Instruction Manual
Model P-20000D & P-30000D
Central Office Air Dryers

(Serial Numbers 7/94 2001 and 7/94 3001 to Present)

P-20000D and P-30000D
High Capacity (R134A)
Refrigeration/Desiccant

PUREGAS

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P-08636 Rev. D

Made in USA

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:
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226A Commerce St.
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LIMITED WARRANTY AGREEMENT

Puregas air dryers carry a one-year warranty against defective workmanship and material. This period starts at date of shipment. Not included are components subject to normal replacement during a years operating time. These parts include, but are not limited to, electrical components, pressure switches, pressure regulators and piston-type air compressors which carry a one year warranty.

On refrigeration type dryers, the basic refrigeration circuit carries a five-year warranty. This warranty covers the refrigeration compressor, refrigeration tubing and coils but NOT the thermostat, thermometer, or fan motor.

Liquid-ring compressors, heatless dryers and circuit boards carry a 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.

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, so as to affect, in our judgement, its proper functioning or reliability neither will it apply to a dryer which has been subjected to misuse, negligence or accident.

THE INSTALLING OF PARTS PURCHASED FROM OTHER THAN PUREGAS WILL VOID THE WARRANTY ON OUR AIR DRYERS.

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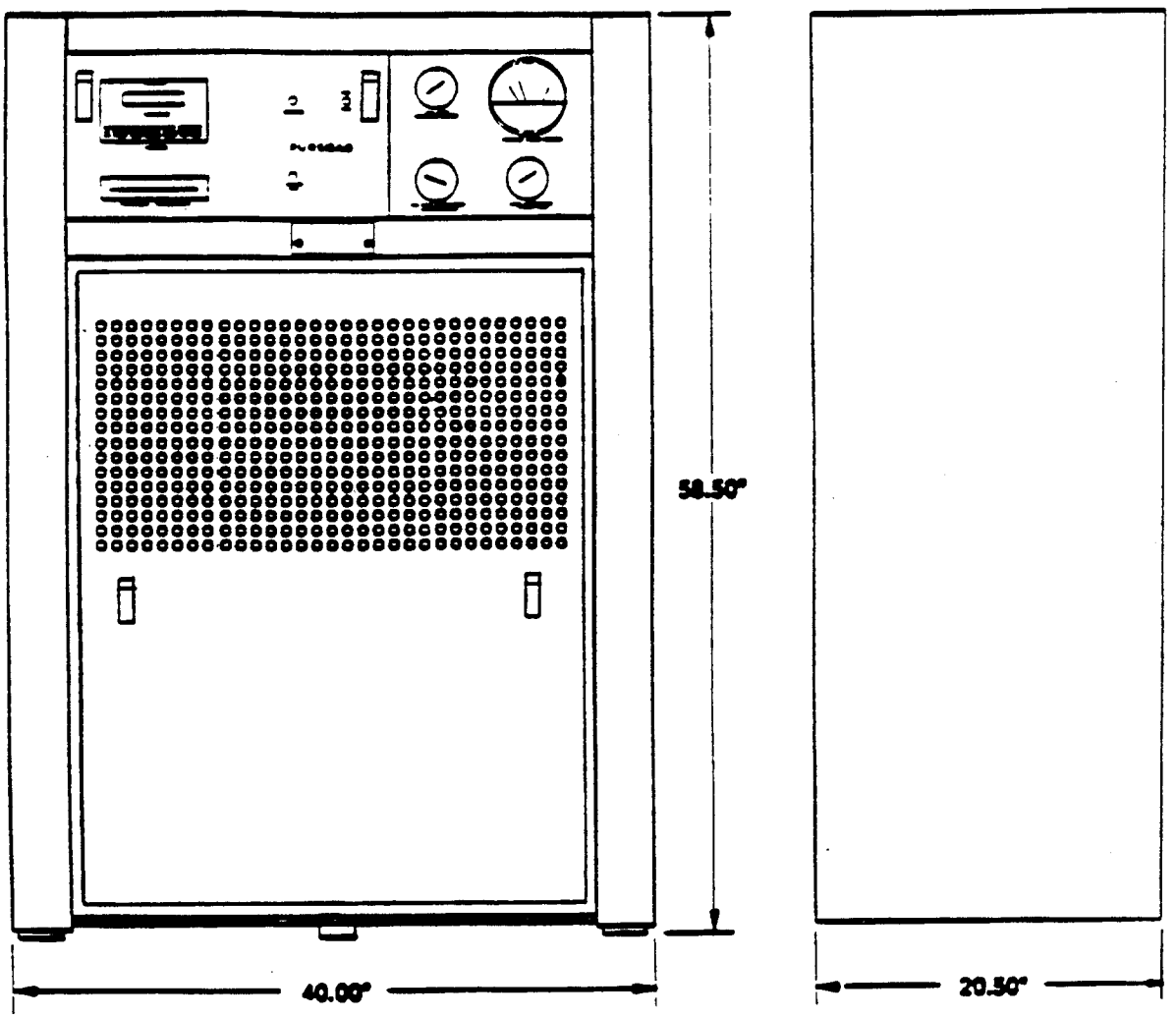
FIGURES AND DRAWINGS

GENERAL

This instruction manual covers the description, maintenance and troubleshooting techniques for the Puregas Model P-20000D/P-30000D Air Dryer. This air dryer supplies a normal continuous delivery of up to 20,000 or 30,000 SCFD of dry air at adjustable pressures of 0-15 PSIG. The model P-20000D/P-30000D air dryer is designed for indoor installation, providing dry compressed air to continuous feed pressure cables, pipe systems or other devices requiring dry air.



Outline Dimensions
Figure 1

DESCRIPTION

Puregas Model P-20000D/P-30000D Air Dryer employs the principles of compression, refrigeration and physical adsorption. The operation is fully automatic and relatively maintenance free. The unit essentially consists of an oilless, water-lubricated air compressor, heat-reactivated desiccant towers and a refrigeration system. It also incorporates the necessary gauges, controls and automatic alarms to insure 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, high temperature or high humidity condition.

Air Dryer Characteristics		
Model Number	**P-20000D**	**P-30000D**
Output Capacity	20,000 SCFD	30,000 SCFD
Power Requirements	208 VAC/1-Ph./17.5 Amp	208 VAC/3-Ph./16.5 Amp
Compressor Type	2 HP, Liquid Ring Type	3 HP, Liquid Ring Type
Heat Dissipation	12,420 BTU/Hr.	11,710 BTU/Hr.
Dryer Type	Refrigeration (R134A) and Heat Reactivated Desiccant.	
Ambient Operating Temperature Range	+40°F to +120°F / (5°C to 48°C) Recommended Operating at 78°F (25.5°C)	
Outlet Pressure Range (Low and High)	Regulated low pressure outlet 0-15 PSIG Regulated high pressure outlet 0-17 PSIG.	
Dry Air Outlet	3/4" (Connections)	
Outlet Air Humidity	Less than 2% R.H. (-40° Atmospheric Dewpoint)	
Dimensions (Metric)	20.5"D x 40.0"W x 58.5"H (52.cm x 102.cm x 149.cm)	
Weight (Metric)	675 Pounds (307 kg)	
Alarms: **Major-**	HIGH TEMPERATURE - Shutdown dryer and alarm.	
"	HIGH HUMIDITY - Shutdown dryer and alarm.	
"	LOW WATER - Shutdown dryer and alarm.	
"	POWER FAIL - Unit off, alarm.	
Minor-	HIGH WATER - Alarm only.	
"	LOW & HIGH PRESSURE - Alarm only.	
"	HIGH FLOW - Alarm only.	

Air Dryer Characteristics
Figure 2.

INSPECTION AND START-UP

DANGER:
It is extremely important to perform the start-up Procedure in the following sequence.

A. Initial Inspection – Remove the lower front door and open the upper instrument panel. Carefully inspect both the exterior and interior of the air dryer for any shipping damage.

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

1. The following items will be secured in the air compressor compartment accessory bag:

1 each	P-03129	Elbow – Conduit, Electric
1 each	P-03130	Conn – Conduit
2 each	P-07353	Tower Inlet Filters
2 each	P-15186	Air Filter
1 each	P-15453	Air Inlet Filter
1 each	P-06824	Water Filter Element
1 each	P-5000838	Plug – Alarm – Female

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

B. **Installation Procedure** – Remove shipping blocks. The shipping blocks must be removed from both the refrigeration and air compressor assembly. Removal of these blocks will permit the assembly to "float freely on the rubber vibration pads.

NOTE:
Failure to remove these shipping blocks Will damage the mounting assembly.

C. **Location** – The air dryers require a supply of clean ambient air for compression and cooling. Normally, most central office locations are suitable since the air compressor intake filter cleans the air prior to use. However, it must be remembered that the filters will clog quickly in a dirty or dusty environment. More frequent filter changes will be necessary to prevent loss of dryer capacity and higher operating temperatures.

C. **Location - (Continued)**
The Model P-20000D generates heat into the space it occupies at the rate of 10,187 BTU/Hr. while the model P-30000D produces 11,710 BTU/Hr. In an air conditioned space the P-20000D would require .85 tons of refrigeration and the P-30000D, .80 tons for heat dissipation. In any case, adequate ventilation must be provided for heat dissipation. Locate the air dryer at least six inches from the wall to allow sufficient air circulation. More area is desirable, if possible, to provide access to the rear of the dryer for service and maintenance purposes.

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

E. **Electrical Hook-up -** Turn the air dryer On/Off switch to OFF. Model P-20000D operates on 208 VAC, single phase, 60 Hz power source, fused for 30 amperes. Model P-30000D operates on 208 VAC, three phase, 60 Hz, 30 amp service. For both models, at the terminal block located at the upper left corner (viewed from the rear of the air dryer), connect the incoming power leads L1 to wire 1, L2 to wire 2, L3 to wire 3 and ground to wire GA. Size 10 gauge wire must be used to provide electrical service to the air dryer.

NOTE:
Phase sequence dictates motor rotation on the P-30000D only. 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.

F. **Alarm Hook-up -** The alarm outputs can be monitored as discrete (individual) or as a two-wire common, depending on the capability of the alarm monitoring system present.

1. To hook up to a two-wire common alarm system, attach the two wires from the monitoring system onto the female connector plug (P-5000838) located in the accessory bag. Then plug in the female connector plug to the male alarm socket located at the top rear of the air dryer.

2. For discrete alarm hook-up, proceed to the discrete alarm outputs (TB1), i.e., orange terminal block on right side of alarm board. Connect the corresponding wires from the monitoring system with the individual alarm outputs at the alarm output terminal block.

3. All individual alarms are normally open, dry contacts. The two common alarms can be configured as either normally closed (N.C.) or normally open (N.O.).

ALARM BOARD DISCRETE ALARM OUTPUTS Terminal Block - (TB1)			
PIN	ALARM	LATCHED ALARMS (Red) (LD#)	PRESENT ALARMS (Yellow) (LD#)
24 - N.O. 23 - Common 22 - N.C.	Common Alarm 1 (top of dryer)	1 (Green)	-
21 - N.O. 20 - Common 19 - N.C.	Common Alarm 2 (cycle kit instl.)	1 (Green)	-
18 - 17 -	HIGH FLOW	2	12
16 - 15 -	SPARE	3	13
14 - 13 -	LOW PRESSURE	4	14
12 - 11 -	HIGH PRESSURE	5	15
10 - 9 -	HIGH WATER	6	16
8 - 7 -	HIGH HUMDITY	7	17
6 - 5 -	LOW WATER	8	18
4 - 3 -	HIGH TEMP.	9	19
2 - 1 -	POWER FAIL	-	-

Alarm Board Discrete Outputs
Figure 3

NOTE:
These alarm points are located on TB1 of the Digital Alarm Board. (Fig. 9, Pg.22)

G. **Start-up** - A plastic plug with a small hole (orifice plug) is located in the low pressure outlet port at the top rear of the air dryer. This plug will permit the unit to operate in a simulated "On-Line" condition.

NOTE:
Remove the intake air filter and have at least 2 quarts of water available before proceeding.

1. Place the On/Off switch to the ON position.
   a. The logic scan LED (green) will start flashing on and off.
   b. The air compressor and heat exchanger fan motor will start.

NOTE:
On Model P-30000D Only: Upon initial start-up, if the air compressor will not accept water and within 30 seconds the heat exchanger gauge does not indicate rising pressure, STOP UNIT IMMEDIATELY and refer to paragraph E, page 4, to correct the phase sequence.

2. Add water to the accumulator until the water level is stabilized below the top sensor. During this time the air dryer may see a low water alarm and shut down. If this occurs, toggle the reset switch. Continue this procedure until the proper water level is achieved.

3. A HIGH HUMIDITY alarm may appear at the alarm display and shut down the air dryer. If this occurs, toggle the reset switch. The air dryer will continue to operate until the fixed 60 second time delay elapses. This condition may occur during the first 30 minutes of operation. Continue resetting the alarm as needed.

4. The seven humidity indicating LED's will begin to energize as dry air passes over the humidity sensor. This again should take less than 30 minutes of operation.

5. Soap check fittings for pressure leaks that may have occurred during shipment.

H. **Power Up Delay Switch** - On the alarm board, locate the power-up delay switch (SW5). This switch is used to delay the start up of the air dryer once power has been applied. This is useful when operating multiple dryers in the same office. It is possible for power surges to occur when more than one air dryer starts up at the same moment, such as following power interruptions. Delays of 0,1,2,4 and 8 seconds are available.

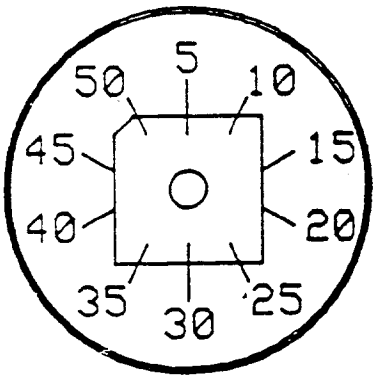
TEST ROUTINE

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

A. **Time Delay Switch -** The time delay switch, located on the alarm board, (Fig. 9, Pg. 22) controls the selectable delay time between the initialization of the alarm condition and the activation of the alarm output.

