both the P-10000-DCO and P-15000-DCO. A general overview of the operation of these machines from ambient air to low pressure dry air is as follows.

5.1.2 General Operating Characteristics:

- A) Refer to Figure 4, Page 11. Ambient air is drawn into the air dryer through the lower cabinet air filter, air intake filter and inlet accumulator to the air compressor. There it is combined with water and compressed to a pressure of 25 PSIG.
- B) The water and compressed air then flow to the water separator. The water is separated and returned through the in line solenoid valve, water heat exchanger, water filter flow control valve and on to the water inlet of the air compressor. There it is once again combined with ambient air to lubricate the air compressor. The primary water sensor, in conjunction with the water dump solenoid valve, monitors and maintains the proper water level.
- C) The saturated air flows from the top of the water separator to the inlet of the 4-way solenoid operated valve. This valve directs the compressed air to one of the two desiccant towers for drying. The compressed air flows up through the tower where the water vapor is adsorbed by the desiccant. The ultra-dry air leaves the tower, passes through a shuttle valve and is channeled to the control components leading to the dry air outlets. A portion of the dry air passes through an orifice in the shuttle valve and expands to near atmospheric pressure. This air then travels downward through the off stream tower where it picks up moisture previously adsorbed by the desiccant. This wet purge air then flows from the tower and is directed back through the 4-way valve to the air compressor inlet.

- D) The dry air which flows past the shuttle valve passes through a back pressure regulator, flow tube regulator, flow tube, check valve, humidity sensing tube and outlet pressure regulator, to the low pressure air outlet. The high-low pressure alarm monitors the outlet pressure. The high pressure air outlet is regulated, and can be used to supply dry air to distribution manifolds and pipe alarm panel systems. Note: The air dryer can deliver high pressure air up to 17 PSIG.
- E) A solid state timer controls the two solenoid pilot valves on the 4-way valve. Tower switchover is initiated every 60 seconds. A 4-8 second null is created by the timer causing the purge solenoid to close. This allows the off stream tower to repressurize before switchover. When this null has elapsed, switchover occurs. In the few seconds after tower switchover, a pressure surge is created by the off stream tower depressurizing. This surge is controlled by a by-pass relief valve. When an over pressure condition exists, the by-pass relief valve will allow air to escape to the atmosphere. This valve also acts as a pressure relief valve when the dryer's air output drops below maximum, causing excessive system pressure.

5.2 Air Compressor

5.2.1 The air compressor is a centrifugal, water-sealed unit with the motor and the compressor rotor directly connected. Incoming water is centrifugally forced to the outer housing wall by a rotor, forming a liquid ring. Incoming air is compressed between the rotor blades and the water ring. The compressed air and water are discharged continuously from the compressor to maintain the system pressure at 25 PSIG.

The air compressor, as stated earlier, is a water-sealed unit. The low water alarm shutdown is a fail-safe feature to prevent seal damage to the compressor due to insufficient water supply. Thus, adequate water for compressor lubrication is always assured. The air compressor itself requires no field maintenance. Dirt and debris from the water are removed in the water filter, assuring a clean water supply to the compressor.

5.3 Back Pressure Regulator

5.3.1 The back pressure regulator limits the minimum system operating pressure. To check the setting on the back pressure regulator:

- A) With the air dryer OFF, disconnect the air line connecting the back pressure regulator to the flow tube. This will allow all air leaving the back pressure regulator to expand to atmospheric conditions. This is the maximum flow the unit can deliver. Turn the dryer ON.
- B) Set the bypass valve so no air is bypassing to the atmosphere by turning the adjustment screw clockwise several turns.
- C) Check the system pressure gauge. It should read 23 PSIG. If so, reconnect the air line and resume normal dryer operation. If the back pressure regulator is out of adjustment, continue.
- D) Loosen locknut at the back pressure regulator.
- E) Turn the adjustment screw clockwise to increase or counterclockwise to decrease the pressure to 23 PSIG at the system pressure gauge.
- F) Tighten the locknut on the adjustment screw.
- G) Reconnect the air line and resume dryer operation.

NOTE:

The heatless drying system has been designed to operate at 25 PSIG. Operating below this pressure can cause the towers to become saturated with moisture causing a humidity alarm. Operating above this recommended pressure will result in higher operating temperatures and lower output volume. Optional: In high altitude applications, reduce system pressure by .75 PSIG per every 1000 feet above sea level.

5.4 Bypass Relief Valve

5.4.1 The bypass relief valve limits the maximum operating pressure of the air compressor. Extended operation at pressures above the recommended maximum operating pressure of 25 PSIG will result in higher operating temperatures and lower output volume. To check the setting of the bypass relief valve do the following.

- A) Make certain the air dryer is ON and is feeding your cable system in a normal operating mode.
- B) Check the system pressure gauge. It should read 25 (+1 -0) PSIG. If so, the bypass valve is set correctly. If the bypass relief valve is out of adjustment, continue.
- C) Loosen the locknut at the bypass relief valve, adjusting screw.
- D) Turn the adjustment screw clockwise to increase or counterclockwise to decrease the pressure to 25 (+1 -0) PSIG on the system pressure gauge.
- E) Tighten the locknut on the adjusting screw.

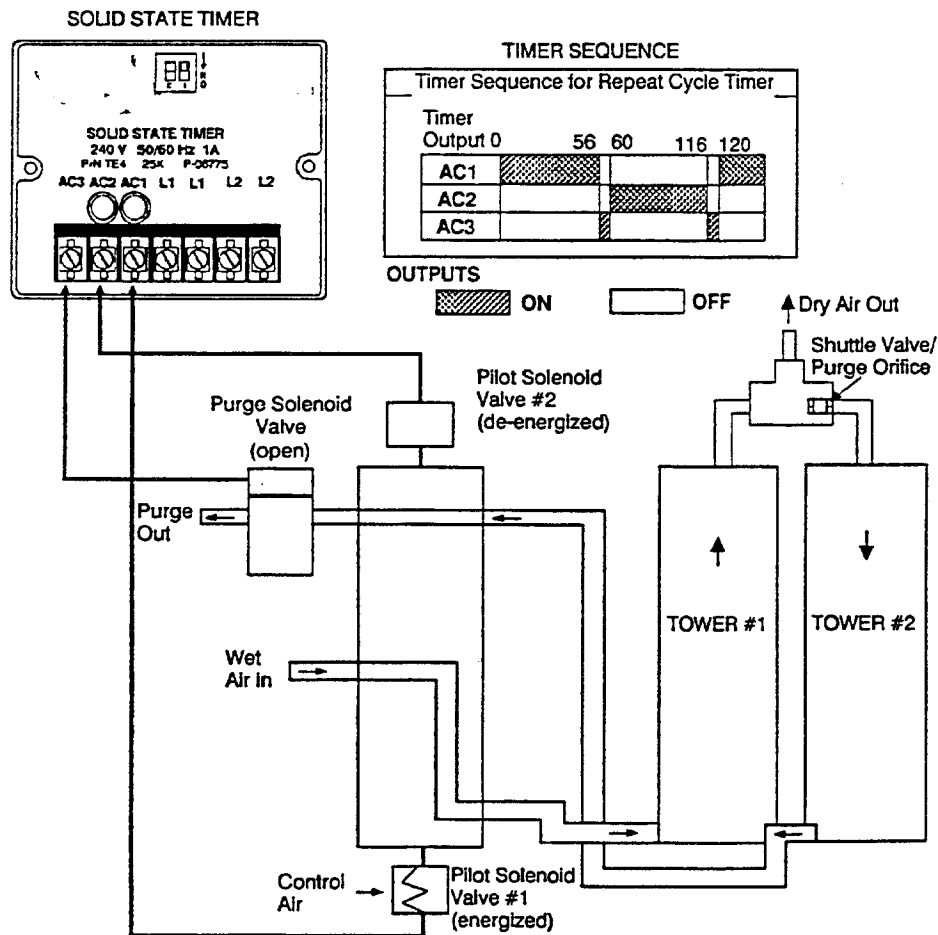
5.5 Optical Water Sensor Switch/Dump System

5.5.1 The middle and upper optical water sensor switches and the water dump solenoid valve work together to monitor and maintain the water level and to eject excess water from the air dryer. The middle, upper and lower optical water sensors are located in the sight tube housing. When the water level increases to where the middle water sensor activates, the water dump solenoid valve is energized and the excess water is dumped following a 15 second fixed time delay (LD22). The alarm board located inside the front panel has a green LED (LD10) located on the lower left corner of the alarm board, which energizes when the middle water sensor activates. This is to aid in the trouble shooting of the middle optical water sensor if necessary. If, for any reason, the middle water sensor should fail to activate, the upper optical water sensor will activate, LD21 will energize, causing an alarm and ejecting the excess water, preventing any water from reaching the desiccant towers. If the water level should become too low, the lower optical water sensor will activate a low water alarm and causing the air dryer to shut down automatically, following a one-minute fixed delay.

5.6 Desiccant Towers/Four-Way Valve/Timer System

5.6.1 The desiccant towers dry the air before it is delivered to the cable system. The 4-way valve directs air to the on stream tower and purge air from the off stream tower to the air compressor inlet. The solid state timer is the control circuit for the 4-way valve.

As saturated air leaves the water separator (Figure 4), it enters the 4-way valve. The valve directs air to the on stream tower, in this case tower #1. The air enters the on stream tower at the bottom. As the moist air passes up through the tower, the desiccant adsorbs the moisture. The dry air leaves the top of the tower and passes through a shuttle valve where it splits into two streams. The main stream passes through the outlet controls and on to the dryer outlet. The other stream passes through a purge orifice, expands to near atmospheric pressure and passes downward through the off stream tower (tower #2) and purges the moisture accumulated from the previous cycle through the 4-way valve and on to the air compressor inlet. This flow process, controlled by the timer, alternates towers every 60 seconds as charted in Figure 5.



