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Heater Control Operating Instructions

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Standard Heater

(non top dry)

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Power Up

Limit switches are checked upon power up. The control checks all the limit switches. If a limit switch has become open circuit the control displays which limit is open circuit. The control will not operate with a limit switch error. The fan will not turn on with an error condition -- there is no way to bypass an error condition -- it must be fixed. (see errors below).

The fan switch is also checked on power up. The fan switch should indicate no airflow. This is necessary to check the function of the airflow switch. However, if the operator forgets and turns the fan on before the controller has been powered up. The controller locks up with the main display alternating " FAN " " On " message. This may be bypassed by depressing and holding the " FAN BYPASS " switch (lower right switch). Normal operating procedure should be to power up the controller with the fan off.

If multiple heaters are tied together, and the master detects that the slaves fan is on (the fan switch stuck ??), the master will lock up displaying " SLA " " ERROR ". This condition may be bypassed with the " FAN BYPASS " switch.

Normal Operating Displays Heater not running

The main display displays the plenum temperature. If the dryer has not been running the display should display outside temperature. The control is preset at the factory to display temperature is centigrade of farenheit.

" AIRFLOW " OF " NO AIRFLOW " is displayed if air is flowing or not flowing.

" RX TX " is displayed if multiple heaters are connected.

The limits are continuously checked during the off mode. A limit switch open or any other error condition will cause the display to show the limit or error condition. When the drying is not running, if the limit or error condition is corrected, the display returns to its normal display. This is not the case with an error or limit condition during the drying operation -- this causes the display to lock up in the error display mode. (see section on running the dryer for mode explination).
The purpose of this is so that when an error does occur, the display keeps the display locked up with the condition that caused the error.

Starting the Dryer

The fan must be turned on first. Attempting to start the dryer without the fan switch indicating there is airflow will cause an airflow alarm when the start switch is depressed. The airflow alarm is simply the entire display blanks and the " NO AIRFLOW " message flashes for a few seconds. The display must show " AIRFLOW " before the dryer can be started.

To start the dryer, just push the " START " switch. The first message to come up will be the " PURGE " message -- the drying process begins with a 10 second purge.

When multiple heaters are connected together, the drying may be started from any heater control.

Running the Dryer

The display will indicate " FLAME " when flame is sensed. If no flame is sensed the " FLAME " message will be off. The display indicate what part of the cycle it is in. If the unit is a cycle dryer, the display will indicate weither it is in the " HI-FLAME " or " LO-FLAME " part of the cycle. (see programming mode for setting the HI / LO-FLAME temperature setting). If the temperature is above the high temperature setting, the flame will be off and the " FLAME " message will be out and the display will be flashing " OFF-CYCLE ".

If the flame is shut off because of the humidity sensor (humidistat) the display flashes " OFF-CYCLE HUMIDISTAT ".

The limits are continuously checked during the drying operation. A limit switch open or any other error condition will cause the dryer to shut down and the fan will be shutdown. If a limit opens or an error condition occurs during drying, the control will lockup in the error display mode, power must be shut off and back on to the control to clear the error condition -- even if the error or limit that caused the shut down has been corrected. The purpose of this is so that when an error does occur, the display keeps locked up with the condition that caused the error so the operator can determine what caused the shutdown.

Programming Set Points

Depressing the " PROGRAM " switch (lower left) causes the display to enter the program mode. Each item below is programmed by using the up and down arrow switches. Holding the up / down arrow switches down for about 2 seconds will cause the numbers to increase / decrease rapidly until the switch is released. When finished programming

an item, depessing " PROGRAM " switch again will cause the new setting to be entered into memory and the display will advace to the next function to be pregrammed.

Programming may be done at anytime (unless an error condition exist) even while the dryer is in operation.

Programming a system with multiple heaters may be done at any heater control console. The information programmed is automatically transmitted to all other heaters when the programming is complete.

Hi Limit Set Point -- The upper left cursor is flashing indicating the mode. If the plenum temperature increases above this point, the flame is shut off -- " OFF-CYCLE " mode.

Cycle Set Point -- The upper 2nd from left cursor is flashing indicating the mode. If the dryer is not a high / low dryer, this function is skipped. If the plenum temperature increases above this point, the flame reduces to " LO-FLAME ".

Humidity Set Point -- The upper 2nd from right cursor is flashing indicating the mode. If the humidity is above this point the dryer operates normally -- flame on and off at the High limit and Cycle set points. If the humidity is below this point the dryer goes into the " OFF-CYCLE " mode. Note: At this time a true humidity sensor has not been introduced. To use this option, set the humidity setting to 50 % and use a humdistat switch. When the humidity is low the switch is closed, indicating low humidity. If the switch is open (high humidity), the dryer runs normally.