1. This delay can be adjusted between 5-50 seconds (Figure 4, below).

2. Before proceeding with the test routine, verify that the delay time is set at 20 seconds (factory recommends a 20 second delay).



Time Delay Adjustment
Figure 4

B. **Alarm Latching Switch -** The alarm latching switch has two positions. The first position is the latch ON mode. This mode requires the alarms to be reset manually. During the latch mode, only the alarms that occur within the time delay period are latched and reported. Alarms that occur after the time delay expires are not processed. This feature enables user to identify the actual alarm. This is the normal recommended mode.

1. The latch OFF mode allows the alarms to clear automatically.

2. If a P-08033G Cycling Kit is installed, the latch mode is enabled and all present alarms will automatically latch. This function is initiated by connector W9 on the digital alarm board. For this test routine, remove W9 connector if it was previously installed.

B. **Alarm Latching Switch - (Continued)**

3. Before proceeding with the test routine, set the latch switch to ON.

NOTE:

The common alarm - LED 1 (green) will always be energized when any alarm condition is present. Refer to Figure 9, p.22, red LED's 1-9 (located on digital alarm board) represent a central office alarm output. Yellow LED's 12-19 represent a present condition only.

C. **Low Pressure Alarm Test (LED 4 on the alarm board)**

1. Remove the air dryer front door and locate the outlet pressure regulator.

2. Rotate the knob counterclockwise and reduce the pressure on the outlet pressure gauge until alarm occurs. At this point, LOW OUT PRESSURE will appear at the alarm display and LD14 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 and LED 4 (red) energize, signifying a central office air dryer alarm.

3. Turn the regulator knob clockwise and increase the outlet pressure to 10 PSIG. Toggle the alarm reset switch and LOW OUT PRESSURE will disappear.

4. If a P-08033G Cycling Kit is installed, this alarm is masked during it's STAND-BY cycle.

D. **High Pressure Alarm Test (LED 5 on the alarm board)**

1. Rotate the pressure regulator adjustment knob clockwise until the outlet pressure gauge indicates 15 PSIG. HIGH OUT PRESSURE will appear at the alarm display and LD15 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 and LED 5 (red) energize, signifying a central office air dryer alarm.

2. Reduce the outlet pressure to 10 PSIG. Toggle the alarm reset switch and HIGH OUT PRESSURE will disappear.

3. If a P-08033G Cycling Kit is installed, this alarm is masked during it's STAND-BY cycle.

E. **High Flow Alarm Test (LED 2 on the alarm board)**

1. Locate the flow meter on the air dryer front panel.

2. The flow meter consist of two separate adjustable alarm set points, low and high.

E. **High Flow Alarm Test - (Continued)**

3. The adjustment knob located on the left side of the flow meter is not used in the model P-20000D and P-30000D air dryer. The adjustment knob located on the right side is for adjusting the high flow alarm set point.

4. Rotate the right knob counterclockwise until the red needle drops below the black flow indicating needle. HI FLOW will appear at the alarm display and LD12 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 (green) and LED 2 (red) energize, signifying a central office air dryer alarm.

5. If a P-08033G Cycling Kit is installed, this alarm is masked during it's STAND-BY cycle.

F. **Humidity Sensor Test (Humidity LED indicators located on the front panel)**

1. Locate the humidity test switch on the alarm board (upper right corner).

2. Press the humidity test button momentarily (Do Not Hold Down).

3. Monitor the seven humidity indicator LED's and verify that the indicators respond and begin to de-energize. It may take several attempts to verify the sensor.

NOTE:

Extreme caution should be used when testing the humidity sensor to avoid accidental humidity sensor saturation. This test is only to verify that the sensor responds to moisture and should not be used to test the electrical alarm portion.

G. **Humidity Alarm Test (LED 7 on the alarm board)**

1. Locate the test button/switch on the humidity circuit board. (Fig 11. p.25)

2. Hold the alarm test button/switch down, monitor the seven humidity LED indicators. The four green LED's will de-energize, HIGH HUMIDITY will appear on the alarm display and LD17 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 and LED 7 (red) energize, signifying a central office air dryer alarm. Continue holding the alarm button/switch down for an additional 40 seconds (1-minute total), and verify the air dryer shutdown. After shutdown occurs, toggle the alarm reset switch and the air dryer will start and HIGH HUMIDITY will disappear from the alarm display.

NOTE:

When testing the air dryer shutdown feature (HIGH HUMIDITY, LO WATER and HI TEMP), the alarm condition must not be interrupted or the 1-minute delay will automatically reset.

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

1. Have at least 2 quarts of clean water available to add to the accumulator after the low water test.

2. Locate the air compressor water drain valve, located on the bottom side of the pump head.

3. Using 1/4" OD plastic tubing, attach one end of the plastic tubing into the drain valve. Route the other end into a bucket or drain. Slowly open the valve and allow the water to drain freely from the air dryer. When the water level drops below the low water sensor, LO WATER will appear at the alarm display and LD18 (yellow) will energize in the present alarm column. Immediately close the compressor water drain valve. Wait 20 seconds and verify that LED 1 and LED 8 (red) energize, signifying a central office air dryer alarm. Continue this alarm condition for an additional 40 seconds (1-minute total), and verify the air dryer shutdown.

4. Remove the air filter housing from the inlet accumulator. Remove the plastic tubing from the drain valve. Toggle the alarm reset switch, the air dryer will start and IMMEDIATELY begin pouring the clean water into the inlet accumulator until the primary dump valve begins ejecting excess water. The LO WATER will disappear from the alarm display.

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

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

1. Proceed with the inlet accumulator and add approximately 1 gallon of clean water.

2. There is an internal fixed time delay of 15 seconds after the water reaches the primary dump sensor and the primary dump solenoid valve begins ejecting water. Therefore it is suggested to be prompt when adding water.

3. After adding the water the secondary dump solenoid valve will begin ejecting water. HI WATER will appear at the alarm display and LD16 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 and LED 6 (red) energize, signifying a central office air dryer alarm.

4. Toggle the alarm reset switch and HI WATER will disappear from the alarm display. Water may be present in the clear high water sensor tube, located below the refrigeration system.

J. **High Temperature Alarm (LED 9 on the alarm board)**

1. There is no safe way to test this sensor using actual heat. This sensor has been fully tested at the factory prior to delivery. The actual high temperature alarm set point is 140 degrees F. This sensor usually detects a timer failure.

2. Proceed to the outlet air tubing and locate the high temperature sensor. Disconnect the two wires #102 and #103 and temporarily short them together. This will simulate a high temperature condition. HI TEMP will appear on the alarm display and LD19 (yellow) will energize in the present alarm column. Wait 20 seconds and verify that LED 1 and LED 9 (red) energize, signifying a central office air dryer alarm. Continue this condition for an additional 40 seconds (1-minute total), and verify the air dryer shutdown.

3. After shutdown occurs, reconnect wires #102 and #103 to the sensor, toggle the alarm reset switch and the air dryer will start and HI TEMP will disappear from the alarm display.

THEORY OF OPERATION

A. Air System - General

Figures 16, 17 and 18 (pgs. 30, 31, 32) are illustrations of a Puregas Model P-20000D/P-30000D Air Dryer. The model number corresponds to the maximum air outlet capacity of the unit, i.e., 20,000 SCFD or 30,000 SCFD (standard cubic feet per day) of dry air. The model P-20000D uses a two horsepower, 208 volt, single phase power supply. The model P-30000D uses a three horsepower, 208 volt, three phase power supply.

B. Air System Operating Characteristics

Figure 5 (pg. 14) is a flow diagram which applies to both the P-20000D/P-30000D air dryer. A general overview of the operation of these machines from ambient air to low pressure dry air is as follows:

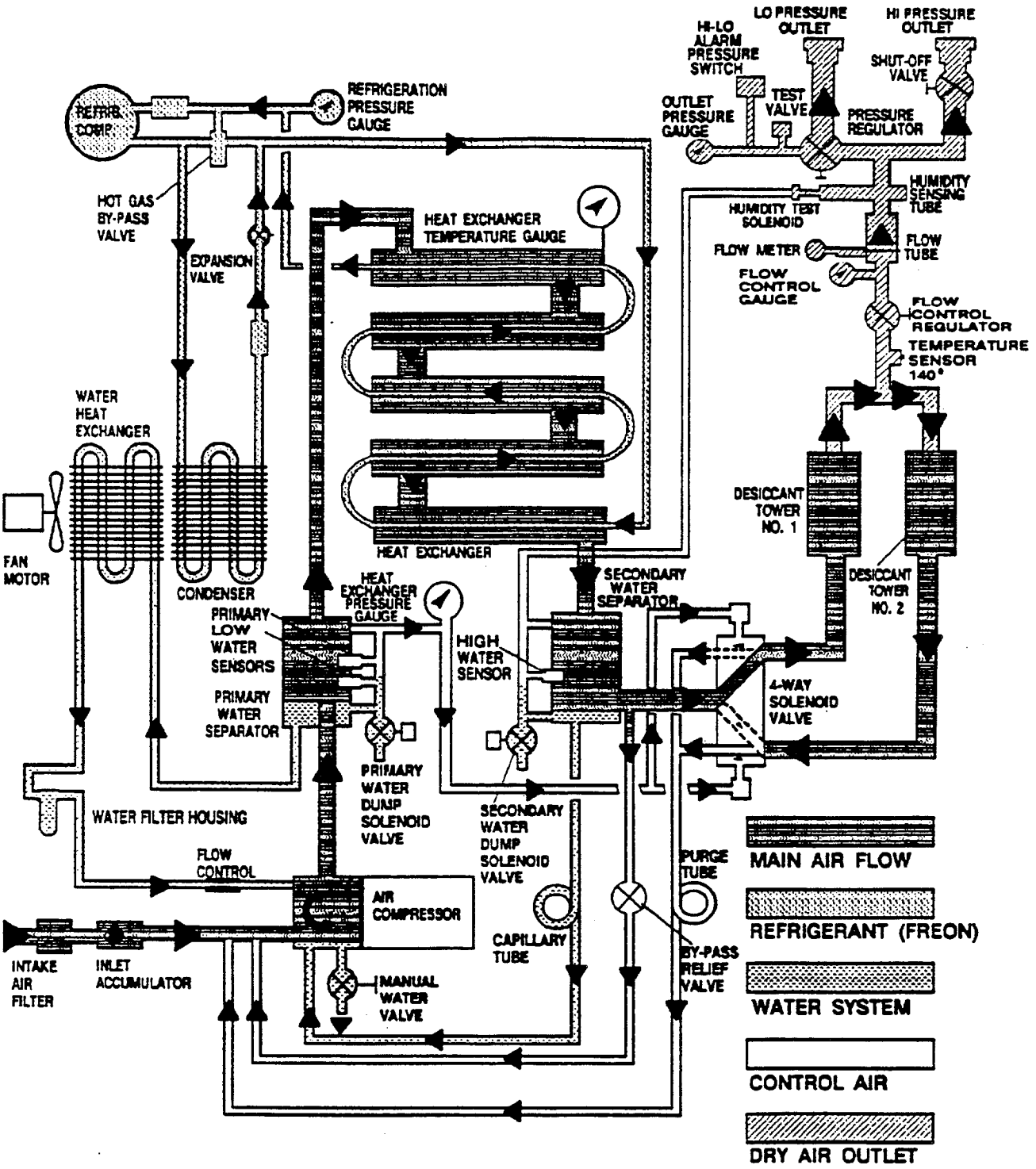
1. Ambient air is drawn into the air dryer through the intake filter and the inlet accumulator to the air compressor. There it is combined with water and compressed to a pressure of 14-26 PSIG.

2. The water and compressed air then flow to the primary water separator. The water is separated and returned through the water heat exchanger, water filter element and the water flow control valve to the water inlet of the liquid-ring air compressor. At the compressor it is once again combined with ambient air to lubricate the air compressor while being compressed. The primary water sensor in conjunction with the primary dump solenoid valve monitor and maintain proper system water level. The compressed air is directed to the refrigeration heat exchanger where it is cooled to between 40-45°F to remove most of the remaining moisture by condensation.

3. The cold compressed air and condensate flow to the secondary water separator to the inlet of the four-way valve. The four-way valve directs the cooled compressed air to one of the two desiccant towers for final drying. The four-way valve is controlled by two air directing solenoid pilot valves. These solenoid pilot valves are controlled by the solid state cycle timer. The compressed air flow up through the on-line desiccant tower where the water vapor is adsorbed by the desiccant. After this final drying process the dried air flows to the piping and control components leading to the dry air outlets. A very small portion of the dried air (purge air) is routed to the top of the other desiccant tower. This purge air sweeps down trough the off-line tower carrying the moisture back through the four-way valve, through the purge tube and back to the air compressor for lubrication and compression.

B. Air System Operating Characteristics - (Continued)

4. The major portion of the dry air leaving the desiccant tower is directed through a humidity sensing tube, outlet pressure regulator and onto the low pressure outlet. A high-low pressure alarm switch monitors the outlet pressure. A high pressure outlet is regulated to 17 PSIG (flow tube control regulator) and can also be used to supply air distribution panels, pipe alarm panels or other equipment requiring dry compressed air.



Flow Diagram
Figure 5

C. Air Compressor

1. The air compressor is a centrifugal, liquid-ring unit with the motor and the compressor impeller directly connected. Incoming water is centrifugally forced to the outer housing wall by an impeller, forming a liquid ring. The compressed air and water are discharged continuously from the compressor to maintain the system (heat exchanger) pressure at 14-26 PSIG.

2. The air compressor 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 can accumulate in the compressor housing and cause excessive wear on the impeller and cone and accelerate the deterioration of the seal. It is necessary to maintain the filtration.