CYCLE TIMER SEQUENCE
FIGURE 5

5.7 Humidity Sensing Tube

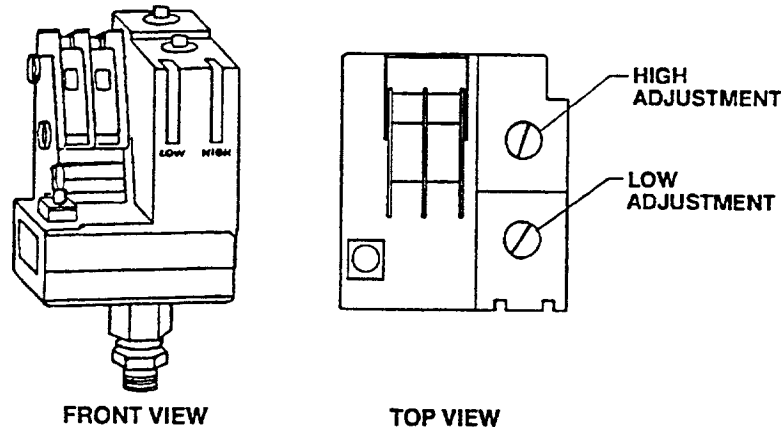
- 5.7.1 Dry air from the desiccant towers flows through the humidity sensing tube and over the humidity sensor (not shown). The sensor signals the alarm system if the relative humidity rises above 10% and shuts down the air dryer following a fixed one minute delay.

5.8 Flow Tube Control Regulator and Meter

- 5.8.1 The flow of air from the desiccant towers is directed through the flow tube regulator and flow tube. The flow tube regulator must be set at 17 PSIG to achieve an accurate reading on the flow meter.

5.8.2 Flow Tube Adjustment Procedures

With the air dryer operating, set the outlet pressure to the cable system as needed. It will now be necessary to adjust the flow tube regulator (Figure 15, Page 28), to a pressure of 17 PSIG. To set; locate the gauge and adjust the regulator knob as necessary to obtain a pressure reading of 17 PSIG on the gauge. After correct pressure has been set, tighten down the locknut on the regulator knob. If the flow rate is increased or decreased dramatically, it will be necessary to readjust the regulator so 17 PSIG will be maintained at all times.



**HIGH-LOW PRESSURE ALARM SWITCH
FIGURE 6**

5.9 High-Low Pressure Switch

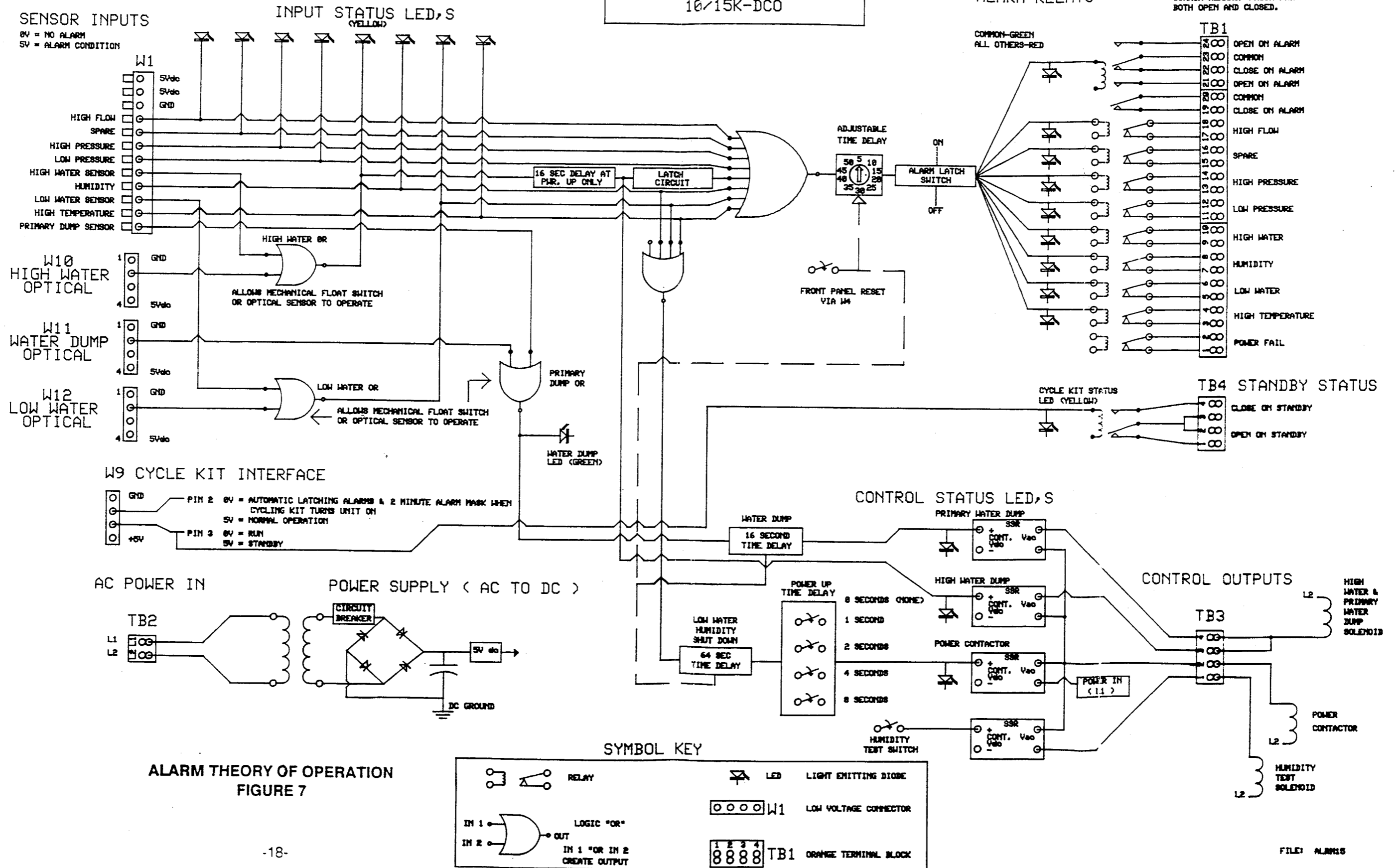
The pressure switch consists of two separate snap action switches, each with an independently adjustable set point. The alarm set points have been factory set to operate at approximately $12.0 + 1.5$ PSIG for the high pressure alarm and $6.5 + 1.5$ PSIG for the low pressure alarm. To adjust the high-low pressure alarm, turn the adjustment screw (clockwise) to raise the set point and (counterclockwise) to lower the set point.

SECTION 6
ELECTRONIC CIRCUITRY

6.1 Solid State Circuitry

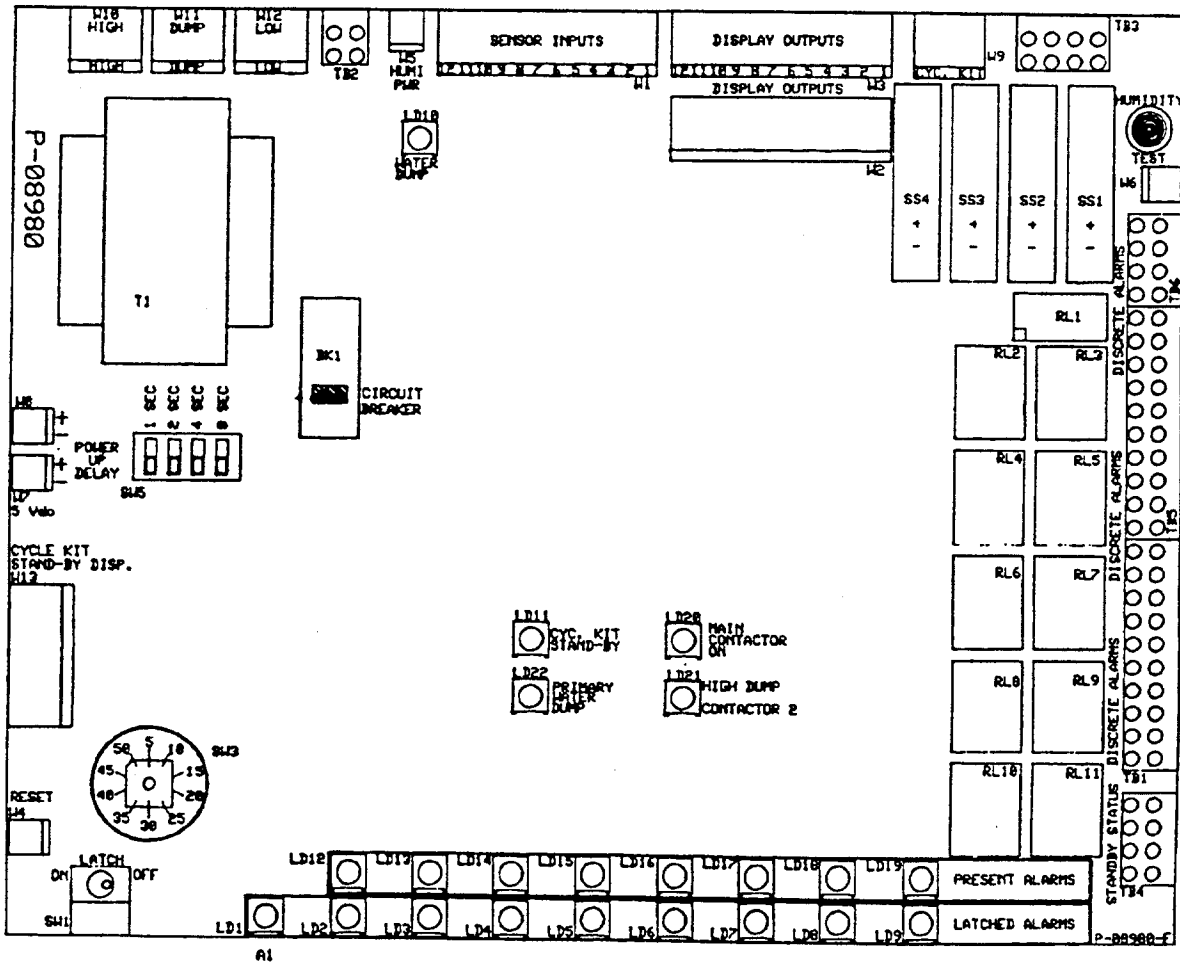
The solid state circuitry consists of five solid state circuit boards: The digital alarm board, humidistat board, display board and cycle timer board.

