

# PORTABLE, DUAL DESICCANT BED DRYERS Model APD 1-9/HDP 1-9 **INSTRUCTION MANUAL**



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## DRYER OPERATION/ FEATURES

The ARID-X dryer series is a dual bed design that provides a constant supply of dry air to the material hopper. While one bed is removing moisture from the process air the other is regenerating by heating the desiccant to a high temperature. Once the regenerated bed cools down, the Zone Valve switches the airflow, and the newly regenerated bed is used to desiccate the process air stream. The saturated bed is now regenerated in the same manner, completing the regeneration cycle. The cycle is depicted Page 8.

The airflow design of the ARID-X dryers makes the regeneration cycle more efficient because we utilize a small amount of the desiccated process air rather than ambient air to regenerate the desiccant bed. This reduces the impact of the high moisture content of the ambient air, which would contaminate the desiccant bed, and allows the dryer to attain a lower dew point. Please see the Air Flow Schematic on Page 6.

## **HP4-X Design**

Our patented HP4-X design incorporates 4 desiccant beds where two are stacked, one over the other. This nearly doubles the amount of desiccant available for drying the process air stream, and because of the tower design, the dryer is able to regenerate the desiccant in the same time as our ARID-X series. This allows the dryer to operate in very high humidity conditions without affecting the process air dew point. In fact, this design produces dew point levels of – 40' to -80' C for faster more complete drying of your material. Please see the Air FLow Diagram on Page 7.

## **Hopper Design**

Dri-Air's "all stainless" hopper design utilizes a stainless steel inner shell surrounded by a stainless steel jacketed insulation layer. The easily removable stainless steel spreader cone promotes proper material flow to ensure that the material is dried efficiently and no dried material is left at the hopper bottom that needs to be fed out prior to operating. You must ensure that your hopper is adequately sized for your usage rate and is kept filled, to ensure that you have sufficient time to dry the material.



DRYER OPERATION/ FEATURES (Cont.)

## Closed Loop Loading System

Dri-Air's closed loop loading system utilizes a dedicated blower, small receiver, filtration system and desiccated air to move the material from the dryer hopper to the molding machine. This eliminates the possibility that your material will be contaminated with moisture as with some other material transfer systems, helping to eliminate defects resulting from moisture contamination. Please refer to the Closed Loop Loader System section of this manual for the proper installation and maintenance.

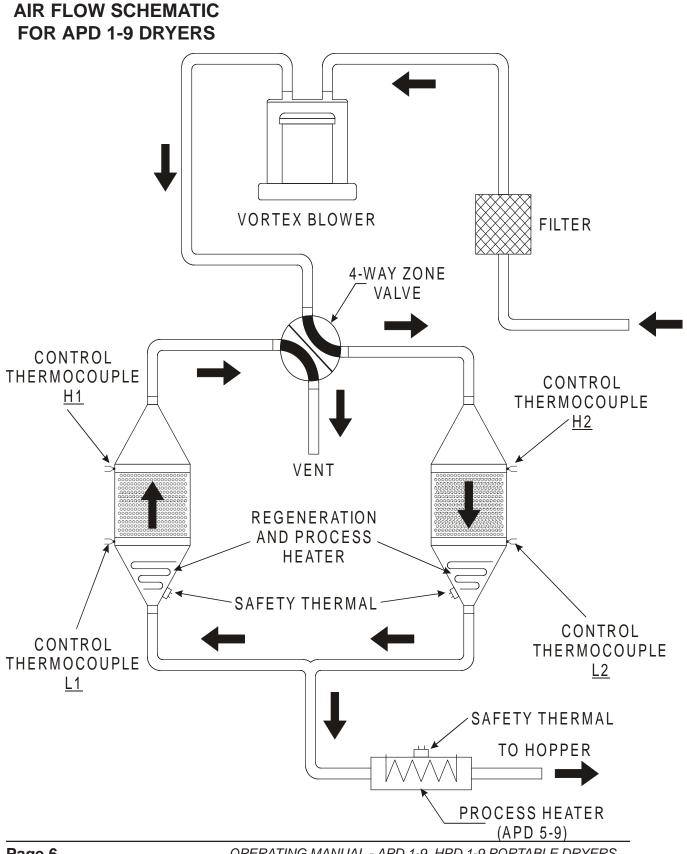
## **Dryer Controls**

The ARID-X series can be supplied with the standard PLC Control Module or the advanced Microprocessor Control Module, while the HP4-X series is only available with the Microprocessor Control Module.