D. Bypass Relief Valve

The bypass relief valve limits the maximum operating pressure of the air compressor. Extended operation at pressures above the recommended 26 PSIG will result in higher operating temperatures, loss of compressor capacity and possible compressor failure. To check and adjust the setting of the bypass relief valve, perform the following instructions:

1. With the air dryer "ON", loosen the locknut on the outlet pressure regulator. Turn the adjustment knob counterclockwise until the outlet pressure is 0 PSIG. Ideally, an external dryer shutoff valve will be available to shutoff completely any air from exiting the air dryer. If your system has a shutoff valve, utilize this instead.

NOTE:
During this procedure, it may be necessary to periodically increase the pressure regulator or open the shutoff valve momentarily, to allow the pressure in the heat exchanger to stabilize.

2. Check the heat exchanger pressure gauge. It should read 26 PSIG. If adjustment is necessary, loosen the locknut at the bypass relief valve. Turn the adjustment knob clockwise to increase or counterclockwise to decrease the pressure to 26 PSIG on the heat exchanger pressure gauge. See above note if pressure doesn't adjust lower.

3. Tighten the locknut on the bypass relief valve. Readjust the outlet pressure regulator and or open the shutoff valve to allow air dryer on-line. The heat exchanger pressure gauge should now be normal, 14-26 PSIG. Tighten the locknut on the outlet pressure regulator.

E. Optical Water Sensor Switch/Dump System

The upper (primary) optical water sensor switch and the water dump solenoid valve work together to monitor and maintain the water level. The upper and lower optical water sensors are located in the sight tube assembly. When the water level increases above the upper water sensor, the water dump solenoid valve is energized and the excess water is dumped following a 15 second fixed time delay. The alarm board located inside the front panel has a green LED (LD10) on the upper left side, which energizes when the upper water sensor activates. When the water level becomes low, the lower optical water sensor activates a low water alarm and causes the air dryer to shut down automatically, following a one-minute fixed time delay.

NOTE: ***IF INSTALLED ON P-08033G CYCLING KIT***
When installed with cycling kit, the water sensor signals are masked during the air dryer stand-by mode. This prevents water from being dumped prematurely on start-up. This may be bypassed by removing the connector on W9 of the air dryer alarm board or using the override switch on the cycling kit.

F. Refrigeration System (R134A)

The refrigeration system utilizes the new refrigerent R134A. This system is universally accepted as Ozone Friendly and Environmentally Safe and contains no CFC's (chlorofluorocarbons). The refrigeration system lowers the temperature of the moist air to approximately 40°-45°F, causing condensation to occur. The system works as follows:

1. The refrigeration compressor compresses R134A refrigerant vapor and discharges it into the fan cooled, finned-type condenser. The R134A refrigerant vapor condenses to a liquid and flows through the expansion valve into the refrigerant-to-air heat exchanger. There the liquid refrigerant cools due to the pressure drop and transfers heat from the compressed air to the refrigerant, i.e., cooling the air and heating the refrigerant. The now heated refrigerant returns to the refrigeration compressor.

2. The refrigeration heat exchanger pressure is controlled by the hot gas bypass valve, which is set to maintain the temperature at a point above freezing. At a normal ambient operating temperature, the hot gas bypass valve is inoperative and should maintain a heat exchanger pressure of approximately 37 PSIG, as indicated on the refrigeration pressure gauge. During periods of low ambient temperatures, the valve will pass hot gas from the refrigeration compressor to the evaporator to prevent frost accumulation inside the heat exchanger. The expansion valve maintains the refrigeration heat exchanger temperature at 40°-45°F. In high or low ambient temperatures or high air output conditions, the heat exchanger temperature may increase or decrease several degrees.

3. Refrigeration System Maintenance - Adjustment of the refrigeration system may become necessary throughout the life of the replaceable refrigeration unit (RRU). If adjustment is required, proceed as follows:

CAUTION:

This adjustment is critical. Too low a setting will cause the RRU to freeze, resulting in a flow restriction and low output. Too high a setting will create higher operating temperatures resulting in a deterioration of the air dryer performance and could result in a humidity alarm. Do not attempt to adjust the hot gas bypass valve.

a. Make sure the heat exchanger filters are clean and unobstructed. Dirty or clogged heat exchanger filters will raise the heat exchanger temperature.

b. With the air dryer "ON", under normal conditions, remove the insulated/drip tape from the expansion valve and turn the adjusting screw with a 3/8" wrench until 36-37 PSIG is indicated on the refrigeration pressure gauge.

c. Recheck the setting after 24 hours.

NOTE:

Ambient conditions effect this setting, so slight variance may occur due to seasonal changes. The reading on the heat exchanger temperature gauge should fall between 40°-50° F.

G. High Optical Water Sensor/Secondary Dump System

The high water sensor and secondary dump solenoid valve are normally inoperative. The two work inconjunction to back up the primary dump system. Should the primary water sensor or its related components fail to eject the excessive accumulation of water, the primary water separator could overfill and allow water to reach the secondary water separator. The high water sensor would detect the excess water and activate an alarm and cause the secondary dump solenoid valve to eject the water, preventing it from reaching the desiccant towers.

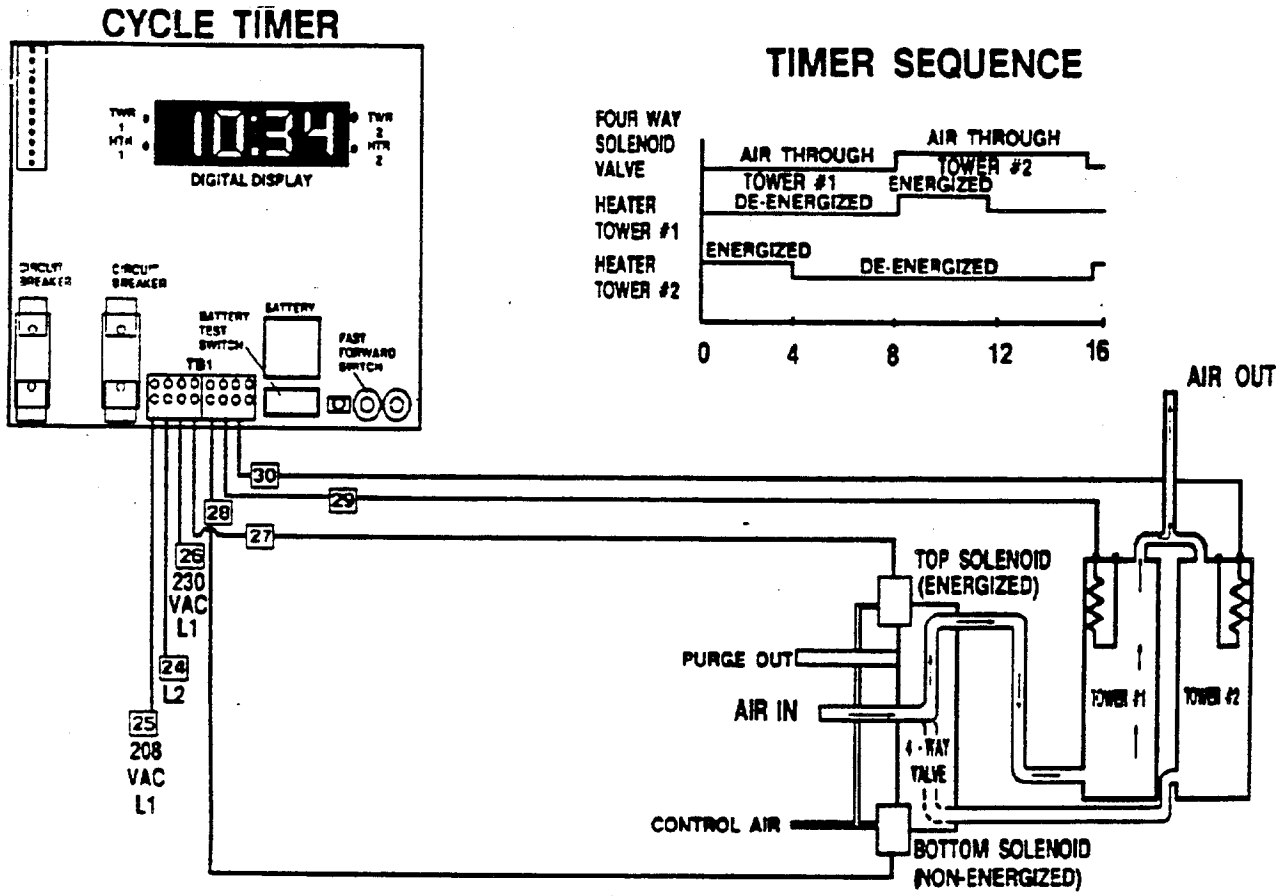
H. Desiccant Towers/Four-Way Valve/Timer System

The desiccant towers are used to final dry the air prior to its delivery to the cable system. A coiled, stainless-steel sheath heating element is embedded in the desiccant to provide the heat necessary for reactivation. Heat reactivation occurs every 16 hours on each tower. The four-way valve directs the air from the secondary separator to the appropriate desiccant tower and also provides a path for the purge flow from the desiccant towers to the compressor. The solid state timer is the control circuit for the four-way valve and desiccant tower heaters.

H. Desiccant Towers/Four-Way Valve/Timer System - (Continued)

As the air exits the secondary water separator, it enters the four-way valve. The four-way valve directs the air through the inlet filter of the on-line tower, in this case tower #1. The air flows from the bottom to the top of the tower. As it passes through the tower, the desiccant adsorbs the moisture in the air. As the dry air exits the tower, the majority is directed onto the outlet components. A very small portion of the dry air (purge) is directed back through the off-line tower (tower #2) and desorbs the moisture that has accumulated in the tower from its previous drying cycle. The purge air then flows through the four-way valve to the purge tube and ultimately to the air compressor for lubrication. This flow process is controlled electrically by the solid state timer board and alternates towers every eight hours as charted in Figure 6. The timer circuit is discussed more fully in the electronic circuitry section.

The four-way valve/solenoids are protected by a 0.4amp circuit breaker located on the solid state timer board. There are two circuit breakers located on the timer board. The left breaker (BK1) protects the timer circuit. The right breaker (BK2) protects the four-way valve/solenoids. The yellow reset button on the breakers should be soft to the touch during normal operation.



Timer Sequence
Figure 6

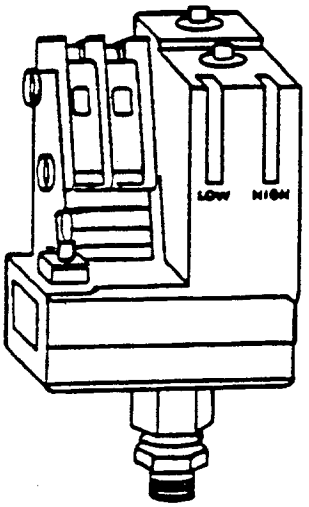
I. **Flow Tube Control Regulator and Flow Meter**
The air flow from the desiccant tower is directed through the flow tube control regulator and flow tube assembly. The control regulator controls the calibration pressure of the flow tube. assembly. The constant 17 PSIG pressure is necessary to insure flow measurement accuracy of the front panel flow meter.

J. **Control Regulator Adjustment Procedure -** With the air dryer "ON", adjust the outlet pressure to the cable system as needed. The control regulator must be set at a constant 17 PSIG. Locate the pressure gauge at the flow tube control regulator. If necessary, loosen the locknut and adjust the regulator knob until the gauge indicates 17 PSIG. Following adjustment, retighten the locknut.

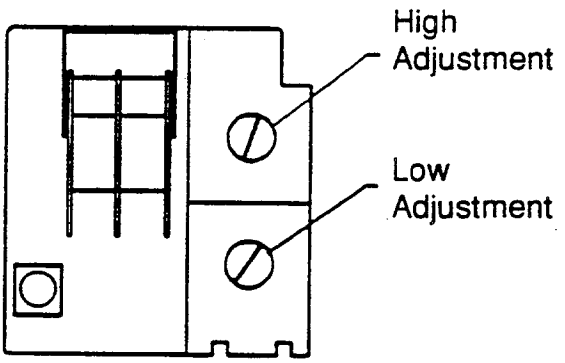
NOTE:
As air dryer flowrates increase or decrease due to cable and pipe pressurization needs, flow tube control pressure will be needing readjusting to maintain a constant 17 PSIG.

K. **Humidity Sensing Tube**
Dry air from the flow tube assembly flows through the humidity sensing tube assembly, across the humidity sensing element (not shown). The humidity sensor signals the alarm system, i.e., humidity circuit board, if the relative humidity of the dry air rises above 10%. The sensor will signal the humidity board and the humidity board will activate an alarm at the alarm board and shutdown following a one-minute delay.

L. **High-Low Pressure Alarm Switch**
The pressure switch consist of two separate snap-action switches, each independently adjustable set point for monitoring both high and low pressure. The alarm set points have been factory set to operate at 12.0 PSIG ±1.5 PSIG for the high pressure alarm and 6.5 PSIG ±1.5 PSIG for the low pressure alarm. To adjust the high and low pressure alarm, turn the corresponding adjustment screw clockwise to increase set point and counterclockwise to lower set point.



