ZEKS

COMPRESSED AIR SOLUTIONS

TECHNICAL MANUAL

ECLIPSE™

DESICCANT AIR DRYER

ZHA HEATED PURGE

150 - 8,000 SCFM

NOTICE

Those operating the machine or performing maintenamce should read and understand the decals positioned on the machine and the contents of this Technical Manual.

Ensure that this Technical manual is not removed permanently from the machine.

ZEKS Compressed Air Solutions

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TM ZHA 150-8000 V0417

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ATTACHMENTS

1. INTRODUCTION

ZEKS Eclipse™ Heat Reactivated Desiccant Dryers are designed to adsorb moisture from compressed air. The dryers are constructed with two towers, each containing desiccant beads, that alternate between on-line (drying) and offline (regenerating) modes, yielding a continuous stream of dry air at the dryer's outlet.

During normal operation, wet air passes through the on line tower and water vapor from the air is adsorbed (collected) on the desiccant beads. While air is being adsorbed in the on-line tower, the moisture on the desiccant in the offline tower is removed by a process called desorption (regeneration). In standard heat reactivated operation, after an initial rapid depressurization, a portion of dried air from the on-line tower passes through a heater and over the desiccant bed and carries the moisture off the bed and out the dryer's exhaust. With the dryer's Bi-Mode feature, the dryers may also be operated in a Heatless mode, which uses more purge air but does not require use of the heater.

The continuous, alternating process of adsorption and desorption is controlled using a Programmable Logic Controller that switches the towers in a specific timed sequence. Very dry compressed air dew points are achieved through the continuous switching and operation of this dryer. ZEKS offers heat reactivated dryers to provide either -40°F or -100°F pressure dew point outlet air.

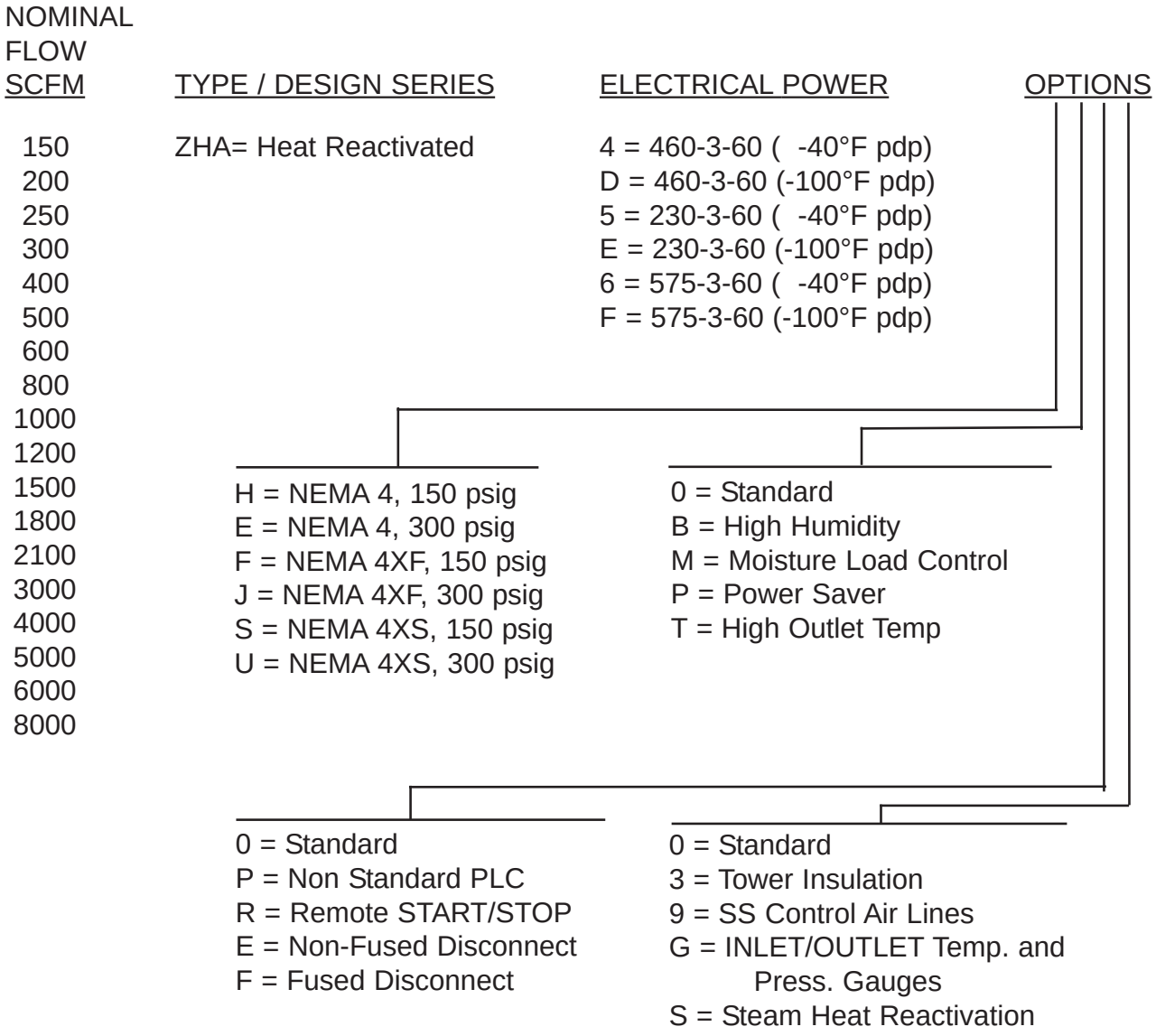
2. ABBREVIATED WARRANTY

ZEKS Eclipse™ heat reactivated desiccant dryer products are warranted to be free from defects in material and workmanship for a period of 12 months from the original date of shipment from the factory. To allow the warranty to be in effect for 12 months from the date of equipment start-up, the Warranty Registration Card must be completed and returned to ZEKS. Alternately, the Warranty Registration Card may be completed on-line at www.zeks.com. The total warranty period cannot exceed 18 months from the original date of shipment from the factory.

Equipment must be installed and operated in accordance with ZEKS' recommendations. ZEKS liability is limited to repair of, refund of purchase price paid for, or replacement in kind at ZEKS' sole option, during the warranty time period stated above. IN NO EVENT SHALL ZEKS BE LIABLE OR RESPONSIBLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, even if the possibility of such incidental or consequential damages has been made known to ZEKS Compressed Air Solutions. In addition, the usual maintenance and replacement type products are not covered by this warranty.

The warranties expressed above are in lieu of and exclusive of all other warranties. There are no other warranties, expressed or implied, except as stated herein. There are no implied warranties of merchantability or fitness for a particular purpose, which are specifically disclaimed.

3. HEAT REACTIVATED DRYER NOMENCLATURE



4. RECEIVING AND INSPECTION

4.1 INSPECTION

Upon receiving your ZEKS air dryer, please inspect the unit closely. Visually check the dryer to make certain that all air lines and electrical connections are securely fastened and were not damaged in transit. If rough handling is detected, note it on your delivery receipt, especially if the dryer will not be immediately uncrated. Obtaining the delivery person's signed agreement to any noted damage will facilitate filing of an insurance claim.

4.2 UNPACKING AND HANDLING

Refer to the General Arrangement drawing for the appropriate means for lifting or moving the dryer. For those dryers that indicate lifting via the structural skid, forks should extend all the way through the skid to reduce unnecessary forces to the dryer during moving. When lifting the dryer, ensure that no stress is applied to the piping or valving. Refer to SECTION 7.2 for locating and mounting of dryer.

NOTICE

Under no circumstances should any person attempt to lift heavy objects without proper lifting equipment (ie., crane, hoist, slings or fork truck). Lifting any unit without proper lifting equipment may cause serious injury.

5. SAFETY AND OPERATION PRECAUTIONS

Because an air dryer is pressurized and contains mechanical parts, the same precautions should be observed as with any piece of machinery of this type where carelessness in operation or maintenance is hazardous to personnel. In addition to the many obvious safety rules that should be followed with this type of machinery, the safety precautions as listed below must be observed:

1. Only qualified personnel shall be permitted to adjust, perform maintenance or repair this dryer.
2. Read all instructions completely before operating unit.
3. Pull main electrical disconnect switch and disconnect any separate control lines, if used, before attempting to work or perform maintenance on the unit.
4. Do not attempt to remove any part while dryer is in an operational mode.
5. Do not attempt to remove any parts without first relieving the entire air system of pressure.
6. Do not operate the dryer at pressures in excess of its rating.
7. Inspect unit daily to observe and correct any unsafe operating conditions.

OSHA Heading Description

WARNING

"Warning" is used to indicate a hazardous situation which has some probability of death or severe injury. Warning should not be considered for property damage accidents unless personal injury risk is present.

CAUTION

"Caution" is used to indicate a hazardous situation which may result in minor or moderate injury.

NOTICE

"Notice" is used to indicate a statement of company policy as the message relates directly or indirectly to the safety of personnel or protection of property. Notice should not be associated directly with a hazard or hazardous situation and must not be used in place of "Danger," "Warning," or "Caution."

NOTICE

The user of any air dryer manufactured by ZEKS Compressed Air Solutions is hereby warned that failure to follow the above Safety and Operation Precautions can result in personal injuries or equipment damage. However, ZEKS Compressed Air Solutions does not state as fact, nor does it mean to imply, that the preceding list of Safety and Operating Precautions is all inclusive, and further, that the observance of this list will prevent all personal injuries or equipment damage.

6. PRINCIPLES OF OPERATION

6.1 INTRODUCTION

As described in SECTION 1, water vapor is removed from compressed air by diverting air flow alternately between two towers filled with activated alumina desiccant. While one tower processes the compressed air stream adsorbing water vapor, the opposite tower regenerates by desorbing the water vapor and venting it to atmosphere.