The PLC Control module includes a PLC control board, display board, temperature controller and touch pad that is programmed for the drying cycle described above. The controller, display board and touch pad indicate the machine status, alarms, set points and allow you to enter operational settings for the dryer. These are explained in more detail later in this manual.

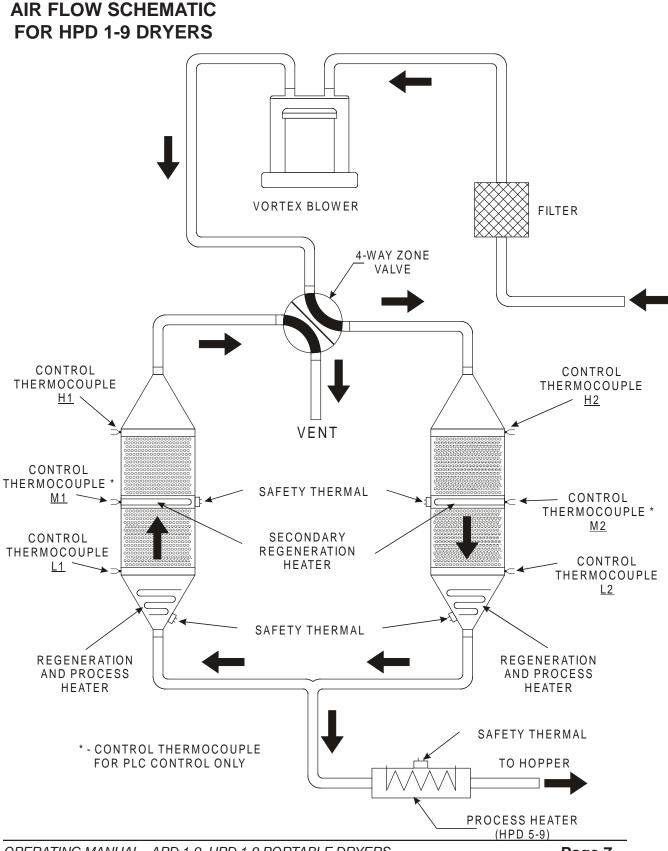
The Microprocessor Control Module is one of the most sophisticated yet operator friendly controls on the market. It has many more features than the PLC control module that provide the operator with more control and operational flexibility with the dryer. These features and the operating instructions are covered in detail in the Microprocessor Control Instruction Manual included with your dryer.





OPERATING MANUAL - APD 1-9, HPD 1-9 PORTABLE DRYERS Revision 10/8/02

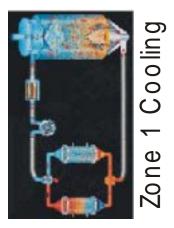




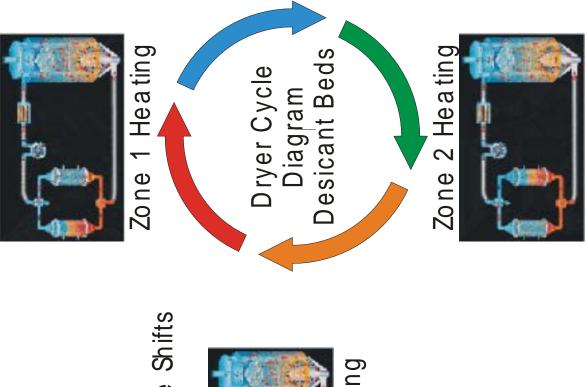
#### OPERATING MANUAL - APD 1-9, HPD 1-9 PORTABLE DRYERS Revision 10/8/02