Front View



Top View

High-Low Pressure Alarm Switch
Figure 7

REVISIONS				DWG. NO. P06721
REV	DESCRIPTION	BY	DATE	ECO
	NEW DRAWING	DK	10-5-92	17636
A	DELETED P-08119 OPTICAL WATER MODULE ADDED CABLE NO. 5 THRU NO. 8 HIGH WATER SENSOR WAS P-08222 DUMP & LOW SENSOR WAS P-08118 ALARM BD. WAS P-06328-F3	DK	10-5-92	20130
B	SEE SHT. 1	DK	12-1-93	21945
C	SEE SHT. 1	AK	7-7-94	22786

CABLE NO. 7 P-09247
CABLE NO. 6 P-09246
CABLE NO. 5 P-09245
SECONDARY SIGHT TUBE
HIGH WATER SENSOR P-09250
PRIMARY SIGHT TUBE
PRIMARY WATER DUMP SENSOR P-09250
LOW WATER SENSOR P-09250
CABLE NO. 1 P-08750
CABLE NO. 2 P-08751
HIGH W10 | DUMP W11 | LOW W12 — OPTICAL SENSOR INPUTS
TB-2 (L2 L1) | HUMI W5 | SENSOR INPUTS W1 | DISPLAY OUTPUTS W2 W3 | CYC KIT W9 | TB-3
COMMON ALARM SOCKET
P-08980-F1 ALARM BOARD
TB-1 ALARM OUTPUTS
24 OPEN ON ALARM
23 COMMON
22 CLOSE ON ALARM
21 OPEN ON ALARM
20 COMMON
19 CLOSE ON ALARM
18 HIGH FLOW
17
16 SPARE
15
14 LOW PRESSURE
13
12 HIGH PRESSURE
11
10 HIGH WATER
9
8 HUMIDITY
7
6 LOW WATER
5
4 HIGH TEMPERATURE
3
2 POWER FAIL
1
TB-4 STANDBY STATUS
4 CLOSE ON STANDBY
3
2
1 OPEN ON STANDBY
W13 CYCLE KIT STAND-BY DISPLAY
RESET
W4 RESET
CABLE NO. 3 P-08752
CABLE NO. 2 P-08751
CABLE NO. 8 P-09248
W4
W1
W3
P-07599-F4 DISPLAY BOARD
CABLE NO. 4 P-08753
P-07580-F3 HUMI
W3
W2 W1
CLOSE ON RISE
COMMON
CLOSE ON FALL
MATERIAL
220 HOT
TB-1
DUAL SHIELDED HUMI CABLE P-07579-G2
HUMIDITY SENSOR
FLOW METER
NC NC
NO NO
COM COM
L1 L2
P-08217 TEMPERATURE PROBE 140 ° F
PRESSURE
HI LOW

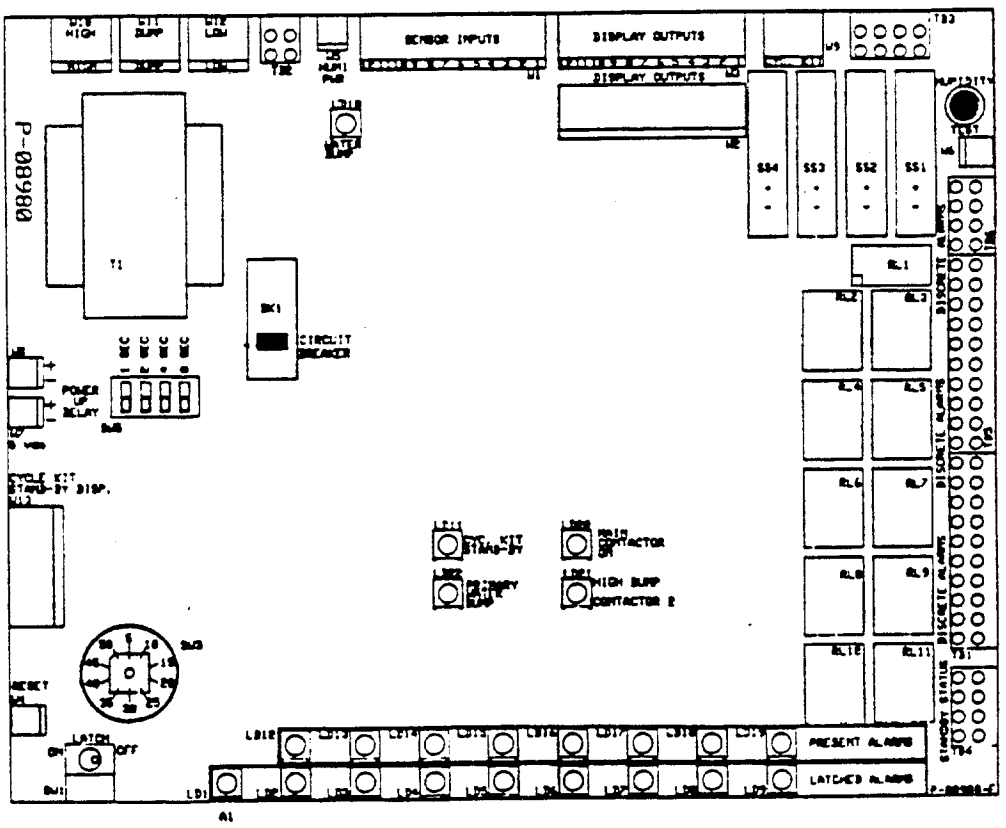
D.C. WIRING DIAGRAM 20/30K-D

REV	DRYER SERIAL #	COMMENTS
-	12-91-2001 THRU 8-92-2010 12-91-3001 THRU 8-92-3008	P06328F3 ALARM BD. P08119 OPTICAL MODULE
A	9-92-2001 THRU 1-94-20XX 9-92-3001 THRU 1-94-30XX	P08980F1 ALARM BD. P09250 OPTICAL SENSORS
B	2-94-2001 THRU 2-94-3001 THRU 11-94-30XX	3 POLE BREAKER - 20,20,10 AMP 3 POLE BREAKER - 18,18,10 AMP
C	12-94-30XX THRU	3 POLE BREAKER - 20,20,10 AMP

QTY	PART NO.	DESCRIPTION	WT.	ITEM NO.
REFERENCE / NEXT ASSY	MATERIAL	FINISH	30K-3	
USED ON 20-30K-D	DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS .X ± .03 .XX ± .02 .XXX ± .010 ANGLES ± 0°30'	TITLE WIRING DIAGRAM 20/30K-D		
	SCALE NO. REQ'D.	DRAWN Charlie Kalbfleisch DATE	D	P-08721 C
	HEAT TREAT	CHECKED DATE		
		APPROVED DATE	SIZE	SHT 2 OF 2 REV

B. Digital Alarm Board

The digital alarm board controls the unit operation and is the interface for a discrete alarm monitoring system (Refer to Figure 3). The sensors are connected to the digital alarm board. Sensor inputs are routed to the front panel alarm display and an adjustable alarm time delay (5-50 seconds). After the selected time delay elapses, the condition of each sensor is transferred to the discrete alarm output relays (Refer to TB1 of the alarm board). The latching switch determines if the alarms will be latched or not latched. Once an alarm latches, the alarm(s) can only be cleared manually (toggling the alarm reset switch). In the non-latch mode, the alarms are cleared automatically, i.e., if an alarm condition clears, the alarm clears. The high humidity, low water and high temperature alarms will enable a fixed 60 second shutdown delay, which shuts down the air dryer should a condition remain for the 60 second period. This shutdown delay will reset, if the alarm condition clears prior to the 60 seconds expiring. This protects against nuisance alarms. The water dump circuit has a fixed 15 second delay prior to activating the primary water dump solenoid valve. This delay enables the unit adequate time to stabilize the internal water level during initial start up.



Digital Alarm Board
Figure 9

B. **Digital Alarm Board - (Continued)**

1. Adjustable Power Up and Start Up Delay

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

2. Automatic Shutdown

High Humidity, Low Water and High Temperature alarms will initiate a 60 second shutdown delay which when expired, shuts down the air dryer.

3. Water Dump System

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

4. Primary Water Dump

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

5. High Water Dump/Alarm

The high water optical sensor, located at the secondary separator in the water sight housing, activates the secondary water dump solenoid valve, ejecting the excess water. Following the alarm time delay, activates a high water alarm. This sequence is delayed only on start up, allowing the water level to stabilize.

6. Low Water/Alarm

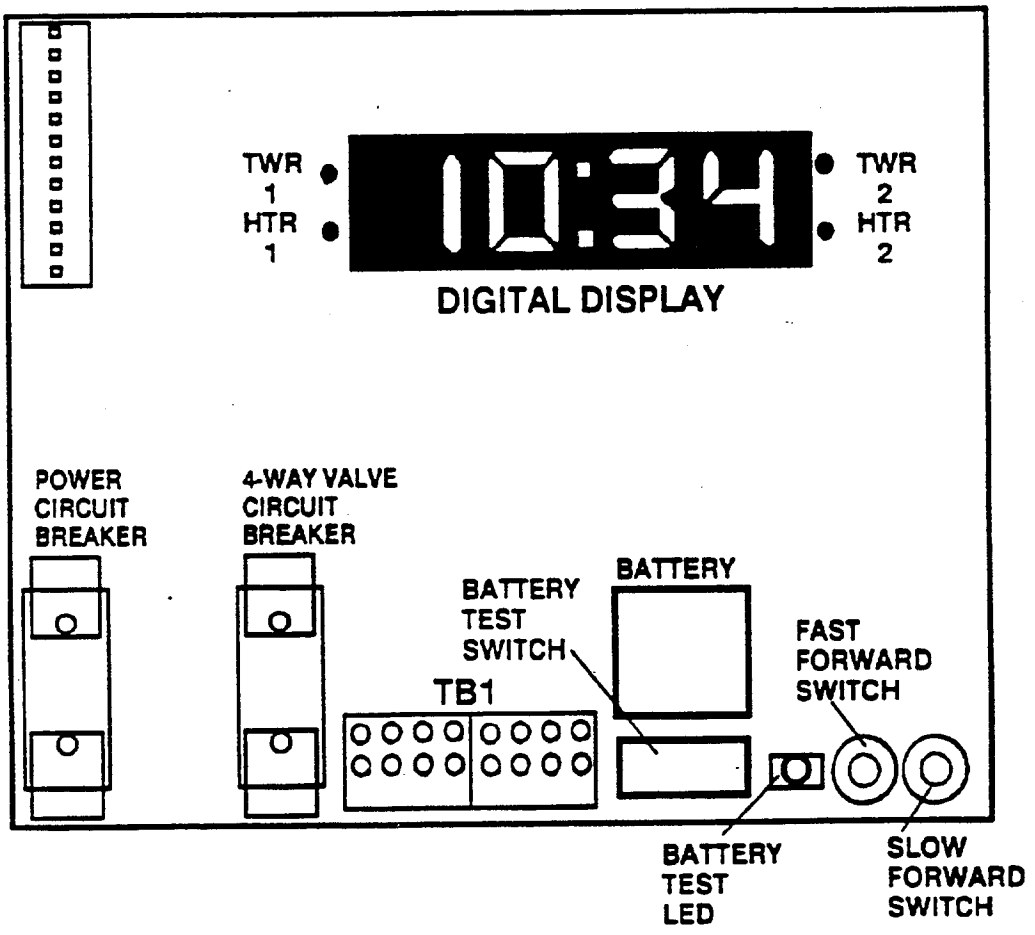
The low water optical sensor, located at the bottom of the water sight housing, activates the low water alarm and shutdown sequence when the water level recedes below the sensor location. This indicates a possible un-safe condition for proper compressor lubrication.

C. **Digital Display Board**

The digital display board monitors and displays any active alarm the moment an alarm(s) is acknowledged. Refer to bottom electrical panel (Fig. 12, pg. 26).

D. **Cycle Timer Board**

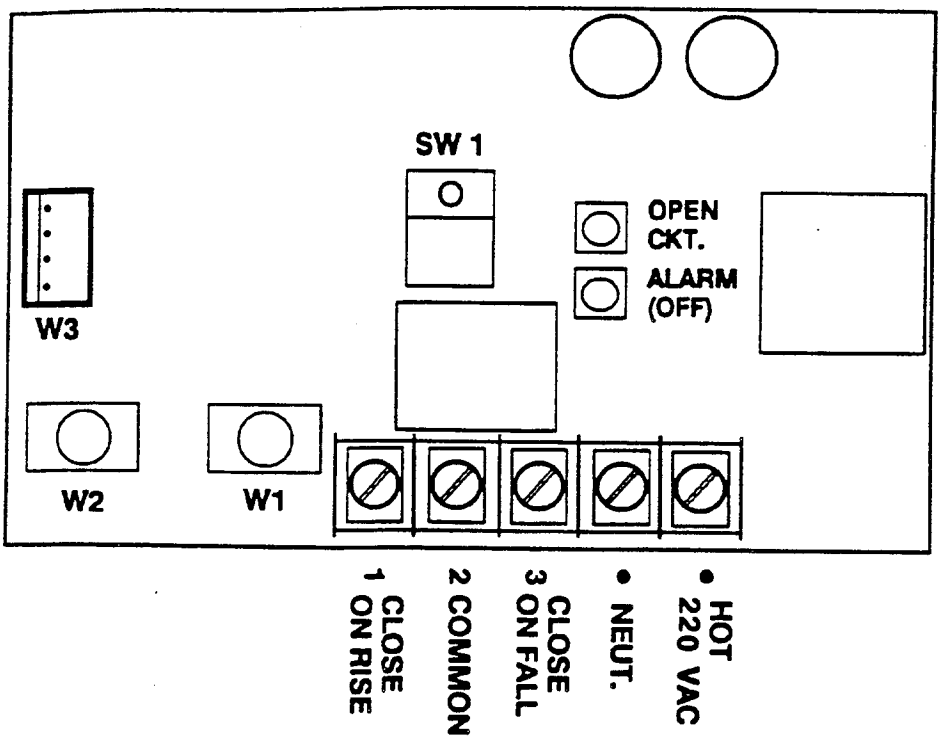
The timer board consist of a 16 hour cycle (Refer to figure 10). This timer controls the four-way valve and tower heaters which perform the necessary switching, drying and purging of the towers. The timer contains an LED digital display which indicates the present hour and minute of the cycle and tower and heater status. For timer sequence information refer to page 18, Figure 6.



