

nano



User Guide

ABP HMI Navigation and Operation

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www.nano-purification.com

nano Aircel ABP System display screen shots and descriptions

(**WARNING:** these screen shots are for quick reference, see manual for safety information, startup, shutdown, and any additional information ... before operation)

Door Device Descriptions:

SYSTEM DISPLAY SCREEN: The display screen provides the operator with various system operation information, alarms, etc. for quick review of dryer system operation ... discussed in the following pages. (Note: The RUNNING/step screens should be the normal displayed screen.)

POWER ON/OFF switch: The POWER on/off switch turns power on to the dryer control system and display (note: display takes a couple of minutes to boot up)

POWER ON green light: The POWER ON light indicates power is turned on to the dryer system... (Note: dryer will not be running if POWER ON light is ON and COMMON ALARM red light ON)

If POWER ON light is ON and the COMMON SHUTDOWN ALARM red light is ON this is an indication the dryer is not running... the SYSTEM on/off may be turned OFF ... or a common shut down alarm has halted dryer operation and operator attention is required.

COMMON SHUTDOWN red light: The COMMON SHUTDOWN red light indicates a shutdown alarm has occurred and halted dryer operation (note: anytime this light is on the dryer will be shutdown)... operator attention is required... also, if the SYSTEM on/off button is not turned ON this alarm will be activated... For the alarm/s that triggered the COMMON SHUTDOWN light, refer to the ALARM STATUS screen to find out what alarm tripped and the read the possible causes and solutions for the alarm in this display screen shot description section and the manual. (Note: The ALARM STATUS screen is accessed from the CONTROL/MAIN MENU screen then press the ALARM STATUS button ... the active alarm/s will be highlighted red)

NORMAL DRYER SYSTEM OPERATION setup: for normal dryer system operation the following should be done: (note: for formal start-up refer to owner's manual... this operation sequence is a quick reference)

1. Make certain all gauge isolation valves, vent valves, instrument valves, pre-filter drain valves, etc., are in the correct positions.
2. Make certain the system has been pressurized to line pressure.
3. The blower intake adjustment valve should have been preset and locked down... slight adjustment might be needed to maintain 400°F. downstream of heater during the heat regeneration cycle.
4. Make certain control air has pressure, set at 100 psi
5. Make certain the dew point sensor valves are setup correctly... the valve upstream of the dew point sensor should be fully open... valve downstream of the sensor should be slightly open until a slight air flow is noticed at the end of the exhaust coil.
6. The 'POWER' ON/OFF switch is 'ON'
7. The "SYSTEM ON" button must be turned "ON"...this is accomplished by pressing the SYSTEM OFF/ON button on the control panel in the MAIN MENU screen.
8. Make certain SERVICE MODE is not active... SERVICE MODE will not be visible or shown on the RUNNING sequence screens when not active ... if SERVICE MODE is shown it means the service routine is active and needs to be placed into normal operation... to deactivate SERVICE MODE from the running/step screens press the SCREEN UNLOCK button until it starts blinking then press the MAIN MENU button... the CONTROL/MAIN menu will be displayed ... next press the SERVICE MENU button... the service screen will appear... then press the DEACTIVATE SERVICE button ... the SERVICE MODE that was seen on each screen will disappear and the Dryer will be in normal operation.

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nano Aircel ABP Screen Shots and Descriptions

9. Check the TEMP SETTINGS in the CONTROL/MAIN menu, by pressing TEMP SETTINGS button and verify all settings are correct as needed.

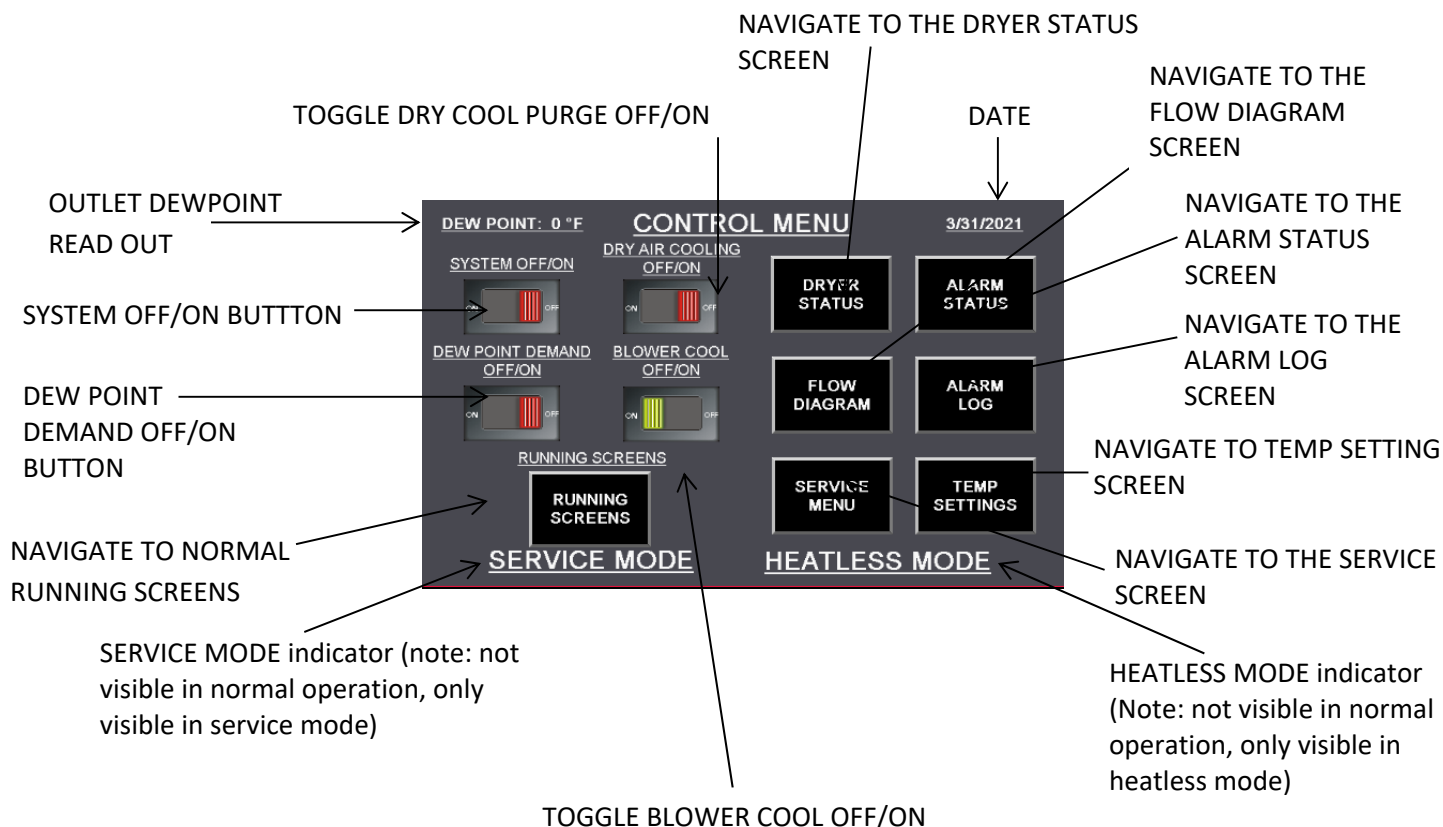
	HEAT CONTROL	400
Normal settings:	DEWPOINT DEMAND	-50
	HIGH HUMIDITY	-10

10. DEWPOINT DEMAND can be turned OFF or ON in the CONTROL/MAIN menu ... push the DEWPOINT DEMAND button 'ON' is energy saving demand mode, the drying period will be extended if below outlet DEWPOINT DEMAND setting in the TEMP SETTINGS screen When the DEWPOINT DEMAND button is pushed 'OFF' is the fixed time mode, the dryer will switch continuously on a standard time cycle mode.
11. DRY COOL PURGE can be turned OFF or ON in the CONTROL/MAIN menu ... push the DRY COOL PURGE button "ON". This will use a portion of the dry air outlet to help cool the regenerating bed and minimize the pressure dew point swing at switchover.
12. BLOWER COOL can be turned OFF or ON in the CONTROL/MAIN menu ... push the BLOWER COOL button "ON". This will initiate the heater sheath cooling process for a total of 8 minutes prior to the DRY COOL PURGE.
13. Typically the RUNNING SCREENS/STEP screens should be the normal screens displayed on the system display when in operation. Other screens can be displayed as the normal operation screen, if needed... such as, the FLOW DIAGRAM screen.
14. Verify no Common Shutdown alarms are active and require attention.
15. The system is ready to go online and dry the process air, make certain any filter, dryer, or user block and bypass valves are in the correct positions.

CONTROL/MAIN MENU SCREEN

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The CONTROL/MAIN MENU screen allows the user some control over system operation; as well as, navigate to the other status and alarm screens.



- **SYSTEM OFF/ON:** Button toggles SYSTEM OFF/ON... ON is system running OFF is system not running
- **DEWPOINT DEMAND OFF/ON:** Button, toggles energy saving mode OFF/ON.... when pushed ON, energy saving mode is enabled... when pushed OFF, energy saving mode is disabled and fixed time cycle mode is enabled, system cycles on a continuous cycle.
- **DRY COOL PURGE OFF/ON:** Button, toggles DRY COOL PURGE OFF/ON...ON is dry air purge from system outlet for vessel cooling...OFF is Blower only cooling which will give a high dew point on switch over

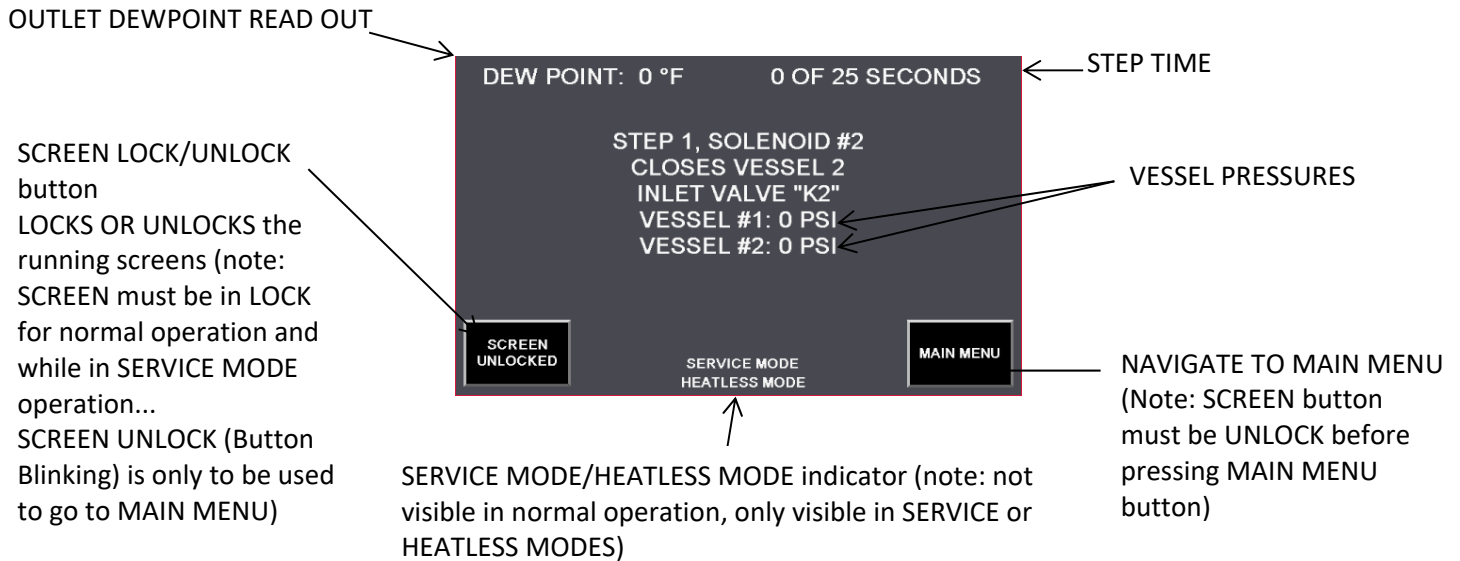
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nano Aircel ABP Screen Shots and Descriptions

- **BLOWER COOL OFF/ON:** Button, toggles BLOWER COOL OFF/ON...ON is blower cooling which draws in atmospheric pressure through the blower in order to cool the heater sheath...OFF will turn both the DRY AIR COOLING and the BLOWER COOL off. **WARNING:** the unit will not cool properly when turned off!
- **RUNNING SCREENS:** Button, navigates to the normal RUNNING screens
- **DRYER STATUS:** Button, navigates to the DRYER STATUS screen
- **FLOW DIAGRAM:** Button, navigates to the FLOW DIAGRAM screen
- **SERVICE MENU:** Button, navigates to the SERVICE MENU screen
- **ALARM STATUS:** Button, navigates to the ALARM STATUS screen
- **ALARM LOG:** Button, navigates to the ALARM LOG screen
- **TEMP SETTINGS:** Button, navigates to the TEMP SETTINGS screen

STEP 1 SELECT VESSEL 2 FOR REGENERATION RUNNING/OPERATION

SCREEN



STEP 1: Vessel 2 is preparing for regeneration. Control system energizes solenoid SOL2, which closes Vessel 2 inlet valve "K2".