**DRYER CYCLE** DIAGRAM



Valve Shifts





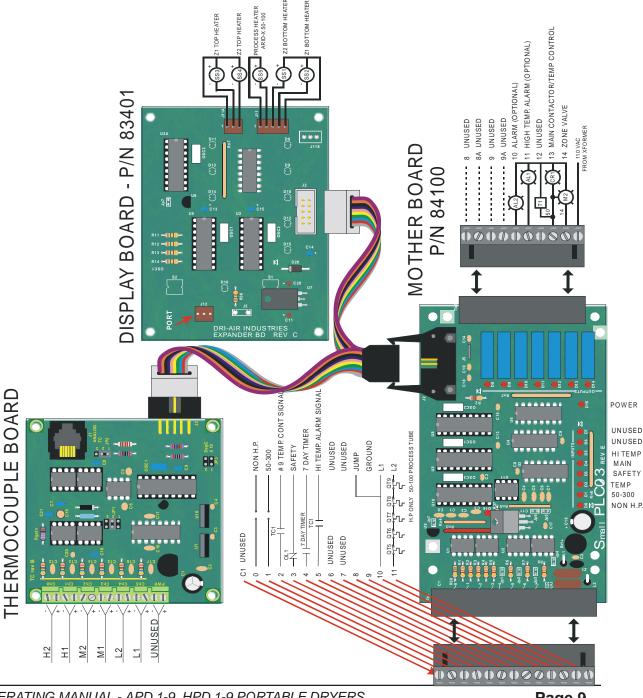
Cooling 2 Zone



## PLC STANDARD ELECTRICS

The control package includes a PLC controller which is programmed for the drying cycle previously discussed. The display board indicates the machine status, heater operation and alarms. See section on start up for details.

Below are descriptions of the inputs and outputs of the PLC which are used for trouble shooting. A lit LED indicates the input or output is actuated. All inputs are 12 volts AC and all outputs are 110 volts AC and 15 v DC to the heater relays. Refer to the electrical schematic for more detail.





## INSTALLATION PROCEDURE

## For all Dri-Air models except ARID-X 10, AHM-1, & PDII

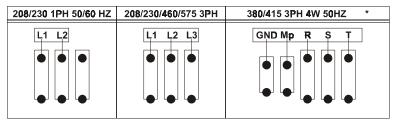
#### **Electrical Connection:**

Open electrical access door on the front of the machine by turning the disconnect off and turning the lower clamping screw 1/2 turn counterclockwise. Locate the disconnect by following the operating handle down to the electrical panel.

Insert the incoming power cable or conduit through the hole provided on the side of the machine.

#### « use approved wire and fastening means «

Wire incoming power to the top of the disconnect as shown in the diagrams below.



## <u>NOTE:</u>

When 3 wire supplies are used in place of 4 wire supplies, a control transformer is required.

#### <u>3 PHASE DRYER INSTALLATION</u> CHECK FOR CORRECT MOTOR ROTATION BEFORE RUNNING DRYER

To check motor rotation......

Leave the electrical cabinet door open so the blower can be observed. Turn on the power to the dryer and press the **ON/ START** touch pad and then immediately press the **OFF/STOP** touch pad. Observe the cooling fan on the top of the blower motor and verify the fan is turning clockwise. If the motor is not turning clockwise, switch any two adjacent supply wires.

## **Compressed Air Connection:**

Compressed air is only required for dryers which have the closed loop loader as part of the system. For those units:

CONNECT COMPRESSED AIR TO INLET ON FRAME UNDER DRYER. The closed loop system includes a regulator that is set to the proper pressure and an automatic drain water separator. Maximum incoming pressure not to exceed <u>145 psi</u> (1.0 mpa).

The unit is now ready for operation.