Cycle Timer Board
Figure 10

E. Humidity Alarm Board and Remote Visual Display

The humidity alarm board monitors the humidity sensing element for moisture. When moisture is detected via the sensing element, an alarm output is activated and reported to the alarm board for processing. If the air dryer is "ON" and no humidity alarm is displayed, press the humidity test button/switch (SW1) to test the circuit. The green LED (Alarm Off) will de-energize and HIGH HUMIDITY will be displayed on the front panel, digital display. All the green LED's (humidity indicators) will also be de-energized and the red LED's will be ON. Release the switch and all LED's will energize and air dryer will be returned to normal. Remove the gray humidity cable and the yellow LED will energize (Open Circuit). The yellow LED indicates the sensor is no longer connected. The humidity alarm board requires no maintenance.



Humidity Alarm Board
Figure 11

REVISIONS			DWG NO.	MW/21
REV	DESCRIPTION	BY	DATE	ECO
	NEW DRAWING	CL	4-11-91	17436
A	SEE SHEET 2	CL	12-5-97	20130
B	ADDED 3 POLE BRKR. ADDED WIRE #1,	CL	12-1-99	21945
-	ADDED TB-2, GND-FRONT PANEL & WIRE #GE, ADDED JUMPER P/N P07398. CKT BRKR LBL. RATED L1-18A, L2-18A, L3-18A.	CL	7-7-04	22784

POWER IN

P-09577 CIRCUIT BREAKER

L1 20A
L2 20A
L3 10A

L1
L2
L3
GND

TB-2

GA

GE

CHASSIS

FRONT PANEL

PWR. LITE

FLOW METER
NC NC
NO NO
COM COM
L1 L2

CONTACTOR
L3 I3
L2 I2
L1 I1
COIL

COMPRESSOR
GD
CHASSIS

FAN
GC
CHASSIS

RRU
1 2 GND

GB
CHASSIS

P-07580-F3 HUMI
M3
M2
M1
CLOSE ON RISE
COMMON
CLOSE ON FALL
NUETRAL
220 HOT
TB-1

W1
10:52
P-06329-F2 TIMER
TB-1
1 2 3 4 5 6 7 8

208 TO 230 TRANSFORMER
H1 H2 H3 H4
X1 X2 X3 X4

TOWER 1 TOP SOLENOID
TOWER 2 BOTTOM SOLENOID
HEATER 1
HEATER 2

JUMPERS P07398
TB-1

HIGH W10
DUMP W11
LOW W12
TB-2
HUMI W5
SENSOR INPUTS W1
DISPLAY OUTPUTS W2 W3
CYC KIT W9
TB-3

COMMON ALARM SOCKET

W13
CYCLE KIT
STAND-BY
DISPLAY

P-08980-F1 ALARM BOARD

TB-1

W4
RESET

TB-4

HUMIDITY TEST SOLENOID
SECONDARY DUMP
PRIMARY DUMP

A.C. WIRING DIAGRAM 20/30K-D

QTY.	PART NO.	DESCRIPTION	WT	ITEM NO.
REFERENCE NEXT ASSY	MATERIAL	FINISH		32-4
USED ON 18-23K-D	DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON: DECIMALS X ± .06, XX ± .03, XXX ± .015; ANGLES ± 0°30'	TITLE WIRING DIAGRAM 20/30K-D		
	SCALE NO. REQ'D	DRAWN Charlie Kuhfleisch DATE	D	F-28721 C
	HEAT TREAT	CHECKED DATE		
		APPROVED DATE	SIZE SHT 1 OF 2	REV

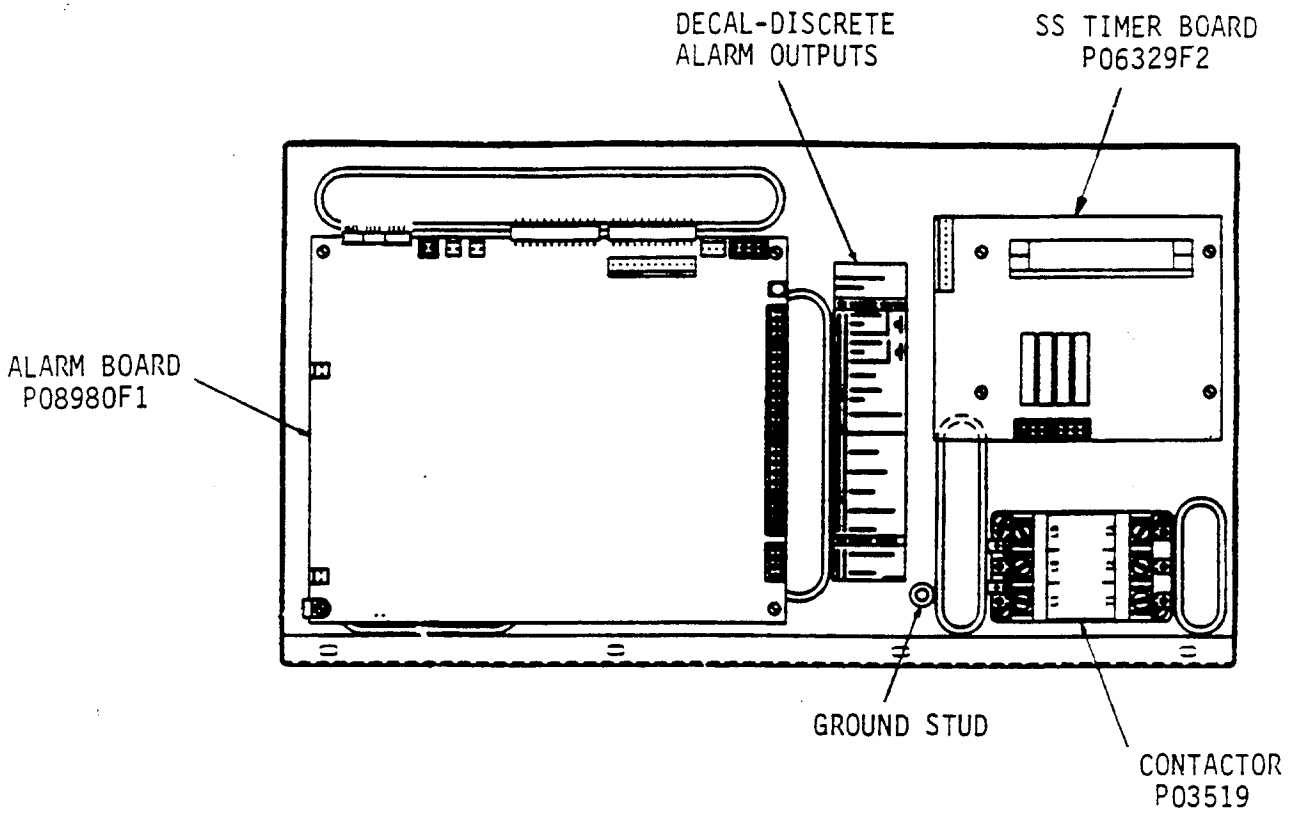
REVISIONS				DWG. NO. P06721
REV	DESCRIPTION	BY	DATE	ECO
	NEW DRAWING	DK	10-5-92	17636
A	DELETED P-08119 OPTICAL WATER MODULE ADDED CABLE NO. 5 THRU NO. 8 HIGH WATER SENSOR WAS P-08222 DUMP & LOW SENSOR WAS P-08118 ALARM BD. WAS P-06328-F3	DK	10-5-92	20130
B	SEE SHT. 1	DK	12-1-93	21945
C	SEE SHT. 1	AK	7-7-94	22786

CABLE NO. 7 P-09247
CABLE NO. 6 P-09246
CABLE NO. 5 P-09245
SECONDARY SIGHT TUBE
HIGH WATER SENSOR P-09250
PRIMARY SIGHT TUBE
PRIMARY WATER DUMP SENSOR P-09250
LOW WATER SENSOR P-09250
CABLE NO. 1 P-08750
CABLE NO. 2 P-08751
HIGH W10 | DUMP W11 | LOW W12 — OPTICAL SENSOR INPUTS
TB-2 (L2 L1) | HUMI W5 | SENSOR INPUTS W1 | DISPLAY OUTPUTS W2 W3 | CYC KIT W9 | TB-3
COMMON ALARM SOCKET
P-08980-F1 ALARM BOARD
TB-1 ALARM OUTPUTS
24 OPEN ON ALARM
23 COMMON
22 CLOSE ON ALARM
21 OPEN ON ALARM
20 COMMON
19 CLOSE ON ALARM
18 HIGH FLOW
17
16 SPARE
15
14 LOW PRESSURE
13
12 HIGH PRESSURE
11
10 HIGH WATER
9
8 HUMIDITY
7
6 LOW WATER
5
4 HIGH TEMPERATURE
3
2 POWER FAIL
1
TB-4 STANDBY STATUS
4 CLOSE ON STANDBY
3
2
1 OPEN ON STANDBY
W13 CYCLE KIT STAND-BY DISPLAY
RESET
W4 RESET
CABLE NO. 3 P-08752
CABLE NO. 2 P-08751
CABLE NO. 8 P-09248
W4
W1
W3
P-07599-F4 DISPLAY BOARD
CABLE NO. 4 P-08753
P-07580-F3 HUMI
W3
W2 W1
CLOSE ON RISE
COMMON
CLOSE ON FALL
MATERIAL
220 HOT
TB-1
DUAL SHIELDED HUMI CABLE P-07579-G2
HUMIDITY SENSOR
FLOW METER
NC NC
NO NO
COM COM
L1 L2
P-08217 TEMPERATURE PROBE 140 ° F
PRESSURE
HI LOW

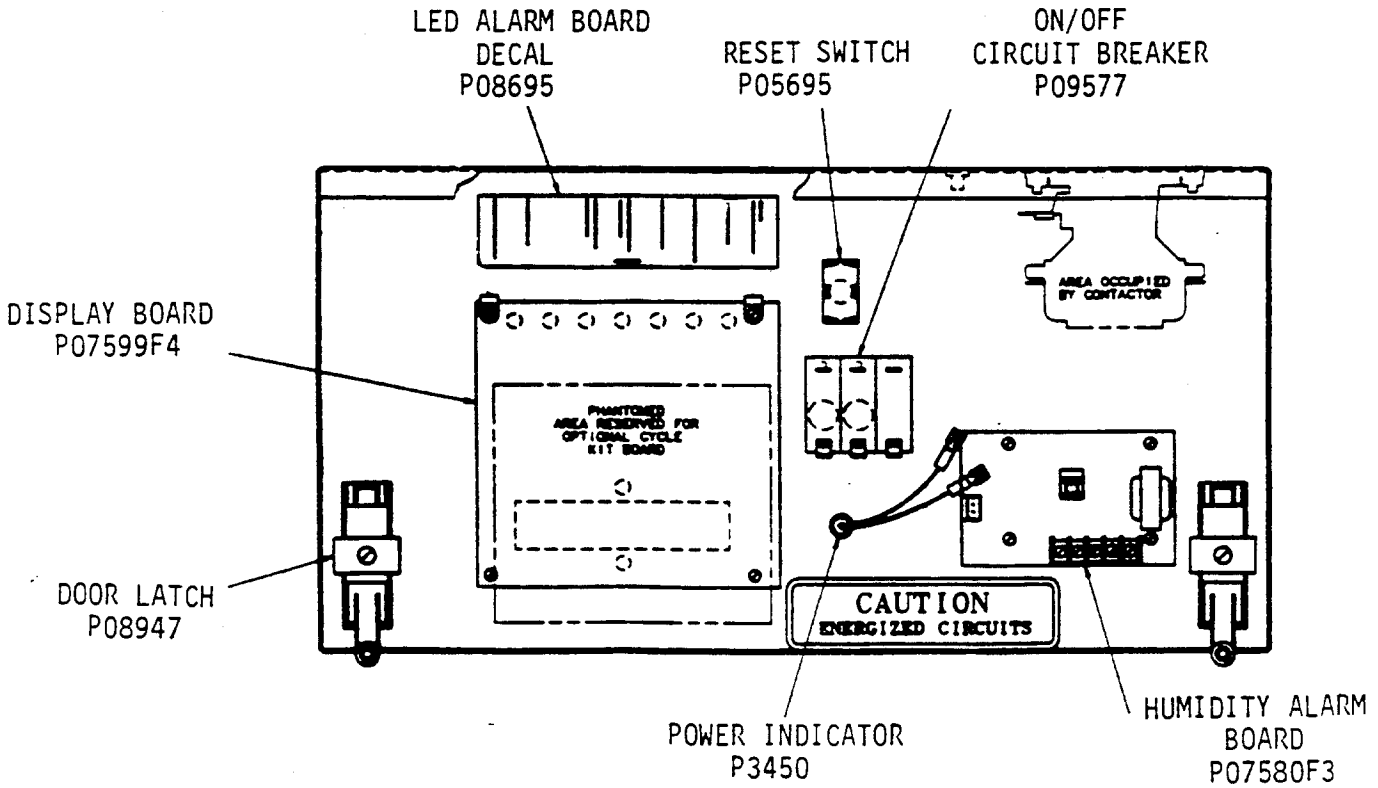
D.C. WIRING DIAGRAM 20/30K-D

REV	DRYER SERIAL #	COMMENTS
-	12-91-2001 THRU 8-92-2010 12-91-3001 THRU 8-92-3008	P06328F3 ALARM BD. P08119 OPTICAL MODULE
A	9-92-2001 THRU 1-94-20XX 9-92-3001 THRU 1-94-30XX	P08980F1 ALARM BD. P09250 OPTICAL SENSORS
B	2-94-2001 THRU 2-94-3001 THRU 11-94-30XX	3 POLE BREAKER - 20,20,10 AMP 3 POLE BREAKER - 18,18,10 AMP
C	12-94-30XX THRU	3 POLE BREAKER - 20,20,10 AMP

QTY	PART NO.	DESCRIPTION	WT.	ITEM NO.
REFERENCE / NEXT ASSY	MATERIAL	FINISH	30K-3	
USED ON 20-30K-D	DIMENSIONAL TOLERANCES UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCE ON DECIMALS .X ± .03 .XX ± .02 .XXX ± .010 ANGLES ± 0°30'	TITLE WIRING DIAGRAM 20/30K-D		
	SCALE NO. REQ'D.	DRAWN Charlie Kalbfleisch DATE	D	P-08721 C
	HEAT TREAT	CHECKED DATE		
		APPROVED DATE	SIZE	SHT 2 OF 2 REV



VIEW OF BACK PORTION OF PANEL



VIEW OF FRONT PORTION OF PANEL

GENERAL MAINTENANCE

Maintenance Matrix and Parts Summary

The following maintenance matrix indicates the maintenance procedures recommended by PUREGAS. If maintenance problems persist after thoroughly consulting this manual, contact 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.