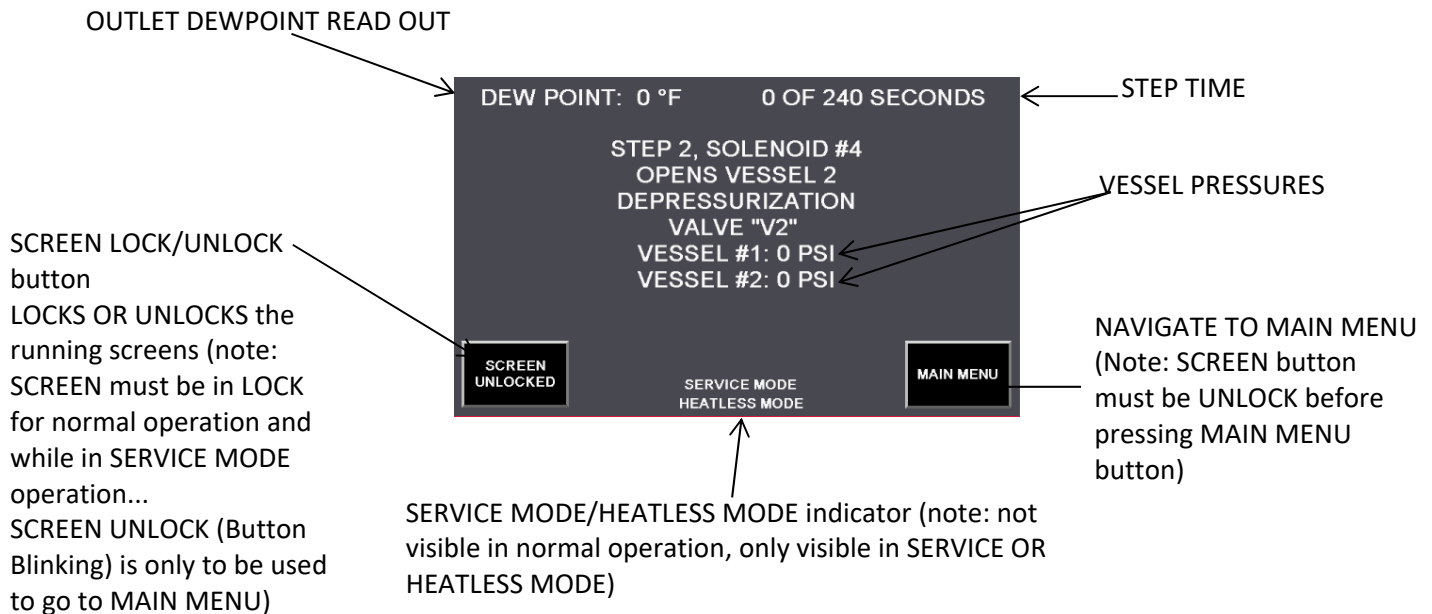
Vessel 1 is drying the inlet air (Vessel 1 inlet valve "K1" should be open and solenoid SOL1 should be energized)... The regeneration valves K3, K4, depressurization valves V1, V2 and re-pressurization valve V3 should all be closed.

The step screens allow the user to view each step of the process. To navigate from this screen, press the **"SCREEN UNLOCK"** button then press the **"MAIN MENU"** button.

If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 2 VESSEL 2 DEPRESSURIZATION RUNNING/OPERATION SCREEN



STEP 2: Vessel 2 is preparing for regeneration ... the PLC control system energizes solenoid SOL4 to open the depressurization valve "V2" which depressurizes Vessel 2. If the pressure in Vessel 2 does not fall below 8 PSI within 240 seconds an alarm will pop up and the system will halt until the problem has been corrected.

Vessel 1 is drying the inlet air (Vessel 1 inlet valve "K1" should be open and solenoid SOL1 should be energized)...inlet valve K2, regeneration valves K3, K4, depressurization valve V1 AND re-pressurization valve V3 should all be closed.

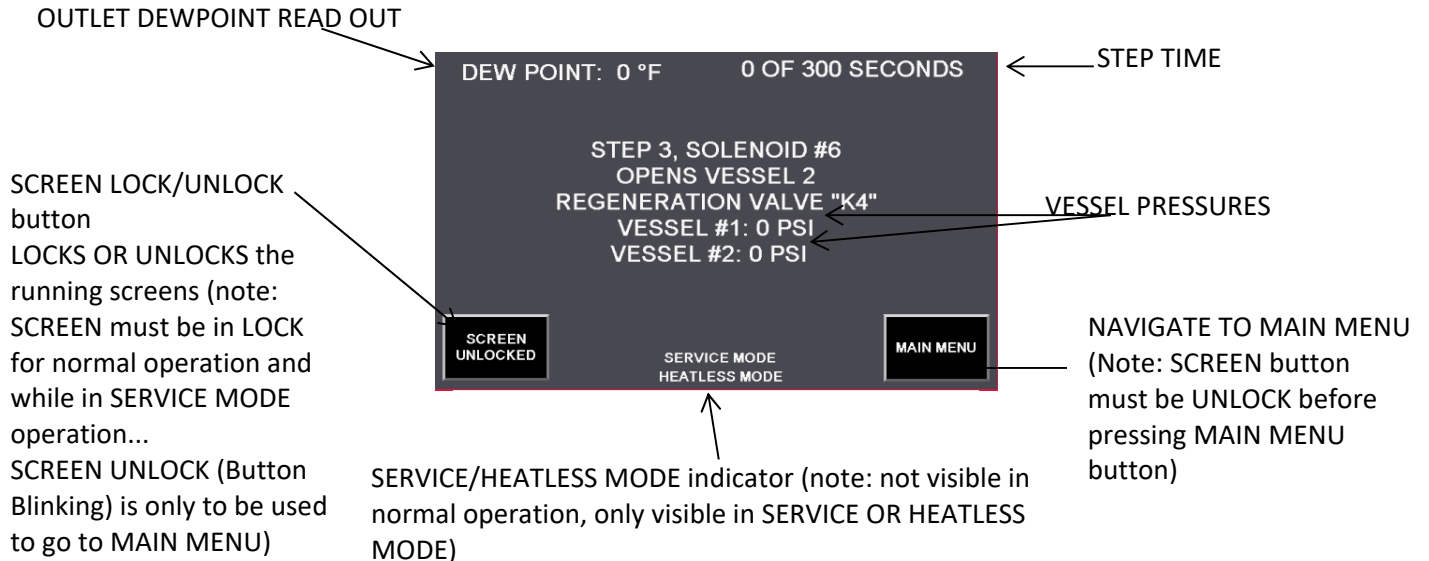
The step screens allow the user to view each step of the process. To navigate from this screen, press the **"SCREEN UNLOCK"** button then press the **"MAIN MENU"** button.

If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(WARNING: if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 3 OPENS VESSEL 2 REGEN VALVES RUNNING/OPERATION

SCREEN



STEP 3: Vessel 2 is preparing for regeneration and Vessel 1 is drying the inlet air ... the PLC control system energizes solenoid SOL6 opening purge exhaust valve K4.

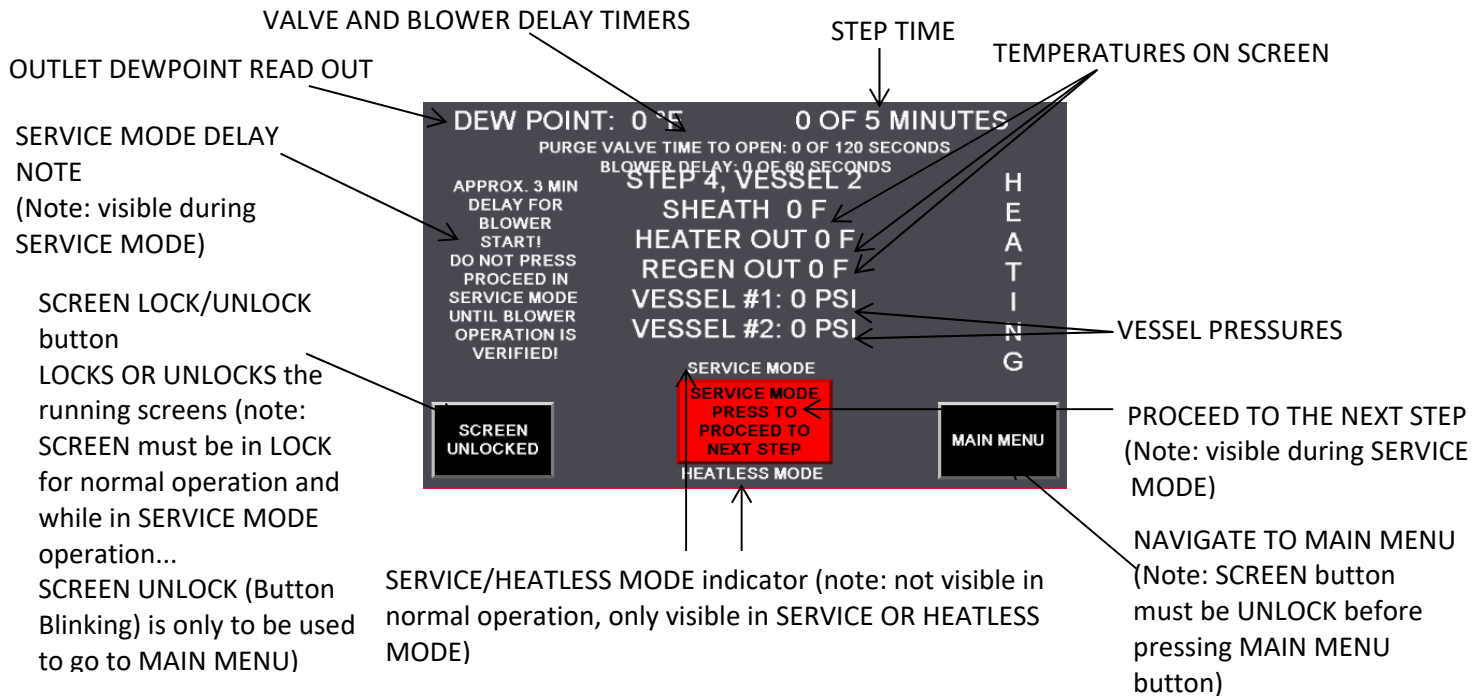
Vessel 1 regen valve K3 and Depressurization valve V1 should all be closed. Depressurization valve V2 and vessel 1 inlet valve K1 should be open.

The step screens allow the user to view each step of the process. To navigate from this screen, press the **"SCREEN UNLOCK"** button then press the **"MAIN MENU"** button.

If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(WARNING: if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 4 VESSEL 2 HEATING RUNNING/OPERATION SCREEN



STEP 4: After a 3 minute delay period ... Vessel 2 will be heat regenerating... blower will be operating and the heater will be energized (Vessel 1 remains on-line drying the inlet air) Vessel 2 pressure should be near zero psi.

The heat regeneration process can operate up to 172 minutes maximum. The heater outlet temperature should operate at a 400°F. constant temperature. The control system will control the heater temperature; however, the blower intake manual valve (or blower discharge on the smaller units) should be adjusted to give the maximum regeneration flow rate and maintain the constant 400°F. heater outlet temperature without the heater cycling ON and OFF.