ZEKS Heat Reactivated Dryers are equipped with ZEKS' Bi-Mode feature. The DPC™ Controller provides the ability to select between heated or heatless regeneration. Both heated and heatless regeneration methods are described in the following sections. Refer to SECTION 8.2 for details on switching dryer operation between Heated Purge and Heatless Pressure Swing operation.

> ***NOTICE***
>
> The DPC™ Controller must be in the OFF position prior to changing the mode (heated purge / heatless) of the dryer. After the change is made and the DPC™ is subsequently turned ON, the dryer will be in the new mode of operation.

6.2 DRYING CYCLE

Saturated compressed air enters the dryer and is diverted to the appropriate tower by the Inlet Flow Valves (Refer to the Process and Instrumentation Diagram). The Right Tower Flow Valve is actuated to a closed position to prevent air flow from entering the regenerating tower. Simultaneously, the Left Tower Flow Valve is actuated to an open position allowing air flow to the drying tower. During this time, the Left Tower Purge Valve is actuated to a closed position, preventing the compressed air from venting to atmosphere. As the compressed air flows through the desiccant material in the left tower at pressure, removal of water vapor from the air stream begins to occur through adsorption. In the adsorption process, the desiccant material draws water vapor out of the compressed air and "holds" it until the left tower drying cycle is complete. Compressed air flows out of the tower for delivery to the process use. The Outlet Flow Check Valves provide air flow diversion to the outlet air connection of the dryer.

6.3 REGENERATION CYCLE

Previously adsorbed moisture removed from the process stream gets stripped or desorbed from the desiccant material in the regeneration process. The first stage of regeneration is tower depressurization. After the Inlet Flow Valves are switched to divert air flow away from the regenerating tower, the appropriate Purge Valve will be opened and the tower will be depressurized. Through depressurization, a significant portion of the previously adsorbed water vapor is stripped off the desiccant material and exhausted to atmosphere.

> **CAUTION**
>
> Any time the dryer is switched between two operating modes, care must be taken to ensure the purge adjustment valve is adjusted correctly. Refer to the Specification Sheet in this manual for proper gauge setting.

6.3.1 Setting the Regeneration Air Flow

Proper setting of the purge flow is necessary to achieve proper dryer performance in the heatless and externally heated modes. Setting the purge flow too high will waste compressed air and if set too low, the dryer will not achieve dew point performance. The purge adjustment manifold consists of the purge adjustment valve, purge pressure gauge, and the purge orifice. The purge pressure gauge is located between the purge adjustment valve and purge orifice. Manually adjust the purge adjustment valve until the reading on purge pressure gauge matches the purge pressure setting listed on the specification sheet in the front of this manual as well as the tag attached to the gauge. Note that there are two purge gauge values corresponding with each mode of operation.

6.3.2 Heated Purge Regeneration

In the heat reactivated mode, the process described in SECTION 6.3.2 is repeated using 7.5% of dry compressed air expanded to atmospheric pressure. However, after air expansion through the Purge Orifice, the purge air is passed through the purge heater. This expanded, heated purge air is then passed through the regenerating tower and exhausted out to atmosphere. After a three minute delay, the heating process occurs for 2 hours and 57 minutes. During the heating process the electric heater is cycled on and off by ZEKS' AccuTemp Solid State relay. This advanced controller precisely monitors purge air temperature and adjusts the heater temperature accordingly. This results in a regeneration air temperature that remains within 3°F from the heater setpoint for the entire regeneration cycle, eliminating temperature swings associated with contactor-based heating system. Upon completion of the three-hour heating period, the electric heater turns off. The dry regeneration air continues to flow for 57 minutes in order to cool down the desiccant bed.

6.3.3 Heatless Pressure Swing Regeneration

In the heatless mode, following depressurization, regeneration uses approximately 15% of the dry compressed air expanded to atmospheric pressure to complete the desorption process. As shown on the P & ID, the compressed air exits the drying tower and a portion of the air flows through the purge adjustment valve and the Purge Orifice. Once the air has passed through the Purge Orifice, it expands to atmospheric pressure and continues the regeneration process. Desorption occurs as the desiccant releases water vapor into the regeneration air and is exhausted through the Outlet Purge Valves.

6.4 TOWER REPRESSURIZATION

Upon completion of tower regeneration, and prior to changing the Inlet Flow Valve position to switch towers, the regenerated tower must be repressurized. Repressurization is accomplished by closing the appropriate purge valve. Closing the Purge Valve allows the regeneration air to pressurize the tower.

NOTICE

Failure to repressurize prior to tower switchover will result in shocking the desiccant material and cause premature desiccant dusting.

6.4.1 Heated Purge Repressurization

Three minutes prior to tower switch-over, repressurization is accomplished by closing the appropriate Purge Valve. When the Purge Valve closes, the regeneration air begins to pressurize the tower. If the dryer is supplied with the optional repressurization piping, the Repressurization Valve opens, allowing some additional air from the outlet of the dryer to assist the purge air and to ensure adequate pressurization. During normal tower regeneration, the Repressurization Valve is held closed so that the only source of air for regeneration passes through the purge adjustment assembly.

6.4.2 Heatless Pressure Swing Repressurization

45 seconds prior to tower switch-over, repressurization is accomplished by closing the appropriate Purge Valve. When the Purge Valve closes, the regeneration air begins to pressurize the tower. If the dryer is supplied with the optional repressurization piping, the Repressurization Valve opens, allowing some additional air from the outlet of the dryer to assist the purge air and to ensure adequate pressurization. During normal tower regeneration, the Repressurization Valve is held closed so that the only source of air for regeneration passes through the purge adjustment assembly.

6.5 VALVES

Flow and Purge Valves are two-way valves that are switched using air-operated double-acting actuators. Each valve is actuated by a four-way solenoid valve as shown on the P & ID.

NOTICE

Actuated valves require 75 psi min. pressure for proper operation.

The Inlet Flow Valves are connected as normally open valves. When the dryer is de-energized, the solenoid valves for the Inlet Flow Valves supply control air to the “OPEN” port on the appropriate valve actuator.

Purge Valves are connected as normally closed valves. When the dryer is de-energized, the solenoid valves for the Purge Valves supply control air to the “CLOSED” port on the appropriate valve actuator.

Outlet Check Valves, as well as Purge Check Valves are single-direction check valves that will allow flow in the direction shown on the P & ID, but not allow flow in the opposite direction.

6.6 CONTROLS

6.6.1 DPC™ User Interface

The DPC™ display provides the user with the operating parameters and their corresponding values. When power is supplied to the dryer, the DPC™ will illuminate and default to the “Standby” mode, displaying the “Press ON” prompt.

The following illustration summarizes the keypad functions.

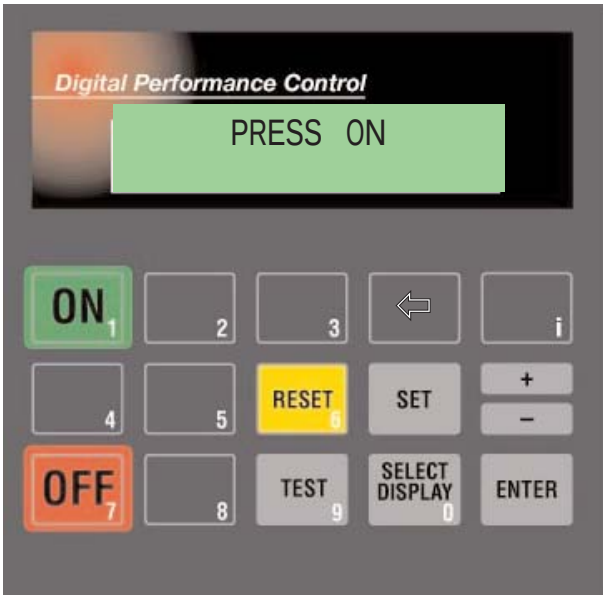


Figure 1 - DPC™ Controller

BUTTONS

- **ON**
  Initiates PLC program. Begins system monitoring and valve switching functions.
- **OFF**
  Stops PLC program. Stops valve switching functions. Initiates Shutdown Sequence. Opens Inlet Flow Valves. Closes Purge Valves.
- **SELECT DISPLAY**
  Allows the user to scroll through the available displays. The last display selected will remain displayed as the default display.
- **+ / -**
  Allows user to increase set point values. Set point values cycle through a fixed range. Also allows entering negative numbers in Technician.
- **⇦ or “blank” button**
  Allows user to step backwards to the previous level of the menu.
- **RESET**
  Pressing once clears the local alarm indication and de-energizes the remote alarm contact for many alarm conditions. Should the alarm condition persist, the alarm will return after the alarm inhibit time has expired.
- **SET**
  Permits the adjustment of parameters in TECHNICIAN.
- **ENTER**
  Used to accept changed parameters and set point values.
- **TEST**
  Not used in Desiccant Dryer applications
- **i**
  Restricted Level access for factory use only.