P-08980-F1 FUNCTIONAL
BLOCK DIAGRAM
10/15K-DCO



6.2 Digital Alarm/Control Board

6.2.1 The digital alarm board controls the unit operation, and is the interface for a discrete monitoring system. (Refer to Figure 2.) The sensors are connected to the digital alarm board. Sensor inputs are routed to the front panel display and an adjustable time delay (0-50 sec.). After the selected delay time has elapsed, the condition of each sensor is transferred to the discrete alarm outputs. At this point, the latching switch determines if the alarms are latched. Once latched, the alarms can only be cleared manually. In the non-latch mode, the alarms are activated when an alarm condition is present. When the alarm condition clears, the alarm clears. The humidity and low water alarms will enable a fixed one-minute delay and shut down the air dryer. The one-minute delay protects against nuisance alarms. The water dump circuit has a fixed 15-second delay before activating the water dump solenoid valve. This delay enables the unit time to stabilize the water level during initial start up.



**DIGITAL ALARM BOARD
FIGURE 8**

6.2.2 Adjustable Power Up and Start Up Delay

Start up delay of 0,1,2,4 and 8 seconds for multiple dryer power up. A 256 second delay masks all alarms at power up and start up.

6.2.3 Automatic Shutdown

High Humidity, Low Water and High Temperature alarms will initiate a 64 second shutdown delay which when expired, will shut down the air dryer.

6.2.4 Water Dump System

Three optical water sensors located in the water sight housing, control the water level, excess water ejection and low water alarm.

6.2.5 Primary Dump

Primary water level is determined by the location of the middle water sensor. When excess water rises above the middle sensor location, the primary optical water sensor activates a 15 second delay. Following the delay, the water dump solenoid valve will energize, ejecting the excess water out the rear drain port.

6.2.6 High Water Dump

The top optical water sensor, located in the top of the water sight housing, activates the water dump solenoid and following the alarm delay, a high water alarm. This sequence is delayed only on start up, allowing water level to stabilize.

6.2.7 Low Water

The lower optical water sensor, located at the bottom of the water sight housing, activates the low water alarm and shutdown sequence when water level recedes below the sensor location.

6.3 Display Board (Refer to Page 24, Figure 12)

6.3.1 The display board monitors and displays any active alarm the moment an alarm(s) is acknowledged.

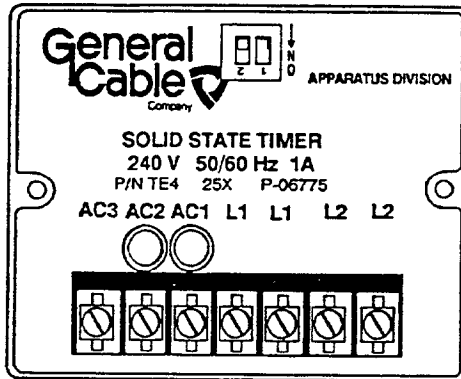
6.4 Cycle Timer Board (Refer to Figure 10)

6.4.1 The cycle timer board operates on a time cycle of 120 seconds. This timer controls the 4-way valve which controls the necessary drying, purging and repressurizing of the towers. The timer contains two indicating lights which indicate the on-stream drying tower.

<u>Time (seconds)</u>	<u>Status Indicators</u>	<u>AC 1</u>	<u>AC 2</u>	<u>AC 3</u>
1 - 56	Air through Tower #1	ON	OFF	OFF
57 - 60	Air through Tower #1	OFF	OFF	ON
61 - 116	Air through Tower #2	OFF	ON	OFF
117 - 120	Air through Tower #2	OFF	OFF	ON

In some environments (high temperature, high elevation, etc.), it may be necessary to increase the off-line tower repressurization time to avoid low system pressure alarms on tower switch over. The P-06775 cycle timer comes preset from the factory at a set 4-second repressurization time. This time can be increased to either 6 or 8 seconds by changing the switch settings as shown below.

S1	S2	OVERLAP - For off-line tower repressurization
ON	OFF	4 Seconds
ON	ON	4 Seconds
OFF	ON	6 Seconds
OFF	OFF	8 Seconds



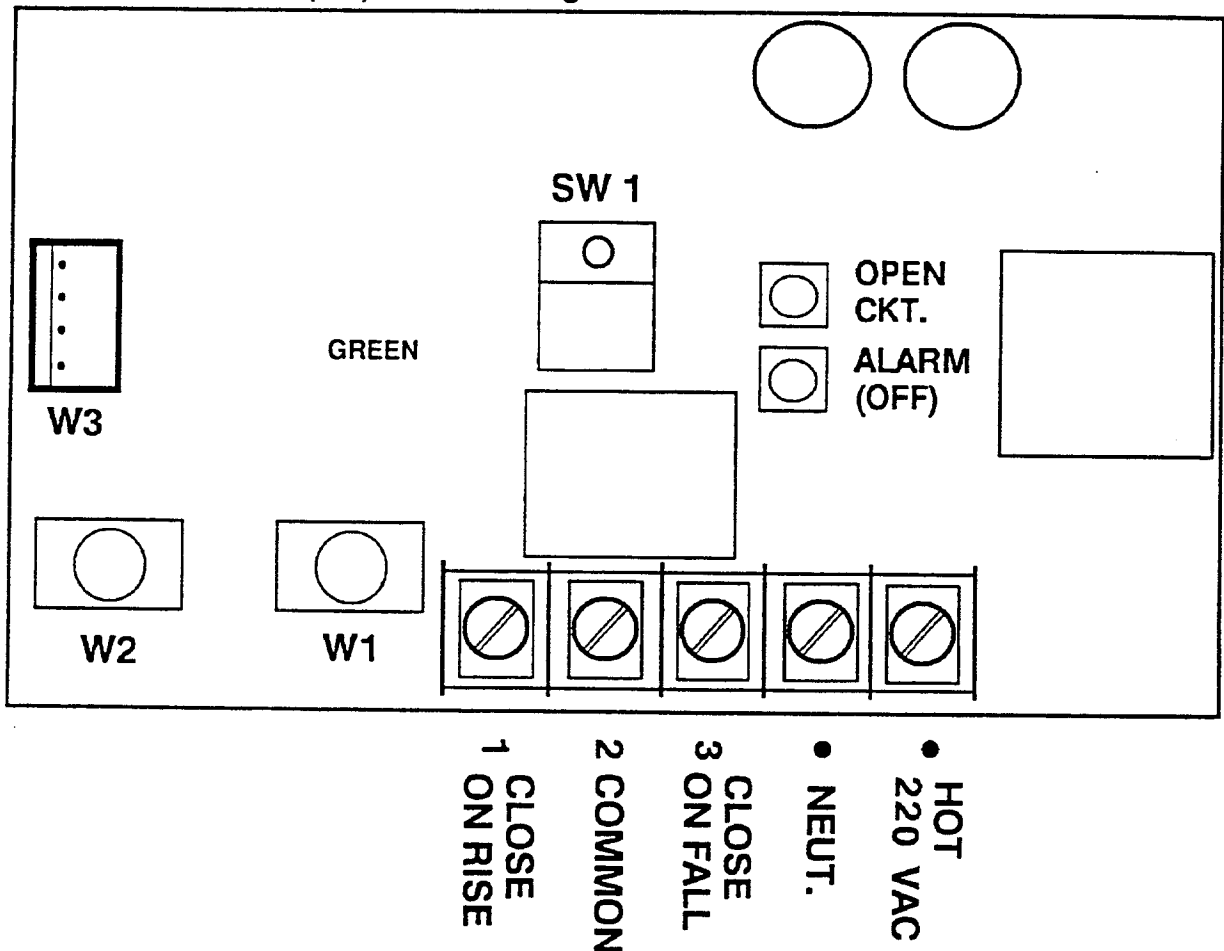
CYCLE TIMER BOARD

Figure 9

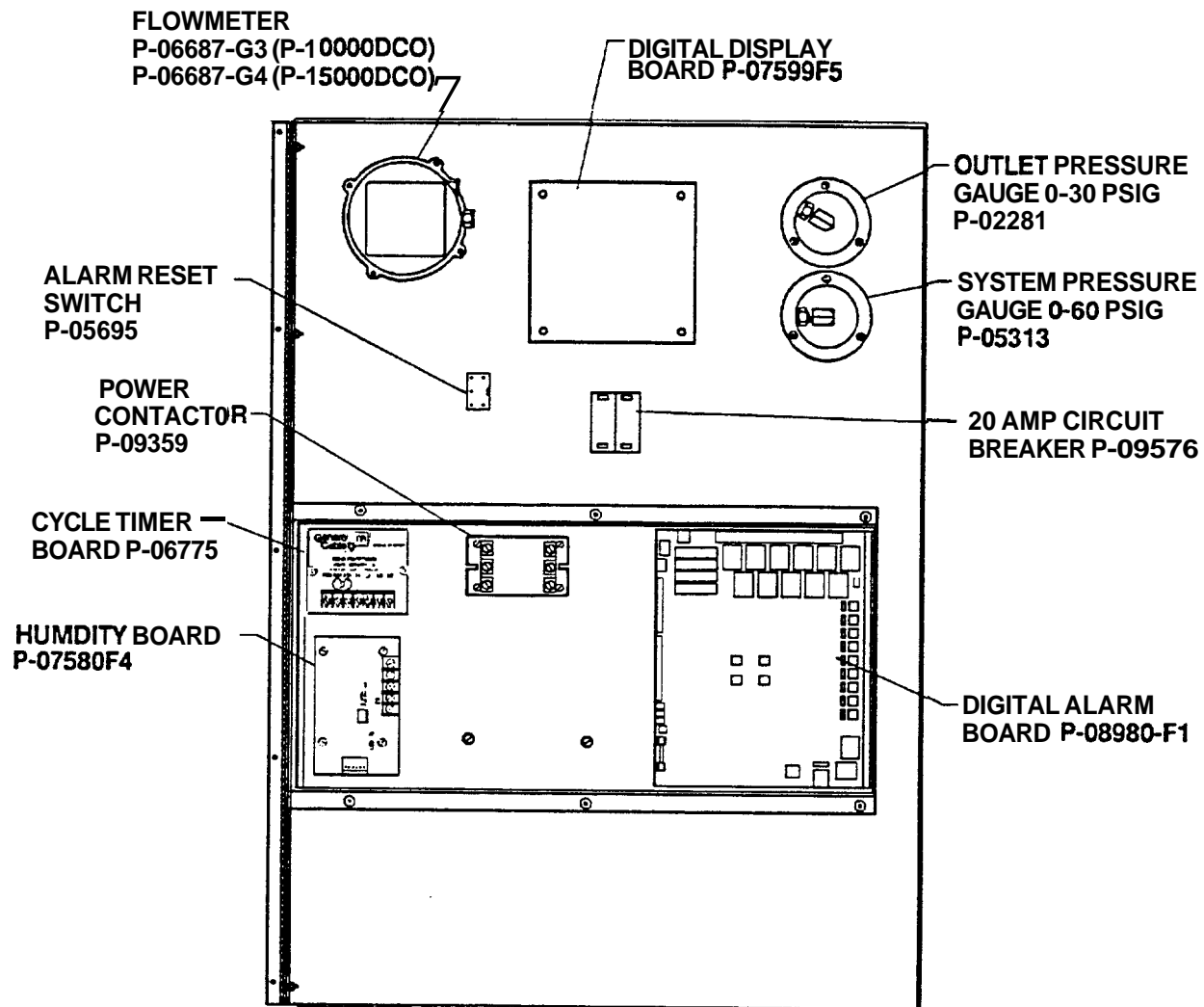
6.5 Humidistat Board and Remote Visual Display (Refer to Figure 10)