## START-UP PROCEDURE

Standard Electrics

Operating this unit is very simple. Once the dryer is connected to the facility power supply, the unit can be started by turning the disconnect located on the electrical panel enclosure to the ON position and pressing the ON button on the Control Panel Key Pad. To shut the dryer off, simply push the OFF button on the Control Panel Key Pad and turn the disconnect to the OFF position.

Setting the process air temperature is done using the Digital Controller.

For a more detailed explanation, see the following sections.

## **Control Panel - Operating Display**

Turn power on at dryer using disconnect. 1. POWER light indicates power to the unit is on. Press ON button on key pad

- 2. Illuminated BLOWER Light indicates Blower is on.
- 3. Flashing ZONE light indicates bed is in Regeneration cycle.
- 4. Steady ZONE light means bed is in cooling cycle.
- 5. Illuminated HEATER light indicates heater is on.

#### Alarm Conditions:

- Flashing HIGH TEMP. ALARM indicates an over or under temp alarm. Unit shuts down.
- 7. Steady HIGH TEMP. ALARM light indicates thermocouple has failed. Further diagnostics are required.
- 8. Flashing ALARM light indicates a safety override condition has occured. Dryer shuts down.



## Digital Controller - Setting Process Air Temperature:

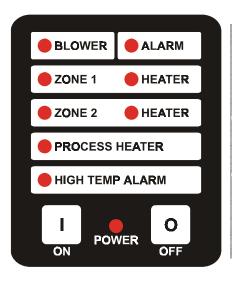
Press <u>SET</u> button - temperature set display will flash.

Press up arrow to increase temperature and down arrow to decrease temperature.

Press <u>SET</u> again to enter the new temperature.

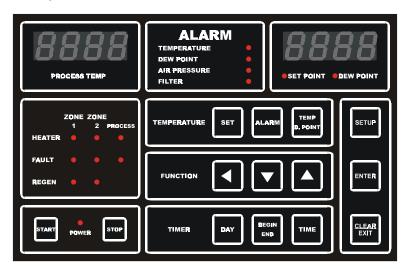
If the display flashes, the temperature is out of the control range.

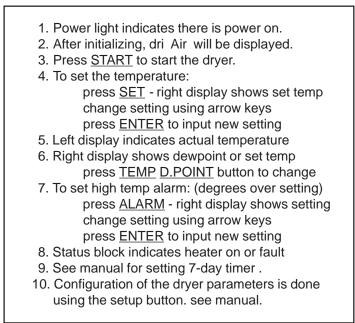
If the display shows <u>0000</u> the thermocouple is not connected or is faulty.





#### **Microprocessor Control**





For a more detailed explanation of the features and operation of our Microprocessor Controller, please consult the Microprocessor Operating manual enclosed with this unit.



## CLOSED LOOP LOADING SYSTEM

The closed loop loading system uses a separate vortex blower to provide the vacuum and "pressure assist" necessary to move the dried resin from the hopper take-off box to the receiver mounted on the feed throat of the molding machine.

At the start of the loading sequence, the lower proximity switch on the receiver senses there is no material. The blower starts, and the loader valve on the inlet line to the blower is opened. Because the receiver is sealed to the feed throat, a vacuum is created within the take off box, pulling material from the hopper.

The outlet of the blower (pressure side) blows air into the take off box to help move the material to the receiver and close the air loop. When the upper proximity switch on the receiver senses material, the blower is stopped and the loader valve is closed to prevent anymore material from being conveyed and left in the hose to possibly be contaminated with moisture.

To operate the system, complete the installation steps detailed below and turn on the system by actuating the toggle switch labeled LOADER on the front of the electrical panel enclosure. If the Dual Closed Loop Loading option has been installed, please consult the Dual Closed Loop Loader Operating Manual enclosed with your dryer.

## RECEIVER

Prior to installing the receiver, you must inspect the surface of the molding press feed throat that the receiver is being installed upon to ensure that it is clean and flush. Surface irregularities must be removed, or a gasket installed, so that there will be no vacuum leaks between the receiver and feed throat after installation.