6.6.2 DynOptic™ Panel User Interface

The DynOptic™ Panel provides clear indication of dryer status via bright LED indicators. The following illustration summarizes the panel's features:

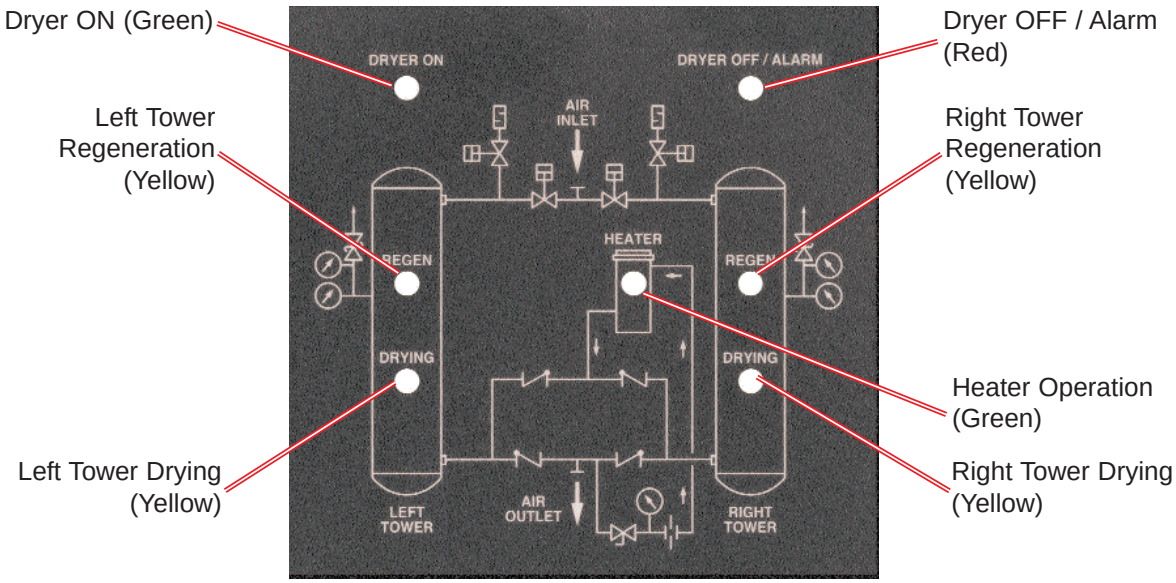


Figure 2 - DynOptic™ Panel

NOTE: ZEKS AccuTemp™ solid state temperature controller modulates the heater repeatedly during the heating cycle. Pulsating of the heater LED will occur as a result and should be considered normal dryer operation.

6.6.3 DPC™ Display Parameters

The DPC™ Controller is capable of displaying a number of system parameters in the default CUSTOMER MODE. The following summarizes the parameters that can be accessed by depressing the SELECT DISPLAY button from the DPC™ Controller. (Note that some displays are optional and may not appear on all models):

- Tower Status {LT DRY / RT REGEN or LT REGEN / RT DRY}: Provides visual confirmation of tower drying and regenerating status.
- Step Timer {ie STEP 4 TIME 120}: Information screen displaying the current step in the program and the time remaining for the displayed step.
- Dew Point Temperature (OPTIONAL) - {DEW POINT TEMP: XX}: When equipped with the optional Dew Point Display feature, provides accurate display of dryer outlet pressure dew point.
- Heater Status (HEATED PURGE MODE ONLY) - {ON / OFF}: Indicates that the heater is being given a signal to heat the purge air.
- Heater Temperature (HEATED PURGE MODE ONLY) - {HEATER TEMP: XX}: Indicates the current temperature of the heater.

- Purge Outlet Temperature (OPTIONAL) - {PURGE OUT TEMP}: When equipped with the optional MLC, indicates the temperature of the purge air.
- Alarms {ALARM LIST - PRESS ENTER}: Depressing <ENT> at this prompt permits viewing of current alarm status and alarm history, which includes the time and date of the alarm occurrence.
- Operating & Purge Times - {OPERATING TIMES - PRESS ENTER}: Depressing <ENT> at this prompt provides access to the operating and purge hours of operation.
- Operating Mode {OPERATING MODE: HEATLESS / HEATED PURGE}: ZHA dryers are capable of operating in Heated Purge and Heatless Pressure Swing modes. This display indicates mode of operation for dryer.

Once the last screen is displayed, depressing the SELECT DISPLAY button will return the display to the top of the list.

6.7 TIMING SEQUENCE

All timing functions are performed by ZEKS' DPC™ Controller, an advanced micro PLC designed exclusively for ZEKS Eclipse™ dryers. The DPC™ Controller is completely programmed at the factory and does not require any further adjustment. The standard timing cycle switches the Inlet Flow Valve, which alternates the drying tower. At the same time as the Inlet Flow Valve opens, the appropriate tower Purge Valve opens to begin the purge flow generation. Once the purge regeneration flow portion of the dryer cycle is complete, tower repressurization begins as previously described.

6.7.1 Heatless Pressure Swing Timer Cycle

In the heatless operating mode, the DPC™ controls a ten-minute cycle. The tower switch-over occurs every five minutes. Ten seconds after tower switch-over occurs, the regenerating tower depressurizes and tower regeneration occurs for four minutes and 15 seconds. At that time, tower repressurization begins.

6.7.2 Heated Purge Timer Cycle

In the externally heated operating mode, the DPC™ controls an eight-hour cycle. The tower switch-over occurs every four hours. Ten seconds after switch-over occurs, the regenerating tower depressurizes for 50 seconds. After depressurization, heated regeneration begins and extends for 2 hours and 58 minutes. The heating supply is turned off and the purge air flow continues for the next 58 minutes. The purge air supply during this time is used to cool down the hot desiccant. After the cool down stage, a repressurization stage repressurizes the offline tower for 3 minutes.

6.8 RESTART MODES

The DPC™ Controller includes a Shutdown Sequence that is activated when the dryer OFF button is depressed. This feature positions the valves to their failsafe position and resets the program and is the recommended method of shutting down the dryer. When the dryer is subsequently energized, the dryer is ready to run at the start of the program. Should, however, power be cut to the dryer before the Shutdown Sequence has been initiated, as would be the case from a power failure, the dryer can be configured to restart in one of two restart modes. Note that access to the settings to change the restart mode for the dryer are located in the TECHNICIAN MODE. Refer to SECTION 8.8 for a description of the restart-modes found in the TECHNICIAN MODE. Note that when the dryer is shut down using the OFF button, the dryer will require user intervention to restart the dryer.

6.8.1 Manual Mode (ZERO)

ZEKS dryers are shipped from the factory in the Manual Mode. After power is re-supplied to the dryer, the user will be presented with the “PRESS ON” display. The valve switching and timing operations will only start once the ON button is depressed. In this configuration, to restart the dryer, the user must manually depress the ON button on the DPC’s control panel.

6.8.2 Auto Restart Mode (LAST)

In this mode, the dryer will re-start automatically once power is applied to the dryer. In TECHNICIAN MODE, this operating mode is activated when the “RESTART” prompt is set to “LAST”. The DPC™ will pick up where it left off in the program once power is applied.

6.9 OPERATING TIMES

In the CUSTOMER MODE, the DPC™ Controller provides access to the following operating hours of the dryer:

SELECT DISPLAY	OPERATING TIMES PRESS ENTER	Depress the SELECT DISPLAY button until the OPERATING TIMES display appears.
ENTER	BEGIN TIMES	Depressing the ENTER button enters the OPERATING TIMES menu.
SELECT DISPLAY	OPERATING HOURS 00000065	Depressing the SELECT DISPLAY button displays the cumulative operating hours of the dryer.
SELECT DISPLAY	PURGE HOURS 00000009	Depressing the SELECT DISPLAY button displays the cumulative hours the dryer has used purge air.
SELECT DISPLAY	HEATER HOURS 00000007	Depressing the SELECT DISPLAY button displays the cumulative hours the heater has been operating.
SELECT DISPLAY	BEGIN TIMES	Depressing the ENTER button returns the display to the top of the OPERATING TIMES menu.
⇦	OPERATING TIMES PRESS ENTER	Depressing the BLANK or ⇦ button (located above the SET button) returns the controller to the CUSTOMER MODE

7.0 ALARMS AND INDICATORS

7.1 MOISTURE INDICATOR (Standard)

The moisture indicator senses a sample of the control air which is taken from the dryer outlet. The indicator provides a gross indication of dew point deterioration at the outlet of the dryer. Under normal operating conditions, the indicator is blue. In the event of a dryer malfunction or prolonged dryer shut down, it will turn gray in the presence of moisture.

7.2 HEATER HIGH TEMPERATURE ALARM WITH INTERLOCK (Standard)

The Heater High Temperature Alarm monitors the internal temperature of the heater housing. Should a component failure occur or system conditions result in the heater temperature rising above the alarm set point, the dryer will alarm. During the alarm condition, the heater is prevented from operating, the DPC™ halts the program at the point where the alarm occurred and displays the condition in the DPC™ LCD display. The dryer will be unable to be reset until the temperature of the heater has fallen below the alarm point. To reinstate the dryer, depress the RESET button on the DPC™ Controller AND manually reset the Heater High Temperature Safety in the electrical enclosure. Note that the alarm condition will return should proper corrective action not be taken.

7.3 HEATER FAILURE ALARM (Standard)

This feature produces an alarm should the heater fail to generate heat at the beginning of the heating cycle. During the initial ten minutes of the heating cycle, the DPC™ Controller monitors the heater temperature. Should the heater temperature fail to rise to 150°F within the ten minute period, the Heater Failure Alarm will be triggered. During this alarm condition, power to the heater is removed and the program is halted. Depressing the RESET button on the DPC™ Controller will reinstate the program and provided the heater problem has been remedied, continue with normal operation.

7.4 FAILURE TO SHIFT ALARM (Standard)

ZEKS Failure To Shift Alarm monitors the dryer sequencing functions to insure proper dryer operation by sensing the pressure in each tower via tower pressure switches. Should one of the following conditions occur, the DPC™ Controller will communicate the alarm condition. There are several types of switching failure modes that can be detected by the Failure To Shift Alarm feature. They are as follows:

7.4.1 Failure to Repressurize

At the end of the repressurization stage of the dryer operation, both towers should be at line pressure. Should the pressure switches indicate that both towers are not at line pressure, the Failure to Shift Alarm will activate and the DPC™ will stop the program at it's current position in the program. The user must depress the RESET button at which time the DPC™ Controller will resume operation from the last step in the program.