If the regeneration outlet temperature at the purge exhaust to ambient reaches 200°F during this cycle, the heater will terminate early saving additional energy...the PLC will automatically advance to the next step which is the heater cooling cycle.

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Vessel 1 regen valves K3, Vessel 1 Depress valve V1 and repress valve V3 should all be closed.

Inlet valve K1, regen valve K4 and vessel 2 Depress valve V2 should be open.

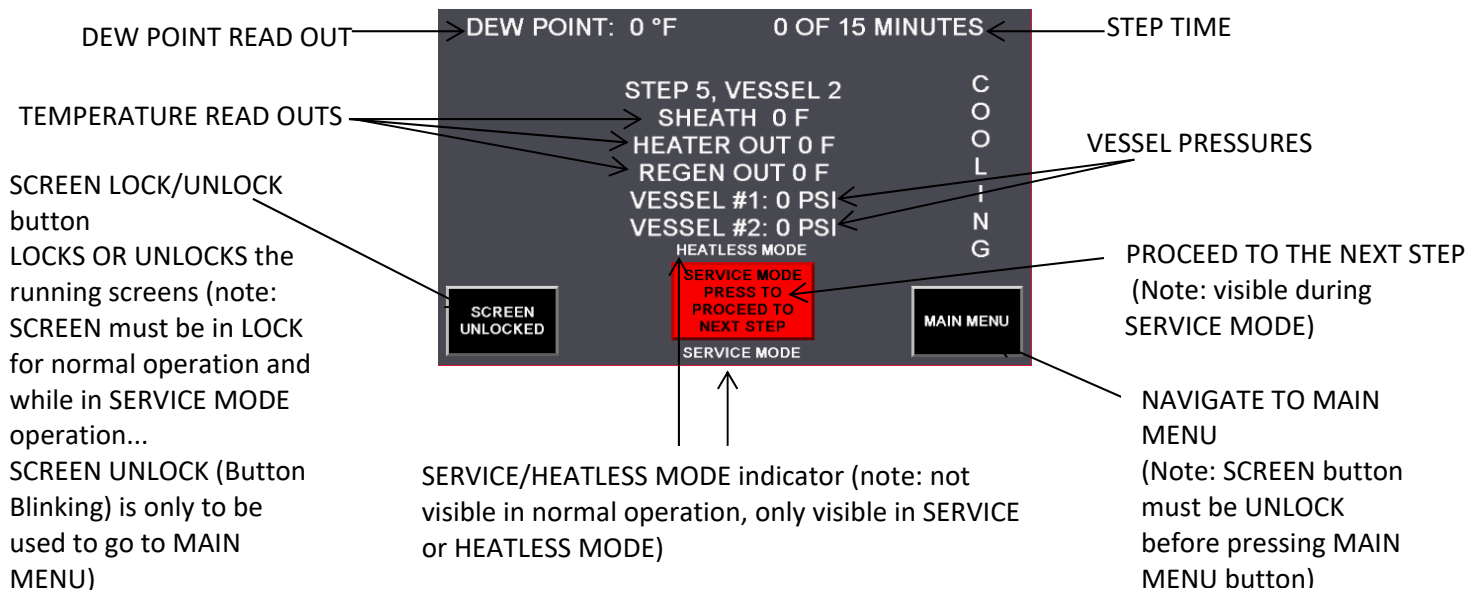
The “**SERVICE MODE PRESS TO PROCEED TO NEXT STEP**” button in red is a service fast cycle button to allow an authorized technician to advance to the next step without waiting for the step to finish. (**WARNING:** this button should not be operated unless authorized by an Aircel Service technician and the valving and operation is verified.)

This screen displays the temperature of the heater sheath, heater outlet and regen outlet ...the heat regeneration time is also displayed.

If in service mode, the “**PROCEED TO NEXT STEP**” will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the “**PROCEED**” button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 5 VESSEL 2 COOLING RUNNING/OPERATION SCREEN



STEP 5: Vessel 2 cooling period, maximum of 53 minutes ... (Vessel 1 is drying inlet air; Vessel 1 inlet valve K1 should be open... Vessel 2 pressure should be near zero psi)... the heater is OFF, blower remains ON for a period of 8 minutes to cool the heater sheath unless dry air cooling is turned off (the blower will remain running the entire 53 minutes). Dry outlet air will then be used to circulate cool air thru the desiccant bed to cool vessel 2 and exhaust out of the regeneration purge outlet valve...the cooling process cycle can operate for up to a period of 53 minutes maximum ... If the regeneration outlet temperature reaches 100°F during this cycle (at the regen outlet thermocouple), the process will terminate early saving additional energy...the PLC will automatically advance to the next step.

In this step ... valves K1, V2 and K4 will be open... valves K2, V1, K3, and V3 will be closed.

The “**SERVICE MODE PRESS TO PROCEED TO NEXT STEP**” button in red is a service fast cycle button to allow an authorized technician to advance to the next step without waiting for the step to finish. (**WARNING:** this button should not be operated unless authorized by a nano Aircel Service technician and the valving and operation is verified.)

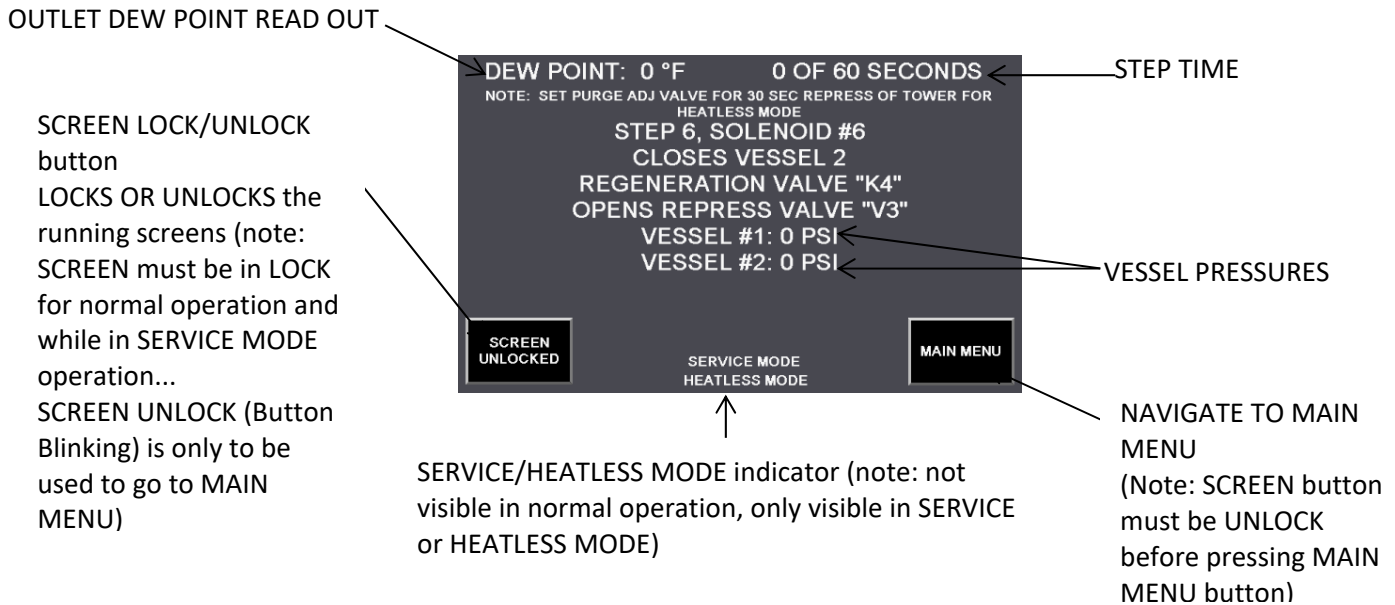
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If in service mode, the **“PROCEED TO NEXT STEP”** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **“PROCEED”** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 6 VESSEL 2 REPRESSURIZATION RUNNING/OPERATION SCREEN



STEP 6: Vessel 2 Re-pressurization ... regen valve K4 and Depress valve V2 will close and the re-pressurization valve V3 will open to slowly pressurize vessel 2 to line pressure (Vessel 1 inlet valve should be open and continuing to dry the process air). The re-pressurization period is 240 seconds (or 4 minutes).

At the end of this step, the PLC looks at the half cycle time and dew point to see if the outlet air pressure dew point is dry enough to extend the drying time saving energy (if the DEWPOINT DEMAND has been selected ON or enabled). If the system has completed a full 4 hours of drying and the dew point is below the -50°F outlet dew point setting, then the system can extend the drying time up to 720 minutes or 12 hours additional time 16 hours total on the vessel, and the **'ENERGY SAVINGS SCREEN'** will be displayed during this time... or if the dew point is above -50°F and the half cycle time is over, the control system will simply go to the next step operation... which is the PARALLEL MODE. If, at any point during the 720 minute extended cycle, the dew point rises above the -50°F set point; the extended drying step will terminate and advance to the next step, which is PARALLEL MODE.

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If in service mode, the **“PROCEED TO NEXT STEP”** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **“PROCEED”** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

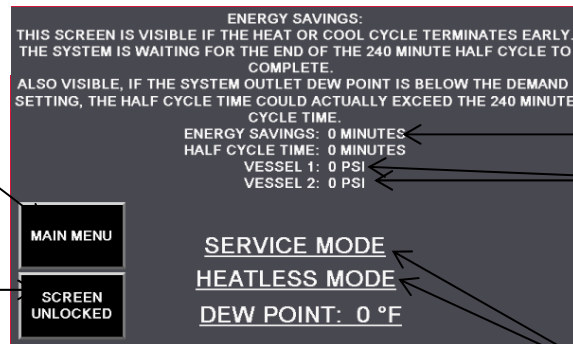
(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

ENERGY SAVINGS SCREEN/WAITING ON HALF CYCLE TO COMPLETE

NAVIGATE TO MAIN MENU
(Note: SCREEN button must be UNLOCK before pressing MAIN MENU button)

SCREEN LOCK/UNLOCK button
LOCKS OR UNLOCKS the running screens (note: SCREEN must be in LOCK for normal operation and while in SERVICE MODE operation...
SCREEN UNLOCK (Button Blinking) is only to be used to go to MAIN MENU)

RUNNING/OPERATION SCREEN



CYCLE TIMES:
ENERGY SAVING TIME
HALF CYCLE TIME
VESSEL PRESSURES

SERVICE/HEATLESS MODE indicator (note: not visible in normal operation, only visible in SERVICE or HEATLESS MODE)

OUTLET DEW POINT READ OUT

ENERGY SAVINGS SCREEN: The energy savings mode screen is shown during the time the system is in an active energy saving mode.

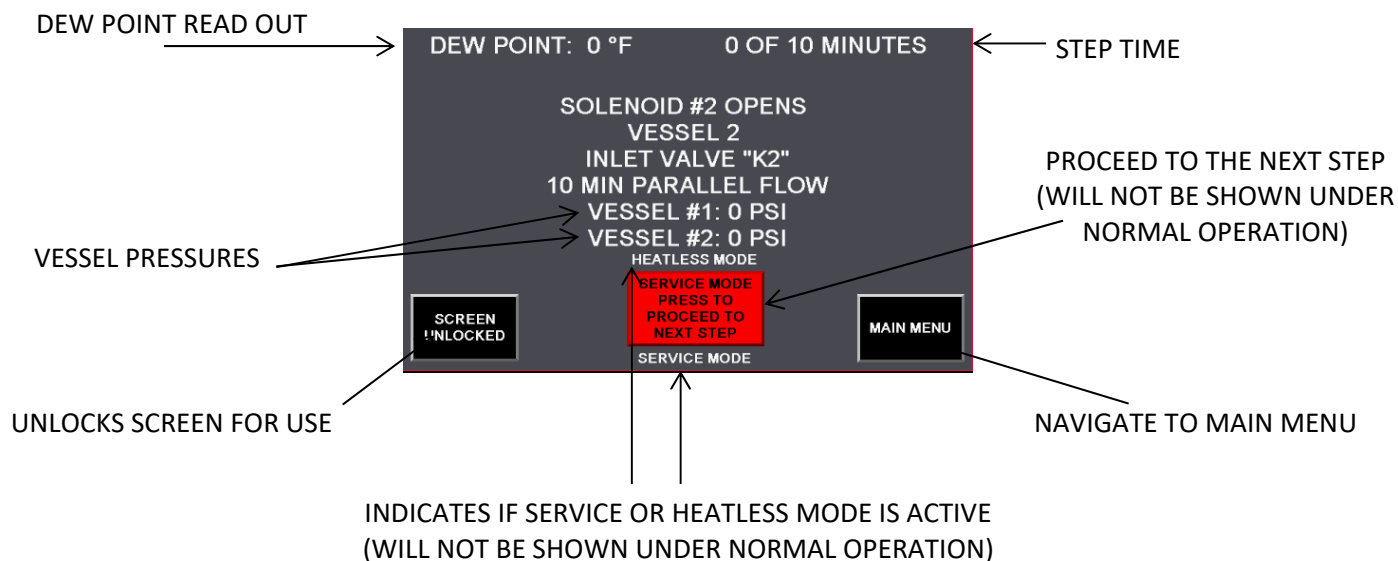
Either waiting on the half cycle time of 240 minutes to complete, if the heating or cooling cycles had terminated earlier than the fixed time cycles during regeneration. Or... waiting on the outlet dew point to reach the set level (of -50°F or higher) with a maximum time limit of 720 minutes of drying time on one vessel while in the energy management mode (which ever happens first).