## **IMPORTANT**

If the molding machine is equipped with a slide gate, swing arm, starve feeder, additive feeder, or feed throat vent, you must ensure these are sealed, as the system may not work properly. If it is impractical, or impossible to seal off the aforementioned equipment, Dri Air Industries has a Flap Valve, available for purchase, that will enable the loading system to function properly.

To install the receiver, simply drill holes in the bottom flange of the receiver to match the hole pattern on the molding press feed throat and affix the receiver with bolts sufficient to accommodate the operating stresses. A silicone gasket is provided with the receiver to ensure a tight seal between the receiver bottom and the feed throat. Connect the plug for the upper proximity switch into the line labeled H and connect the lower proximity switch plug into the line labeled L. Connect the material feed hose and vacuum hose as shown in drawing 82222 in the appendix to this manual.



## VACUUM CHECK

Prior to production operation of the loading system, we strongly recommend that you ensure the loading system is properly sealed. To test the seal, follow the steps detailed below.

While the loader is running, close the hopper slide gate and remove the material wand and attached hose from the takeoff box. Check the vacuum level by placing your hand over the wand. Return the wand to the takeoff box.

Remove the hose from the bottom port of the blowback filter canister. Place your hand over the filter canister port. Compare this vacuum level to the level observed at the material wand. The two vacuum levels should be the same.

Any difference between the vacuum levels is caused from leaks in the loading system. Check for loose hoses, missing gasket on the cyclone, or other possible sources of leaks described below.

The most likely source is the seal between the feed throat and receiver, or the configuration of the feed throat and material feeder associated with the molding press. The presence of vacuum leaks at these locations may exhibit the following characteristics:

■ Material in the receiver may be seen to bubble or move when loading, as a leak at the feed throat causes air to be drawn in at the bottom of the receiver rather than from the take off box.

Poor transfer of material from the take-off box to the receiver.

Large amounts of material or dust being pulled into the blowback filter cannister.

If any of these occurrences are observed, the steps to improve the vacuum seal detailed in the previous section on Receiver Installation will be required.

The proximity sensors supplied with the receiver may require adjustment to operate properly. When positioning the sensors, ensure that they are placed as close as possible to the outer surface of the receiver as they operate by sensing the density of the material in the receiver. Vertically position the lower sensor to set the material level at which the load cycle will initiate and the upper sensor to set the material level at which the load cycle will stop. **CAUTION: Do not overfill the reciever as material may be drawn back into the blowback filter canister.** 

## PROXIMITY SENSOR ADJUSTMENT



To adjust the sensor's sensitivity, turn the adjustment screw on the back of the sensor. The adjustment screw turns a 20 turn potentiometer with a clutch to prevent over adjustment. If you are unsure as to the current setting of the sensor, turn the screw 20 turns **counterclockwise**. The LED should light with no material in front of the sensor. Turn the screw 4-6 turns **clockwise** and proceed as directed below.

With <u>no material in front of the sensor</u>, the LED on the back of the sensor should be lit. If not, turn the adjustment screw located on the end of the sensor <u>counterclockwise</u> until the LED turns on.

With material in front of the sensor, the LED on the back of the sensor should be off. If not, turn the adjustment screw **clockwise**, until it turns off.

#### Material flow to the receiver should be continuous and smooth. Irregularities in flow rate and volume can be affected by the position of the material wand inserted into the take-off box or the density of the resin. To adjust the flow, take the steps detailed below.

Upon initial operation of the loading system, push the wand in until it stops. Then pull it out 1 to 2 inches and tighten the set screw on the take-off box material outlet. Operate the loading system and observe how the material flows into the receiver. If the flow rate is not as desired, the wand can be adjusted **out** to reduce the flow of material conveyed, or **in**, to increase the amount. Typically, loading times are 5-6 seconds for a 2" receiver and 15-20 seconds for the 4" receiver.