Temperature Differential -- The upper right cursor is flashing indicating the mode. If the flame shuts off because the temperature is greater than the High Limit Set Point, the temperature must fall below the (Set Point - Temperature Differential) for the flame to come back on.

Humidity Differential -- The upper right cursor is flashing indicating the mode. If the flame shuts off because the Humidity is less than the Humidity Set Point, the Humidity must rise above the (Set Point + Humidity Differential) for the flame to come back on.

Programming Hours to Shut Down

To change the hours to shut down, depress and hold the " SHUTDOWN HOURS " switch. While holding in on the switch, depress the up / down arrow switches to alter the hours. Setting range is 0 to 200 hours.

Drying Grain in the Hours to Shut Down Mode

While drying grain, depress and hold the " SHUTDOWN HOURS " switch. While holding in on the switch, depress the " START " switch. After depressing the start switch one time, the heater is in the shutdown mode where when the time expires the fan an heater

shut down -- this is indicated by the lower left cursor flashing. Depressing the start switch again (while holding in on the " SHUTDOWN HOURS " switch) will cause the heater to shut only the heater off, leaving the fan on when the time expires -- this is indicated by the 2nd from lower left cursor flashing. Depressing the start switch one more time returns the heater into the continuous -- non-shutdown mode.

Run Hours Display

Run hours are recorded when the controller detects that the fan is on (airflow). The hours may be viewed by depressing the " HOURS " to get hours and " HOURS X 1000 " to get the number of 1000 hours accumulated.

Multiple Heater Notes

When Multiple heaters are connected together, the temperature and humidity sensors must be connected to the master.

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Top Dry

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Setup and Configuration

There are two possible configuration modes for the Top Dry.

1) Stand alone heater control. In this case the control is located up on the fan / heater and has been pre-programmed. Power is then applied from a switch below, the start switch is a momentary switch that is attached to J7-7 connector. The dryer is started by depressing that momentary switch. Note that in this mode, the display is remote, therefore error conditions will shut the dryer down but cannot be viewed unless you climb up and look at the display.

2) Remote display unit. In this case the master control is up on top -- where all the sensors and limits are attached. The remote display below is attached through athe serial 2 (or 3) wire link. The remote display is used to program the master, view errors and starta the dryer. In essence, the remote display, is just an extension of the master.

Power Up

Limit switches are checked upon power up. The control checks all the limit switches. If a limit switch has become open circuit the control displays which limit is open circuit. The control will not operate with a limit switch error. The fan will not turn on with an error condition -- there is no way to bypass an error condition -- it must be fixed. (see errors below).

The fan switch is also checked on power up. The fan switch should indicate no airflow. This is necessary to check the function of the airflow switch. The fan switch error on power up cannot be bypassed since in the Top Dry system -- the fan is controlled by the heater control.

If multiple heaters are tied together, and the master detects that the slaves fan is on (the fan switch stuck ??), the master will lock up displaying " SLA " " ERROR ".

Normal Operating Displays Heater not running

The main display displays the either Heater Run Time (lower left cursor), Cool Down Time (lower 2nd from left cursor), Plenum (lower 2nd from right cursor) or Grain Temperature (lower right cursor). The " Mode Select " switch (fan bypass) is used to select the mode to be displayed. Note that the cursors do not flash when in the normal display -- they do flash when in the program mode (see below).

The heat and cool down shown on the display is the amount of time programmed.

" AIRFLOW " OF " NO AIRFLOW " is displayed if air is flowing or not flowing.

" RX TX " is displayed if there is a master with remote.

The limits are continuously checked during the off mode. A limit switch open or any other error condition will cause the display to show the limit or error condition. When the drying is not running, if the limit or error condition is corrected, the display returns to its normal display. This is not the case with an error or limit condition during the drying operation -- this causes the display to lock up in the error display mode. (see section on running the dryer for mode explination).
The purpose of this is so that when an error does occur, the display keeps the display locked up with the condition that caused the error.

Programming Top Dry -- Plemum and Grain Temperatures

Depress the Program Temperature switch on either the master or remote. The upper left cursor will be flashing. Use the up and down arrow switches to program the temperature.