6.5.1 The humidistat board has a remote visual display consisting of seven (7) LEDs (four green, three red) which are located below the digital display on the front panel.

During normal "DRY AIR" conditions, all LEDs will be energized. If the relative humidity increases above 2%, the "2%" indicator will de-energize. If the relative humidity increases above 10%, (which is the alarm point), the first red LED will de-energize. As the percentage of relative humidity continues to increase, the other red LEDs will de-energize. A HUMIDITY (humidity alarm) will appear at the display when the 10% (red) LED de-energizes.



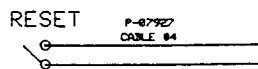
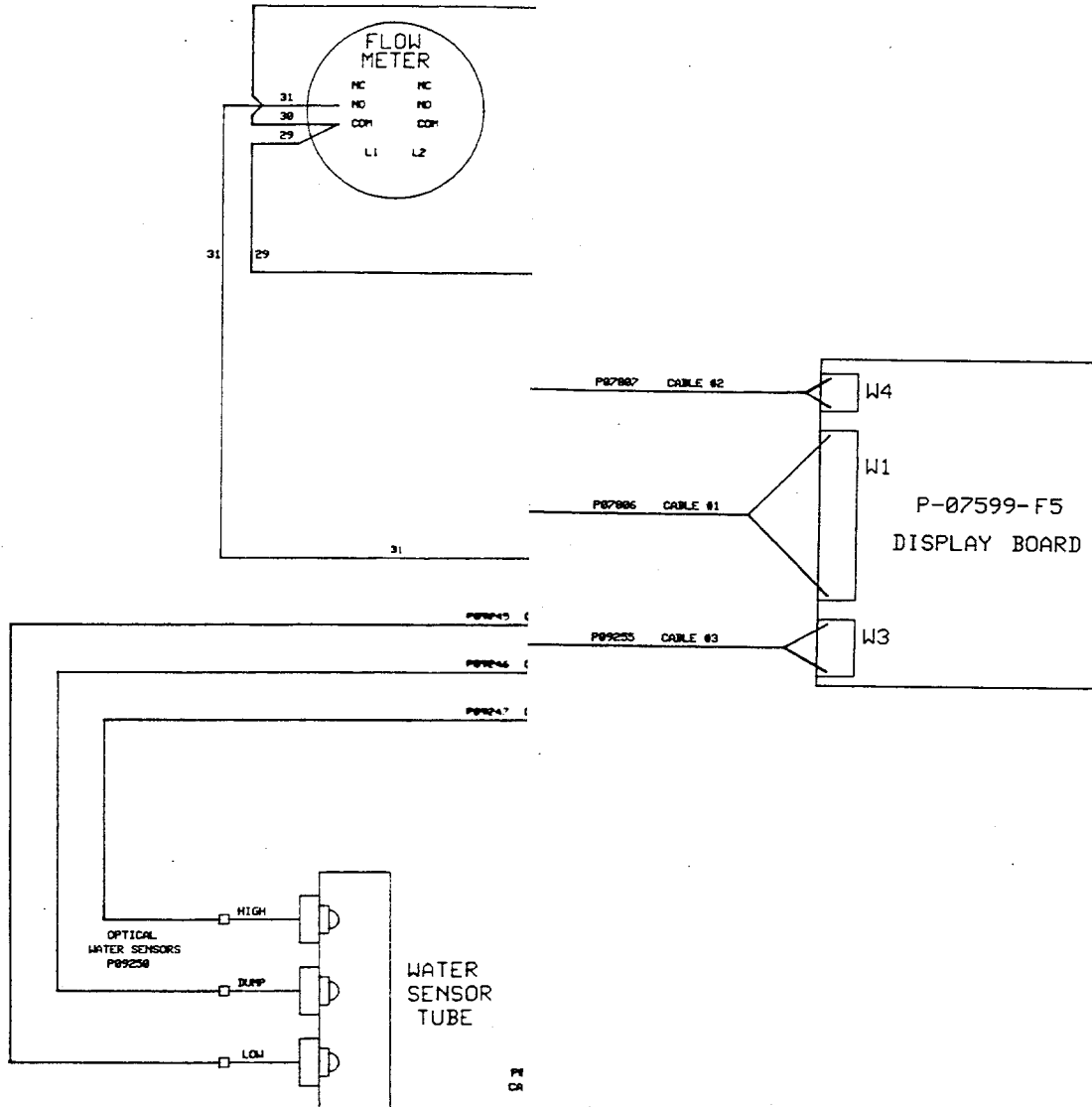
HUMIDISTAT BOARD
Figure 10



ELECTRICAL PANEL
 Figure 11

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REV		DESCRIPTION	REVISIONS		DWG. NO.	BY	DATE	ECO
G		REVISED & REDRAWN	C.K.	1-17-93	P-06668		29425	



D.C. WIRING
DIAGRAM
10K DCO / 15K DCO

1931001 THRU PRESENT
DRYER S/N 1931501 THRU PRESENT

TY.	PART NO.	DESCRIPTION	WT.	ITEM NO.
				15K-B
B/12K USED ON	MATERIAL		FINISH	
	DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES DECIMALS TOLERANCE ON ANGLES IN 1/16 2/1000 3/1000 FRACTIONS TOLERANCE ON ANGLES 1/16 2/1000 3/1000		TITLE WIRE DIAGRAM 8K/10K/12K/15K	
	SCALE	NO. REVD.	DATE	DATE
	HEAT TREAT	APPROVED	DATE	DATE
		DRIVER <i>Chad K</i>	DATE 1-20-93	D
		CHECKED	DATE	P-06668
		APPROVED	DATE	G
			REV. BY	Z OF Z
				REV

SECTION 7 GENERAL MAINTENANCE

- 7.1 The following maintenance matrix indicates the maintenance procedures recommended by Puregas. If maintenance problems persist after thoroughly consulting this manual, contact General Cable Company, Puregas Technical Service Department at (303) 427-3700 or 1-800-521-5351.

Caution:
When working around energized circuits, extreme caution should be taken to prevent injury to personnel and damage to equipment.

It is very important that routine maintenance be performed at six month, one year and five year intervals. Puregas recommends a historical record be maintained on all air dryers.

7.2 Maintenance Matrix and Parts Summary

<u>Model P-10000-DCO/ Model P-15000-DCO</u>	<u>Maintenance Procedure (Refer To Manual)</u>	<u>Frequency Interval</u>	<u>Time (min.) Required</u>
Condenser Coils	Clean	A	10
Air Fittings	Leak Test	B	15
Water Filter Element	Replace	A	5
Desiccant Tower Outlet Filters	Replace	C	30
Upper and Lower Vent Filter	Replace	A	5
Air Inlet Filter	Replace	B	5
Flowrate*	Check (Compare to previous flow rate)	B	1
Humidity Sensor*	Check (Refer to Par. 4.6, Pg. 9)	B	1
Humidity Alarm*	Check (Refer to Par. 4.7, Pg. 9)	B	5
High-Low Pressure Alarm *	Check (Refer to Par. 4.3-4, Pg. 8)	B	5
Output Regulator*	Check/Adjust	B	5
Optical Water Sensor*	Clean (Don't use cleaners)	A	15
Back Pressure Regulator *	Check (Refer to Par. 5.3, Pg. 14)	B	5
Bypass Relief Valve*	Check/Adjust (Refer to Par. 5.4, Pg. 15)	B	5

Frequency Interval

A - Every 6 months, or as needed

B - Every 6 months

C - 1 year

D - 5 years

* Recommended Checks

7.3 Maintenance Kit P-07586 Consists of:

<u>PART NUMBER</u>	<u>DESCRIPTION</u>	<u>QUANTITY</u>
P-06658	Air Filter Element	4
P-06824	Water Filter Element	2
P-07316	Instructions	1
P-15-453	Filter Cartridge Air Inlet	2
P-5000-6-47D	Humidity Sensor	1

DIGITAL ALARM
DISPLAY (BANK DURING
NORMAL OPERATION)

ALARM LED
(ENERGIZED DURING
ALARM CONDITION)

LOGIC LED
(PULSE ON AND OFF)