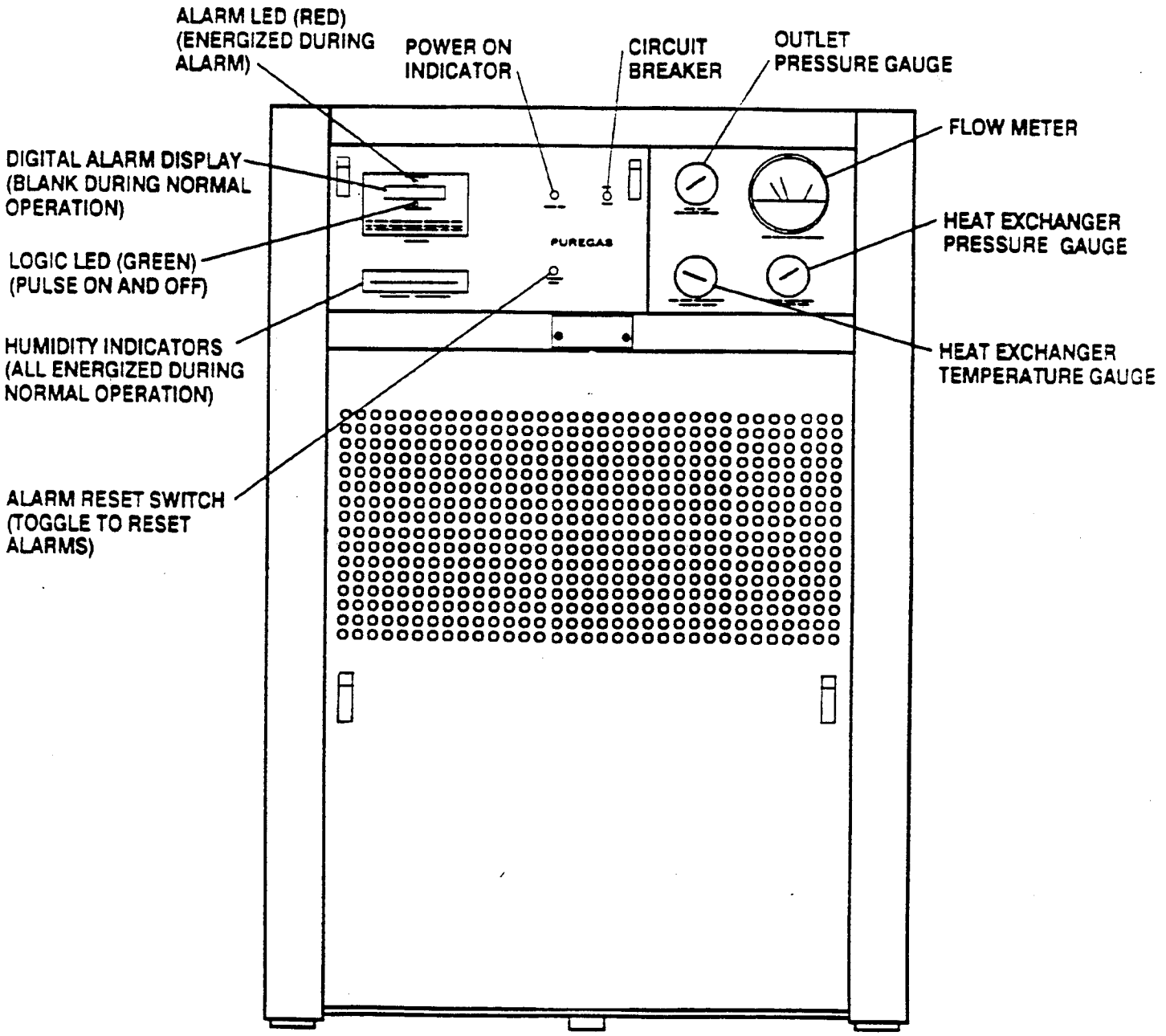
PUREGAS recommends a historical record be maintained on all air dryers. The part number for the maintenance kit is P-08656.

A. AIR DRYER SERVICE AND MAINTENANCE MATRIX

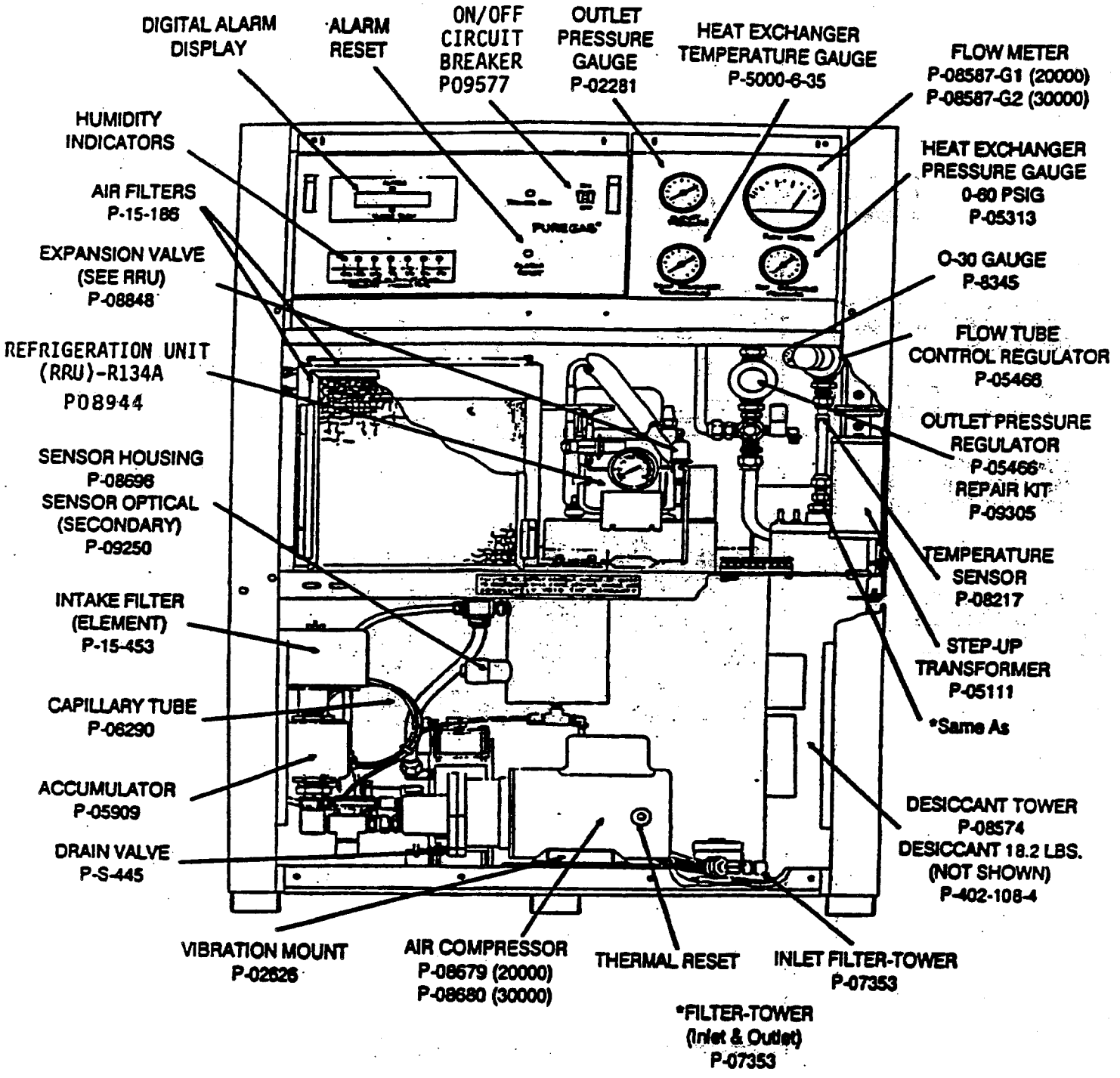
Model P-20000D and P-30000D Air Dryer	Maintenance Procedure	Frequency Interval*	Est. Time Required (In Minutes)
Flowrate/Air Fittings	Check/Leak Test	A	1/30
Humidity Alarm	Check	A	5
High-Low Press. Alarm	Check	A	5
Heat Exchanger Press.	Check	A	1
Heat Exchanger Temp.	Check	A	1
Outlet Pressure	Check/Adjust	A	5
Condenser Filter	Replace	A	5
Air Inlet Filter	Replace	A	5
Des.Twr. Inlet Filters	Replace	A	30
Optical Water Sensors	Check/Clean	A	30
Bypass Relief Valve	Check/Adjust	A	5
Condenser Coils	Clean	A	15
Water Filter Element	Replace	A	10
Timer Battery	Check/Replace	A/C	1/5
Des. Twr. Outlet Filters	Replace	D	30

*Frequency Interval: A - Every 6 months, B - 1-year, C - 3-years, D - 5-years.

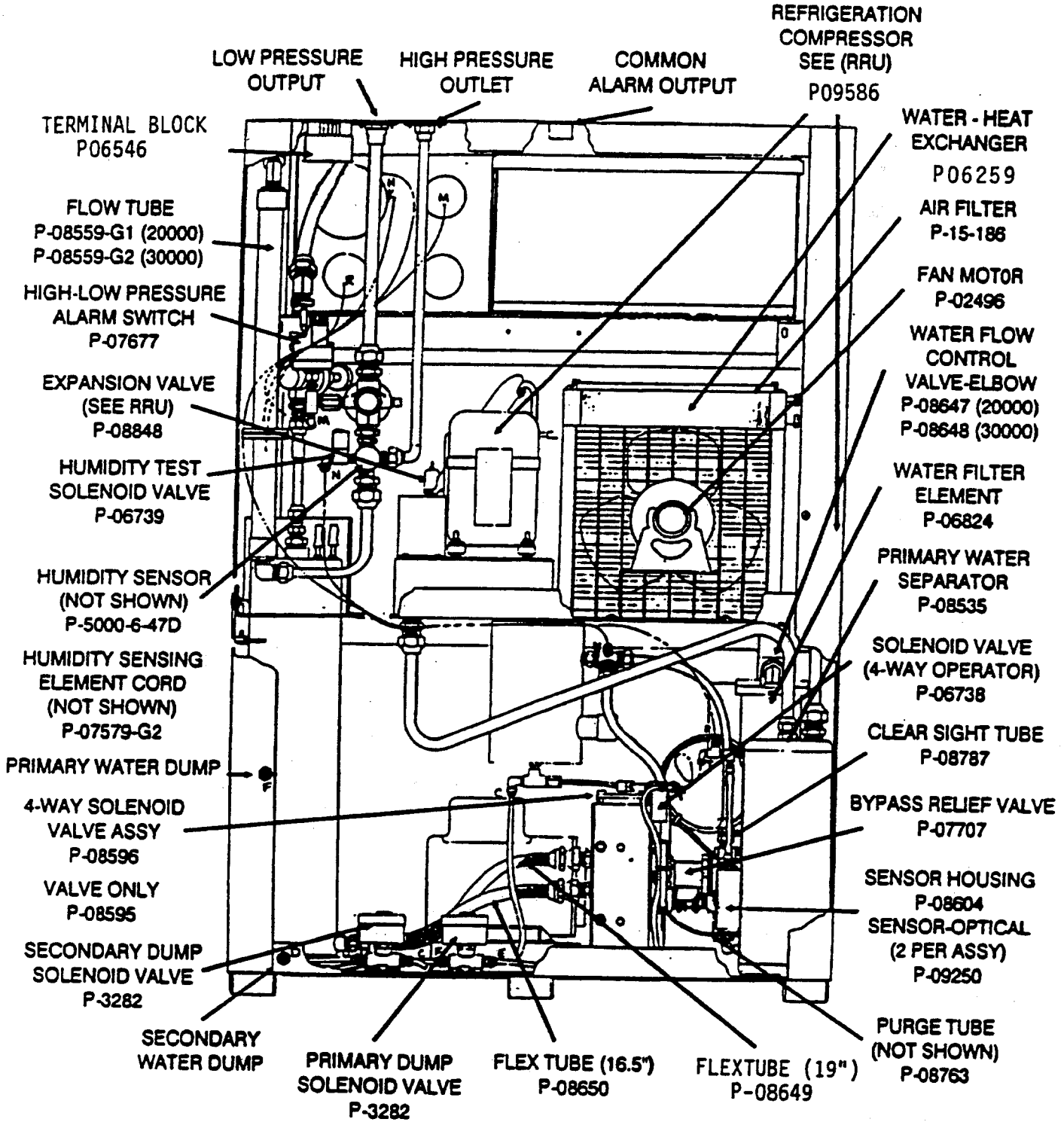
Figure 15



Front View
Figure 16



Front View with Front Panel Removed
Figure 17



Rear View
Figure 18

B. Recommended Spare Parts List - PUREGAS P-20000D/P-30000D

Quantity*	Part Number	Description
1	P-5000635	Heat Exchanger Temp. Gauge
1	P-06290	Capillary Tube (plastic)
1	P-07707	Bypass Relief Valve
1	P-08217	Temperature Sensor (140°F.)
1	P-08763	Purge Tube (plastic)
1	P-09250	Optical Water Sensor
1	P-3282	Solenoid Dump Valve
1	P-06824	Water Filter Element
1	P-08655	Maintenance Kit (w/o sensor)
1	P-08656	Maintenance Kit (w/ sensor)
1	P-09577	Circuit Breaker (25 Amp)
1	P-03519	Power Contactor
1	P-08980F1	Digital Alarm Board
1	P-06329F2	Solid State Timer Board
2	P-5000647D	Humidity Sensing Element
1	P-07580F3	Humidity Alarm Board
1	P-01500	Solenoid Valve (4-Way Valve)
1	P-05137	Seal Repair Kit (Compressor)
1	P-03083	Repair Kit (4-Way Valve)
* Quantities listed above are recommended spare parts for one or more air dryers.		
Optional Spare Parts:		
1	P-08679	Air Compressor (P-20000D)
1	P-08680	Air Compressor (P-30000D)
1	P-08600	Refrigeration Unit (RRU)
1	P-08595	Four-Way Valve

Spare Parts List
Figure 19

C. Optional Equipment

The P-08033G Puregas Auto-Synchronous Cycling Kit provides total control and flexibility for the cycling of up to 4 air dryers. It has four selectable timing configurations, i.e., 16-hour, 24-hour, 7-day and Stand-by mode. In the event of an on-line air dryer alarm, automatically energizes the stand-by air dryer. This system can be installed on any manufacturers' air dryers.