7.4.2 Failure to Depressurize

At the end of the depressurization stage of the dryer operation, the regenerating tower should be at atmospheric pressure. Should the pressure switches indicate that this is not the case, the Failure to Shift Alarm will activate and the DPC™ will stop the program at it's current position in the program. The user must depress the RESET button at which time the DPC™ Controller will resume operation from the last step in the program.

7.5 HIGH HUMIDITY ALARM (Optional)

The High Humidity Alarm communicates an alarm condition in the event that outlet dew point deterioration occurs. One of two moisture sensors are used to sample the outlet air moisture content. When a dryer is provided without Moisture Load Control / Dew Point Display option, a humidistat with a relative humidity sensor is preset to communicate a High Humidity Alarm condition when the dew point rises above -10°F (for -40°F dryers). Refer to SECTION 8.10 for details on enabling / disabling the High Humidity alarm on dryers equipped with this feature.

When a dryer is provided with Moisture Load Control / Dew Point Display option, a dew point sensor is used to detect this alarm condition. The dew point sensor transmits the outlet pressure dew point to the DPC™ Controller. The DPC™ Controller compares the dew point to the customer specified set point. Should the dew point be greater than the set point, a High Humidity Alarm will be initiated. Refer to SECTION 8.10 for details on setting the High Humidity Setpoint for dryers equipped with the Moisture Load Control / Dew Point Display feature.

7.6 HIGH OUTLET TEMPERATURE (Optional)

This option provides continuous monitoring of the the dryer discharge air temperature via a thermostat that senses the outlet air temperature during dryer operation. Should a high outlet temperature condition exist, the alarm is displayed on the DPC™ Controller to alert maintenance personnel of a malfunction. This alarm does not interrupt the dryer program. Depressing the RESET button will clear the alarm provided the alarm condition as been addressed. Note that the alarm will clear automatically once the high temperature condition is corrected.

7.7 DEW POINT TRANSMITTER FAULT (Optional w/ MLC)

When operating the dryer with the Moisture Load Control (MLC) activated, should the DPC™ Controller detect a fault with the Dew Point Transmitter, the Controller will display the message, “ALARM - MLC OFF”. When this alarm indication appears, the MLC feature is automatically disabled. Once the source of the fault is detected and remedied, the user MUST REACTIVATE the MLC feature in TECHNICIAN MODE. Note that provided the High Dew Point Alarm feature has been activated in TECHNICIAN MODE, depressing the RESET button without remedying the problem will display the message “DP SENSOR FAULT” after a brief delay. Otherwise, the dryer will continue to operate in the standard timed drying cycle.

Note that with the MLC feature off and the High Dew Point Alarm activated in TECHNICIAN MODE, should the Controller detect a fault with the Dew Point Transmitter, the DPC™ Controller will display the message, “DP SENSOR FAULT”. As with the other alarms, pressing RESET without addressing the source of the fault will result in a new alarm after a brief delay.

7.8 ALARM LIST

The DPC™ Controller stores the 20 most recent alarm conditions. These alarms are stored with the type of alarm as well as the date and time the alarm occurred. This list can greatly facilitate troubleshooting the dryer and provide an indication of dryer operation during unattended service. The following describe the method to access and review the alarms stored in the DPC™ Controller:

SELECT DISPLAY	ALARM LIST PRESS ENTER	Depress the SELECT DISPLAY button until the ALARM LIST display appears.
ENTER	BEGIN ALARMS	Depressing the ENTER button enters the ALARM LIST menu.
SELECT DISPLAY	ALARM OFF	Depressing the SELECT DISPLAY button advances the menu to the current alarm status.
SELECT DISPLAY	FAIL TO SHIFT TM 1635 DATE 1104	Depressing the SELECT DISPLAY list displays the most recent of the alarms stored by the DPC™. Refer to the diagram at the end of this section for an explanation of the ALARM LIST Display.

Depressing the SELECT DISPLAY button will reveal the previous alarm condition(s), as well as the remaining available alarm placeholders for alarms. To EXIT the ALARM LIST, perform the following:

⇦	BEGIN ALARMS	Depressing the BLANK or ⇦ button (located above the SET button) returns the controller to the top of the ALARM LIST.
⇦	ALARM LIST PRESS ENTER	Depressing the BLANK or ⇦ button again returns the controller to the CUSTOMER MODE.

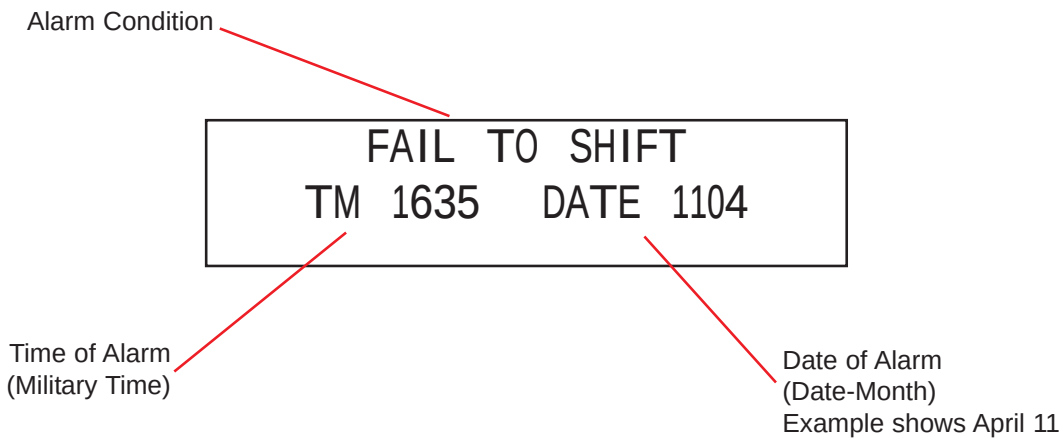


Figure 3 - Alarm Screen Details

8.0 TECHNICIAN MODE

The DPC provides a protected TECHNICIAN MODE to manipulate several parameters not accessible by the casual operator. Below is a list of parameters that can be accessed and manipulated by the technician in the TECHNICIAN MODE:

Parameter	Display	Set Point
BIMODE OPERATION	OPMODE	HTLS, HEATED
HEATER TEMPERATURE	SET HTR TEMP	300 - 425
SELECTDRY SETTING (HEATLESS MODE ONLY)	SELECTDRY	-40, -4, +38
MOISTURE LOAD CONTROL (OPTIONAL)	MOISTURE LOAD CONTROL	OFF , ON
MOISTURE LOAD CONTROL SETPOINT (OPTIONAL)	MLC SET POINT	-76 - +68
POWER SAVER	POWER SAVER	OFF , ON
RESTART MODE	RESTART	LAST, ZERO
EXTENDED HEATING	EXTENDED HEATING	OFF , ON
PURGEMIZER SETTING (HEATLESS MODE ONLY)	PURGEMIZER	30% - 100%
HIGH HUMIDITY ALARM ACTIVATION (OPTIONAL)	HIHUMID	OFF , ON
HIGH HUMIDITY SETPOINT (OPTIONAL) *	HIHUMID SETPOINT	-76 - +68

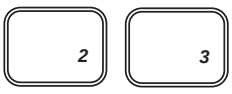
* NOTE: Setpoints indicated are adjustable ONLY when dryer is equipped with the Moisture Load Control / Dew Point Display option. Setpoints are non-adjustable on dryers without this option

8.1 ENTERING TECHNICIAN MODE

WARNING

TECHNICIAN MODE should only be entered by qualified service personnel. Altering the set points in TECHNICIAN MODE will have a significant effect on the operation of the dryer. Incorrect set points may damage dryer and cause potential serious injury.

To enter the TECHNICIAN MODE, perform the following keystrokes:



BEGIN
TECHNICIAN MODE

Pressing the “2” and “3” buttons simultaneously enters the TECHNICIAN MODE.

SET OPMODE
HEATLESS

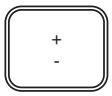
Depressing SELECT DISPLAY scrolls through the available parameters.

8.2 OPERATING MODE (BI-MODE)

As described in SECTION 6, Eclipse ZHA Heat Reactivated Dryers come standard with the Bi-Mode feature, permitting the dryer to operate in a heated purge mode as well as a heatless pressure swing mode. To change the operation mode of the dryer, perform the following keystrokes:

SET OPMODE
HEATED PURGE

Depress the SELECT DISPLAY button until the SET OPERATION MODE screen is displayed.



SET OPMODE
HEATLESS

Depress the +/- button until the desired operating mode is displayed. Pressing SELECT DISPLAY saves the current selection.

NOTICE

The DPC™ Controller must be in the OFF position prior to changing the mode (heated purge / heatless) of the dryer. After the change is made and the DPC™ is subsequently turned ON, the dryer will be in the new mode of operation.

CAUTION

Any time the dryer is switched between two operating modes, care must be taken to ensure the purge adjustment valve is adjusted correctly. Refer to the specification sheet in this manual for proper gauge setting.

8.3 SelectDry™ (-40°F Dryers Only, Heatless Mode Only)

When the ZHA dryer is in the heatless operating mode, the SelectDry™ allows the user to select between -40°F, -4°F and +38°F pressure dew points. Selecting a higher (wetter) pressure dew point lengthens the drying cycle, making the regeneration process commence less frequently than at lower (dryer) dew points. This results in energy savings by depressurizing the system less times per hour. The chart below describes the available outlet pressure dew points that may be selected along with their respective cycle times.