OUTLET PRESSURE
GAUGE 0-30 PSIG

SYSTEM PRESSURE
GAUGE 0-60 PSIG

ON/OFF CIRCUIT
BREAKER

DOOR LATCH

UPPER COMPARTMENT
DOOR

PANEL LATCH

LOWER COMPARTMENT
PANEL DOOR

UPPER CABINET
AIR FILTER
(NOT SHOWN)
P-06658

FLOW METER

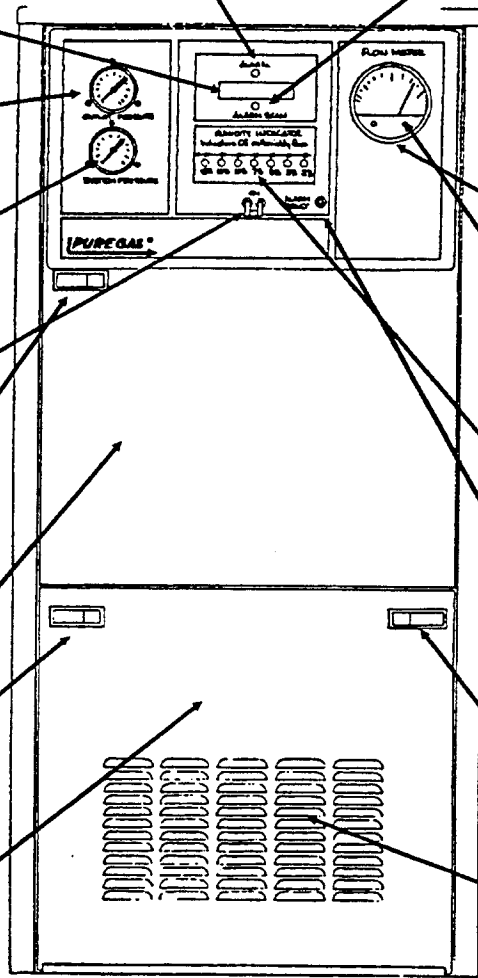
HIGH FLOW ALARM
ADJUSTMENT KNOB

HUMIDITY INDICATORS
(ALL ENERGIZED
DURING NORMAL
OPERATION)