The control wall unit can be operated on either 110 or 220 VAC, 60Hz power, switchable on the module. Air dryer placement can be up to 20' from module (25' interface cables included). Installation requires four basic tools, wire crimping tool, wire stripper, thin head regular screw driver and regular standard screwdriver.

Call PUREGAS at 1-800-521-5351 for ordering information.

TROUBLESHOOTING INFORMATION GUIDE

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 begin with the simplest and progress to more complicated possibilities. Each step should be followed in listed sequence to expedite service. It is recommended that once the problem has been isolated, the corresponding text in the maintenance section be reviewed for additional information. Following repair, re-test alarms to assure system in working properly.

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

This guide requires a Volt Ohm Meter (VOM) and will specify DC (Direct Current) or AC (Alternating Current) setting.

This troubleshooting information guide can by no means cover every possible cause for malfunction, but will help to solve most problems. If the problem persist after thoroughly consulting the troubleshooting section, contact the PUREGAS Technical Services 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 tests and make adjustments. EXTREME CARE MUST BE EXERCISED TO AVOID CONTACT WITH LIVE ELECTRICAL OR MOVING PARTS!.

TROUBLESHOOTING INFORMATION GUIDE

1. AIR SYSTEM

A	HEAT EXCHANGER PRESSURE IS BELOW 14 PSIG.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	High Ambient Temperature.	NOTE: This condition in itself would not be a cause, but it would contribute to lessening the efficiency of the air compressor.	
A2	Air demand in excess of maximum rated capacity of air dryer.	Check gauges for low heat exchanger pressure and flow meter for increased flowrate.	Locate the air demand, i.e., if inside the air dryer, repair leak (see A7),if flowmeter indicates increased flow, suspect cables and repair leaks.
A3	Bypass relief valve out of adjustment or defective.	Check the heat exchanger pressure with no flow.	Readjust the bypass relief valve to 26 PSIG. If valve won't adjust, replace.
A4	Dirty or obstructed water filter.	Check water filter element.	Clean or replace the water filter element.
A5	Obstructed flow control elbow.	Check flow control elbow and check for obstructions.	Clean or replace the flow control elbow.
A6	Defective heat exchanger pressure gauge.	Test the accuracy of the heat exchanger pressure gauge using a P-DG100 digital pressure gauge.	Replace defective heat exchanger pressure gauge.
A7	Leak in the air dryer system.	With no outlet flow. check all fittings with an appropriate leak testing solution.	Tighten any loose connections as required.
A8	Defective air compressor.	Check the heat exchanger pressure with no outlet flow.	If heat exchanger pressure indicates 14 PSIG or less, replace air compressor.
B	**HEAT EXCHANGER PRESSURE IS ABOVE 26 PSIG.**		
B1	Refrigeration system out of adjustment or defective. Causing freeze up to occur.	Check heat exchanger temperature gauge. If temperature is below 37°F., the refrigeration is freezing. If outlet pressure is low and difficult to adjust and heat exchanger pressure is still above normal, then check refrigeration system.	Readjust the refrigeration system as indicated in the manual. Following adjustment, shut down air dryer to allow refrigeration system to unfreeze. Re-start dryer and re-check temperature adjustment, if adjustment doesn't repair problem, replace refrigeration unit.

2. HUMIDITY ALARM SYSTEM.

A	AIR DRYER IN HUMIDITY ALARM.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Defective humidity board.	Check the humidity alarm set point.	Disconnect the gray sensing cord. Verify that the front panel LED's (3-red and 4-green) energize. If yelow LED located on the board energizes, proceed to next step. If yellow LED remains de-energized, replace circuit board.
A2	Defective humidity sensor or cord connection.	Check the humidity board, yellow LED.	If yellow LED is lit, suspect faulty cord or sensor connection and reinsert or replace cord or sensor. If yellow LED is de-energized, check front panel LED's (3-red and 4-green), if all are energized, replace board. If humidity is indicated proceed to next step.
A3	Incorrect humidity board.	Check humidity board. Model P-20000D/P-30000D uses a unique humidity board thats not used in older models.	If wrong board is suspected, install correct humidity board. If correct board is installed, proceed to next step.
A4	Defective alarm board.	Disconnect wire #112 from the humidity board.	Toggle alarm reset switch. If alarm clears, suspect humidity board. If remain, replace defective alarm board.
NOTE: The following are possible causes for a humidity condition. After isolating and correcting the problem, the air dryer must run off-line for a minimum of 16 hours to completely dry the desiccant towers and clear the alarm prior to being put back into service.			
A5	Defective refrigeration system.	Check the heat exchanger temperature. It should read 40°-45°F.	If the temperature is above 50°F. See section 7, REFRIGERATION SYSTEM.
A6	Plugged purge tube.	Check purge tube for debris which may cause restriction.	Free purge tube of restriction or replace purge tube.
A7	Defective timer board.	Refer to Component test section of this manual .	Replace timer if found defective.

A	AIR DRYER IN HUMIDITY ALARM - (CONTINUED)		
A8	Defective four-way valve.	If timer tests OK, remove tube going to tower #1 and check for air flow from 4-way to tower during hours 0-8 of the time cycle. Remove hose going to tower #2 and check for air flow during hours 9-15.	If air flows correctly, i.e., to tower #1 (hours 0-8), to tower #2 (hours 9-15), 4-way is OK. If air flow is not correct, suspect 4-way valve or solenoids.
B	**AIR DRYER HUMIDITY ALARM DOES NOT FUNCTION**		
B1	Defective humidity sensing element.	Toggle the humidity sensor test switch, located on the alarm board and monitor the humidity LED indicators located on the front panel.	If LED's begin to de-energize, sensor is OK. If LED's do not respond, IMMEDIATELY STOP! and replace sensing element.

CAUTION:

Do not measure sensing element or in any way apply DC voltage to the sensing element. Using a VOM to measure resistance across the sensing element will apply DC voltage.

3. PRESSURE ALARM SYSTEM.

A	AIR DRYER IN PRESSURE ALARM.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Flow in excess of maximum rated capacity of air dryer. (Low pressure alarm). Or low flow. (High pressure alarm).	Check outlet pressure gauge and heat exchanger pressure gauge.	Locate source of leak or restriction and correct/repair. Readjust alarm set points if necessary.
A2	Pressure alarm out of adjustment or defective.	Loosen the locknut on the pressure regulator and adjust from 0-15 PSIG to determine if the high and low pressure alarm set points are correct.	If the high and/or low pressure alarms are out of adjustment, readjust to desired alarming pressure. If switch can not be adjusted, replace switch.
A3	Defective outlet pressure gauge.	Check the accuracy of the outlet pressure gauge, using a P-DG20 or P-DG100 digital pressure gauge.	Replace the outlet pressure gauge if defective.
A4	Defective pressure regulator.	Loosen the locknut on the pressure regulator and adjust from 0-15 PSIG. Observe the outlet pressure gauge throughout adjustment.	If the needle movement is erratic, sticks or will not respond, replace pressure gauge.

A	AIR DRYER IN PRESSURE ALARM - (CONTINUED)		
A5	Leak, restriction or blockage in the air system.	See section 1, AIR SYSTEM.	
A6	Defective alarm board.	Locate the high/low pressure alarm switch. Remove wire #110 (High) and wire #109 (Low).	Toggle the alarm reset switch, if alarm(s) clears, proceed to next step. If alarm doesn't clear, replace defective alarm board.

4. LOW WATER ALARM SYSTEM.

A	AIR DRYER IN LOW WATER CONDITION.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Low Water.	Check sensor housing to verify water level is below the low 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 switch. If problem persist, refer to Component test section of this manual, i.e., Optical Water Sensors.
A2	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.
NOTE: A very small leak will cause an intermittent (every few days or once a week) low water alarm.			
A3	Capillary tube blocked or restricted.	Check the capillary tube for proper flow at connector. Water and air can be observed flowing through the tube. Also check air dryer alarm log for any High Water Alarms, indicating a recent history of water backing up into the secondary.	If the capillary tube is blocked or restricted, clean or replace.

B	AIR DRYER CONTINUALLY EJECTING WATER RESULTING IN A LOW WATER ALARM. (See Component Test Section, Optical Water Sensors).		
B1	Dirty or Defective Optical Water Sensor.	See Component Test Section, Optical Water Sensors and perform test.	
C	**NO LOW WATER ALARM OR SHUTDOWN IN LOW WATER CONDITION.**		
C1	Defective lower optical water sensor.	Perform the low water alarm test as outlined in the alarm routine section.	If alarm functions normally, proceed to next step. If alarm will not work, refer to the Components test section.
C2	Loose or poor electrical connections.	Check associated wiring for good and proper connections.	Repair any bad electrical connections.
C3	Defective alarm board.	Proceed to the alarm board, LED, LD18 (yellow) and verify status. If *"ON", check LED, LD20 status. If "ON", dryer will shut down following the (1) minute time delay. If unit doesn't shutdown following delay, using VOM, check voltage between L2 and TB3 pin 2, (contactor).	If 208-230 VAC is present, replace alarm board. If no voltage is present, replace power contactor. *If LD18 is "OFF". Clean and/or replace the low water optical sensor. Refer to the Components test section.

5. PRIMARY WATER EJECTION SYSTEM

A	WATER LEVEL IN THE PRIMARY SEPARATOR IS ABOVE NORMAL.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Dirty or defective primary optical water sensor. (Not ejecting excess water).	With water level above the primary water sensor, check alarm board, LED10. If LED is "ON", proceed to next step.	If LED10 is "OFF", remove sensor and clean lens with soft cloth (Do not use cleaning fluid). If problem persist after cleaning, replace sensor. Sensor should only be finger tight.
A2	Loose or poor electrical connections.	Check wiring for good and proper connections.	Repair any bad connections.

A	WATER LEVEL IN THE PRIMARY SEPARATOR IS ABOVE NORMAL - (CONTINUED)		
A3	Defective alarm board.	With water level above primary water sensor, check LED10. LED10 should be "ON", wait 15 seconds for water dump delay to elapse. Check primary water dump LED,LD22. If "ON", proceed to next step. NOTE: If unit is installed on cycling kit, disconnect W9 connector.	If primary dump LED,LD22 is "OFF", replace alarm board. NOTE: If installed on cycling kit, disconnect W9 connector and re-test.
A4	Primary dump solenoid valve.	Check for voltage at the primary dump solenoid valve. Using a VOM, set for AC voltage, attach the meter leads across wires #42 and #20. Measurement must be made with solenoid still connected in the circuit. (Water level must still be above the primary sensor).	If 208 Volts is present, replace the primary dump solenoid valve. If no voltage is measured, suspect faulty wiring connections. If connections are good, replace alarm board.

6. SECONDARY WATER EJECTION SYSTEM

A	WATER ACCUMULATION IN THE SECONDARY SEPARATOR. (AIR DRYER DOES NOT EJECT EXCESS WATER)		
	POSSIBLE CAUSE	CHECK	CORRECTIVE ACTION
A1	Loose or improper electrical connections.	Check wire connections at the secondary optical water sensor plug.	Repair any bad electrical connections. Reinsert plug into the connector at sensor.
A2	Dirty or defective secondary optical water sensor.	With water present at the secondary sensor sight tube (above sensor), check alarm board, LED, LD21. If LD21 is "ON", proceed to next step.	If LD21 is "OFF", remove sensor from sight tube and clean lens. (Do not use cleaning fluid). Reinsert and retest, as described in the ALARM TEST ROUTINE (High Water Alarm Test). Sensor should only be finger tight. If problems continue, perform test in outlined in the Component test section.

A	WATER ACCUMULATION IN THE SECONDARY SEPARATOR - (CONTINUED)		
A3	Defective alarm board.	With water level above the secondary sensor, check alarm board, LED, LD21. Verify that it is "ON". If unit is installed on cycling kit, remove W9. Check voltage at secondary dump solenoid valve, using an AC volt meter. It is very important to take measurement with solenoid connected.	If voltage is present (with wires connected), replace secondary dump solenoid valve. If no voltage is measured, replace alarm board.
B	**SECONDARY DUMP VALVE CONTINUOUSLY EJECTS WATER.**		
B1	Incorrect connection at the alarm board.	At the alarm board check connectors W10 (High), W11 (Dump) and W12 (Low).	Correct connection is required.
B2	Dirty or defective secondary optical water sensor.	Proceed to the alarm board, LED, LD21. If LD21 is "OFF", proceed to the next step.	If LD21 is "ON", remove the sensor and clean lens (Do not use cleaning fluid). If problem persist, perform test as indicated in the Component test section.
B3	Defective alarm board.	Check LED, LD21. If "OFF", and secondary is dumping water/air, check voltage at the secondary dump solenoid valve, using an AC volt meter. It is important that measurement only be made with solenoid wires still connected.	If 208 volts is measured, replace alarm board. If no voltage is measured, replace secondary dump solenoid valve.
NOTE: It is very important that the user of this guide never skip steps. The Troubleshooting Information Guide's accuracy depends on the user's cooperation.			