ISO 8573.1 Class	Pressure Dew Point		Cycle Length	Regenerations per hour
2	-40 °F	-40 °C	10 min	12
3	-4 °F	-20 °C	16 min	7.5
4	+38 °F	+3 °C	24 min	5

The following illustrates the method of accessing and adjusting the SelectDry™ feature

SELECTDRY DEW PT
-40°F (-40°C)

Depress the SELECT DISPLAY button until the SELECTDRY screen is displayed.

SELECTDRY DEW PT
-4°F (-20°C)

Depress the +/- button until the desired dew point is displayed. Pressing SELECT DISPLAY saves the current selection.

8.4 HEATER TEMPERATURE SETPOINT (Heated Purge Mode Only)

The DPC™Controller permits the user to adjust the temperature of the heater, thereby altering the regeneration temperature in the heated purge mode.

WARNING

The user is advised to only alter the regeneration temperature after being instructed to do so by ZEKS factory personnel. Improper or inappropriate manipulation of the heater temperature can result in degraded dryer performance, equipment damage and serious injury. Notify ZEKS Compressed Air Solutions prior to altering the heater temperature.

The following illustrates the method of adjusting the setpoint for the heater temperature:

SELECT DISPLAY	SET HTR TEMP 375°F (190°C)	Depress the SELECT DISPLAY button until the HEATER TEMPERATURE SET POINT screen is displayed.
SET	HTR TEMP SET 375°F (190°C)	Pressing the SET button permits the value of the HEATER TEMPERATURE SETPOINT to be changed
3	HTR TEMP SET 3__°F (190°C)	Use the numbers on the keypad to enter the desired value for the HEATER TEMPERATURE setpoint.
8	HTR TEMP SET 38_°F (190°C)	Use the numbers on the keypad to enter the desired value for the HEATER TEMPERATURE setpoint.
0	HTR TEMP SET 380°F (190°C)	Use the numbers on the keypad to enter the desired value for the HEATER TEMPERATURE setpoint.
ENTER	SET HTR TEMP 380°F (193°C)	Depressing ENTER saves the selected set point.

8.5 PurgeMizer™ (Heatless Mode Only, -40°F Dryers Only)

In the heatless pressure swing mode, the PurgeMizer™ feature allows the user to reduce the duration of the purge cycle to more closely match the inlet conditions to the dryer. This feature is well suited for applications where the dryer is consistently under-flowed, allowing only the required amount of purge air to be used. The PurgeMizer feature allows the user to select the relative duration of the purge cycle, from 30% - 100%, in 10% increments.

The following illustrates the method of accessing and adjusting the PurgeMizer™ feature

SELECT DISPLAY	PURGE MIZER % PRG SELECT 100	Depress the SELECT DISPLAY button until the PURGE MIZER screen is displayed.
+ -	PURGE MIZER % PRG SELECT 70	Depress the +/- button until the desired percent purge is displayed. Pressing SELECT DISPLAY saves the current selection.

NOTICE

On dryers equipped with the optional Moisture Load Control feature, the PurgeMizer™ MUST be set to 100% in order for the Moisture Load Control to operate properly.

8.6 MOISTURE LOAD CONTROL / DEW POINT DISPLAY (Optional)

The Moisture Load Control / Dew Point Display option includes a dew point sensor that transmits the outlet pressure dew point to the DPC™ Controller. The DPC™ Controller displays the outlet pressure dew point in real-time. This option package also includes Moisture Load Control, an energy savings feature that matches moisture loading and regeneration energy usage. Drying equipment is typically operated below full flow rating and/or below maximum water loading capacity of the desiccant bed. The Moisture Load Control feature utilizes the data communicated from the dew point sensor and extends the normal timed switching sequence in proportion to the moisture loading on the dryer.

When the Moisture Load Control feature is turned off, all switching sequences occur as described in SECTION 6.7. When the Moisture Load Control feature is activated, the drying sequence is governed by the outlet pressure dew point as measured by the dew point sensor. When the sampled outlet dew point registers below the customer set point (-43°F default for -40°F dryers; -102°F on -100°F dryers), an immediate change in dryer operation will not be noticeable. The dryer will continue its normal regeneration process through tower re-pressurization. Once the tower is re-pressurized, both towers will be at line pressure but air will only flow through the tower indicated by the DynOptic™ Panel. Tower switch over sequence is delayed until the dew point elevates above the Moisture Load Control setpoint, at which point tower switch over will occur.

NOTICE

New desiccant has a moisture holding capacity higher than the dryer's design regeneration capacity. The desiccant ages in a three- to six- month time period at which point it stabilizes to an "aged" state. During this aging process at initial start-up or after desiccant replacement, the Moisture Load Control feature should be deactivated.

8.6.1 Enabling / Disabling Moisture Load Control

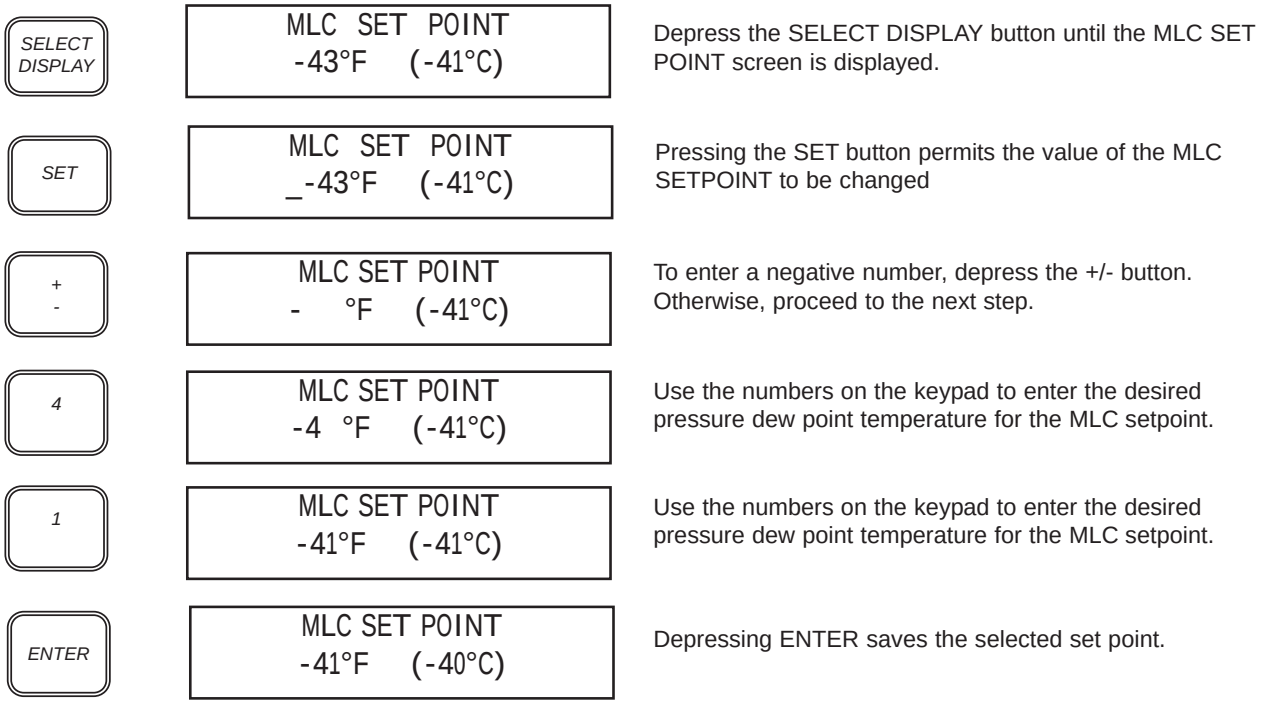
The following illustrates the method of accessing and adjusting the Moisture Load Control feature:

SELECT DISPLAY	MOISTURE LOAD CONTROL: OFF	Depress the SELECT DISPLAY button until the MOISTURE LOAD CONTROL screen is displayed.
+ / -	MOISTURE LOAD CONTROL: ON	Depress the +/- button until the desired set point is displayed. Pressing SELECT DISPLAY saves the current selection.

8.6.2 Set Point Adjustment

On dryers equipped with the optional Digital Dew Point Display, the Moisture Load Control setpoint can be adjusted to match the dryers requirements to the desired pressure dew point. Note that on dryers equipped with Moisture Load Control but not the Digital Dew Point Display, manipulating these values will have no effect on Moisture Load Control operation.

The following illustrates the method of adjusting the setpoint for the Moisture Load Control feature:



NOTICE

The Moisture Load Control set point should not be lower (wetter) than the SelectDry setting. Failure to do so will prevent the Moisture Load control feature from operating. In addition, when operating in Moisture Load Control, the PurgeMizer™ should be set to 100%.

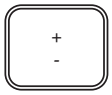
8.7 POWER SAVER (OPTIONAL, HEATED PURGE MODE)

On dryers equipped with Power Saver, the temperature of the purge exhaust is monitored and displayed on the DPC™ Controller. After a tower switch-over, and at the beginning of tower regeneration, the purge exhaust temperature will be relatively low (normally 90°F - 110°F). The purge exhaust temperature will increase as desiccant regeneration progresses. As nearly all of the previously adsorbed moisture is driven off of the desiccant, the exhaust temperature will begin to rise. The timing for the temperature change will vary depending on moisture loading on the towers. When the purge exhaust temperature reaches 195°F, which indicates that the desiccant heating is complete, the DPC™ Controller will remove power to the heater. Once the heater is turned off, the tower cool down process begins and continues for 57 minutes. Purge air will continue to exhaust and the exhaust air temperature will continue to rise (250°F is not uncommon) as it removes the heat from the regenerated desiccant material. As the cool down progresses, the exhaust temperature will begin to decrease. After cooling, the Purge Valves close and the optional Repressurization Valve (if equipped) opens. The off-line tower remains pressurized until the tower switchover sequence is initiated. Activation of the Power Saver feature is via the DPC™ Controller.