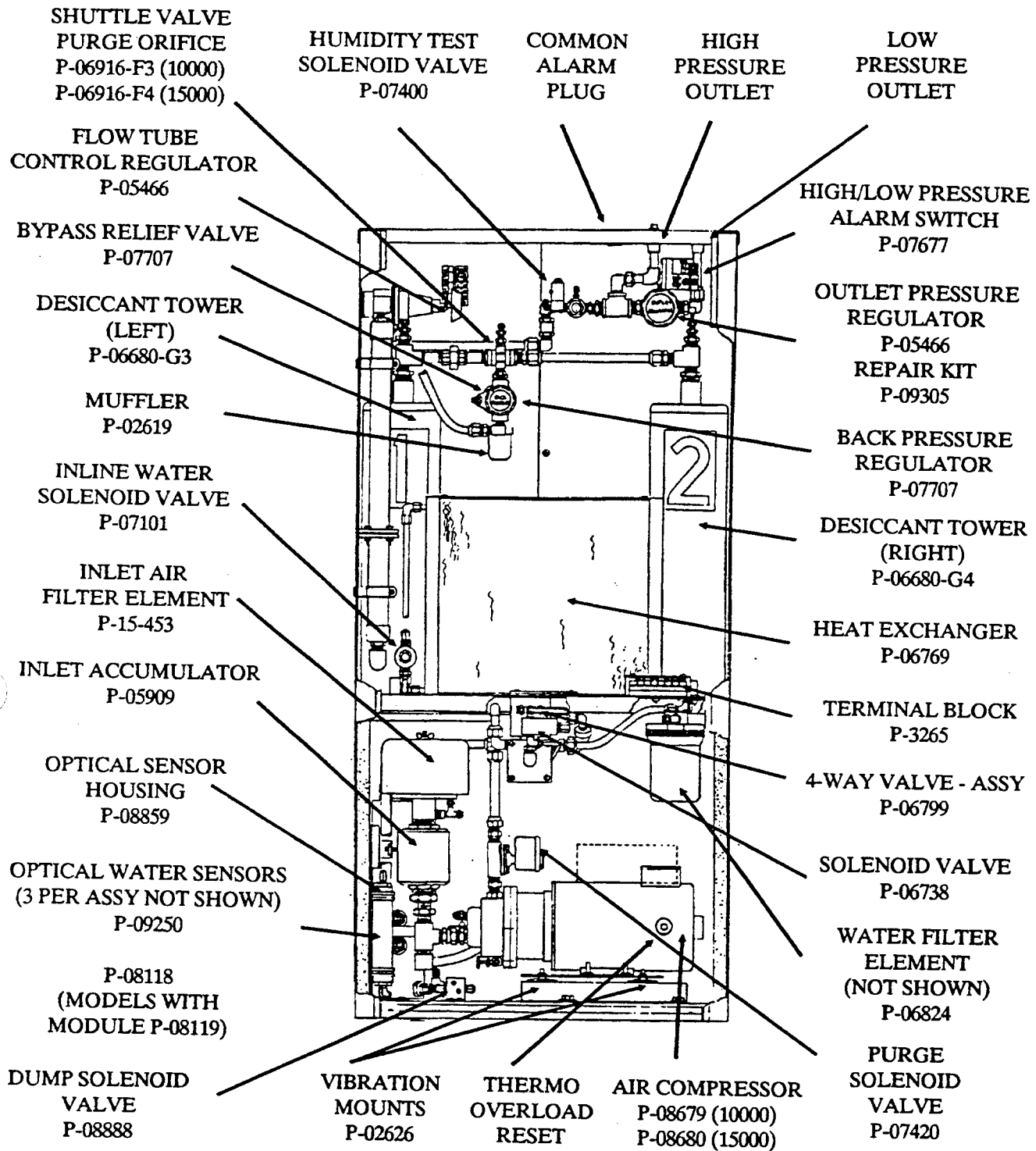
ALARM RESET

PANEL LATCH

LOWER COMPARTMENT
AIR FILTER
(NOT SHOWN)
P-06658

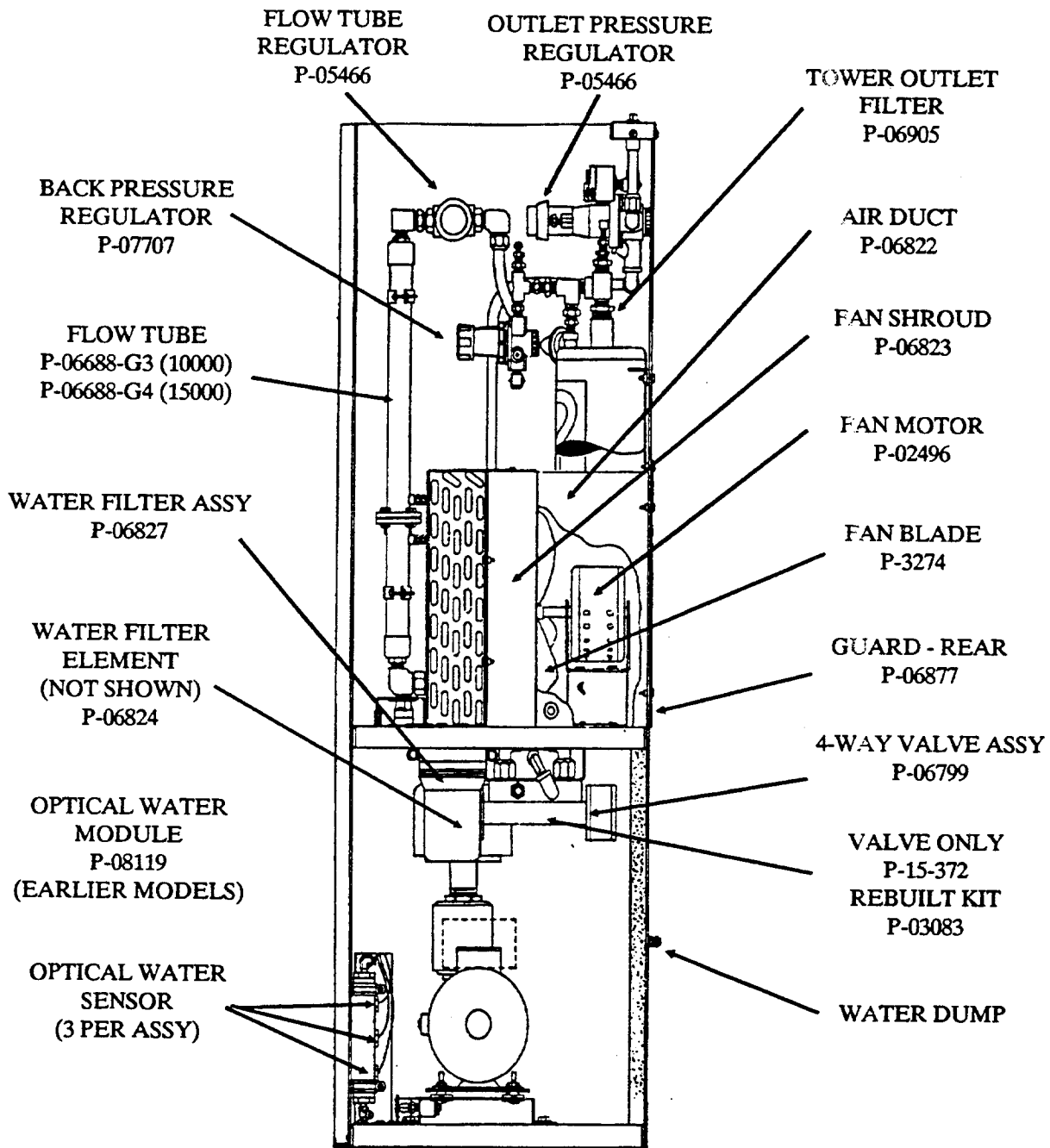


FRONT VIEW
FIGURE 13



FRONT VIEW WITH DOOR OPEN AND PANEL REMOVED

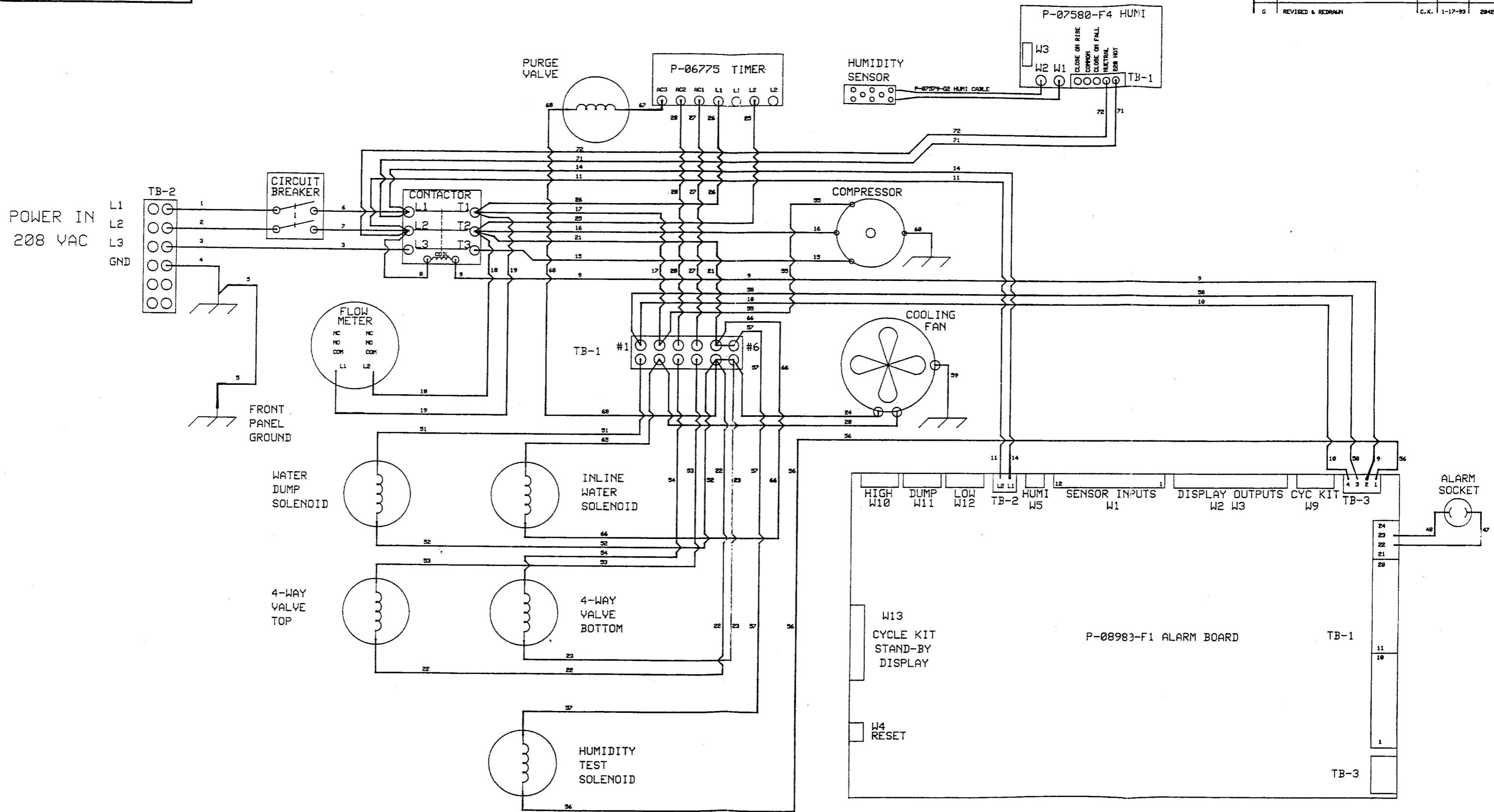
Figure 14



RIGHT SIDE VIEW
Figure 15

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REV		DESCRIPTION	REVISIONS	DWG. NO.	BY	DATE	ECO
G		REVISED & REDRAWN		P-06668	C.K.	1-17-93	29425



A.C. WIRING

DIAGRAM

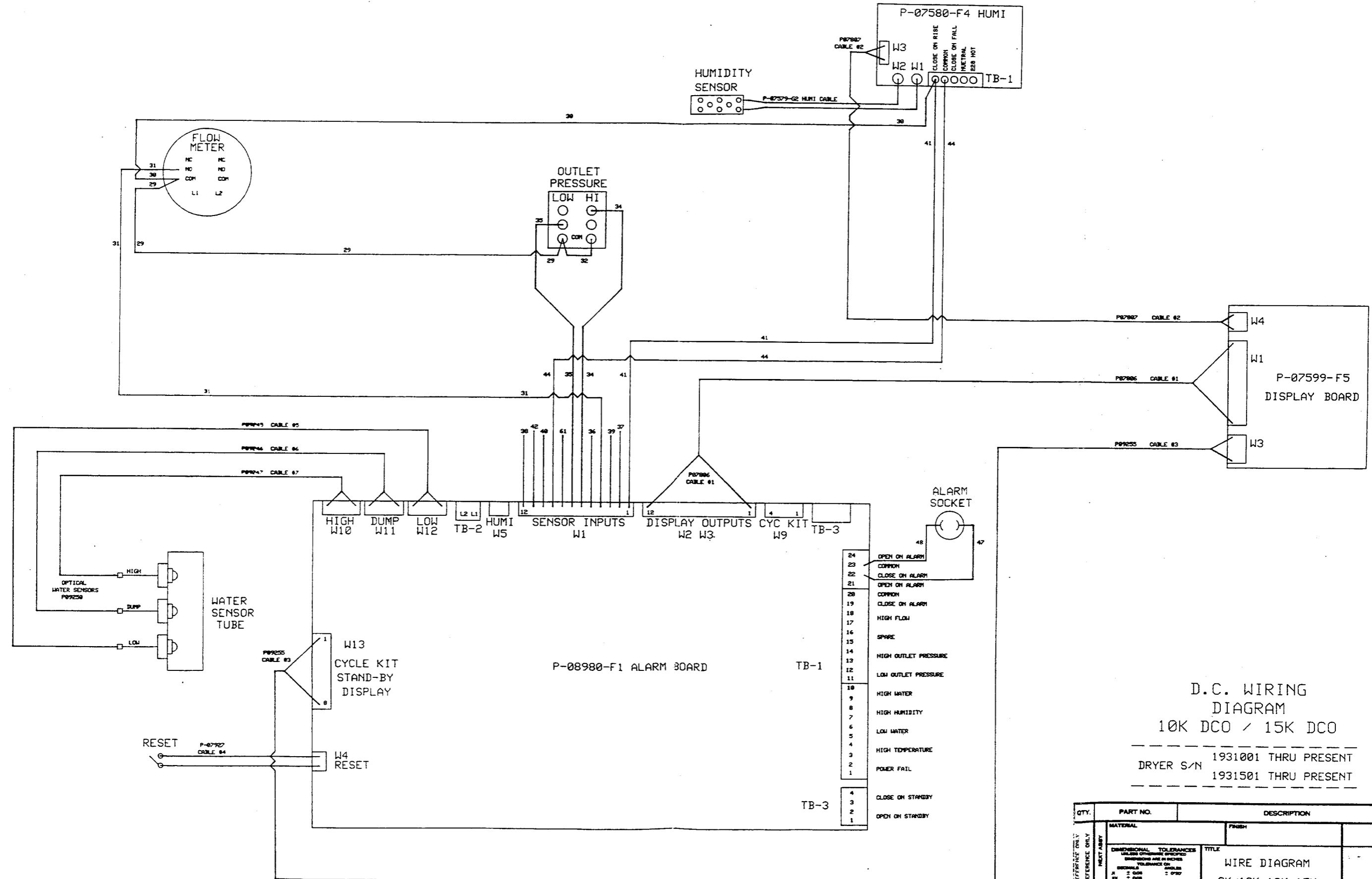
10K DCO / 15K DCO

DRYER S/N 1931001 THRU PRESENT
 1931501 THRU PRESENT

QTY.	PART NO.	DESCRIPTION	WT.	ITEM NO.
				15K-A
DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES		TITLE		
DECIMALS TOLERANCE IS ± 0.005		WIRE DIAGRAM		
FRACTIONS TOLERANCE IS ± 0.005		8K/10K/12K/15K		
HOLE DIMENSIONS ARE IN INCHES		DRAWN: CK		
SCALE: NO. 1:1		DATE: 1-2-93		
CHECKED: [Signature]		DATE: [Signature]		
APPROVED: [Signature]		DATE: [Signature]		
D		P-06668		
G		G		

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REV		DESCRIPTION	BY	DATE	ECO
G		REVISED & REDRAWN	C.K.	1-17-93	20425



D.C. WIRING
DIAGRAM
10K DCO / 15K DCO
DRYER S/N 1931001 THRU PRESENT
1931501 THRU PRESENT

QTY.	PART NO.	DESCRIPTION	WT.	ITEM NO.
		MATERIAL FINISH		15K-B
		TITLE		
		WIRE DIAGRAM		
		8K/10K/12K/15K		
		DATE		
		1-28-15		
		CHECKED		
		DATE		
		APPROVED		
		DATE		
		REV		
		REV		

PUREGAS P-10,000-DCO/P-15,000-DCO

<u>QUANTITY</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
1	P-07707	Back Pressure Regulator/Bypass Relief Valve
4	P-06658	Cabinet Air Filter
1	P-09250	Optical Water Sensor Switch
1	P-08118	Optical Water Sensor Switch (Earlier Models)
1	P-08888	Solenoid Dump Valve
1	P-06824	Water Filter Element
1	P-07586	Maintenance Kit
1	P-06799	Four-Way Valve
1	P-09576	20 Amp Circuit Breaker
1	P-09359	Power Contactor
1	P-08990FI	Digital Alarm Board
1	P-07599F5	Digital Display Board
1	P-06775	Solid State Timer
1	P-07580F4	Humidity Alarm Board
2	P-5000-6-47D	Sensing Element
1	P-07400	Humidity Test Solenoid/Pilot Solenoid
4	P-02626	Vibration Mounts
1	P-06738	4-Way Solenoid Only
1	P-03083	4-Way Valve Rebuild Kit

Quantities listed are recommended spare parts for one or more air dryers

Optional Spare Parts

P-08679	Air Compressor (P-10000 -DCO)
P-08680	Air Compressor (P-15000-DCO)

7.4 Optional Equipment

7.4.1 The P-08033-G solid state cycling module provides for automatic alternating operation of Puregas Models P-10000-DCO/P-15000-DCO, and can be used to cycle other Puregas dryers and other manufacturers' air dryers. With the continuous operation of multiple air drying units, it may be desirable to have automatic cycling of two, three, or four air dryers to decrease the operating hours and to reduce the frequency of maintenance. The cycling module also furnishes automatic start of the standby air dryer in the event of failure of the unit in service. Installation of the P-08033-G solid state cycling module is relatively simple. The kit consists of 2, 3 or 4 control modules and a base unit with the necessary wiring and mounting hardware for installation in the two, three, or four air dryers. Call 1-800-521-5351 for ordering information.