This display will disappear (advances to next step) ... when the half cycle has timed out and the outlet dew point is not good (above -50°F, such as -48°F)... or when in the energy management mode if the outlet dew point is still below the -50°F setting and the maximum time of 720 minutes has been reached.

This screen will not be visible while the unit is in SERVICE MODE or HEATLESS MODE. If SERVICE MODE or HEATLESS MODE is activated during this step, the unit will advance to the next step (HEATLESS MODE) or the PRESS TO PROCEED BUTTON will appear (SERVICE MODE).

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

PARALLEL FLOW OPERATION SCREEN



PARALLEL VESSEL 2: Parallel flow mode operation is the last step prior to a Vessel switchover to begin drying, it allows the recently regenerated Vessel to further cool down with some of the inlet gas flow since it will be diverted to both vessels (the inlet valves will be open during this process), which helps reduce dew point and temperature spikes after switchover... the parallel flow period is 10 minutes.

IN THIS STEP, Vessel 1 is still the main drying vessel (Vessel 1 Inlet valve K1 should be open)...the control system PLC will energize solenoid SOL 2 to open Vessel 2 inlet valve K2 and de-energize solenoid SOL 7 to close re-pressurization valve V3 to allow parallel flow for 10 minutes. All regen and depress valves are closed during this step and the heater and blower should not be active. At the end of the 10 minute parallel flow, the system will advance to Step 7.

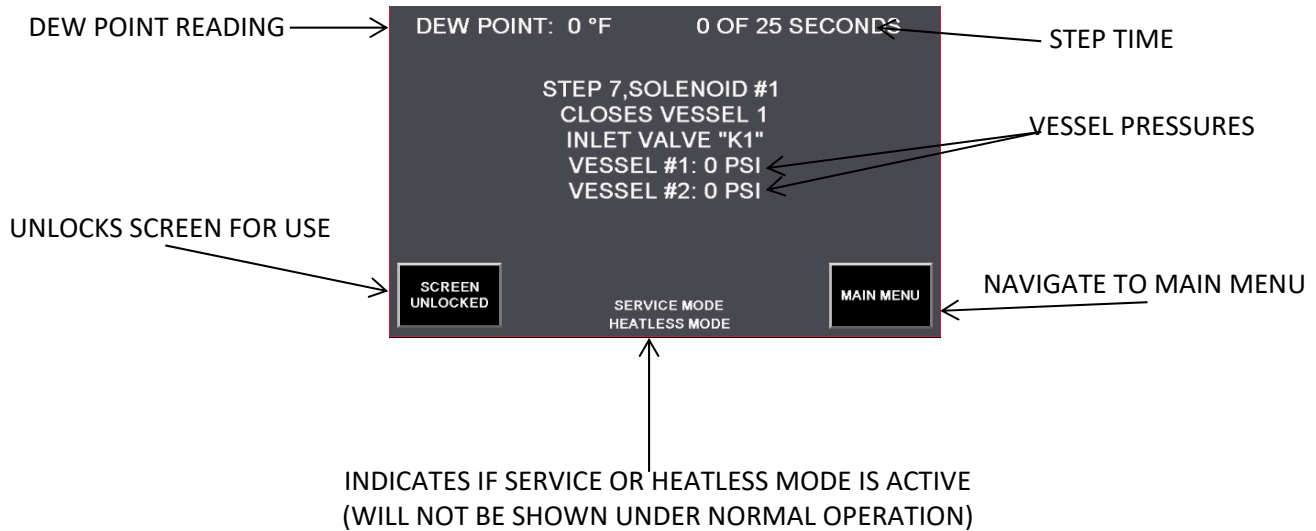
If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

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(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

- **SCREEN UNLOCK/RUNNING SCREENS:** UNLOCKS THE SCREEN FOR NAVIGATION
- **MAIN MENU:** NAVIGATES TO THE MAIN MENU
- **SERVICE MODE PRESS TO PROCEED TO NEXT STEP:** ALLOWS A SERVICE TECHNICIAN TO JUMP TO THE NEXT STEP (this is only visible during the service routine)

STEP 7 OPERATION SCREEN

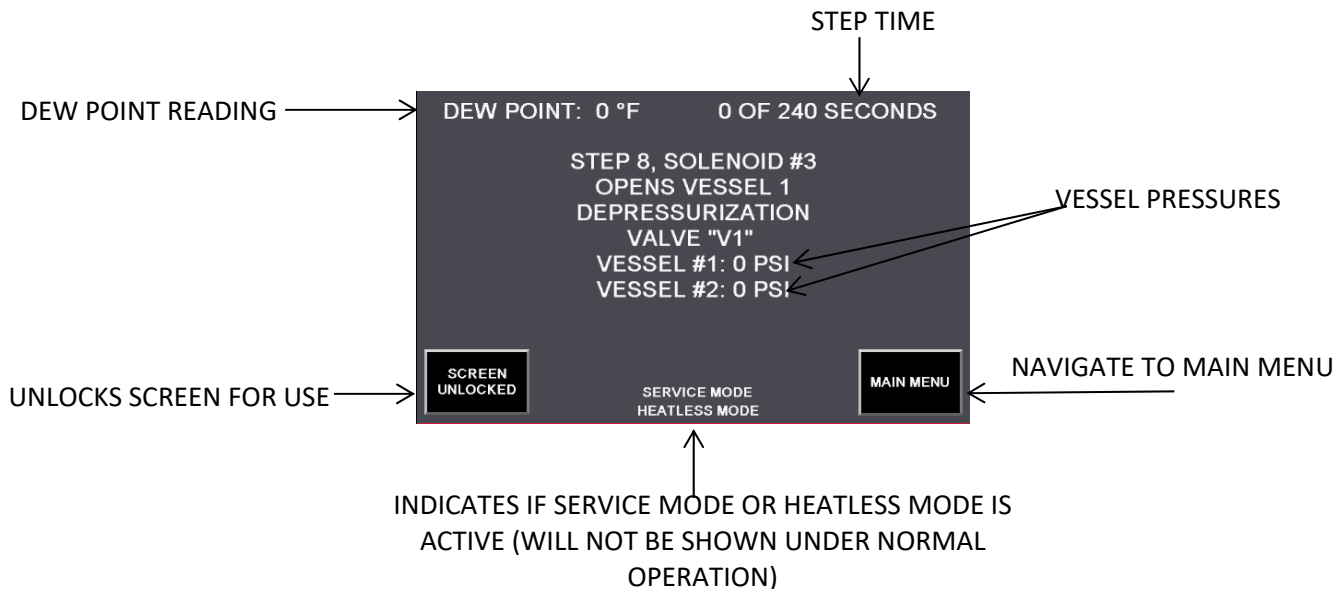


STEP 7: Vessel 2 is drying the inlet air (Vessel 2 inlet valve “K2” should be open)...Vessel 1 inlet is preparing for regeneration. Control system energizes SOL1 which closes Vessel 1 inlet valve “K1”. The regeneration valves K3 and K4 along with depressurization valves V1 and V2 should be in the closed position.

If in service mode, the **“PROCEED TO NEXT STEP”** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the ‘SERVICE’ pushbutton to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 8 OPERATION SCREEN

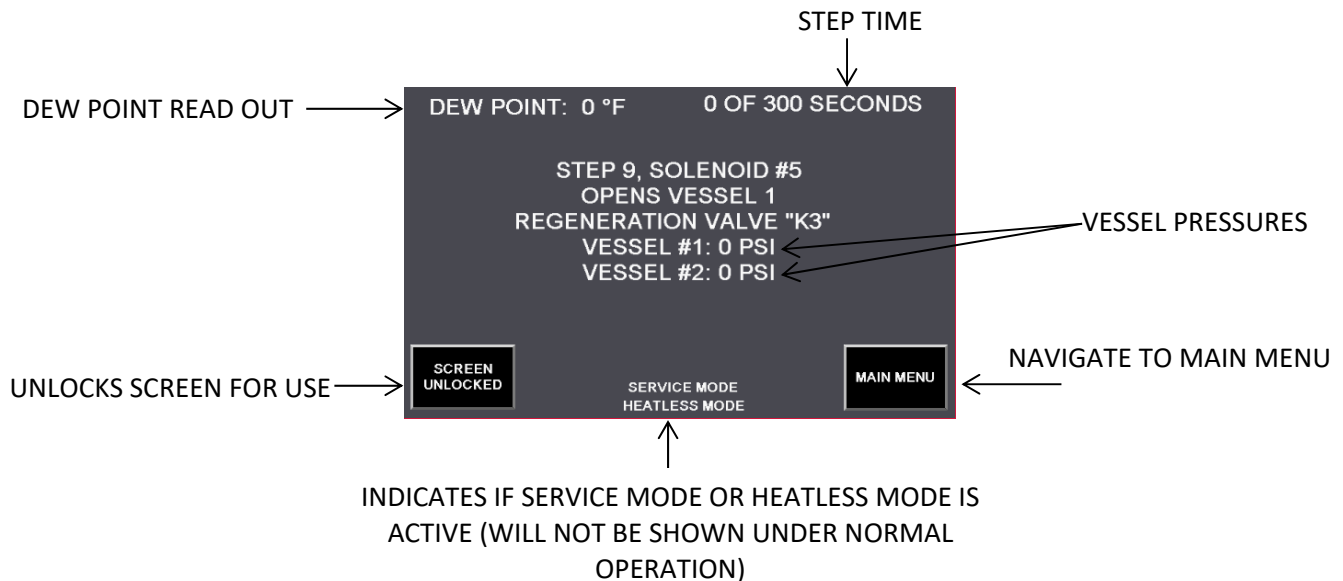


STEP 8: Vessel 2 is drying the inlet air (Vessel 2 inlet valve "K2" should be open)...Vessel 1 is preparing for regeneration, the PLC control system energizes SOL3 to open the depressurization valve "V1" which slowly depressurizes Vessel 1. If the pressure in Vessel 1 does not fall below 8 PSI within 240 seconds, an alarm will pop up and the system will halt until the problem has been corrected. The regeneration valves K3 and K4 along with Depressurization valve V2 and inlet valve K1 should be closed.