The following illustrates the method of accessing and activating the Power Saver feature:

POWER SAVER:
OFF

Depress the SELECT DISPLAY button until the POWER SAVER screen is displayed.



POWER SAVER:
ON

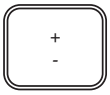
Depress the +/- button until the desired set point is displayed. Pressing SELECT DISPLAY saves the current selection.

8.8 RESTART MODE

ZEKS' Eclipse™ dryers can be configured to restart in one of two operating modes. As described in SECTION 6.8, the dryer may be configured for Manual operation (factory default) or Auto Restart, which permits the dryer to operate automatically once power is re-applied to the dryer after a power failure. The following illustrates the method of accessing and adjusting the different start modes for the dryer:

RESTART:
ZERO

Depress the SELECT DISPLAY button until the START MODE screen is displayed.



RESTART:
LAST

To change the start mode from its current selection to the alternate setting, depress the +/- button until the desired set point is displayed. Pressing SELECT DISPLAY saves the current selection.

NOTICE

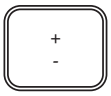
The restart modes will only affect restarting should power be unexpectedly removed from the dryer. After proper shut down, the dryer will require the user to depress the ON button to initiate the operation of the dryer program.

8.9 EXTENDED HEATING (OPTIONAL)

On dryers equipped with both the Moisture Load Control option as well as Power Saver, the dryer may be operated in an extended heating mode. In this mode, the heating cycle is extended while the Moisture Load Control function prolongs the drying cycle. This feature is particularly useful when operating the dryer with new desiccant. As described earlier in this manual, new desiccant has the ability to adsorb more moisture than the dryer can desorb in a fixed regeneration cycle. With the Extended Heating operation, the Moisture Load Control feature can be used immediately without the need to age the desiccant. This feature is provided only when the dryer is equipped with both the Moisture Load Control and Power Saver options. To enable the Extended Heating mode, perform the following keystrokes:

EXTENDED HEATING OFF

Depress the SELECT DISPLAY button until the EXTENDED HEATING screen is displayed.



EXTENDED HEATING ON

Depress the +/- button until the desired set point is displayed. Pressing SELECT DISPLAY saves the current selection.

8.10 HIGH HUMIDITY ALARM (OPTIONAL)

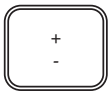
8.10.1 Description and Activation

As described in SECTION 7.5, the High Humidity Alarm can be configured in two ways. Without the Moisture Load Control / Dew Point Display option, the High Humidity Alarm is triggered by a humidistat. When the dryer is equipped with the optional Moisture Load Control / Dew Point Display feature, the dew point sensor transmits the dew point to the DPC™. Should the outlet pressure dew point exceed the customer specified set point, High Humidity Alarm will activate.

The following illustrates the method of activating the High Humidity Alarm feature:

HIHUMID ALARM
OFF

Depress the SELECT DISPLAY button until the HIGH HUMIDITY screen is displayed.



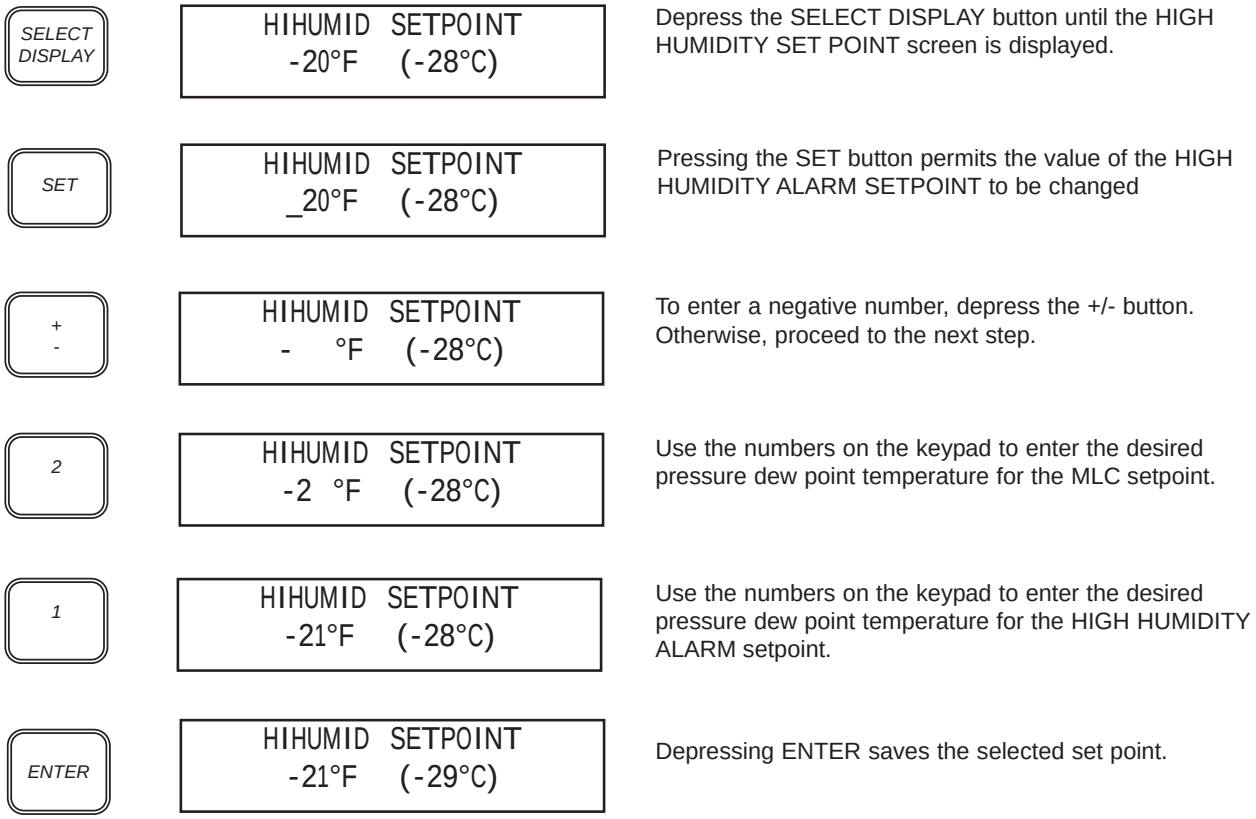
HIHUMID ALARM
ON

Depress the +/- button until the desired set point is displayed. Pressing SELECT DISPLAY saves the current selection.

8.10.2 Setpoint Adjustment

On dryers equipped with the optional Moisture Load Control / Dew Point Display, the High Humidity Alarm setpoint can be adjusted as follows. Note that on dryers equipped with the High Humidity Alarm but not the Digital Dew Point Display, manipulating these values will have no effect on the High Humidity Alarm operation.

The following illustrates the method of adjusting the setpoint for the High Humidity Alarm feature:



NOTICE

The High Humidity Alarm set point should not be greater than the Moisture Load Control set point. Failure to do so will result in an alarm indication. ZEKS recommends setting the High Humidity Alarm at least 10°F wetter than the Moisture Load Control setpoints.

8.11 PROGRAM JOG

All Eclipse heated purge and blower purge dryers come equipped with a Program Jog feature that is accessible via the DPC™ Controller. This feature allows the dryer cycle to be accelerated for troubleshooting and routine inspection purposes. By accessing the Program Jog routine in the DPC™, the customer can advance the program to the next program step. Note that the program advance feature will not advance through all steps of the program

WARNING

When the Program Jog is initiated in the middle of the heating cycle, advancing the program without allowing normal tower cool down will result in an outlet air temperature that may exceed 300°F. As such, proper precautions must be taken to protect downstream equipment from high temperature exposure.

NOTICE

During the Program Jog routine, the display may show intermediate steps in the program that are not active in the current program set up. This should be considered normal operation.

The DPC™ Controller will only permit the jog function during specific stages of the program. Should the program be at a stage where the program can not advance, the following will be displayed:


```
JOG:      WAIT
STEP 4 TIME   0
```

Depress the SELECT DISPLAY button until the JOG MODE display appears. The WAIT prompt will appear should the program not be able to advance at this stage.

Should the program be at a stage whereby the DPC™ permits the jog feature, the following will be displayed:

```
JOG: ENT TO JOG
STEP 6 TIME10699
```

Depress the SELECT DISPLAY button until the JOG MODE display appears. The PRESS ENTER prompt will appear, along with the current step and remaining time, should the program be able to advance at this stage.


```
JOG: ENT TO JOG
STEP 8 TIME00550
```

Depressing the ENTER button advances the program to the next step. The display will indicate the next step has been initiated.

NOTICE

The Program Jog advances steps #6, #8, #20 & #22, which are the longest program steps. The balance of the steps are not advanced in Program Jog Mode.

NOTICE

To exit the TECHNICIAN MODE, press the “+ / -” key to the initial “SET OPMODE” screen and depress the “BLANK” (or ⇦) button located above the SET button, to return to the CUSTOMER MODE.

9. INSTALLATION AND START-UP

9.1 APPLICATION AND CHECK ANALYSIS

ZEKS ECLIPSE Regenerative air dryers are shipped complete with desiccant up to and including model 2000ZHA. On larger units, the desiccant is packaged separately for ease in handling. Refer to SECTION 10.6 for desiccant fill procedures.

To achieve the best dryer performance, carefully check that the design and installation requirements outlined below are satisfied.