If the material flow is irregular, with "slugs" of resin being delivered to the receiver, the wand is most likely pushed too far into the take-off box. This "chokes" off the air flow required to convey the material, causing the irregular flow. To remedy this condition, pull the wand out slightly and the material will flow more evenly and quickly.

If little or no material is conveyed and there are no blockages in the take-off box or material hose the wand may be pulled too far out of the take-off box. Push the wand in until you get the desired flow rate.

## MATERIAL FLOW ADJUSTMENT



#### Material will not feed.

BASIC TROUBLE SHOOTING for CLOSED LOOP LOADING SYSTEM

- 1. Ensure the proximity sensors are adjusted and working properly. Both sensors LED's should be lit when the receiver is empty. Check that the sensors are tightened on the bracket and the cable connectors are tight and correct.
- 2. Check system for leaks. Tighten hose clamps. Check seal at receiver/feed throat interface by comparing vacuum levels as directed in previous section on Receiver Installation.
- 3. Ensure the blower operates. Check the electrical system to see if the relay is working and that the blower overload is not tripped. Trip window will be orange/yellow if tripped. Check to see that the blower rotation is correct (clockwise).
- 4. Ensure that the compressed air is connected to the system and the pressure regulator is set to 60 psi. Does the air valve open when the system calls for material? The air line to the valve can be easily disconnected by pushing in on the plastic sleeve and removing the hose. The air line should be pressurized when the system is loading.
- 5. Ensure the drain valve at the bottom of the filter is closed properly.

## CLOSED LOOP LOADER MAINTENANCE

## Daily Maintenance: Clean filter when loader is not working.

The filter is cleaned automatically with an air blast at the start of each loading cycle. The canister needs to be drained periodically by opening the valve at the bottom of the canister. Gently bang on the side of the cannister with your hand to loosen any fines and <u>close the valve</u>.

## **Monthly Maintenance:**

Clean filter sock by removing the quick clamp on the filter and removing the top cover. Remove the bag assembly and blow off with an air gun. Install bag assembly, top cover and quick clamp checking that the seal is proper. This maintenance may need to be performed more frequently if your material is dusty, or less frequent if your material is clean. We strongly recommend it be performed every 6 months regardless of material conditions

Tighten all hoses and hose clamps and check for leaks.



## DRYER OPERATION TROUBLE SHOOTING

The new Dri-Air Standard PLC and MICROPROCESSOR Electrics were designed for quick diagnosis of problems.

The following steps should be done before proceeding with other diagnostic steps.

## 1. Check the Power Circuit:

- a. Incoming fuses or circuit breaker
- b. All dryer fuses:

Each fuse, with the exception of the main fuses, has a blown fuse indicator light that illuminates when the fuse is blown.

- c. Is power supplied to the unit?
- d. Check heater continuity using a volt ohmmeter.

## 2. Compressed Air:

## For those models that require compressed air.

- a. Is compressed air connected with at least 60 PSI
- b. Check water separator and drain if necessary
- c. Pressure gage should read 60 PSI
- 3. Air Flow Circuit:
  - a. Ensure Zone Valve position corresponds to the regeneration cycle by comparing the Zone position lights on the Zone Valve to the ZONE position lights on the dryer panel.
  - b. Make sure that all hoses are connected, not crushed, and free from obstructions.
  - c. Inspect filter and make sure cover is tight and the filter is clean.

## 4. Control Circuit:

- a. Using the PLC/MICRO Display Panel ZONE indicator lights as a guide for the dryer regeneration cycle, check that all inputs/outputs are proper for the part of the regeneration cycle that the machine is in.
- b. Monitor the PLC output lights to ensure the corresponding LED on the power board is illuminated and there is an output voltage to the heater.

## 5. Operating Conditions:

a. Check the process temperature. It should <u>not</u> be set below 140° F (60° C) because the unit will go into high temp alarm.