If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(WARNING: if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 9 OPERATION SCREEN

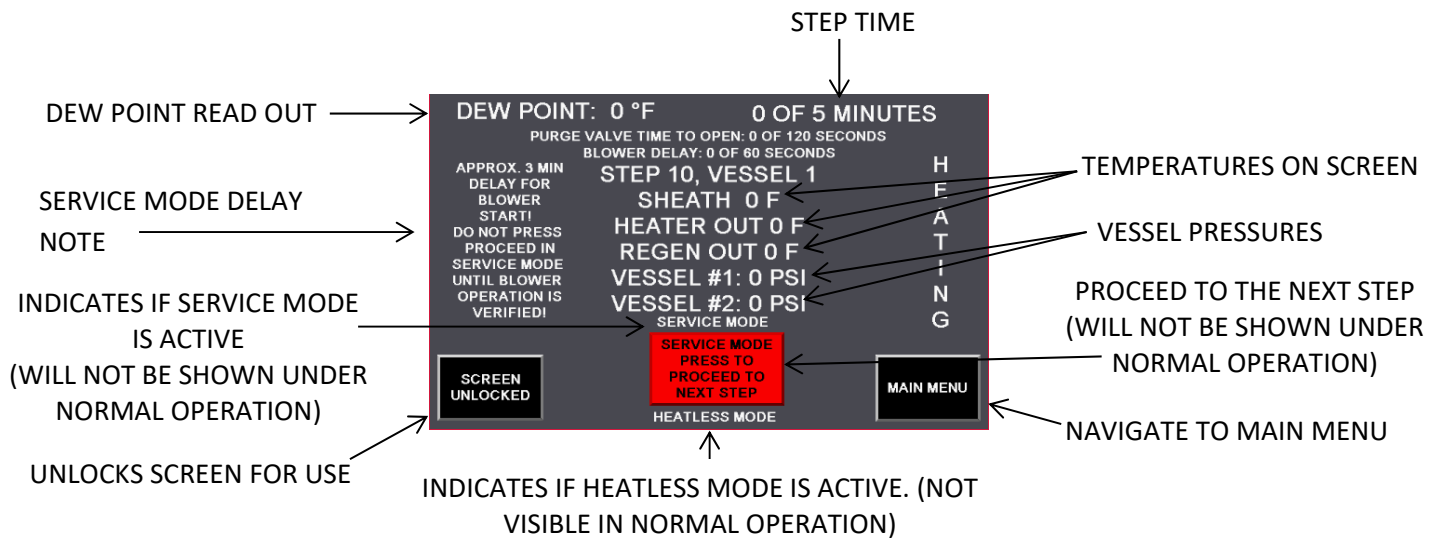


STEP 9: Vessel 2 is drying the inlet air (Vessel 2 inlet valve should be open)...Vessel 1 has depressurized to 8 PSI preparing for regeneration...solenoids SOL3, SOL5, SOL9 and SOL 12 energize opening valves V3, V5, V9 and V12. Vessel 2 regen valves V4, V6, V10, V11 and V13 along with Depressurization valve V8 and inlet valve V1 should be closed.

If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 10 OPERATION SCREEN



STEP 10: Vessel 2 is drying the inlet air (Vessel 2 inlet valve should be open)...Vessel 1 is depressurized to 8 PSI...Vessel 1 Depressurization valve V1, Regeneration valves K3 is open. The heat regeneration process now begins...the blower and heater are on...the heating process cycle can operate for up to a period of 172 minutes. If the regeneration outlet temperature reaches 200°F during this cycle, the heater will turn off (the blower will remain on) and the heating step will terminate early saving additional energy...the PLC will automatically advance to the heater cooling cycle.

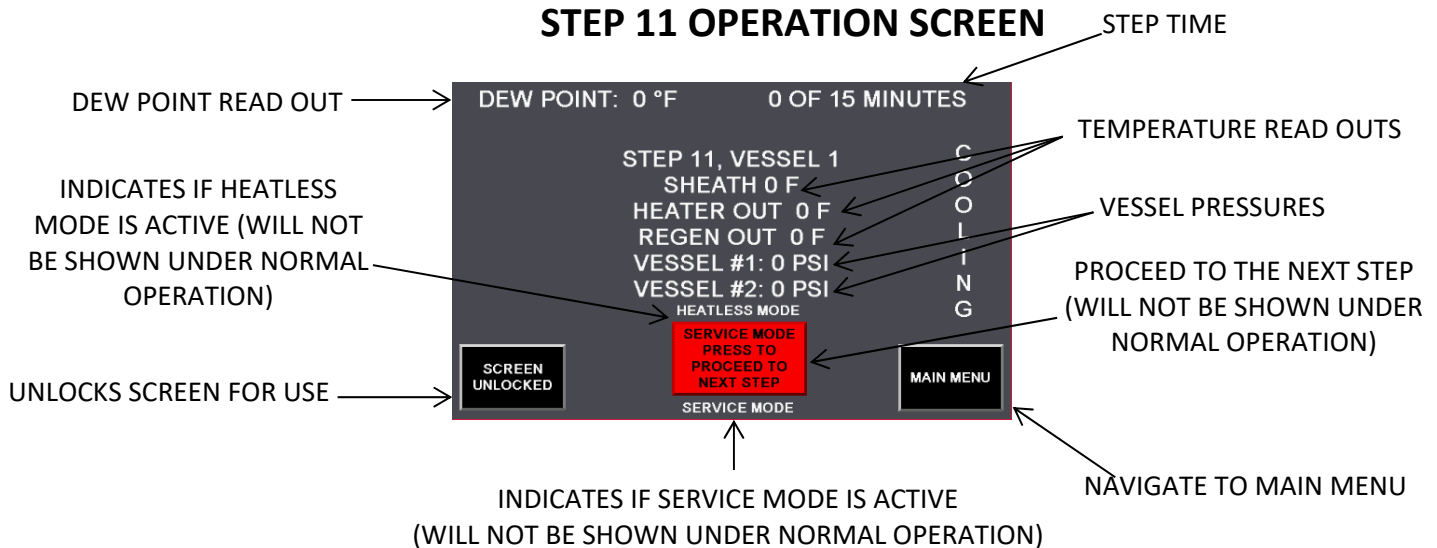
The “**SERVICE MODE PRESS TO PROCEED TO NEXT STEP**” button in red is a service fast button to allow an authorized technician to advance to the next step without waiting for the step to finish. (**WARNING:** this button should not be operated unless authorized by a nano Aircel Service technician.)

This screen displays the temperature of the heater sheath, heater outlet, and regen outlet...the heat regeneration time is also displayed.

If in service mode, the “**PROCEED TO NEXT STEP**” will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the “**PROCEED**” button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 11 OPERATION SCREEN



STEP 11: Vessel 2 is drying the inlet air (Vessel 2 inlet valve should be open)...Vessel 1 depressurization valve V1 and regeneration valve K3 are opened...the blower pushes air through the heater to cool the sheath for a period of 8 minutes...then the DRY AIR COOLING takes over for up to a period of 53 minutes. If the regeneration outlet temperature reaches 100°F during this cycle, the process will terminate early saving additional energy...the PLC will automatically advance to the next step.

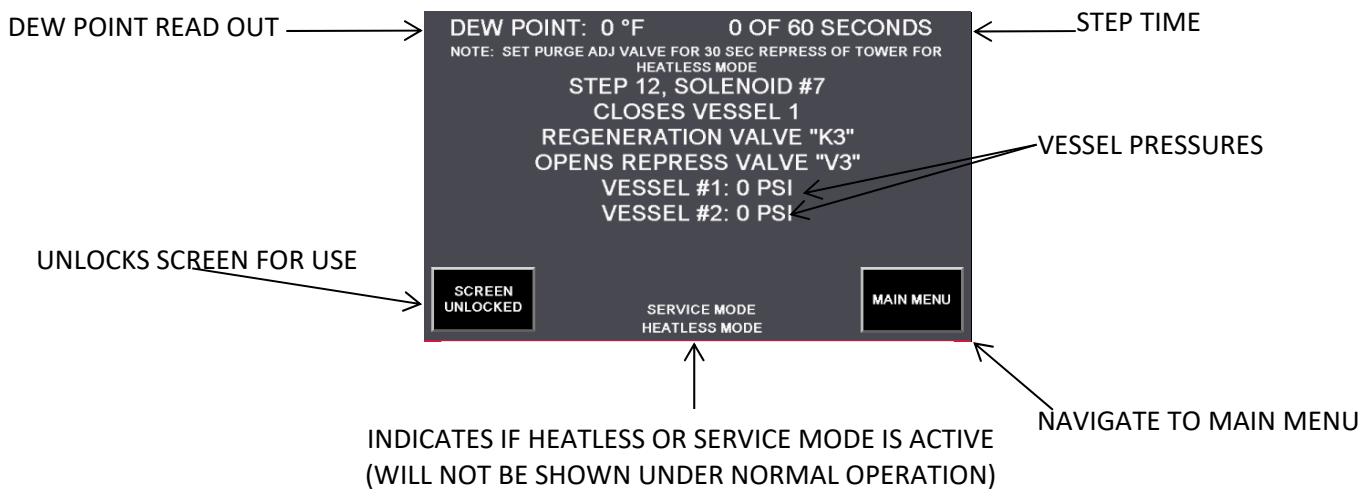
The “**SERVICE MODE PRESS TO PROCEED TO NEXT STEP**” button in red is a service fast button to allow an authorized technician to advance to the next step without waiting for the step to finish. (**WARNING:** this button should not be operated unless authorized by an Aircel Service technician.)

This screen displays the temperature of the heater sheath, heater outlet, regen outlet and blower inlet...the cooling time is also displayed.

If in service mode, the “**PROCEED TO NEXT STEP**” will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the “**PROCEED**” button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

STEP 12 OPERATION SCREEN



STEP 12: Vessel 2 is drying the inlet air (Vessel 2 inlet valve should be open)...This step re-pressurizes the regenerated Vessel 1 to complete the half cycle... Vessel 1 depressurization valve V1 and regeneration valve K3 are closed... the re-pressurization valve V4 is opened to slowly re-pressurize Vessel 1 to line pressure. The re-pressurization period totals 300 seconds (5 minutes).

At the end of this step, the PLC looks at the half cycle time and dew point to see if the outlet air pressure dew point is dry enough to extend the drying time saving energy (if the DEWPOINT DEMAND has been selected ON or enabled). If the system has completed a full 4 hours of drying and the dew point is below the -50°F outlet dew point setting, then the system can extend the drying time up to 720 minutes or 12 hours additional time 16 hours total on the vessel, and the **'ENERGY SAVINGS SCREEN'** will be displayed during this time... or if the dew point is above -50°F and the half cycle time is over, the control system will simply go to the next step operation... which is the PARALLEL MODE. If, at any point during the 720 minute extended cycle, the dew point rises above the -50°F set point; the extended drying step will terminate and advance to the next step, which is PARALLEL MODE.

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If in service mode, the **“PROCEED TO NEXT STEP”** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **“PROCEED”** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

➤ **SCREEN UNLOCK/RUNNING SCREENS:** UNLOCKS THE SCREEN

FOR NAVIGATION

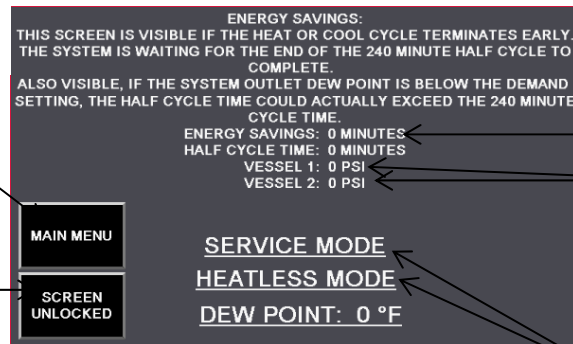
➤ **MAIN MENU:** NAVIGATES TO THE MAIN MENU

ENERGY SAVINGS SCREEN/WAITING ON HALF CYCLE TO COMPLETE

RUNNING/OPERATION SCREEN

NAVIGATE TO MAIN MENU
(Note: SCREEN button must be UNLOCK before pressing MAIN MENU button)

SCREEN LOCK/UNLOCK button
LOCKS OR UNLOCKS the running screens (note: SCREEN must be in LOCK for normal operation and while in SERVICE MODE operation...
SCREEN UNLOCK (Button Blinking) is only to be used to go to MAIN MENU)



CYCLE TIMES:
ENERGY SAVING TIME
HALF CYCLE TIME
VESSEL PRESSURES

SERVICE/HEATLESS MODE indicator (note: not visible in normal operation, only visible in SERVICE or HEATLESS MODE)

OUTLET DEW POINT READ OUT

ENERGY SAVINGS SCREEN: The energy savings mode screen is shown during the time the system is in an active energy saving mode.