ZEKS dryers are available with an operating range from 75 - 150 PSIG. Air available for your usage will vary with operating pressure. The maximum design pressure of the standard Eclipse Dryers is 150 PSIG. For units that require higher operating pressures, consult your ZEKS representative.

Dryers are sized according to flow and pressure drop, not pipe size. The difference between the inlet and the outlet flow is the amount of purge air required. This air is exhausted to atmosphere and is not available for use downstream. Make certain air supply to dryer meets air demand plus purge air requirements.

NOTICE

The standard dryer is not rated for any gas other than air.

NOTICE

ZEKS recommends that the mufflers be cleaned after initial start-up to remove any desiccant dust generated during shipment. After running dryer for initial 30 minute period, de-energize / depressurize dryer and remove mufflers. Disassemble and clean the removable insert inside the muffler core. Reinstall mufflers prior to operating dryer.

9.2 LOCATING AND MOUNTING

The dryer must never be installed where process air and/or ambient temperature exceeds 120°F or drops below 50°F. Locate dryer to avoid extremes of heat and cold from ambient or other conditions. If the dryer is exposed to ambient conditions below 50°F, dryer must be equipped with provisions for low ambient operation. Where applicable, dryer towers may be insulated to reduce heat loses. Avoid locating dryer outside or where it is exposed to the elements.

The dryer, or any air system component, must be located to avoid exposure to pulsation in the compressed air as well as possible surges due to fluctuating demand. In addition, care must be used to minimize exposure to vibration transmitted through mounting pads or piping.

Provide adequate space around the dryer for normal maintenance requirements and service.

If the dryer is shipped with the desiccant packaged separately, install the desiccant after locating and mounting. Desiccant has been provided separately to minimize handling difficulty and placing unnecessary stress on the dryer assembly.

Bolt the dryer to the foundation using the bolt holes provided in the base frame. Anchor bolts should project a minimum of 3.5 inches above the foundation and allow proper nut and washer assembly.

9.3 PIPING

Pipe the compressed air lines to the inlet and outlet connections. Locate the prefilters as close as possible to the dryer. Ensure the positioning allows for ease of servicing.

Note that the wet air inlet is located at the dryer's upper manifold and the dry outlet air is located at dryer's lower manifold. In situations where air supply is required 24 hours a day (it is undesirable to interrupt the airflow), a three-valve bypass system is recommended to bypass the dryer. To keep pressure drop at a minimum, use the fewest elbows necessary.

Once all piping has been connected all joints, including those on the dryer, should be soap bubble tested at line pressure to ensure no joints have been damaged in transit and site placement.

9.4 FILTRATION

It is important that a prefilter and an afterfilter be provided in your dryer installation.

NOTICE

All dryers must have proper filtration. Liquid water and oil must be removed before the air enters the dryer. Ensure separators, prefilters and drains are in good working order. Failure to do so will void warranty.

It is recommended that a mechanical separator be installed immediately preceding the prefilter to remove the bulk liquid and entrained water.

Coalescing prefilters, located before the dryer, protect desiccant beds from contamination by oil, entrained water, pipe scale, etc., thereby, extending dryer desiccant life. Locate prefilters as close to dryer as possible.

Afterfilters, located after the dryer, help eliminate the possibility of desiccant dusting carrying over into the air system.

WARNING

High temperature filters must be used to prevent rupture possibility in the event dryer failure should occur. Consult your ZEKS representative for appropriate filter selection.

9.5 ELECTRICAL CONNECTION

Refer to wiring diagram for all electrical connections. Electrical connection must be hard piped with an external fused disconnect switch with proper overload protection.

Size field connection knock-out for the conduit fitting required by the NEC.

Service wires must be sized according to the minimum circuit ampacity shown on the dryer serial nameplate and the requirements of the NEC.

The power connections are marked L1, L2 and L3.

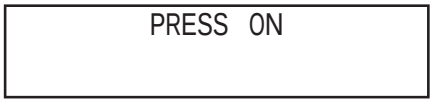
> ***NOTICE***
>
> Dryer must be grounded with the full sized ground wire connected to an earth ground.

9.6 START-UP

> ***NOTICE***
>
> Initial dryer start-up must be in the Heated Purge Mode

- With dryer de-energized, slowly pressurize the dryer. When the dryer reaches full operating pressure, check the system for air leaks. Soap test all joints and fitting. To maintain desired dew point, any leaks detected must be repaired, especially those on the outlet side of the dryer.

- Turn on dryer disconnect switch to apply power to the dryer.



Once power is applied to the dryer and after a brief initialization sequence, the PRESS ON prompt will be displayed.

- Verify all actuated valves are in their failsafe position.

- Using a voltmeter, check the power connections for the correct voltage shown on the dryer serial nameplate

- Close and secure all electrical panel covers.

- Ensure that the purge adjustment valve is in the open position.

Depress the ON button to initiate the dryer program. The DPC™ Controller will display the first CUSTOMER MODE screen

- The sequence will initiate proper Inlet and Purge Valve positioning and tower depressurization.

- If the dryer has been in storage or off for an extended period of time, the Blue Moisture Indicator (BMI) may be gray, the High Humidity Alarm (if equipped) may be activated and the Dew Point Display (if equipped) may indicate a high dew point. Depending upon the duration of idle time, it may take anywhere from one to twelve hours for the alarm to deactivate, the BMI to return to its normal blue state and the dew point to drop.

- For dryers equipped with Moisture Load Control, refer to SECTION 8.6 regarding the use of this option on new equipment.

NOTICE

-100°F dryers require flow through the dryer to lower the pressure dew point to design levels. Failure to permit air flow through the dryer (dead-heading) will result in elevated outlet dew points. Once air is permitted to flow through the dryer, the pressure dew point will gradually reduce to design levels.

9.7 SHUT DOWN PROCEDURES

The following procedures must be followed to properly shut down the Heat Reactivated Dryer to avoid damage to the unit and preserve dryer performance. The dryer requires compressed air to actuate the valves. Removing the compressed air supply prior to shutting down the dryer will result in improper valve positioning. In addition, the dryer must complete a specific Shutdown Sequence prior to being turned off. Should power be removed from the dryer or air pressure removed from the dryer prior to the completion of the Shutdown Sequence, damage to the dryer may occur. Lastly, the inlet valves are configured to open on a loss of power and the purge valves configured to close (fail safe). Should a valve open to a depressurized tower, as would be the case if the dryer were stopped in mid-cycle, a rapid pressurization will occur.

NOTICE

The force of repeated rapid pressurizations will damage the dryer.

NOTICE

On dryers equipped with Moisture Load Control (MLC), merely leaving the unit in MLC without a compressed air supply is not advised, as it is likely that the system pressure will decay over time. Should this occur, the unit will go into a FTS alarm as well as risk misalignment of valves should switchover occur prior to reinstating the air compressor.

CAUTION

Dryer should not be shut down during the heating cycle. Doing so may cause the Heater High Temperature alarm to activate, which will require the user to manually reset the Heater High Temperature safety in the control enclosure. If the dryer must be shut down during the heating cycle, advance the program via the Program Jog function (see SECTION 8.11) to the end of the heating cycle prior to initiating the Shutdown Sequence.

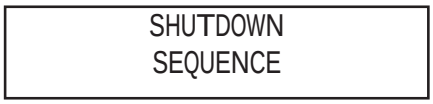
For all Heat Reactivated Dryers that will be routinely shut down and restarted, ZEKS recommends that an isolation valve be installed at the dryer outlet. Upon restarting the dryer, it is likely that the pressure downstream of the dryer will have decayed. When starting the dryer without the valve (or with the valve in the fully open position), the high velocities of the air through the towers could damage the desiccant, as well as provide unprocessed air down stream.

NOTICE

Prior to removing power or compressed air from the dryer, depress the OFF button on the DPC™. This initiates the Shutdown Sequence, which closes the purge valves, repressurizes the off-line tower and opens the flow valves. **DO NOT REMOVE POWER OR COMPRESSED AIR FROM THE DRYER DURING THE SHUTDOWN SEQUENCE.**

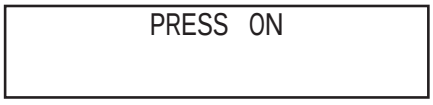
Shut Down Procedure:

- **Maintain a compressed air source to the dryer and a supply of power to the DPC™ Controller.**



Depress the OFF button to initiate the SHUTDOWN SEQUENCE.

- **Permit the dryer to complete the full SHUTDOWN SEQUENCE (30 seconds)**



Once the PRESS ON Prompt is displayed, the dryer has completed the SHUTDOWN SEQUENCE. Power and air may be safely removed from the dryer.

- **De-energize the dryer**
- **Shut down air compressor or bypass dryer**
- **Close Isolation Valves (if equipped)**

NOTE: On the subsequent Start-up, the outlet isolation valve should be in the closed position. Slowly open the valve to build pressure downstream.

10. MAINTENANCE AND SYSTEM CHECK

10.1 SCHEDULED MAINTENANCE

Daily Maintenance Functions:

- Check and record inlet pressure, temperature and flow. Verify that it is within specifications.
- Check tower pressure gauge readings within operating tolerance.
- Check tower pressure gauges for proper dryer cycling.
- Check that prefilter condensate drains are functioning properly
- Verify that pressure in purging tower is 5 PSIG or less.
- Verify that prefilter and afterfilter differential pressure is within operating limits.

Monthly Maintenance Functions:

- Check your operating conditions: inlet flow, inlet pressure, and inlet temperature.
- Check prefilter(s) and afterfilter(s) differential pressure and drains.
- Check dryer cycle and sequence of operations (i.e. drying,depressurizing, regenerating).

Quarterly Maintenance Functions:

- Replace prefilter(s) and afterfilter(s) cartridges.
- Check pilot air filter element and replace as needed.