7. REFRIGERATION SYSTEM

A	HEAT EXCHANGER TEMPERATURE ABOVE 50°F.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	High ambient temperature (above +100°F.)	See Troubleshooting Guide, section 1, AIR SYSTEM.	

A	HEAT EXCHANGER TEMPERATURE ABOVE 50°F - (CONTINUED)		
A2	Air demand in excess of maximum rated capacity of the air dryer.	See Troubleshooting Guide, section 1, AIR SYSTEM.	
A3	Expansion valve out of adjustment.	Check refrigeration pressure gauge and verify that the pressure indicated is 37 PSIG.	Readjust if necessary as outlined in the Refrigeration maintenance section of this manual.
A4	Defective heat exchanger temperature gauge.	Verify that the gauge temperature probe is properly inserted into the well at the rear of the RRU. If probe appears properly inserted, remove and place it into a glass of ice water. The probe should be totally immersed and not touching the sides of the glass. The temperature should stabilize at 32°-35°F.	If temperature reading was OK, proceed to next step. If the heat exchanger temperature gauge indicated a wrong reading, replace it.
A5	Defective refrigeration system.	Using an AC volt meter, check for 208 - 220 volts across wires #35 and #22.	If proper voltage is measured, replace RRU. If no voltage is measured, check wiring for loose connection.
A6	Loss of refrigerant (R134A).	Adjust refrigeration setting as outlined in the Refrigeration maintenance section of this manual.	If refrigeration system fails to respond to the setting, replace the RRU.
B	**LOW HEAT EXCHANGER TEMPERATURE, BELOW 37°F.**		
B1	Ambient temperature too cold or varies to much.	Check to see that room temperature is stable and remains between +40°F and +100°F.	It is recommended to maintain room temperature at +70°F year round.
B2	Expansion valve and/or hot gas bypass valve is out of adjustment.	Adjust refrigeration setting as outlined in the Refrigeration maintenance section of this manual.	
B3	Defective heat exchanger temperature gauge.	Refer to problem and corrective action on A4 of this page.	

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 that wires are not cut or burned.

8. ELECTRICAL SYSTEM

A	NO POWER TO THE AIR DRYER.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Circuit breaker tripped at main power supply.	Check and reset main circuit breaker if necessary.	If problem persist, check power supply for sufficient voltage (208-230VAC).
A2	Loose or poor electrical connections.	Check power connections.	Repair any bad or suspect electrical connections.
B	**POWER TO THE AIR DRYER, BUT THE AIR COMPRESSOR AND FAN MOTOR DO NOT OPERATE.**		
B1	Air dryer in HIGH HUMIDITY, LOW WATER or HI TEMP. alarm.	Check for alarm. If no alarm is present, proceed to next step.	If air dryer is in alarm, see troubleshooting information for these alarms.
B2	Loose or poor electrical connections.	Check power connections at terminal block.	Repair any bad or suspect electrical connections.
B3	Defective power contactor.	Using an AC volt meter, check for 208 - 220 volts across L1 - L2 and T1 - T2.	If voltage is present at both, check wiring and proceed to next step. If voltage is only measured at L1 - L2, measure across wires #13 and #40. If 208 volts is present, replace contactor. If no voltage is measured, suspect alarm board or wiring. If installed on cycling kit, suspect cycling kit.
C	**THE AIR COMPRESSOR HAS POWER BUT WILL NOT OPERATE.**		
C1	The air compressor thermo-overload has tripped.	Check and reset thermo-overload switch.	If problem persist, suspect too high heat exchanger pressure or faulty air compressor.
C2	Defective air compressor motor.	Remove top electrical box cover and check internal components for evidence of failure (burnt appearance).	If internal capacitor or start-switch appears burnt or discolored, replace motor.

9. DESICCANT TOWERS/SOLID STATE TIMER/FOUR-WAY VALVE.

A	AIR DRYER DISCHARGING HOT AIR.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Defective solid state timer.	Refer to Component test section and perform the timer test.	If timer test indicates faulty timer, replace timer. If test indicates "GOOD" timer, proceed to next step.
A2	Defective four-way valve.	If timer tests OK, remove tube going to tower #1 and check for air flow from 4-way to tower during hours 0-8 of the time cycle. Remove hose going to tower #2 and check for air flow during hours 9-15.	If air flows correctly, i.e., to tower #1 (hours 0-8), to tower #2 (hours 9-15), 4-way is OK. If air flow is not correct, suspect 4-way valve or solenoids.

10. FLOW ALARM SYSTEM.

A	FLOW ALARM WILL NOT ACTIVATE.		
	POSSIBLE CAUSE	**CHECK**	**CORRECTIVE ACTION**
A1	Loose or poor electrical connections.	Check wires #12, #13, #101, #102 and #107 for good connections.	Repair any bad connections or crimps if necessary.
A2	Defective flow meter.	Verify that the high flow alarm adjustment needle (Red needle-right side) is adjusted to the far left, causing an alarm.	Check alarm board, LED's LD12 (yellow) and LD2 (red). The yellow LED should be "ON" and following the time delay the red will energize. If the yellow LED is "OFF", suspect loose connection (wire #107) or defective flow meter.
A3	Defective alarm board.	If yellow LED is "ON", but following time delay, red LED does not energize, suspect defective alarm board. If yellow LED never energizes, proceed to the alarm board connector W1. Using a DC volt meter, measure across pins 3 and 4.	If no voltage is measured, suspect wiring or defective flow meter. If 5 volts is present and yellow LED (LD12) remains "OFF", replace alarm board.

B	UNIT IN HIGH FLOW ALARM, BUT UNIT IS NOT IN A HIGH FLOW CONDITION.		
B1	Defective flow meter.	Verify that the high flow alarm adjustment needle (Red needle-right side) is not adjusted too far left, causing an alarm. Readjust needle if necessary to the right, out of an alarm condition.	Check alarm board, LED's LD12 (yellow) and LD2 (red), the yellow LED should not be "ON". If the yellow LED is "ON", remove wire #107 from the rear of the flow meter. If the alarm clears, replace defective flow meter. If alarm still present replace alarm board.

COMPONENT TEST SECTION

A. SOLID STATE TIMER TEST

Most air dryer humidity alarms can be contributed to a defective component in the drying system. When tested properly, the solid state timer and its control outputs can be utilized to diagnose the problem and isolate the defective component. The following procedure should always be followed when a humidity alarm condition exist.

STEP 1. FAST FORWARDING TIMER AND CHECKING VOLTAGES

Air dryer must be ON and operating. Advance timer through the 16 hour time cycle in increments of 4 hours (hour 0,4,8 and 12), recording voltages across pins 2-4,2-5,2-6 and 2-7. The pin numbers refer to the orange terminal block located at the timer.

CHART A.

Set Timer Hour to.	Measure Voltages Between These Pins			
	Pin 2 and 4 4-Way Sol. (Top) (Air thru Tower 1)	Pin 2 and 5 4-Way Sol. (Btm) (Air Thru Tower 2)	Pin 2 and 6 Heater-Tower 1	Pin 2 and 7 Heater-Tower 2
0 thru 3	208 VAC	0 VAC	0 VAC	230 VAC
4 thru 7	208 VAC	0 VAC	0 VAC	0 VAC
8 thru 11	0 VAC	208 VAC	230 VAC	0 VAC
12 thru 15	0 VAC	208 VAC	0 VAC	0 VAC

STEP 2. RESET CIRCUIT BREAKERS AND RETEST

Following voltage checks, if voltage readings on pins 2-4 or pins 2-5 are incorrect, please check circuit breakers BK1 and BK2 on the timer board. Reset and repeat step 1.
A tripped circuit breaker will push harder than when reset.

If voltages are correct, and humidity alarm still present, suspect 4-way valve (internal) switching problem or plugged purge tube. Proceed to step 3.

STEP 3. RESISTANCE/LOAD TEST (OHMS)

If circuit breakers tripped and or faulty voltages were recorded on step 1., turn air dryer OFF and refer to Chart B, reference **Resistance/Load Test (Ohms)** and measure and record resistances across the loads, i.e., pins 2-4, 2-5, 2-6 and 2-7.

A. SOLID STATE TIMER TEST - (CONTINUED)

CHART B.

Air Dryer Must be OFF for Resistance/Load Test (Ohms)				
Measure for Resistance Between Pins	**Pins 2 and 4**	**Pins 2 and 5**	**Pins 2 and 6**	**Pins 2 and 7**
	580-1500 Ohm	580-1500 Ohm	84-95 Ohm	84-95 Ohm

An open would indicate a burnt open coil or heater or a disconnected wire or bad crimp. ***An open load may be seen in step 1., as 208 or 230VAC when 0 should be measured.***

A short or low resistance would indicate a possible shorted coil or heater and could cause circuit breakers to trip. ***This condition may be seen in step 1., as a 0 VAC when 208 or 230 VAC should be measured.***

STEP 4. RESISTANCE/GROUND TEST

If above resistance measurements are within the specified parameters, then measure resistance from pins 4,5,6 and 7 to the ground lug. An open should be measured. If any resistance is measured, remove wires from suspect component and recheck across the suspect component and to ground. ***This condition may be seen in step 1., as a voltage reading of 110-115VAC when 0 should be measured.***

Any questions, please contact a Puregas technical services representative toll-free 1-800-521-5351 or 303-427-3700.

COMPONENT TEST SECTION

B. OPTICAL WATER SENSORS TEST

Optical sensors are solid state devices, a non-mechanical designed switch. They are extremely reliable and field proven. However, due to its "black box" concept, intial troubleshooting and component testing can be challenging. The following procedure will help you debug optical sensor problems to device level of isolation. This procedure should be consulted when units are experiencing false High-Water alarms, Low-Water alarms, inoperative alarms, inoperative water dumping or continuous water dumping.

Earlier model air dryers (manufactured 9/92 and earlier) utilized an electronic module (black box mounted near sensors). SPECIAL INSTRUCTIONS FOR THESE MODELS ARE WRITTEN IN BOLD ITALICS.

STEP 1. DISCONNECTING THE WATER DUMP SIGNALS

Proceed to the primary dump solenoid valve and secondary dump solenoid valve and disconnect the two control wires connected to the solenoid valve and secure the loose wires safely with electrical tape. This will temporarily inhibit the system from dumping water. ***Proceed to the optical sensor module and disconnect the wires located on terminals P-3 and P-4.*** Following step 1, if unit continues leaking water from the dump solenoid valve(s), proceed directly to step 5B.

STEP 2. TESTING OPTICAL SENSOR (LED) INPUT VOLTAGE

Proceed to the air dryer main alarm board (P-08980F), locate connectors W10,W11 and W12 (optical sensors), using a VOM, measure for DC voltage between the #1 pin and #3 pin on all sensors. Sensors must be connected to main alarm board and air dryer ON during measuring. ***Proceed to the black module, where sensors are connected. Measure for DC voltage between Blue wire and Black wire on all sensors. Sensors must be connected to black module during measuring.***

RESULTS: If measured 1 to 2 VDC, the input to the sensor is GOOD. Proceed to next step.
If measured 4 to 5 VDC, sensor is BAD. Replace any bad sensors.

STEP 3. STABILIZING WATER LEVEL FOR TESTING

Add water as necessary to bring water level above the low water sensor, but below the primary dump sensor.

B. OPTICAL WATER SENSORS TEST - (CONTINUED)

STEP 4. TESTING OPTICAL SENSOR (LED) OUTPUT VOLTAGE

Proceed to the main alarm board (P-08980F), locate connectors W10,W11 and W12 (optical sensors), using a VOM, measure for DC voltage between the #1 pin and #2 pin on all sensors. ***Proceed to the black module, where sensors are connected. Measure for DC voltage between Blue wire and Green wire on all sensors.*** Readings must be taken with water level above and below sensors. Add water to achieve desired test level. If water becomes too high during testing, carefully reconnect the primary dump solenoid valve until proper level is achieved. ***Locate loose wire previously removed from black module terminal P-4 and short to P-1 location of the module. Disconnect when proper water level is achieved.***

RESULTS: Water Level BELOW sensor - Measure 5 VDC
Water Level ABOVE sensor - Measure 0 VDC
If test reveals wrong voltages, clean and retest sensor or replace sensor.

IMPORTANT NOTICE:

CLEAN faulty sensors using a soft cloth (DO NOT APPLY CLEANING AGENT) and retest. If sensor continues to fail, replace bad sensor.

STEP 5A REPLACE FAULTY SENSORS AND RESTORE AIR DRYER TO NORMAL.

Following sensor replacement, reconnect wires to the dump solenoid valve. ***Reconnect loose wires to position P-3 and P-4 of the black module.*** Restore air dryer to normal. If unit operates normal, Ignore Step 5B.

B. OPTICAL WATER SENSORS TEST - (CONTINUED)

STEP 5B. REPLACE FAULTY DUMP SOLENOID OR ALARM BOARD.
Following sensor replacement. If sensors pass input and output tests and problems persist, REPLACE ALARM BOARD. If dump solenoid continues to dump water with wires disconnected, REPLACE SOLENOID VALVE. ***If wires located on position P-3 and P-4 of the black module are disconnected and unit continues to dump water in error, locate dump solenoid valve, and disconnect electrical wires.***

RESULTS: ***If unit continues to dump water, REPLACE DUMP SOLENOID.***
If unit stops dumping water, REPLACE ALARM BOARD.

If problems persist, repeat procedure and contact Puregas at 800-521-5351.