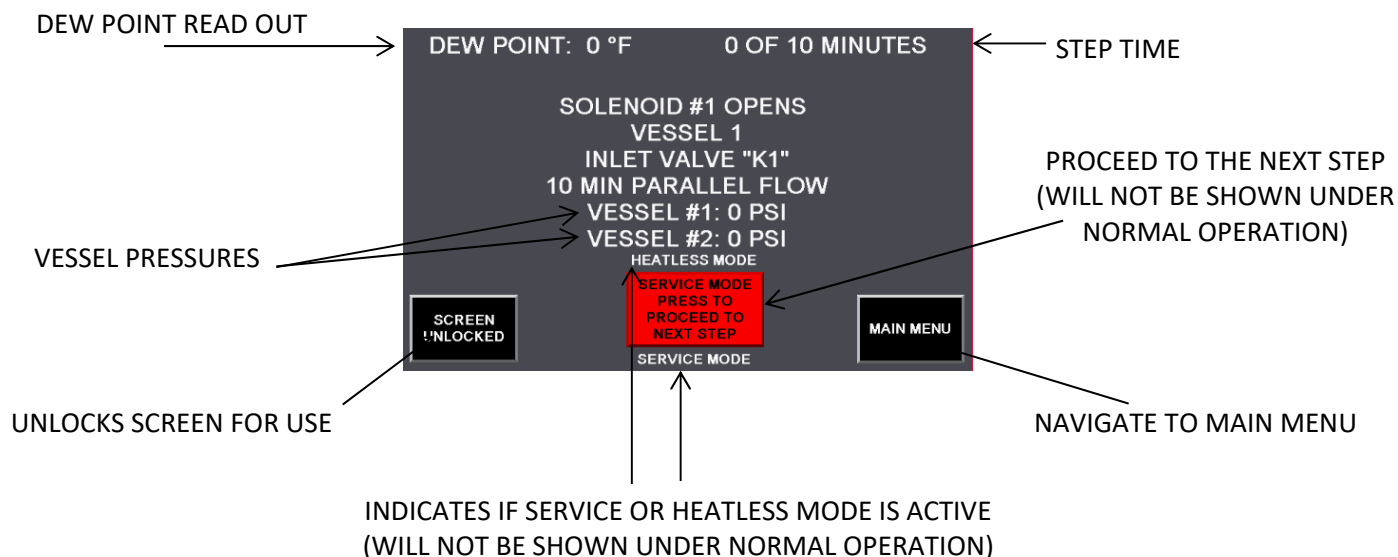
Either waiting on the half cycle time of 240 minutes to complete, if the heating or cooling cycles had terminated earlier than the fixed time cycles during regeneration. Or... waiting on the outlet dew point to reach the set level (of -50°F or higher) with a maximum time limit of 720 minutes of drying time on one vessel while in the energy management mode (which ever happens first).

This display will disappear (advances to next step) ... when the half cycle has timed out and the outlet dew point is not good (above -50°F, such as -48°F)... or when in the energy management mode if the outlet dew point is still below the -50°F setting and the maximum time of 720 minutes has been reached.

This screen will not be visible while the unit is in SERVICE MODE or HEATLESS MODE. If SERVICE MODE or HEATLESS MODE is activated during this step, the unit will advance to the next step (HEATLESS MODE) or the PRESS TO PROCEED BUTTON will appear (SERVICE MODE).

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

PARALLEL FLOW OPERATION SCREEN



PARALLEL VESSEL 1: Parallel flow mode operation is the last step prior to a Vessel switchover to begin drying, it allows the recently regenerated Vessel to further cool down with some of the inlet gas flow since it will be diverted to both vessels (the inlet and outlet valves will all be open during this process), which helps reduce dew point and temperature spikes after switchover... the parallel flow period is 10 minutes.

IN THIS STEP, Vessel 2 is still the main drying vessel (Vessel 2 Inlet valve K2 should be open)...the control system PLC will energize solenoid SOL 1 to open Vessel 1 inlet valve K1 and de-energize solenoid SOL 7 to close re-pressurization valve V4 to allow parallel flow for 10 minutes. All regen and depress valves are closed during this step and the heater and blower should not be active. At the end of the 10 minute parallel flow, the system will advance to Step 1.

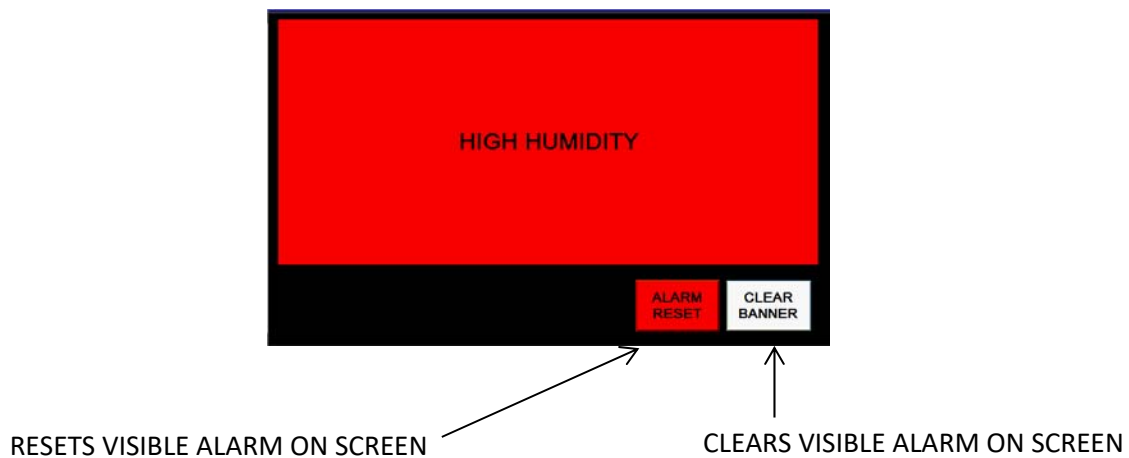
If in service mode, the **"PROCEED TO NEXT STEP"** will be displayed on the screen once the STEP is complete, if everything has been verified in the step... press the **"PROCEED"** button to proceed to next step. This will allow an authorized service technician to view operation of the system in a shorter time period.

(Continued next page)

(**WARNING:** if the screen is unlocked, the screen will not advance nor will the **PRESS TO PROCEED** button appear when the step is complete.)

- **SCREEN UNLOCK/RUNNING SCREENS:** UNLOCKS THE SCREEN FOR NAVIGATION
- **MAIN MENU:** NAVIGATES TO THE MAIN MENU
- **SERVICE MODE PRESS TO PROCEED TO NEXT STEP:** ALLOWS A SERVICE TECHNICIAN TO JUMP TO THE NEXT STEP (this is only visible during the service routine)

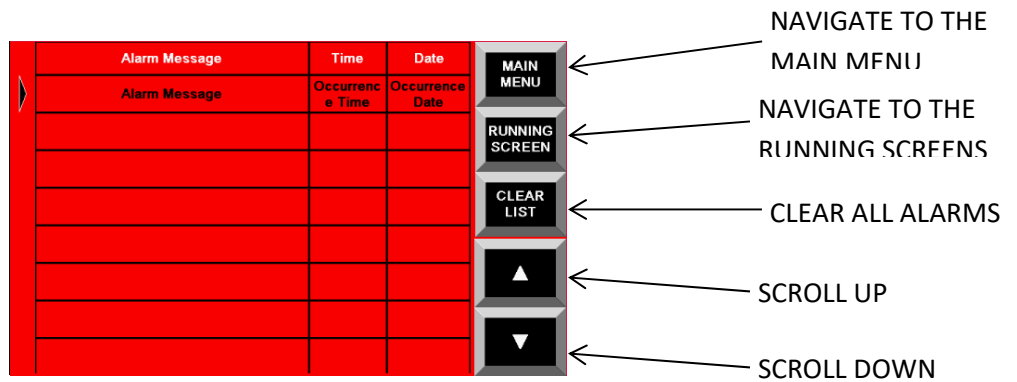
ALARM BANNER SCREEN



ALARM BANNER SCREEN: The alarm banner screen is visible when there is an alarm. It is not recommended to reset the alarm until the issue has been resolved. This banner will help a service technician to better provide support. The alarm will be captured on the Alarm Status Screen as well.

- **ALARM RESET:** RESETS THE SELECTED ALARM (if the alarm condition is corrected)
- **CLEAR BANNER:** CLEARS THE BANNER (will return to the last screen visible)

ALARMS LOG SCREEN



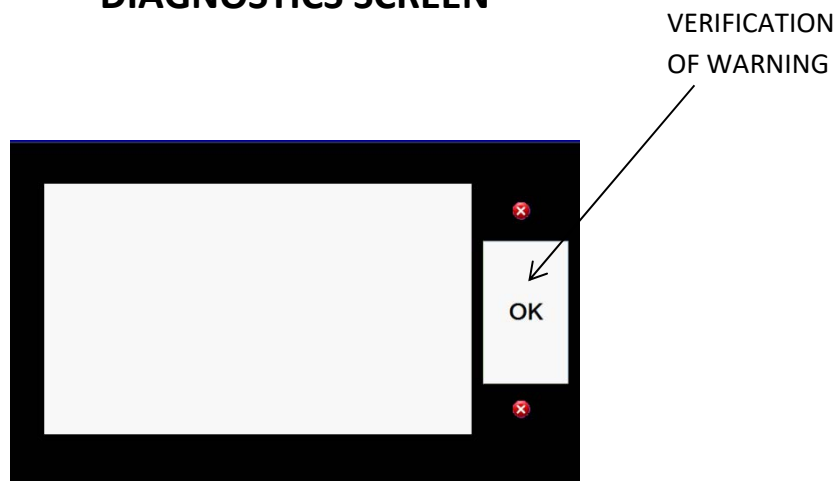
ALARM LOG SCREEN: The alarms screen shows the alarm message and gives time and date of the alarm.

- MAIN MENU: NAVIGATE BACK TO THE MAIN MENU
- RUNNING SCREENS: NAVIGATE TO THE MAIN OPERATION SCREEN
- CLEAR LIST: CLEARS ALL INACTIVE ALARMS (NOT RECOMMENDED WITHOUT APPROVAL FROM AIRCEL SERVICE TECH)

➤ : SCROLL UP

➤ : SCROLL DOWN

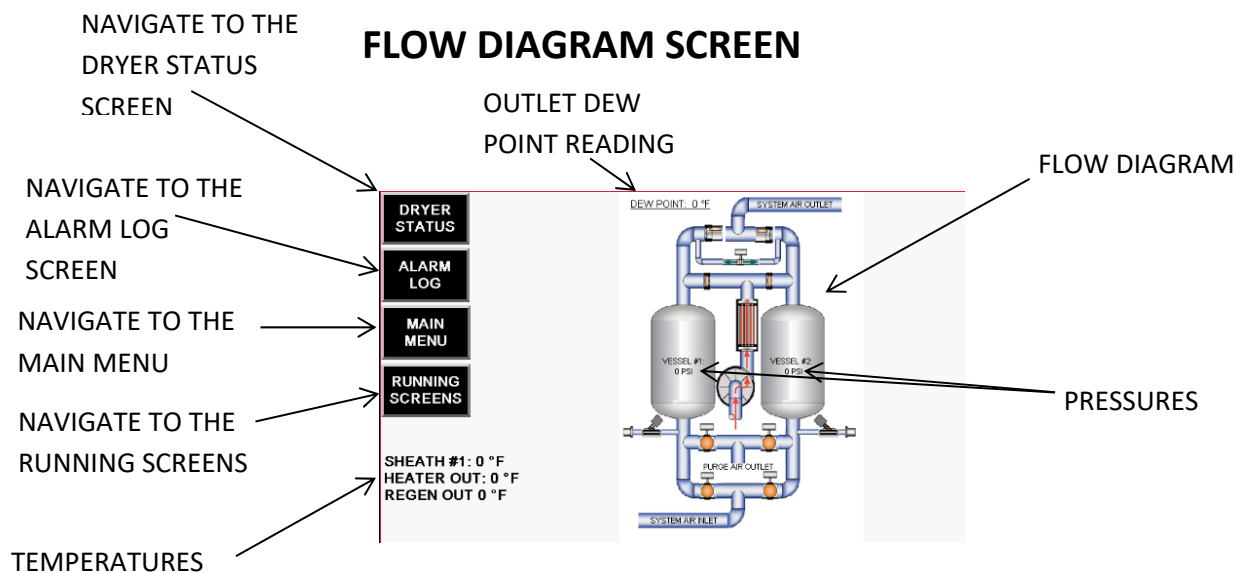
DIAGNOSTICS SCREEN



DIAGNOSTIC SCREEN: is visible if a communication or HMI failure occurs.

- **OK:** USED TO VERIFY THE WARNING HAS BEEN READ AND ACKNOWLEDGED (this screen is provided by the HMI to show communications errors, between the host and the HMI, and diagnostic failures of the HMI.)