Semi-Annual Maintenance Functions:

- Check outlet dew point.
- Check amp draw on heater.

Annual Maintenance Functions:

- Check desiccant and replace if necessary.
- Inspect and clean solenoid valves and check valves. Replace worn or damaged seats and parts as required.
- Test lights and switches, replace as necessary.
- Test electrical components, replace as necessary.
- Check and repair any air leaks, loose bolts, flanges and fittings.

Every Two Years:

- Change check valves
- Change control solenoid valves
- Check and change temperature probes

Every Five Years:

- Replace desiccant.

NOTICE

Refer to SECTION 9.7 for the proper way to shut down the Heat Reactivated Dryer.

10.2 PREFILTERS and AFTERFILTERS

Prefilter cartridges must be changed as often as required to prevent contamination of the regenerative dryer's desiccant bed.

Prefilter drains must be checked daily. Failure to drain condensed liquid from the sump of the filter housing will result in carry over and damage to the desiccant material. Afterfilters are used to prevent desiccant dust particulate contamination from migrating downstream into plant processes. Elements should be changed as pressure drop increases to an undesirable level.

NOTICE

Should the drying system be overloaded and/or malfunctioning causing high pressure drop, afterfilters will prematurely plug. This problem can be avoided by frequent inspection and cleaning of cartridges.

10.3 MUFFLER CHANGE-OUT PROCEDURE

- Turn control power off per shutdown procedures described in SECTION 9.7.

WARNING

To avoid injury, depressurize dryer before performing any service

- Once the dryer has been depressurized, replace the muffler.
- Follow normal start-up procedures as described in SECTION 9.

10.4 SOLENOID VALVES

Periodically clean all solenoid valves. Cleaning can be accomplished by removing the solenoid, removing the mufflers and removing the valve bodies from the manifold. Check and replace o-rings as necessary. If the solenoid valves fail to operate, check the following:

- Control Circuit - Verify that the solenoid is receiving electric current.
- Burned out solenoid coil.
- High/Low voltage - Voltage should be +/- 10% of nameplate readings.
- Solenoid valve leaking - Disassemble, clean and repack or replace.

10.5 PILOT OPERATED ACTUATOR

Should the actuator fail to rotate, disconnect the pilot lines to check if the actuator is receiving pilot pressure.

If the actuator is receiving pressure:

- Verify that control pressure is 75 psig min.
- Ensure the inlet valve is not plugged.

10.6 DESICCANT CHANGEOUT PROCEDURE

WARNING

To avoid injury, depressurize dryer before performing any service.

CAUTION

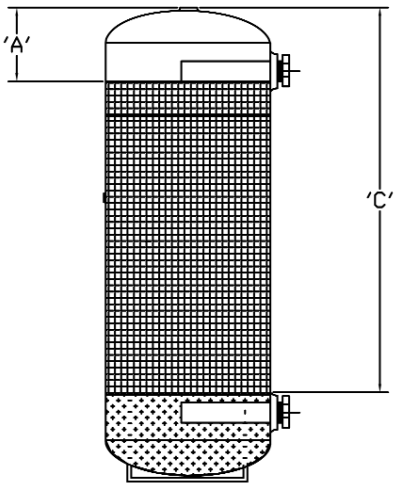
Be sure to wear respiratory protection during the draining and filling process to minimize inhalation of desiccant, as desiccant will produce dust during this procedure.

- Eclipse™ dryers are furnished with fill and drain ports on each desiccant tower. Remove the caps on both ports.
- To assist in getting the desiccant to flow from the tower, insert a small rod in to the drain port as necessary. This may be required as the desiccant is packed into the towers which may interfere with the desiccant flow from the towers.
- Retainer screens, located at the inlet and outlet piping connections of the tower, are removable on all models. It is suggested that these screens be removed and cleaned at the time of desiccant changeout. These screens can be accessed by disconnecting the upper and lower manifolds from the dryer towers.
- After cleaning the retainer screens, replace screens and reattach the outlet port plug.
- With the fill port plug removed, fill the dryer tower with the appropriate grade and size desiccant. The level and grade of the desiccant should be consistent with the Desiccant Fill Chart.

CAUTION

Desiccant quantity, positioning and grades must match the corresponding values in the Desiccant Fill Chart. Failure to do so may result in poor dryer performance.

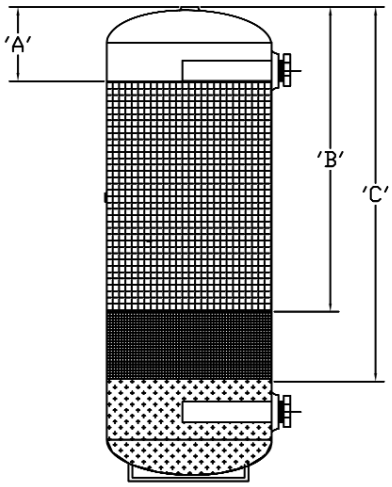
- Once the towers have been filled, replace the fill port plug on each tower.
- Any connections disturbed in the desiccant changeout process should be leak tested prior to re-commissioning the dryer.



ZHA -40 deg F Dryers
ZBA Dryers

Desiccant (4-8 mm) # 698350

Desiccant (2-5 mm) # 699279



ZHA -100 deg F Dryers

Desiccant (4-8 mm) # 698350

Desiccant (2-5 mm) # 699279

Mol Sieve # 631259

ZHA / ZBA Dryers

Model No	'A'	'B'	'C'
150ZHA/ZBA	7.00"	37.75"	52.25"
200ZHA/ZBA	9.00"	36.75"	51.00"
250ZHA/ZBA	16.00"	40.12"	52.25"
300ZHA/ZBA	8.00"	35.00"	51.25"
400ZHA/ZBA	24.00"	50.37"	64.38"
500ZHA/ZBA	14.00"	45.50"	62.75"

Model No	'A'	'B'	'C'
600ZHA/ZBA	30.00"	59.75"	75.50"
800ZHA/ZBA	10.00"	55.75"	75.50"
1000ZHA/ZBA	19.50"	52.50"	69.50"
1200ZHA/ZBA	14.50"	50.25"	69.50"
1500ZHA/ZBA	28.00"	63.00"	78.50"
1800ZHA/ZBA	17.00"	60.00"	78.50"
2100ZHA/ZBA	10.00"	60.00"	78.50"
3000ZHA/ZBA	7.75"	53.75"	81.00"
4000ZHA/ZBA	9.00"	47.50"	74.50"
5000ZHA/ZBA	6.00"	49.00"	79.00"
6000ZHA/ZBA	9.00"	54.00"	*74.25"
8000ZHA/ZBA	6.50"	55.00"	*76.75"

* Fill to top of Distribution Plate

DESICCANT FILL CHART

MODEL	3/16" (4MM-8MM) ACTIVATED ALUMINA (LB)	1/8" (2MM-5MM) ACTIVATED ALUMINA (LB)
150	52	184
200	78	266
250	100	298
300	111	359
400	160	444
500	178	570
600	86	922
800	86	1,184
1000	142	1,258
1200	142	1,464
1500	266	1,934
1800	266	2,334
2100	266	2,662
3000	572	3,654
4000	720	4,418
5000	896	6,304
6000	1,100	7,540
8000	1,400	10,120

11. TROUBLESHOOTING

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Elevated dew point	Insufficient purge rate	Check purge flow settings. Check purge piping for obstruction. Clean purge piping and muffler.
	Inlet air/gas pressure below design condition.	Check pressure source.
	Flow rate higher than design condition.	Check flow rate and cause for increased demand.
	Inlet temperature above design condition.	Check aftercooler, clean and service as necessary.
	Entrained water entering desiccant bed.	Check air/moisture separator and prefilter. Replace dryer desiccant if necessary.
	Desiccant contaminated by oil.	Install suitable prefilter. Replace dryer desiccant.
Excessive pressure drop in dryer	Excessive flow rate.	Check flow rate and cause for increased air demand.
	Inlet pressure below design condition.	Check pressure source.
Excessive back pressure in regenerating tower (Above 5 PSIG).	Air is leaking across valve.	Check inlet valve. Verify inlet valve is closed to purging tower (0 PSIG tower).
Excessively high pressure at the purge guage (Heat Reactivated and Heatless Modes)	Improper calibration	Check gauge against tower gauges when in switching sequence. Replace gauge as required.

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Failure to Shift (Switching Failure)	No input power	Check power input.
	Defective solenoid valve	Check solenoid valve.
	No pilot air / Low pilot air pressure	Check pilot air line. Check that control air line filter is clean. Check regulator setpoint.
	Defective pressure switch	Check switch. Open pressure: >65 psig; close pressure: <40 psig
Failure to Shift (Dryer fails to pressurize.)	Faulty purge valve	Check purge valve and its solenoid valve.
		Check that repressurization circuit is sending control signal.
Failure to Shift (Dryer fails to depressurize.)	Purge valve does not open. Purge valve stuck in closed position.	Check solenoid valve. Repair and replace if necessary.
Heater High Temp. Alarm (Heater runs continuously)	Contactor stuck closed.	Replace contactor.
	Defective thermocouple	Replace thermocouple.
	Defective temperature control	Replace temperature control.
Heat High Temp. Alarm (Loss of flow across heater)	Valve switching failure	Contact ZEKS Distributor / Factory

NOTICE

The Heater High Temperature Alarm halts the DPC™ program. Prior to reinstating dryer, note the position of all valves. This is critical in determining the possible cause of the alarm condition.

NOTICE

To reset the Heater High Temperature Alarm, reset the DPC™ Controller using the RESET button and manually reset the Heater High Temperature safety in the control enclosure.