SECTION 8 TROUBLESHOOTING INFORMATION GUIDE

- 8.0** This troubleshooting guide is set in a columnar format to simplify the isolation of problems, possible causes, areas to check and corrective action required to restore the air dryer to normal operation. It is further divided into system headings for easy referral. Where possible, the most likely causes have been listed first. Otherwise, the causes start with the simplest and progress to more complicated possibilities. The steps should be followed in sequence to expedite service. It is further suggested that once the problem has been isolated, the corresponding text in the Maintenance Section be reviewed to provide additional information. After the air dryer has been serviced, the alarms should be re-tested to assure the alarm system is working properly.

The alarm troubleshooting guide is easy to use and very effective when used properly. Therefore, it is suggested when entering a problem, always start at the beginning and continue in sequence by reading the possible cause, check and corrective action paragraphs and follow the procedures indicated.

This guide will require a Volt Ohm Meter (VOM) and will specify D.C. (direct current) or A.C. (alternating current) setting.

The troubleshooting information guide can by no means cover every possible cause for malfunction, but will help solve most problems. If the problem persists after thoroughly consulting the troubleshooting section, contact General Cable Company, Puregas Technical Service Department at (303) 427-3700 or 1-800-521-5351.

DANGER

This section requires access to components inside the cabinet of the air dryer. In most cases, an energized and operating air dryer is necessary to conduct test and make adjustments. Extreme care should be exercised to avoid contact with live electrical or moving parts.

TROUBLESHOOTING GUIDE P-10000-DCO/P-15000-DCO

8.1 LOW OUTLET PRESSURE ALARM SYSTEM

PROBLEM: LOW OUTLET PRESSURE ALARM CONDITION

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Flow in excess of maximum rated capacity of air dryer.	Check outlet pressure gauge and flow meter readings. Is there a high flow alarm?	If there is a high flow alarm and the outlet pressure is low, find source of excessive air demand and correct it.
2. Pressure alarm out of adjustment or defective	Check the low pressure alarm setting as described in Section 5.9.	Readjust the pressure switch or replace if defective.
3. Defective outlet pressure regulator.	Loosen the locknut on the outlet pressure regulator and adjust from 0-15 PSIG while observing the needle movement on the outlet pressure gauge.	If needle movement is erratic, needle sticks or outlet pressure will not adjust, replace outlet pressure regulator.
4. Leak, restriction or blockage in air system.	Check the piping for restrictions and the fittings for leakage.	Correct as necessary.
5. Defective control board.	Locate the control board and set the alarm latching switch (Sw1) to OFF. Locate connector W1. Using a DC VOM, put the black lead on ground test point and the red lead on pin 6 with the air dryer in alarm. +5 VDC and a C.O. alarm should be present.	If +5 (+1) VDC is present and a C.O. alarm is present, proceed to next step. If +5 (+1) VDC is present but no C.O. alarm is present or 0 VDC is present and a C.O. alarm exists, replace the control board.
6. Weak compressor.	Check the system pressure with no outlet flow from air dryer or bypass relief valve.	If system pressure is below 25 PSIG, replace compressor. In high altitude applications, lower pressure is permissible.
7. Bypass relief valve or back pressure regulator out of adjustment.	Check adjustments as described in Sections 5.3 and 5.4.	If out of adjustment, adjust as described or replace if defective.
8. Restriction or blockage in water system.	Check water filter and flow control valve.	Clean or replace as necessary.
9. Inline water solenoid valve failure.	Check inline solenoid valve and verify that it is open when air dryer is running.	Repair or replace inline water solenoid valve if defective.
10. High ambient temperature.	Check the ambient temperature.	If above 120° F., cool area around air dryer or relocate air dryer to cooler environment.

TROUBLESHOOTING GUIDE P-10000-DCO/P-15000-DCO

8.2 HIGH OUTLET PRESSURE ALARM SYSTEM

PROBLEM: HIGH OUTLET PRESSURE ALARM

POSSIBLE CAUSE

1. Outlet pressure regulator set incorrectly or defective.
2. Pressure alarm out of adjustment or defective.
3. Defective control board.
4. Loose wire connections from pressure switch to control board.

CHECK

- Check the setting of the outlet pressure regulator.
- Check the high outlet pressure alarm setting as described in Section 5.9.
- Locate the control board and set the alarm latching switch (SW1) to OFF. With the air dryer in a high pressure alarm, locate connector W1. Using a DC VOM, put the black lead on the ground test point and the red lead on pin 7. +5 VDC and a C.O. alarm should be present.
- Check the connections on wires number 29, 30, 32, 34 and 41.

CORRECTIVE ACTION

- Readjust if set incorrectly or replace if defective
- Readjust the pressure switch or replace if defective.
- If +5 (+1) VDC is present and a C.O. alarm exists, go to the next step. If +5 (+1) VDC is present and no C.O. alarm exists or 0 VDC is present and a C.O. alarm exists, replace control board. If 0 VDC exists and no C.O. alarm is present, suspect loose wiring or a defective pressure switch.
- If the connections are loose or defective, correct as necessary.

TROUBLESHOOTING GUIDE P-10000-DCO/P-15000-DCO

8.3 HUMIDITY ALARM SYSTEM

PROBLEM: AIR DRYER IN HUMIDITY ALARM

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Humidity circuit board defective.	Check the humidity alarm set point.	Disconnect sensing cord. If the seven humidity alarm LED indicators energize, the humidity indication is correct and the air dryer can be assumed to be "wet", proceed to step 6. If the LED indicator remains de-energized, the problem is in the humidity circuit. Proceed to the next step.
<i>Note: Due to the "open circuit detection" feature, disconnecting sensor cord will not clear alarm condition. However, humidity LED indicators should energize with cord disconnected.</i>		
2. Loose or poor electrical connections.	Check all wiring in the humidity circuit for good and proper connections.	Repair any bad conditions.
3. Incorrect humidity board.	Check humidity board to make sure the correct board is present. (The 10000/15000 Digital uses a humidity board which differs from those used in other air dryers.)	Install correct humidity board.
4. Defective humidity board.	Locate connector W1 on the control board. Using DC VOM, put the black lead Pin 3 and the red lead on pin 9. Press the set button located on the humidity board. + 5 VDC should disappear when button is released.	If humidity board tested incorrectly, replace humidity board. If humidity board tested correctly, continue to next step.
5. Defective control board.	Disconnect connector W1 from the control board.	If alarm clears, suspect faulty wiring. If alarm does not clear, replace control board.
6. Plugged purge orifice.	Check the purge orifice for debris which may be obstructing the flow.	Free purge orifice of restrictions and obstructions or replace.

...continued ...

TROUBLESHOOTING GUIDE P-10000-DCO/P-15000-DCO

8.3 HUMIDITY ALARM SYSTEM (continued)

PROBLEM: AIR DRYER IN HUMIDITY ALARM (continued)

NOTE:

The following are possible causes for a humidity condition. After isolating and correcting the problem, the air dryer may have to be run up to 2 hours to dry out the entire system and clear the alarm. The higher the system pressure, the faster the towers will dry out. It is advisable to run the dryer at 30-32 PSIG system pressure to dry out the towers.

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
8. Low system pressure.	Check the system pressure. It should be 25 PSIG at sea level.	Adjust bypass relief valve and back pressure regulator as described in Sections 5.3 and 5.4.
9. Leaking humidity test solenoid valve.	Check humidity test solenoid valve for leakage into humidity tube.	Replace solenoid valve if defective.
10. Defective timer.	Refer to Section 6.4 for proper timer operation.	Replace timer if it is defective.
11. Defective 4-way valve.	Refer to Section 5.6 for proper 4-way valve operation.	Repair or replace 4-way valve if it is defective.
12. Defective purge solenoid valve.	Remove the purge air line from the bottom of the purge solenoid and verify the air is flowing through the valve.	If no air is flowing through the valve, check for proper voltage and, if necessary, replace the purge solenoid valve.
13. High system temperature.	Feel water line connecting water filter and air compressor.	If line is warm or hot, replace dirty air filters. Clean heat exchanger. Check fan for proper rotation.
14. Excessively high ambient temperature.	Check ambient temperature. It should be below 120° F.	Cool environment around dryer or relocate dryer to cooler environment.

TROUBLESHOOTING GUIDE P-10000-DCO/P-15000-DCO

8.4 LOW WATER ALARM SYSTEM

PROBLEM: AIR DRYER IN LOW WATER CONDITION

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Low water.	Check sight optical sensor tube to verify that the water level is below the low optical water sensor.	If water level is below the low water sensor, proceed to the next step. If water level is above the low water sensor, reset the alarm if necessary.
2. Water and/or air leaks in the air dryer system.	Check all fittings closely with an appropriate leak testing solution with the dryer on and no outlet flow.	Tighten any loose fittings as required using an appropriate thread sealant.
3. Dump solenoid valve leaking water.	Check water outlet of air dryer for water leakage.	If the dump solenoid valve is leaking, repair or replace the valve.
4. Leaking inline water solenoid valve.	Check water level in the water separator when the dryer has been off for several hours.	If the water level is above the top water sensor in the water separator, replace or repair the inline water solenoid valve.
5. Dirty water filter element.	Dirty water filter element may discolor when dirty, however not always.	Replace water filter element.
6. Plugged water flow control elbow.	Check elbow for debris which may be obstructing water flow.	Free elbow of restrictions and obstructions or replace.

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8.4 LOW WATER ALARM SYSTEM (continued)

PROBLEM: AIR DRYER CONTINUALLY EJECTING WATER RESULTING IN A LOW WATER ALARM (See Section 5.5 for additional information)

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Defective primary water sensor.	Verify water level in sight tube. If water level is below middle sensor, proceed to alarm board and locate LED's LD10 and LD22. If both LED's are energized, remove connector W11.	If LED's de-energize and unit stops ejecting water, Clean or replace middle optical water sensor.
2. Defective high water sensor.	Proceed to alarm LED LD17 and check and verify status. If LD17 is OFF, proceed to next step.	If LD17 is ON, and W11 is disconnected, remove W10. If unit stops ejecting water and LD17 turns OFF, Clean or replace high water optical sensor.
3. Defective control board.	If unit continues to eject water, with W11 disconnected, Using VOM attach lead to L2 (White wire) and other lead to TB3 pin 4.	If 208-230VAC is present, Replace control board. If no voltage is found, Replace dump solenoid.