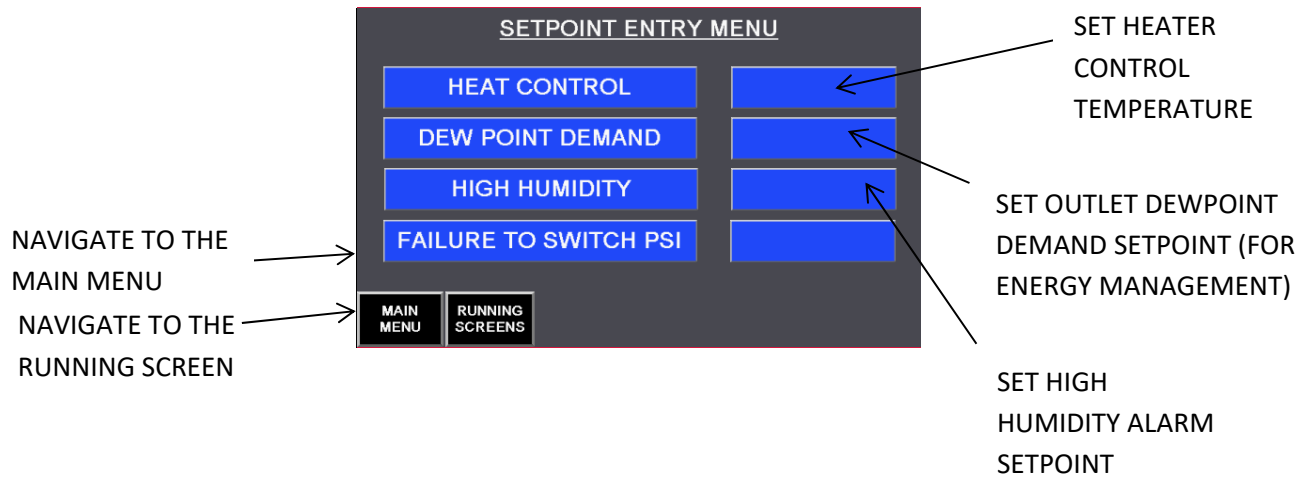
nano Aircel ABP Screen Shots and Descriptions



The flow diagram screen shows the user in which direction the unit is drying as well as which vessel is regenerating. Also shown are the temperatures of the regeneration outlet, heater outlet, cooler outlet and heater sheath. The open/closed status of each valve is shown.

- **DRYER STATUS:** NAVIGATE TO THE DRYER STATUS SCREEN
- **ALALRM LOG:** NAVIGATE TO THE ALARM LOG SCREEN
- **MAIN MENU:** NAVIGATE TO THE MAIN MENU SCREEN
- **RUNNING SCREENS:** NAVIGATE TO THE MAIN OPERATION SCREEN

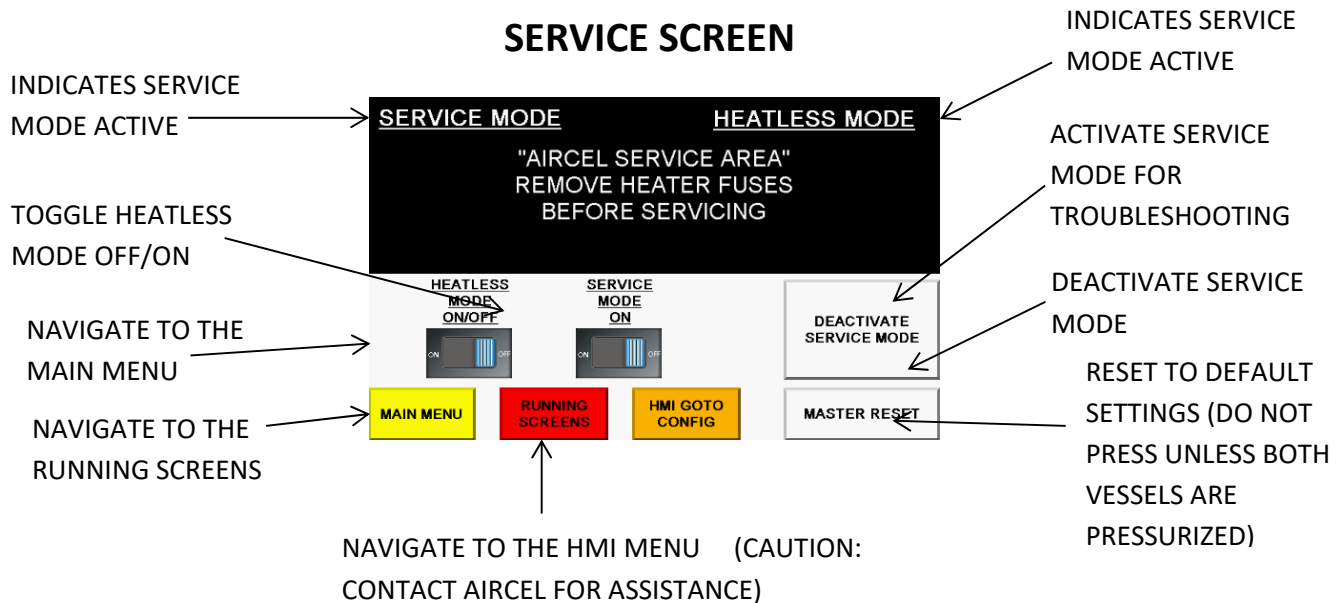
ENTRY SCREEN



ENTRY SCREEN: The entry screen is where the temperatures can be set and maintained for the heat cycle. The dew point and failure to shift settings can be set here as well. The dew point settings are for demand cycle control and the failure to shift settings are for pressure failures in the system. Demand cycle control is an energy saving technique that is provided to stop the unit from cycling when the dew point setting has been achieved: for example - once the dew point has dropped below -40°F, the unit will not cycle until the dew point comes back up above the set point. This provides a significant amount of energy savings by extending the drying mode and reducing the amount of heater and blower run time for regeneration.

- **MAIN MENU:** NAVIGATE TO THE MAIN MENU SCREEN
- **RUNNING SCREENS:** NAVIGATE TO THE MAIN OPERATION SCREEN
- **EACH OF THE BOXES TO THE RIGHT OF THE SCREEN CAN BE SELECTED TO MAKE CHANGES AS NEEDED.**

nano Aircel ABP Screen Shots and Descriptions



The service mode screen is a screen that can be used by a qualified service technician to operate the unit in a manner to troubleshoot each step to locate any problems.

- **MAIN MENU:** NAVIGATE TO THE MAIN MENU SCREEN
- **RUNNING SCREENS:** NAVIGATE TO THE MAIN OPERATION SCREEN
- **SERVICE MODE OFF/ON:** SETS THE DRYER OPERATION TO SERVICE MODE (SHORTER RUN TIME AND THE ABILITY TO SKIP HEAT AND COOL MODE FOR TROUBLESHOOTING)
- **DEACTIVATE SERVICE MODE:** TURNS SERVICE MODE OFF
- **MASTER RESET:** RESETS ALL SETTINGS AND USER OPERATION TIMES BACK TO THE ORIGINAL FACTORY SETTINGS
- **HMI GOTO CONFIG:** ALLOWS THE USER TO ENTER INTO THE HMI CONFIGURATION SCREEN WHERE THE CONFIGURATION OF THE HMI AS WELL AS THE PROGRAM OF THE HMI CAN BE ALTERED
- **HEATLESS MODE OFF/ON:** TOGGLE HEATLESS MODE ON DURING HEATER OR BLOWER FAULTS

ACTIVATING THE SERVICE ROUTINE FUNCTION: The SERVICE MODE OFF/ON button is used to observe the entire system operation in a reduced amount of time... also, gives the ability to advance a different step in the process, if required.

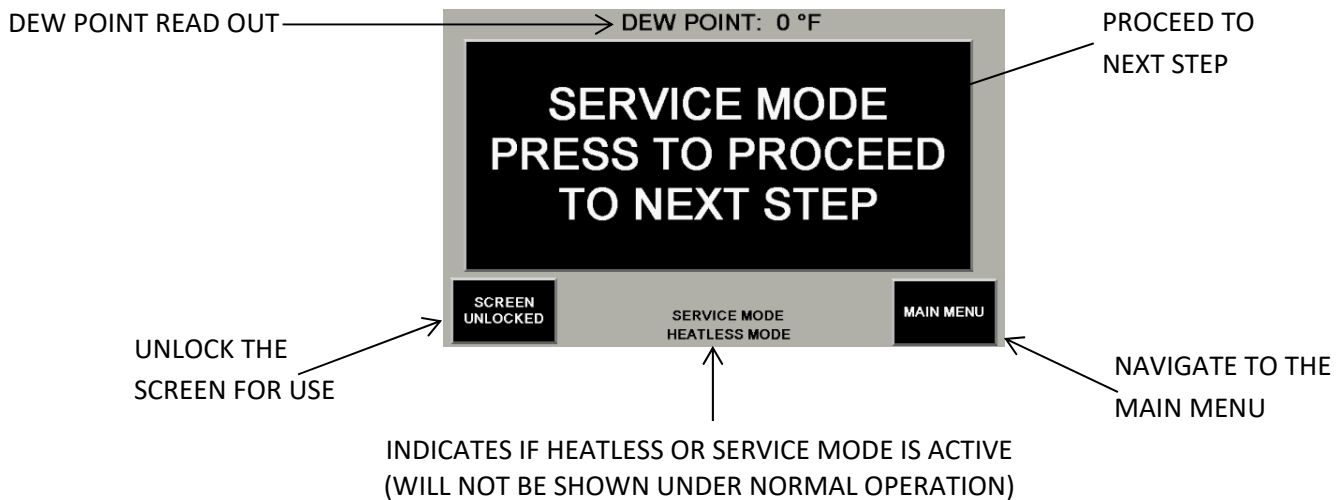
To activate the service routine function, navigate to the **“SERVICE MENU”** and press **SERVICE MODE OFF/ON** button. NOTE: the SERVICE icon will be visible on screen indicating service mode is active. Once the service function is activated, the program will not advance without the operator or service technician manually stepping through the program using the ‘SERVICE’ / PROCEED button when prompted.

To deactivate the service function, navigate to the **“SERVICE MENU”** and press **DEACTIVATE SERVICE MODE”**.

(**Caution:** typically only used by nano Aircel authorized personnel or qualified personnel familiar with the equipment. Reminder... always note which step is current, before cycling thru the steps, so the service routine can be halted at the step the service routine began. Make certain the correct actions are observed in each step ... such as: drying, depressurizing, heating, cooling, re-pressurizing, parallel mode, and vessel switching)

FOR ALARM INFORMATION: refer to this system display screen shots and descriptions section and the owner’s manual

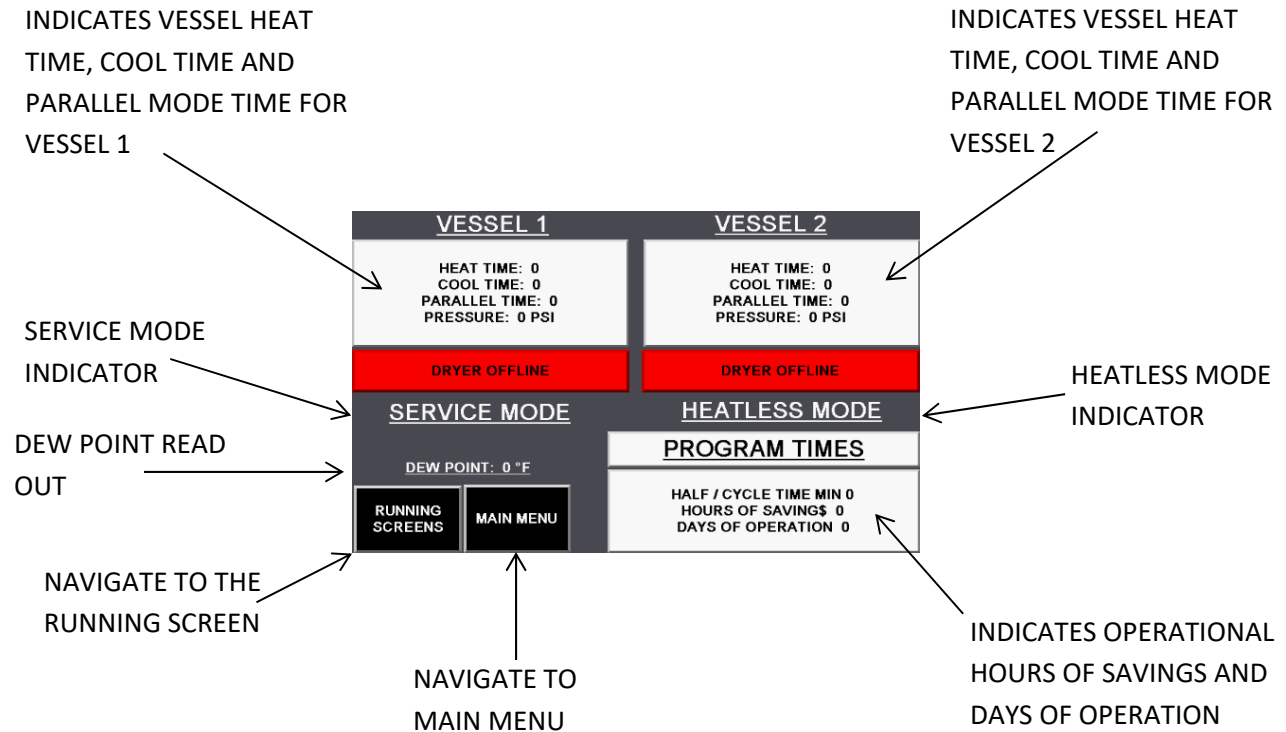
PROCEED SCREEN



The Proceed Screen comes up in between each step during service mode. This happens to ensure the next steps do not proceed until the service technician is ready.