This first temperature setting is the temperature at which when

the main and cycle burners both shut off -- no flame. Depressing the Program switch again will cause the display to advance to setting the cycle temperature setting (upper 2nd from left cursor flashing). This temperature setting is the temperature above which the heater goes to low flame. Depressing the Program switch again will cause the display to advance to setting the the grain temperature limit (upper 2nd from right cursor flashing). When the grain tempreture gets to this temperature, the heater control advances to the cool down cycle. If no cool down time is programmed in -- the dryer shuts down when the grain gets to that temperature. Depressing the Program switch again will cause the display to advance to setting the differential temperature setting (upper right cursor flashing). This differential is basically hystersis, when a main or cycle solenoid is shut off due to exceding the temperature set point, that burner will not come on again until the temperature falls below the (set point minus temperature differential). depressing the Program switch again will cause the control to exit the program mode.

Programming Top Dry -- Heat and Cool Down Timers

Depressing the Program Heat and Cool down switch will casue the lower left cursor to begin flashing, indicating a new heat time may be entered. This heat time is the length of time the heater will run in the heater mode (burners controlling to the temperature set in the above program mode). This time can be set from 1.0 hours to 20.0 hours. Depressing the Program Heat and Cool down switch again will cause the lower 2nd from left cursor to begin flashing. This is the cool down period. When the burners get shut down due to the heat timer timing out, the fan will continue to run during this cool down period. The cool down can be set from 0.0 hours to 20.0 hours. If set to 0.0 hours -- there is no cool down period. Depressing the Program Heat and Cool down switch again will cause the control to exit the program mode.

Programming Top Dry -- Fan Delay for Slaves

Power up with the " Program Dry / Cool Timers " and " Program Temperatures " switches depressed to adjust the programmable delay for top dry fans

The dry time and cool time " carrots " on the display both flash indicating -it is in the program delay time mode.

--- Note: This can only be done on the master

Starting the Dryer

To start the dryer, just push the " START " switch. The fan comes on immediately on the master, and after the programmable delay in the slaves. The first message to

come up will be the " PURGE " message -- the drying process begins with a 10 second purge.

When multiple heaters are connected together, the drying may be started from any heater control.

Note: If attempting to run the dryer with the grain temperature above the grain temperature setting will cause the enter display to blank, flashing the " TEMP HI-LIMIT " error for about 5 seconds. To get around this problem, allow the fans to run until the grain temperature has lowered or enter the program mode and raise the grain temperauture limit setting. Once the grain temperature has been lowered, reduce the grain temperature back to the original setting.

Running the Dryer

The display will indicate " FLAME " when flame is sensed. If no flame is sensed the " FLAME " message will be off. The display indicate what part of the cycle it is in. If the unit is a cycle dryer, the display will indicate weither it is in the " HI-FLAME " or " LO-FLAME " part of the cycle. (see programming mode for setting the HI / LO-FLAME temperature setting). If the temperature is above the high temperature setting, the flame will be off and the " FLAME " message will be out and the display will be flashing " OFF-CYCLE ".

The limits are continuously checked during the drying operation. A limit switch open or any other error condition will cause the dryer to shut down and the fan will be shutdown. If a limit opens or an error condition occurs during drying, the control will lockup in the error display mode, power must be shut off and back on to the control to clear the error condition -- even if the error or limit that caused the shut down has been corrected. The purpose of this is so that when an error does occur, the display keeps locked up with the condition that caused the error so the operator can determine what caused the shutdown.

The main display displays the either Heater Run Time (lower left cursor), Cool Down Time (lower 2nd from left cursor), Plenum (lower 2nd from right cursor) or Grain Temperature (lower right cursor). The " Mode Select " switch (fan bypass) is used to select the mode to be displayed. Note that the cursors do not flash when in the normal display -- they do flash when in the program mode (see below).

The heat and cool down shown on the display is the amount of time remaining in the heat or cool down period. Note, that if you are in the Heater time period, you cannot view the cool time remaining since you are not in a cool down period. However, the cool down period may be altered or viewed by entering the program mode. The same is true if the heater control is in the cool down period, you cannot view the heater run time -- since that time has already time out.

Run Hours Display

Run hours are recorded when the controller detects that the fan is on (airflow). The hours may be viewed by depressing the " HOURS " to get hours and " HOURS X 1000 " to get the number of 1000 hours accumulated.

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Factory Configuration

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Configuration Dip Switches (normally done at GSI)

These switches are used to configure the heater control for various types of heaters.

Stand alone heater with no slaves -- all dip switches in the off state.