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8.4 LOW WATER ALARM SYSTEM (continued)

PROBLEM: NO LOW WATER ALARM OR SHUTDOWN IN LOW WATER CONDITION

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Defective lower water sensor.	Perform the low water alarm test procedure as outlined in Section 4.8.	Replace the low water sensor if the switch is defective.
2. Loose or poor electrical connections.	Check wires #39 and #40 for good and proper connections.	Repair any bad electrical connections.
3. Defective control board.	Proceed to LED LD17 and verify status. If ON, next locate LED's LD20 and LD21 and check status. If LD20 and LD21 are ON, Dryer should normally shut down, following a 64 second delay. After 64 seconds, unit does not shut down, Using VOM, check voltage between L2 and TB2 pin 2 (contactor 1) and pin 3 (contactor 2).	If 208-230VAC is present, Replace control board. If no voltage is found, Replace corresponding contactor.
	If Led LD17 is OFF	Clean or replace low water optical sensor.

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8.5 HIGH WATER ALARM SYSTEM

Note:

The high water alarm system is designed as a backup to the primary water ejection system and is normally inoperative. High water accumulation in the water separator is an indication that a problem exists.

PROBLEM: HIGH WATER ALARM AND WATER IS INDEED HIGH IN WATER SEPARATOR

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Loose or improper electrical connections.	Check wires connectors W10, W11 and W12 for proper connections.	Repair any bad electrical connections.
2. Defective primary water sensor.	Verify water level in sight tube. If water level is above middle sensor, proceed to alarm board and locate LED's LD10 and LD22. If both LED's are energized, proceed to step 3.	If LED's are OFF and unit stops ejecting water, Clean or replace middle optical water sensor.
3. Defective control board.	If unit still does not eject water, Using VOM, attach lead to L2 and other lead to TB3 pin 4.	If 208-230VAC is present, Replace dump solenoid. If no voltage is found, Replace control board.
4. Leaking inline water solenoid valve. This problem will only surface when the dryer has been off for several hours and is restarted, as is the case when using a cycle kit.	Check the water level in the water separator after the dryer has been off for several hours.	If the water level is high, replace or repair the solenoid valve.

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8.6 ELECTRICAL SYSTEM

NOTE:

When troubleshooting electrical problems, always suspect connections. Check that screws are tight on terminal blocks, fast-on terminals are completely butted, solder joints are solid, crimps are good and wires are not cut or burned.

PROBLEM: NO POWER TO AIR DRYER

<u>POSSIBLE CAUSE</u>	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Circuit breaker tripped at main power supply.	Check circuit breaker to see if it has tripped and for 208 VAC at power connections.	Reset circuit breaker. Check power supply for sufficient voltage.
2. Loose or poor electrical connections.	Check power connection.	Repair any bad electrical connections.
1. Humidity or low water alarm.	Check for humidity or low water alarm.	If dryer is in a humidity or low condition, see Sections 8.3 and 8.4 for possible causes.
2. Loose or poor electrical connections.	Check power connections at terminal block.	Repair any bad electrical connections.
3. Defective power contactor.	Check for 208 VAC into and out of the power contactor.	Replace contactor if defective.
1. Loose or poor electrical connections.	Check for 208 VAC to the air compressor.	Repair any bad electrical connections.

PROBLEM: DRYER HAS POWER BUT COMPRESSOR WILL NOT RUN

1. Loose or improper electrical connections.	Check wires #15, #16 and #55 if applicable for proper connections.	Repair any bad electrical connections.
2. The thermo overload could be tripped.	Visually check to see if the overload has tripped.	Press in the button to reset the overload.
3. Bad alarm board.	Verify power to TB2 L1, L2.	Hit reset and dryer should start. If not - bad alarm or tripped circuit breaker on alarm board. Check for 5 VDC.

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8.7 FLOW ALARM SYSTEM

PROBLEM: FLOW ALARM INOPERATIVE

POSSIBLE CAUSE	<u>CHECK</u>	<u>CORRECTIVE ACTION</u>
1. Loose or improper electrical connections.	Check wires 18, 19, 29, 30, 31.	Repair any bad electrical connections.
2. Power does not exist.	Check for 208 VAC at flow meter across pins L1 and L2.	If power is not present, contact Puregas Service Department. If power is present, proceed to next step.
<i>Note: For units purchased before 9/92.</i>		
3. Flow meter is defective.	Check the light on the front face of the flow meter and verify it's on.	If power exists and the light on the front face is not energized, replace the flow meter. If light is present, proceed to next steps.

NOTE:

If a P-08033 or P-06400 cycle kit exists, remove W9 connection and retry all tests. If no problem exists when W9 is disconnected, call the factory.

PROBLEM: ELECTRICAL

Create a hi flow condition. Refer to section 4.5, page 8. Check alarm board W1/Pin 3 to Pin 4 or 5 volts DC. If 5 volts exists, wait for time delay SW1 on alarm board and verify that LED1 and LED2 come on.	If LED's 1 & 2 don't come on, suspect alarm board. If LED's 1 & 2 do come on, suspect display board or cable.
If 5 volts does not exist.	Suspect a bad flowmeter.

PROBLEM: HI FLOW EXISTS ON DISPLAY BUT UNIT IS NOT IN HI FLOW

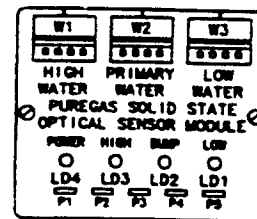
Toggle Reset	Verify not in Hi Flow. Refer to Section 4.5, page 8.
Check Alarm board W1/Pin 3 to Pin 4 for 5 volts DC. If 5 volts does exist.	Suspect bad flow meter.
If 5 volts does not exist, check LED1 & LED2 at alarm board to determine if they're on.	Suspect bad display or cable.
LED's 1 & 2 are off.	Suspect bad alarm board.

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8.8 Optical Sensor Module, P-08119 (Earlier Models)

Most air dryer problems associated with the optical water dump circuit can be attributed to a faulty optical water sensor. The following optical water sensor/dump system check procedure should be used when a faulty sensor is suspected, causing problems such as continuous water dumping, false high water alarm, false low water alarm or an inoperative primary dump circuit.

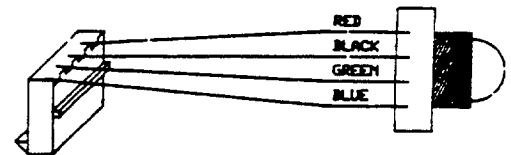
Step 1 - Disconnecting the Water Dump Signals. Disconnect the wires located on terminal P-3 and P-4 of the optical sensor module. This will temporarily inhibit the electronic water dump system from dumping water.



Note: If unit continues to dump water in error following Step 1, proceed directly to Step 5B.

Step 2 - Stabilizing Water Level for Testing. Add water as necessary to bring water level just above the low water sensor, but below the primary or center sensor.

Step 3 - Testing Sensor (LED) Input Voltage. Using a volt meter, measure the DC voltage between the blue and black wires on all sensors. If measurement is between 1-2 VDC, sensor is good; If measurement is between 4-5 VDC, sensor is bad. Replace any sensors that fail this test.



Note: Sensors must be connected to module at all times during testing.

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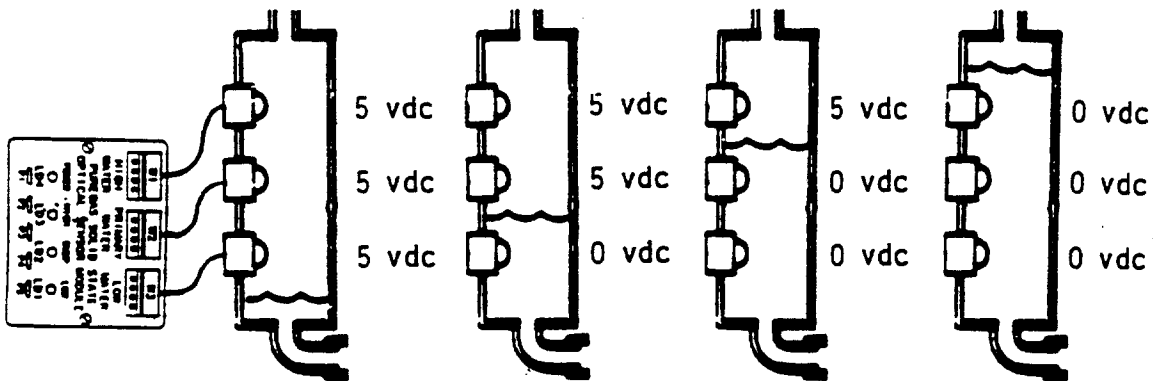
8.8 Optical Sensor Module, P-08119 (Earlier Models, continued)

Step 4 - Testing Sensor (LED) Output Voltage.

Using a volt meter, measure the DC voltage between the blue and green wires on all sensors. Readings must be taken with water level below and above sensors. Add water to achieve desired test level. If water level is below the sensor, reading should be 5 VDC. If water level is above sensor, reading should be 0 VDC.

Note: If water level becomes too high during testing, short the loose wire from P-4 to P-1 (this activates the water dump system) and hold until desired level is achieved.

Important: Clean faulty sensors using a soft cloth (DO NOT APPLY CLEANING AGENT) and retest. If sensor continues to fail output test, replace.



Step 5A - Restore to Normal Operation.

Following faulty sensor replacement, reconnect wires to P-3 and P-4 of module and restore air dryer to normal operation.

Step 5B - Replace Faulty Dump Valve or Alarm Board.

If wires P-3 and P-4 on the module are disconnected and unit continues to dump water in error, locate dump solenoid valve and disconnect any one of the two wires. After dump solenoid valve is disconnected if unit continues to dump water, replace valve. If unit stops dumping water, replace alarm board.