- **MAIN MENU:** NAVIGATE TO THE MAIN MENU SCREEN
- **SCREEN UNLOCK:** UNLOCKS THE SCREEN FOR USE
- **SERVICE MODE PRESS TO PROCEED TO THE NEXT STEP:** SELECTS THE NEXT STEP FOR OPERATION (THIS IS A MANUAL OPERATION AND MUST BE COMPLETED BY THE USER OR SERVICE TECH DURING SERVICE MODE.)(DO NOT LEAVE THE UNIT UNATTENDED DURING SERVICE MODE.)

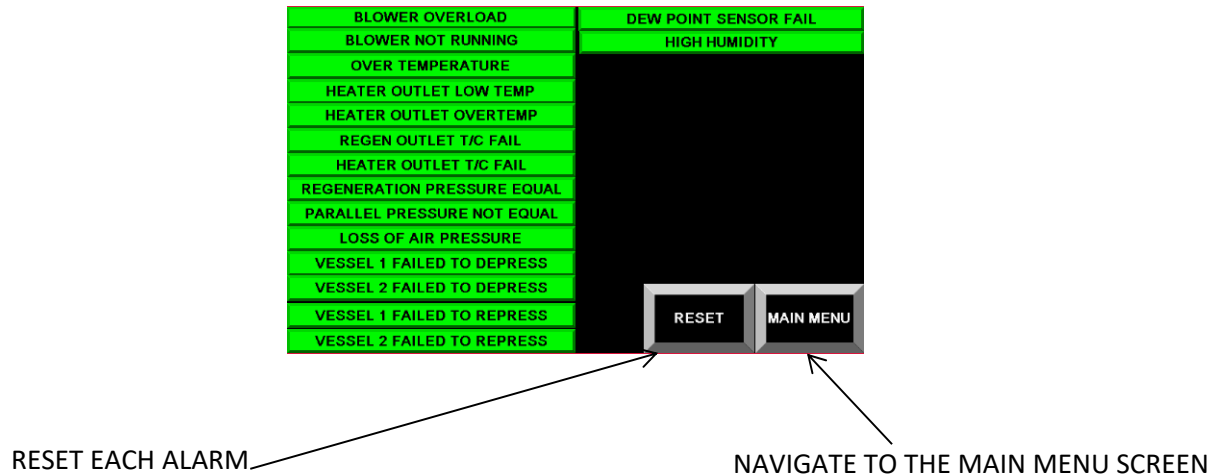
STATUS SCREEN



The status screen allows the user to view the status of the unit.

- **MAIN MENU:** NAVIGATE TO THE MAIN MENU SCREEN
- **RUNNING SCREENS:** NAVIGATE TO THE MAIN OPERATING SCREEN

ALARM STATUS SCREEN



The alarm status screen gives the user the option to check the status of each alarm.

- **RESET:** RESETS ALL ALARMS (ONLY IF THE PROBLEMS HAVE BEEN CORRECTED)
- **MAIN:** NAVIGATE BACK TO THE MAIN MENU

Below is a list of each alarm with description of cause, each of which will cause the unit to stop functioning until it is repaired. The following will also cause the common shut-down alarm dry contacts to change states:

(Continued next page)

nano Aircel ABP Screen Shots and Descriptions

- **Blower Overload:** alarm is given if the Motor Starter Protector (MSP) circuit breaker trips. This is caused by the following:

- o Overcurrent due to motor failure
- o MSP not set properly
- o Loss of power on one leg of the 3-phase circuit

The **Blower Overload** alarm must be reset manually once the problem has been corrected. **NOTE:** use caution when resetting the MSP, the operator must ensure the power is removed from the panel before proceeding.

- **Blower Not Running:** alarm is given if the PLC sends the signal for the blower motor to start but the contactor doesn't pull in to run. This can be caused by a break in the wiring, a bad contactor or a bad PLC terminal connection. This alarm will automatically reset once the problem has been corrected.

- **Over Temperature:** alarm is caused by the temperature exceeding the maximum allowed temperature in the heater sheath or heater outlet.

Possible causes for exceeding temperatures are as follows:

- o A contactor has become stuck in the closed position
- o A thermocouple has failed high (out of range)
- o A thermocouple wire has been disconnected or broken

There are failsafe's in place to ensure that, once the heater has reached the high limit, it will shut off and cool down. If this alarm continues to happen, the user will need to find and correct the issue. The alarm will automatically reset once the temperature falls below a certain set point.

- **Heater Outlet Low Temp:** alarm is visible if the heater outlet temperature does not reach 200°F within 30 minutes of starting the heating cycle. There are several reasons as to why the heater might not reach the temperature in time. They are as follows:

- o Extremely cold Ambient Temperatures will cause the heater to not reach temperature. Blower pulls in cold air and pushes it across the heater.
- o A contactor or contactors have failed to close.
- o The blower is not running.
- o The thermocouple has failed.
- o Loss of power to one or more legs of the 3-phase power circuit.

This alarm will automatically reset once the problem has been corrected.

- **Heater Outlet Over Temp:** See **Over Temperature** alarm above.

- (Continued next page)

nano Aircel ABP Screen Shots and Descriptions

- **Regen Outlet T/C Fail:** alarm happens when the thermocouple becomes out of range. This happens when there is a break in the thermocouple wires or if the thermocouple is bad. This alarm will reset automatically once the issue has been corrected.
- **Heater Outlet T/C Fail:** see **Regen Outlet T/C Fail** above.
- **Regeneration Pressure Equal:** alarm occurs when the pressure in both vessels are either both above or below the minimum operating pressure of the unit (60 PSI). This can occur if there is not sufficient pressure in the unit from a possible compressor failure or shut down. Other possible problems could stem from a failed valve or solenoid. If a valve fails to open or remain open during regeneration and the pressure in the regenerating tower comes up above 60 PSI, this alarm will show and the regeneration process will stop. Another possible cause could be a transducer failure. This could cause the PLC to perceive the vessel as full when it is not. Once the issue has been fixed, the alarm will reset automatically.
- **Parallel Pressure Not Equal:** alarm happens when the pressure in one or both vessels falls below the minimum operating pressure during the parallel step of the half cycle. The following are some causes of this failure:
 - A regeneration or depressurization valve has failed to close causing the air to escape and losing pressure from the vessel.
 - The air compressor has either failed or been shut off before the unit was shut down.
 - Transducer failureThis alarm is automatically reset once corrective action has taken place.
- **Loss of Air Pressure:** alarm occurs when the pressure of the drying tower drops below 60 PSI. known causes are as follows:
 - Transducer Failure
 - Valve FailureThis alarm will automatically reset once the problem has been corrected.
- **Depress V1 Failure:** happens when vessel 1 fails to depressurize within the given time allotted. Possible causes are:
 - Loss of air pressure on control air line
 - Valve failure
 - Bad transducer
 - Bad PLC inputThis alarm will self-reset once the issue has been repaired.

(Continued next page)

nano Aircel ABP Screen Shots and Descriptions

- **Depress V2 Failure:** happens when vessel 2 fails to depressurize within the given time allotted. Possible causes are:
 - Loss of air pressure on control air line
 - Valve failure
 - Solenoid failure
 - Bad transducer
 - Bad PLC input

This alarm will self-reset once the issue has been repaired.

- **Repress V1 Failure:** happens when vessel 1 does not reach the minimum operating pressure of 60 PSI within the allotted time. Possible causes are:
 - Loss of air pressure on control air line
 - Valve failure
 - Solenoid failure
 - Bad transducer
 - Bad PLC input

This alarm will self-reset once the issue has been repaired.

- **Repress V2 Failure:** happens when vessel 2 does not reach the minimum operating pressure of 60 PSI within the allotted time. Possible causes are:
 - Loss of air pressure on control air line
 - Valve failure
 - Solenoid failure
 - Bad transducer
 - Bad PLC input

This alarm will self-reset once the issue has been repaired.

The following alarms will not cause the unit to stop functioning and will cause the dew point system alarm dry contacts to change states:

- **Dew Point Sensor Fail:** alarm occurs when the dew point sensor drifts out of range below -155°F. This failure can be caused by the sensor is out of calibration, the sensor cable is unplugged or wire is broken, a bad PLC input or analog card or a damaged dew point sensor. This alarm will reset automatically once it is above the set point.
- **High Humidity:** is seen when the dew point reading rises above the high humidity alarm point setting (10°F by default). This may happen for short periods of time during switch-over from one tower drying to the next. This alarm will automatically reset once the reading drops below the set point.

Heatless Mode

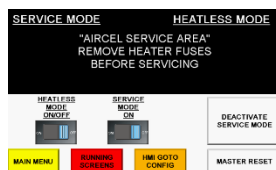
Heatless mode is an operation that can be utilized if any of the following upset conditions should happen:

- Blower motor failure
- Heater failure

During these upset conditions, the unit will not be able to function due to the failure of any one of the listed components above. To keep the unit operating, Aircel has provided a solution; Heatless Mode. In heatless mode, the unit will regenerate each tower utilizing certain steps while locking out others. The timing has been altered in the program to make this functional. This will keep the unit running long enough to replace the components without much downtime.

To place the unit in heatless mode, please follow the steps below (**NOTE: THE UNIT WILL NOT OPERATE CORRECTLY IF THE HEATLESS MODE BUTTON IS PRESSED DURING ANY OTHER STEP THAN DEPRESS! PLEASE FOLLOW THE INSTRUCTIONS BELOW PROPERLY!**):

- First turn the unit off to ensure there is no power present in the panel
- Next remove the heater fuses to ensure the heater will not operate by accident
- Once the fuses are removed and the panel is locked, return power to the panel
- After the startup period of 3 to 4 minutes, the PLC will be ready to communicate with the HMI.
- Navigate to the service menu and select Service Mode On



(Continued next page)

nano Aircel ABP Screen Shots and Descriptions

- Once in service mode, return to the operations screen and step through to the re-pressurization step (6 or 12)
- Then return to the service menu and Deactivate Service Mode
- Now activate heatless mode by pressing the Heatless Mode Off/On button
- Navigate back to the operations screens

The unit should now be in heatless mode and switching towers every 7.5 minutes. This will keep the unit running. Please note that in heatless mode, the unit will be using dry air from the outlet of the unit to purge the regenerating vessel. This may cause a slight decrease in air flow from the dryer.

To deactivate heatless mode (once the component has been replaced), follow the steps below:

- First wait till the unit is in re-pressurization steps 6 or 12
- Then deactivate heatless mode by pressing the heatless mode button in the service menu
- The unit will now return to standard blower purge mode.
- Turn the power off to the panel and replace the heater fuses
- Re-apply power and return to normal operations

For more assistance, please contact a service technician by calling the number provided on the back page of the user manual.



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