Multiple heaters connected together through the serial link.
- Master with 1 slave -- dip switch 7 on / all others off.
- Master with 2 slaves -- dip switch 8 on / all others off.
- Master with 3 slaves -- dip switch 7 & 8 on / all others off.
- Slave # 1 -- dip switch 1 on / all others off.
- Slave # 2 -- dip switch 2 on / all others off.
- Slave # 3 -- dip switch 1 & 2 on / all others off.

Top Dry Stand alone with no remote display at the bottom.
--- Dip switch 6 on -- all others off

Top Dry Master with a remote display at the bottom
--- Dip switch 6 & 7 on -- all others off

Top Dry Master with a remote display at the bottom and another fan heater -- with heater control
--- Dip switch 6 & 8 on -- all others off

Top Dry Master with a remote display at the bottom and 2 other fan heaters -- with heater control
--- Dip switch 6, 7 & 8 on -- all others off

Top Dry Remote display at the bottom
--- Dip switch 1 & 6 on -- all others off

Top Dry 2nd fan heater
--- Dip switch 2 & 6 on -- all others off

Top Dry 3nd fan heater
--- Dip switch 1, 2 & 6 on -- all others off

Note: Top dry may be run with 2nd or 3rd heater, but without remote. If a 2nd fan heater is attached -- it should always use

Factory Programming (normally done at GSI)

To enter the Factory Programming mode, power the unit on with the " PROGRAM " switch depressed. The display shows a " 0 ". Increment the display to 3 using the up arrow switch then depress " PROGRAM " switch again. Note: this must be done within a few seconds or the unit will exit and go onto the main mode -- you will have to power off and try again.

Upon first entering the Factory Program mode the display will show " _ _ C " or " n o C ". " _ _ C " indicates it is a hi / lo heater. " n o C " indicates it is not a hi / lo flame dryer. The setting may be altered by depressing the up or down arrow switches. When finished, depressing the " PROGRAM " switch again will advance to humidity heater control setup -- the display will show " _ _ H " or " n o H ". " _ _ H " indicates the humidity sensor is present. " n o H " indicates it has no humidity sensor. The setting may be altered by depressing the up or down arrow switches. When finished, depressing the " PROGRAM " switch again will advance to Farhenheit / Centigrade set mode. The display will be flashing either F or C. The setting may be altered by depressing the up or down arrow switches.

Error Conditions

Limit switches:

PLENUM, HOUSING, VAPOR, TEMP_HI_LIMIT

Misc error numbers:

1	TEMPERATURE PROBE 1 OPEN
2	TEMPERATURE PROBE 1 SHORT
3	TEMPERATURE PROBE 2 OPEN
4	TEMPERATURE PROBE 2 SHORT
5	AIR_FLOW_OPEN
6	AIR_FLOW_SHORT
7	ILLEGAL_FLAME_SENSE
8	FLAME_PROBE_SHORT_ERROR

(Errors 9 through 11 are displayed only if multiple heaters are tied together through serial link.)

9	SLAVE # 1 INCONSISTANY WITH MASTER WITH EITHER THE DRYING_GRAIN FLAG OR THE LP MAIN SOLANOID OR CYCLE SOLENOID

-- MOST LIKELY THE SLAVE GOT RESET
POWERING UPWITH THE SOLENOIDS OFF

10 SLAVE # 2 INCONSISTANY SAME AS ERROR 9 FOR SLAVE # 1

11 SLAVE # 3 INCONSISTANY SAME AS ERROR 9 FOR SLAVE # 1

12 Wrong Voltage. Dip switch # 5 is the voltage selector switch. If Dip Switch 5 is " ON " -- that selects 240 VAC. If the unit has only 120 VAC applied, error 12 will show up. If Dip Switch 5 is " ON " -- that selects 120 VAC. If the unit has 240 VAC applied, error 12 will show up.

This is important because if the Fan Heater is set up at GSI for 120 VAC and the customer connects to 240 VAC -- the Heater Control will work -- but if allowed to operate -- the solenoids will have 240 VAC applied to them -- they won't last long.

13 + 11 LIMIT SHORTED

Multiple heater error conditions:

When 2 or more heaters are connected together through the serial link.

If the master cannot communicate with a slave controller the master will display " SLA " on the main display -- and the " RX " " TX " symbols will be flashing.

If a limit switch error or one of the error numbers 1 through 8 occur -- that error is displayed on the slave where the error orginates. The master simply displays " SLA " " ERROR ".

MIsc Notes

Temperature sensor connection. The temperature sensor (bolt) must always be connected to the master. In the case of the top dry, both temperature sensors must be connected to the master (unit at the top). Top dry grain temperature input is connected to J7 pins 14 and 18.