## Machine will not start: Power light is not on.

## DRYER OPERATION DETAILED DIAGNOSIS (PLC Controlled Dryer)

For MicroControlled dryers please see the Microprocessor Control Instruction Manual

- 1. Check circuit breakers (CB1) or incoming fuses inside control box to see if they are tripped or blown. Reset circuit breakers by turning them off and then on.
- 2. Check small fuses (FU1 & FU2) next to contactor. The LED will be lit if they are blown. Replace if necessary by opening the fuse holder and put new fuse into holder.
- 3. Check that incoming power to the unit is proper.
- 4. Check safety snap discs.

#### Alarm light is flashing: Unit will not run. Main contactor is not pulling in.

1. Check the motor overload <u>OL1</u> located in the panel. If it is tripped, the window will show as orange/yellow. Reset overload by pushing in the reset button.

## Machine will not run: High Temp Alarm Light flashing.

This indicates that the temperature has exceeded the high limit programmed into the temperature control or the set temperature can not be reached.

Press stop and restart machine holding in the start button. Monitor the actual temperature to see if it exceeds the set point or can not reach the set point. If it can not reach set point, see section below.

## Machine will not run: High Temperature Alarm Light on, not flashing:

1. This indicates an "open" thermocouple or the temperature in the desiccant tower exceeded 900° F.

## Machine will not reach temperature:

- 1. If the process heater light is not lit.
  - A. Check output from temperature controller and input to PLC.
  - B. Check the thermocouple. The tip should be in the middle of the hose.
- 2. If the process heater light is lit.
  - A. Check fuses on power board
  - B. Check solid state relays on power board.
  - C. Check that the air flow is not obstructed.
  - D. Check blower rotation
  - E. Check heater for continuity.

Check the limit first by pressing the <u>SET</u> button on the temperature control and holding until <u>AL</u> is displayed. The setting shown indicated the amount over set point that the alarm will be actuated. It is factory set to 50°F (30°C) and should not be set below 30°F (16°C) or it will actuate too soon.



#### If the temp exceeds the set point check the following:

- 1. Remove the hose from the top of the hopper to check air flow. There should be air flow out of the hopper with a suction on the hose. If there is little or no flow, check the inlet hose.
- 2. Inspect the filter to make sure that it is clean and not affecting the air flow.
- 3. Check the power boards to see if one of the solid state relays has failed on. Using an ammeter or voltmeter on the output to the heater, see if there is power when the LED is not lit which will indicate a failed relay.
- 4. Check the valve position.

The Dri-Air rotary valve is designed to provide very little flow restriction and no leakage. It incorporates high temperature, self adjusting seals for years of trouble free service. The electrical controls are built into the end of the valve and include position lights.

Trouble shooting is easy. If the lights indicating position do not match the zone displayed on the control panel, or there are no lights, the valve is not working properly. See if the cam is actuating a switch.

## DO NOT PUT FINGERS INTO VALVE WITH POWER ON

Check all electrical connections to make sure they are tight.

Contact factory with the serial number of the dryer for a replacement valve.

## DRI-AIR ROTARY ZONE VALVE



APD 1-4 and , HPD-1-4

PARTS LISTS	DESCRIPTION	<u>AP</u>	D <u>HPD</u>	
GENERAL	Dryer Filter Element Zone Valve Thermocouple (Process) Desiccant 80082 (Lbs/Machine) Tower Clamp Tower Gasket Regeneration Valve Pressure Switch Regulator MAC Valve Caster (Swivel) Caster (Fixed)	810 837 821 8 lb 810 810 810 810 817 817 817	05 83705 74 82174 s. 14 lbs. 17 81017 28 81028 R NR R NR R NR R NR 99 81799	
<u>CLOSED LOOP LOADER</u>	Filter Element Blowback Valve Proximity Switch (K10203 Std. El.) Proximity Switch (K15208 Micro) Regulator Air Valve (SMC) Load Valve	8236 8269 8118 8229 8299 8422 8422	95 82695 80 81180 98 82298 95 82995 20 84220	
		<u>STD</u>	MICRO	
ELECTRICAL	Disconnect Temperature Control (RKC CB-100) Main Board Display Board Thermocouple Board	82308 84016 84100 83401 84049	84016   NR     84100   82071     83401   82072     84049   NR     83437   84131     NR   82246     82270   82270     82302   82302     80576   80576	
NOTE: TO ORDER BLOWERS OR OVERLOAD REFER TO PART NUMBER ON ITEM.	Transformer Current Transformer Main Contactor Solid State Relay IEC Contactor	NR 82270 82302 80576		
*: IEC CONTACTOR USED IN ALL FM, PD & HM DRYERS AND CLL POWER PACKS WITH SERIAL NUMBERS GREATER THAN D14650	IEC Contactor * Power Board Power Board (208 & 230 v Dryers) Single Pole Relay Double Pole Relay Dual Solid State Board Toggle Switch Safety Thermal Switch (Tower) Thermocouple (Tower) TRI-Solid State Board Dewpoint Sensor Solid State Timor (Plawback)	84860 84860   83493 83493   84080 84080   82496 82496   80587 80587   NR 82870   80466 80466   80221 80221   82174 82174   NR 83468   81908 81908		
	Solid State Timer (Blowback) Solid State Timer (Cleanout) Solid State Timer (Auger Delay) 208V 2	83318 83527 83442 30V 400V	83318 83527 83442 <b>480V 575V</b>	
<u>HEATERS</u>	Regeneration (Cone Style) 83342 83 HP Center (Flat Style) 82373 82	3373 83982		



APD 5-9 and , HPD-5-9

	APD 5-9 and , HPD-5-9				
	DESCRIPTION			APD	<u>HPD</u>
GENERAL	Dryer Filter Element Zone Valve Thermocouple (Process) Desiccant 80082 (Lbs/Mach Tower Clamp Tower Gasket Regeneration Valve Pressure Switch Regulator MAC Valve Caster (Swivel) Caster (Fixed)	ine)		81331 83705 82174 30 lbs. 81172 82795 NR NR NR NR NR 81799 81798	81331 83705 82174 50 lbs. 81172 82795 NR NR NR NR 81799 81798
CLOSED LOOP LOADER	Filter Element Blowback Valve Proximity Switch (K10203 S Proximity Switch (K15208 M Regulator Air Valve (SMC)			82389 82695 81180 82298 82995 84220	82389 82695 81180 82298 82995 84220
			<u>STD</u>	MI	<u>CRO</u>
ELECTRICAL	Disconnect Temperature Control (RKC CB-100) Main Board Display Board Thermocouple Board Transformer Current Transformer		82308 84016 84100 83401 84049 83437 NR	82 82 82 82 82 82	2308 NR 2071 2072 NR 4131 2246
NOTE: TO ORDER BLOWERS OR OVERLOAD REFER TO PART NUMBER ON ITEM.	Main Contactor Solid State Relay IEC Contactor IEC Contactor * Power Board Power Board (208 & 230 v E	82302 80576 84860 83493 84080	822708227082302823028057680576848608486083493834938408084080		
*: IEC CONTACTOR USED IN ALL FM, PD & HM DRYERS AND CLL POWER PACKS WITH SERIAL NUMBERS GREATER THAN D14650	Single Pole Relay Double Pole Relay Dual Solid State Board Toggle Switch Safety Thermal Switch (Tow Safety Thermal Switch (Prod Thermocouple (Tower) Transformer .050 TRI-Solid State Board Dewpoint Sensor Solid State Timer (Blowback Solid State Timer (Cleanout) Solid State Timer (Auger De	82496 80587 NR 80466 80221 80551 822455 NR 81908 83318 83527 83442	80587     82870     80466     80221     80551     82175     82245     83468     81908     83318     83527		
		<u>230V</u>	<u>400V</u>	<u>480V</u>	<u>575V</u>
<u>HEATERS</u>	Regeneration (Cone Style) HP Center (Flat Style) Process		81766 83934 84204		81432 83372 84065



NOTES:

