Mathews Company

Means Commitment

PINNACLE LITE

2 Volume

Controls Manual

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CONTROLS MANUAL - PINNACLE LITE

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LIMITED WARRANTY FOR WHOLE GOODS

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Table of Contents

Section 1

Introduction

Overview

This volume of the manual is intended to provide you with a thorough overview and explanation of the touch screen software that interfaces with the Pinnacle Lite Programmable Logic Controller (PLC). All possible features of the current Pinnacle Lite software (HMI version 13.0051.XX and PLC version 13.0200.XX, where XX refers to a minor revision, 01, 02, etc.) will be explained, however it is important to understand that not all machines that this software will be installed on will have all of those features. The following highlights what features are/were available based on the model year of the dryer:

Model Year	Features / Options
2010:	discharge moisture sensor and printer optional
2011:	digital temperature controller(s) communications standard discharge moisture sensor standard
2012:	digital temperature controller(s) communications standard discharge moisture sensor standard auxiliary alarm monitoring standard
2013:	AccuDry mode of operation digital temperature controller(s) communications standard discharge moisture sensor standard auxiliary alarm monitoring standard

Pinnacle Lite is a member of the Pinnacle family of control systems which controls the dryer through a combination of the PLC interfaced with a Human Machine Interface (HMI) or "touch screen" and conventional relays and timers that are interfaced through buttons and switches. Pinnacle, a completely PLC-controlled system does not include any buttons or switches; As all operator control is done through a larger touch screen.

Pinnacle Lite Remote Cabinet

Pinnacle Remote Cabinet

The Pinnacle Lite control system's components are intermixed between the High Voltage Cabinet and the Remote Control Cabinet. The PLC is located in the High Voltage Cabinet whereas the HMI is located in the Remote Control Cabinet along with all of the switches and lights. Because the Pinnacle Lite control system utilizes both PLC components and non-PLC components, it is important to understand the capabilities and limitations of the system. The primary responsibility of the PLC is to monitor and control the discharge

system and associated components. All fill equipment, takeaway equipment, burners, and fans are all controlled through the buttons and switches mounted in the remote cabinet.

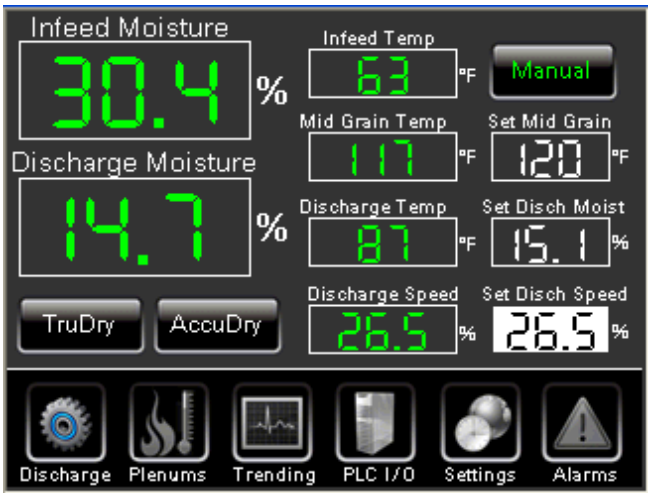
Although the PLC's responsibility is to only control the discharge of the dryer, it is designed to monitor other aspects of the dryer's performance for a more comprehensive overview:

Plenum Temperatures

The plenum temperature(s) are digitally controlled through the use of temperature controllers that are mounted on or near the dryer's gas train. The PLC/HMI system monitors the controller(s) and displays pertinent information on the touch screen. Alarms from these temperature controllers are also monitored and will be displayed accordingly on the touch screen.

Moisture Monitoring

The discharge and infeed (if equipped) moisture sensor readings are monitored and any associated alarms corresponding to the grain moisture levels will be displayed accordingly on the touch screen. Additionally, all calibration and setup of the moisture sensors are done via the touch screen and the touch screen provides interface for printer settings (if equipped) which includes print frequency, on/off control and other related functions.



Auxiliary Alarms

The Pinnacle Lite control system also monitors the status of several other elements of the dryer that are unrelated to the discharge system so that in the event of a system shutdown, thesource of the shutdown may be correctly identified. These additional auxiliary alarms, which are presented on the touch screen, include: grain flow, high temperature limit, motor overloads and more.

User Interface

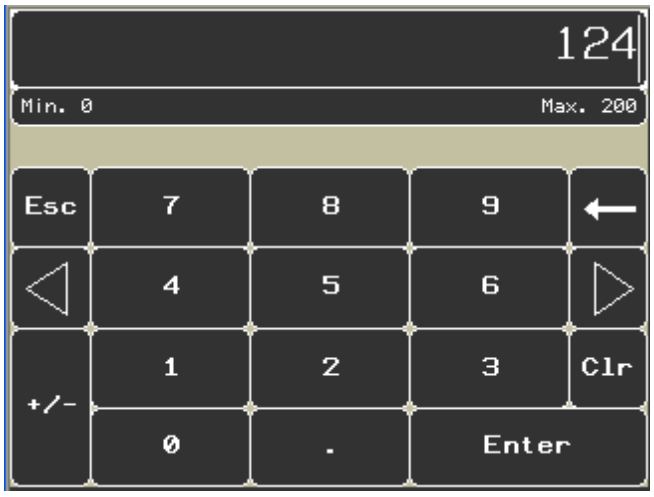
The touch screen interface of Pinnacle Lite has been initially designed and continues to be refined, based on user feedback over past years, to provide the most intuitive and straightforward approach to interfacing with the machine. Navigation through the screens is accomplished by selecting one of the six main chapters (Discharge, Plenums, Trending, PLC I/O, Settings, Alarms) that are shown across the bottom banner of the touch screen. Depending on what chapter you are on, the corresponding icon will illuminate in color which helps understand where you are within the program.

The touch screen allows you to not only monitor parameters, but to also change operational and alarm set points. For the most part, values that can be changed will be displayed as black text with a white background. Values that display in green with the dark gray background are read-only values and cannot be changed.

Example of a displayed value that can be changed: 

Example of a displayed value that cannot be changed: 

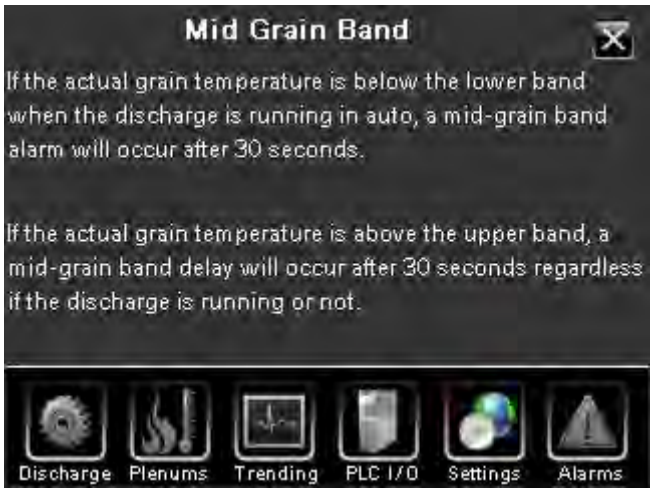
Selecting a white field to change the numerical value will bring up a number keypad. Depending on the input that is being changed, there may be a minimum and maximum range to the value which will be displayed on the keypad. When attempting to enter a value outside of the min/max range, the value will be displayed red on the keypad and will not allow the value to be entered. Once a suitable value has been entered, press "Enter" to input the value and be returned to the screen that the value was being entered on. If you do not wish to change the value, press "Esc" to return without making a change. The "←" button will delete one digit and "Clr" will delete the entire entry.



Certain values can be jogged by pressing an up arrow or down arrow. Pressing these buttons will increase or decrease the target value. An example of this can be found on the Discharge screen in which the discharge speed setpoint or mid-grain temperature setpoint can be finely adjusted by pressing the up or down arrow buttons.

Certain data field inputs or buttons have a help button associated with it so that it's function or purpose is readily available. This will be indicated with a "?" button and simply pressing it will display a help message pop-up which can easily be closed by pressing the "x" button in the upper right hand corner.

Example of a "?" help button: 



Section 2

Operation

Overview

While operating the dryer, the majority of the time you will be monitoring the Discharge screen to see the dryer's discharge rate, average mid-grain temperature, or the discharged grain's moisture and temperature. Occasionally you may find it useful to monitor your plenum temperature(s) on the Plenums page or occasionally looking at a historical trend in the Trending chapter. The following is a comprehensive explanation of what each screen displays and what functions can be performed.

Discharge

The Discharge screen displays the dryer's discharge rate in % discharge which is a relative value based on the drive and transmission system of the dryer's metering system. The metering discharge system's speed is controlled by means of a variable frequency drive (VFD) and the 0% - 100% discharge speed read on the touch screen correlates to 5Hz - 40Hz or 5Hz - 60Hz or 5Hz - 72Hz depending on the exact dryer model, this further correlates to the actual speed of the discharge metering motor. A lower discharge speed means more time in the dryer for the grain and a higher discharge speed means less time in the dryer. Additional insight into the dryer's discharge rate can be found in the PLC I/O chapter on the Discharge Speed Analog Output screen where you will find the calculated discharge rate in bu/hr or metric tonnes/hr, calculated motor speed, calculated metering speed, and the calculated frequency output from the VFD.

The read-only values that are displayed on the Discharge Screen are normally shown with green color for the numerical values, however certain conditions may cause these values to show colors other than green if any of the following conditions occur:

Discharge Moisture Displays Yellow - The discharge moisture value will display yellow if the discharge moisture is outside of the minimum/maximum discharge moisture limit as defined by the alarm setpoint. This alarm will apply to both TruDry and AccuDry Systems. Alarm setpoints are explained in the Settings section of the manual.

Discharge Speed Displays Red - The discharge speed value will display red when the proximity switch is bypassed in the Features Enable section which is explained in the Settings section of the manual.

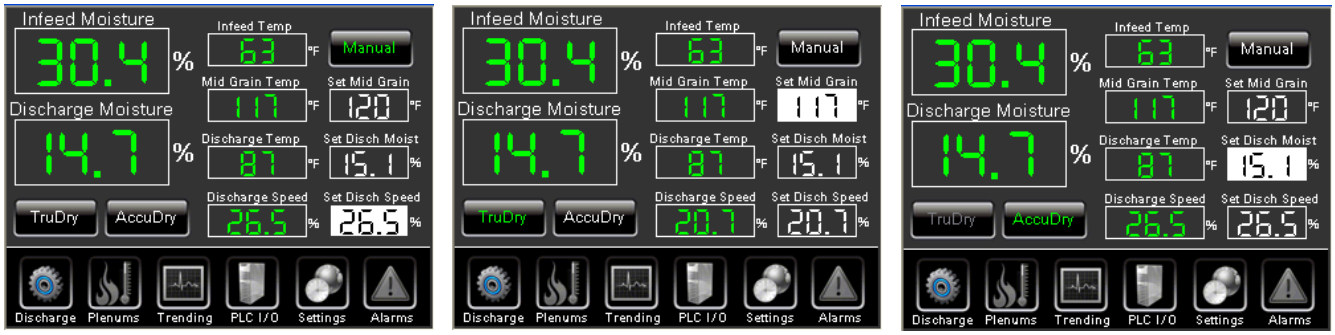
Discharge Grain Temperature Displays Yellow - The discharge grain temperature will display yellow when the measured temperature is outside of the range of the moisture/temperature sensor. This alarm will apply to both TruDry and AccuDry Systems

Mid-Grain Temperature Displays Yellow - The mid-grain temperature will display yellow when it is outside of the mid-grain temperature band as defined by the alarm setpoint. Alarm setpoints are explained in the Settings section of the manual.

Mid-Grain Temperature Displays Red - The mid-grain temperature will display red when it has been outside of the mid-grain temperature band as defined by the alarm setpoint; this condition will shutdown the dryer. Alarm setpoints are explained in the Settings section of the manual.

Based on options equipped with the dryer, certain values, buttons or functions may not appear on the Discharge screen as shown in the following examples:

Without any additional features enabled (TruDry Technology), the discharge screen will simply display the actual and setpoint discharge speed % as well as the actual and setpoint average mid-grain temperature, in addition to the operating mode (Manual vs. TruDry) and the discharge grain temperature. Regardless of what options are equipped on the machine, there will always be four (4) mid-grain temperatures that are monitored which provides the input for the TruDry mode of operation; the 4 temperatures are averaged which is what is displayed on the Discharge screen. To see each individual mid-grain temperature you will have to navigate to the PLC I/O chapter, and be signed in as a service technician, which will be explained further in the PLC I/O section of the Operation section of this manual. The mid-grain temperature and grain temperature values as well as any other temperature values can be displayed in either degrees Celsius or degrees Fahrenheit; this setting can be changed in the Dryer Configuration page of the Settings chapter which will be explained further in the settings section of this manual. It is important to note that based on your current operating mode, only certain setpoints that apply to that particular mode will appear as white boxes for modification.



Manual mode of operation means you can directly tell the discharge metering system what speed the dryer will discharge grain at. Depending on what model dryer you are operating, the % discharge speed will correspond to an approximate bu/hr or metric tonnes/hr value. These values are calculated based on discharge capacity values which will be discussed further in the settings section. Additionally, a table is included on the next page so that you may correlate the discharge speed % to bu/hr or metric tonnes/hr.

	All Heat						Heat + Cool					
	20%-15% Moisture			25%-15% Moisture			20%-15% Moisture			25%-15% Moisture		
	bu/hr	tonnes/ hr	speed	bu/hr	tonnes/ hr	speed	bu/hr	tonnes/ hr	speed	bu/hr	tonnes/ hr	speed
L1250	725	16.9	70%	500	11.6	45%	430	10.0	38%	280	6.5	21%
L1350	1,080	25.2	47%	730	17.0	29%	630	14.7	24%	410	9.6	12%
L2550	1,690	39.4	78%	1,040	24.2	45%	1,010	23.5	43%	645	15.0	24%
L2650	1,895	44.1	89%	1,170	27.3	51%	1,130	26.3	49%	735	17.1	29%
L2700	2,040	47.5	96%	1,270	29.6	57%	1,230	28.7	55%	800	18.6	32%
L3100	2,350	54.7	52%	1,490	34.7	29%	1,700	39.6	35%	1,100	25.6	19%
L3105	3,020	70.3	69%	1,595	37.2	32%	1,900	44.3	40%	1,250	29.1	23%
L4145	3,700	86.2	87%	1,670	38.9	34%	2,300	53.6	50%	1,350	31.4	26%
L5175	4,200	97.8	100%	2,080	48.4	45%	2,925	68.1	67%	1,750	40.8	36%
L6205*	5,040	117.2	100%	2,500	58.1	57%	3,660	85.1	86%	2,190	50.9	48%
CF320 / 320C	325	7.6	62%	200	4.7	35%	185	4.3	31%	120	2.8	17%
CF420 / 420C	445	10.4	56%	300	7.0	35%	255	5.9	28%	165	3.8	15%
CF520 / 520C	565	13.2	53%	400	9.3	35%	325	7.6	26%	215	5.0	14%
CF620 / 620C	565	13.2	53%	400	9.3	35%	-	-	-	-	-	-
CF720	565	13.2	53%	400	9.3	35%	325	7.6	26%	215	5.0	14%
CF730	730	17.0	55%	485	11.3	33%	415	9.7	27%	295	6.9	17%
CF820 / 820C	900	21.0	56%	575	13.4	33%	510	11.9	28%	375	8.7	18%
T2030 / 2030V	710	16.5	53%	405	9.4	26%	375	8.7	24%	215	5.0	10%
T2440 / 2440V	850	19.8	52%	485	11.3	26%	455	10.6	24%	260	6.1	10%
T2850 / 2850V	990	23.1	52%	565	13.2	26%	525	12.2	24%	300	7.0	10%
10520	-	-	-	-	-	-	560	13.0	37%	320	7.5	18%
10630	-	-	-	-	-	-	690	16.1	48%	395	9.2	24%
10730	-	-	-	-	-	-	790	18.4	56%	455	10.6	29%
10840	-	-	-	-	-	-	945	22.0	57%	545	12.7	30%
101050	-	-	-	-	-	-	1,155	26.9	71%	670	15.6	38%
101275	-	-	-	-	-	-	1,385	32.3	87%	805	18.8	47%
10530	-	-	-	-	-	-	700	16.3	44%	400	9.3	19%
10740	-	-	-	-	-	-	930	21.7	41%	540	12.6	18%
10950	-	-	-	-	-	-	1,240	28.9	43%	720	16.8	19%
101160	-	-	-	-	-	-	1,500	34.9	42%	870	20.3	19%
101375	-	-	-	-	-	-	1,700	39.6	40%	1,000	23.3	18%
2000	-	-	-	-	-	-	2,000	46.6	44%	1,200	28.0	23%
2400	-	-	-	-	-	-	2,400	55.9	44%	1,440	33.5	23%
2700	-	-	-	-	-	-	2,700	62.9	42%	1,620	37.7	21%
3000	-	-	-	-	-	-	3,000	69.9	46%	1,800	41.9	24%
3500	-	-	-	-	-	-	3,500	81.5	48%	2,100	48.9	25%
4000	-	-	-	-	-	-	4,000	93.2	50%	2,400	55.9	26%
4800	-	-	-	-	-	-	4,800	111.8	55%	2,800	65.2	28%

*Note: May need to run at lower plenum temperatures for low moisture removal when drying in all heat.

TruDry is the name of a discharge mode of operation that automatically increases or decreases the discharge speed of the dryer. TruDry is not an automatic moisture control mode of operation and does not utilize the discharge moisture value, but instead controls the discharge rate by attempting to maintain an average mid-grain temperature setpoint. The principal of operation is that as the grain in the dryer increases in moisture, the mid-grain temperature will go down and when the grain in the dryer decreases in moisture, the mid-grain temperature will go up. Therefore, what the controller will do is utilize a negative responding Proportional-Integral-Derivative (PID) control loop which will increase the discharge rate when the mid-grain temperature goes up and decrease the discharge rate when the mid-grain temperature goes down. This essentially means that as the grain's moisture goes up, the dryer will slow down and as the grain's moisture goes down, the dryer will speed up.

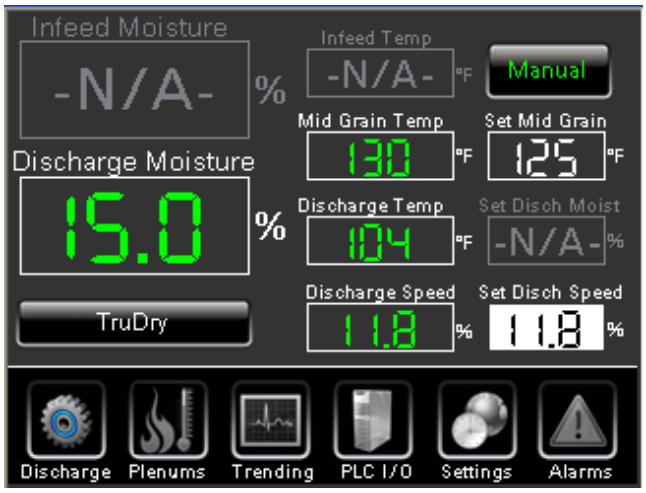
In order to effectively use the TruDry mode of operation, it is important to allow the dryer to get to a steady state operating condition for 2-3 hours (depending on the size of the machine and the incoming grain moisture) with a desirable and consistent discharge moisture output. Once this steady state condition has been met, you will want to set the mid-grain temperature setpoint to a value equal to the current actual mid-grain temperature. Note that although you are running the dryer in manual, you will still be able to change the mid-grain temperature setpoint. At this point, the dryer has been running for 2-3 hours and steady state has been reached, so the current reading for the actual mid-grain temperature should correspond to the desired grain moisture that is currently being discharged from the dryer. It is important to understand that TruDry is not controlling the dryer on discharge moisture, but rather indirectly based on the average mid-grain temperature.

Another step to ensure a smooth and successful transition from manual mode to TruDry is to verify the minimum and maximum discharge speed on the Operational Setpoints page of the Settings Chapter is set to a reasonable. The minimum and maximum speed setpoint refers to the minimum and maximum speed that the dryer can run at. When running in TruDry mode this is especially important because the TruDry control algorithm will attempt to speed up and slow down to maintain the mid-grain temperature setpoint, and the amount of room that the controller has to work with is determined by the minimum and maximum speed setpoints. For example if the min/max speed setpoints are 0% - 100%, the range of speed output from the controller will be higher, which means the rate at which the speed changes will be higher. On the other hand, if the min/max setpoints are 30% - 75%, the controller can only operate within that band and only has a range of 45% to work with. More information on how to change the minimum and maximum speed setpoints on the Operational Setpoints screen is found in the Settings section of this manual. A table of suggested minimum and maximum values is shown on the next page.

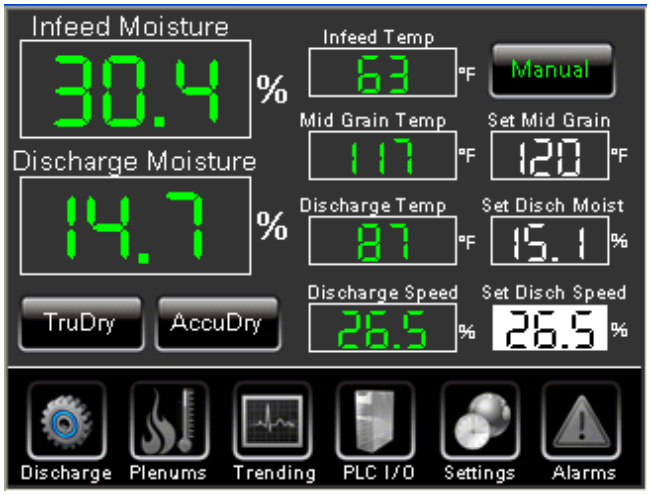
	All Heat		Heat + Cool	
	Recommended		Recommended	
	Min	Max	Min	Max
L1250	40%	80%	10%	50%
L1350	20%	60%	0%	40%
L2550	30%	90%	10%	60%
L2650	40%	100%	10%	60%
L2700	50%	100%	20%	70%
L3100	20%	60%	0%	50%
L3105	20%	80%	10%	60%
L4145	20%	100%	10%	70%
L5175	30%	100%	20%	80%
L6205	40%	100%	30%	90%
CF320 / 320C	20%	70%	0%	50%
CF420 / 420C	20%	70%	0%	40%
CF520 / 520C	20%	60%	0%	40%
CF620 / 620C	20%	60%	-	-
CF720	20%	60%	0%	40%
CF730	20%	60%	0%	40%
CF820 / 820C	20%	70%	0%	40%
T2030 / 2030V	20%	60%	0%	40%
T2440 / 2440V	20%	60%	0%	40%
T2850 / 2850V	20%	60%	0%	40%
10520	-	-	0%	50%
10630	-	-	10%	60%
10730	-	-	10%	70%
10840	-	-	10%	70%
101050	-	-	20%	90%
101275	-	-	30%	100%
10530	-	-	5%	60%
10740	-	-	5%	60%
10950	-	-	5%	60%
101160	-	-	5%	60%
101375	-	-	5%	60%
2000	-	-	10%	60%
2400	-	-	10%	60%
2700	-	-	10%	60%
3000	-	-	10%	65%
3500	-	-	10%	65%
4000	-	-	10%	65%
4800	-	-	10%	65%

Once the average mid-grain temperature setpoint has been set and the minimum and maximum speed range has been established, TruDry mode of operation can be selected by touching the TruDry button which will now illuminate the text green. Once TruDry mode of operation has been selected, the ability to manually change the speed will be inhibited and the only parameter that can be adjusted will be the mid-grain temperature setpoint. While running in TruDry, you will see the speed continuously increase or decrease to maintain the target mid-grain temperature. Do not continuously tweak the mid-grain temperature, let it try to control to the setpoint value that you previously established. TruDry should be able to handle 3-5% swings in incoming moisture with reasonable discharge moisture variation if the dryer was properly brought up to steady state as previously explained. If after running for an extended period of time you have determined that the target mid-grain temperature is too high or too low, minor adjustments can be made, but should only be done periodically, not continuously. If you want to meticulously control the dryer, then you should be running in the manual mode of operation in which you can directly control the dryer's discharge rate.

If a discharge moisture sensor is installed on the machine, the discharge moisture and discharge temperature values will be displayed on the Discharge screen:

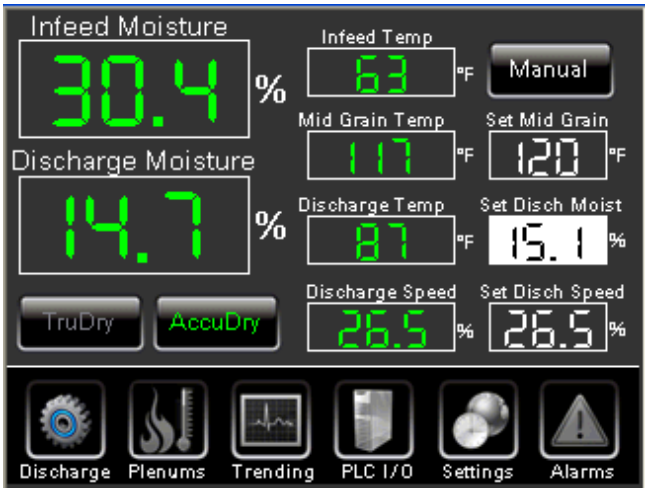


If an infeed moisture sensor is installed on the machine, the infeed moisture and infeed temperature values will be displayed on the Discharge screen:



It is not possible to have an infeed sensor without a discharge sensor and when an infeed sensor is installed, an additional mode of operation exists, if enabled, which will be discussed later in this manual; this feature is AccuDry.

The AccuDry mode of operation utilizes input signals from both the discharge moisture sensor and the infeed moisture sensor to control the dryer's discharge rate. When the AccuDry mode of operation is available, it will display it's corresponding toggle button next to the TruDry button. Also, when AccuDry is available, an additional input will be made available which allows you to enter the target discharge moisture setpoint.



When running in AccuDry, similar to the guidelines that were provided for TruDry, the minimum and maximum speed setpoints are important to the controller's operation. The AccuDry control algorithm will attempt to speed up and slow down to maintain the discharge moisture setpoint, and the amount of room that the controller has to work with is determined by the minimum and maximum speed setpoints. For example if the min/max speed setpoints are 1% - 100%, the range of speed output from the controller will be higher, which means the rate at which the speed changes will be higher. On the other hand, if the min/max setpoints are 30% - 75%, the controller can only operate within that band and only has a range of 45% to work with. More information on how to change the minimum and maximum speed setpoints on the Operational Setpoints screen is found in the Settings section of this manual.

Similar to how the mid-grain temperature setpoint (used in TruDry) can be changed while in manual mode, so too can the discharge moisture setpoint (used in AccuDry) be changed while in manual mode. The only limitation is that you cannot change the discharge speed setpoint when you are in TruDry or AccuDry.

In order to effectively use the AccuDry mode of operation, it is important to allow the dryer to get to a steady state operating condition for 2-3 hours upon initial installation (depending on the size of the machine and the incoming grain moisture) with a desirable and consistent discharge moisture output. Once this steady state condition has been met, you will confirm the discharge moisture setpoint that you want and make any required changes. Also, be sure to set the minimum and maximum discharge speed on the Operational Setpoints page of the Settings Chapter to an accurate band.

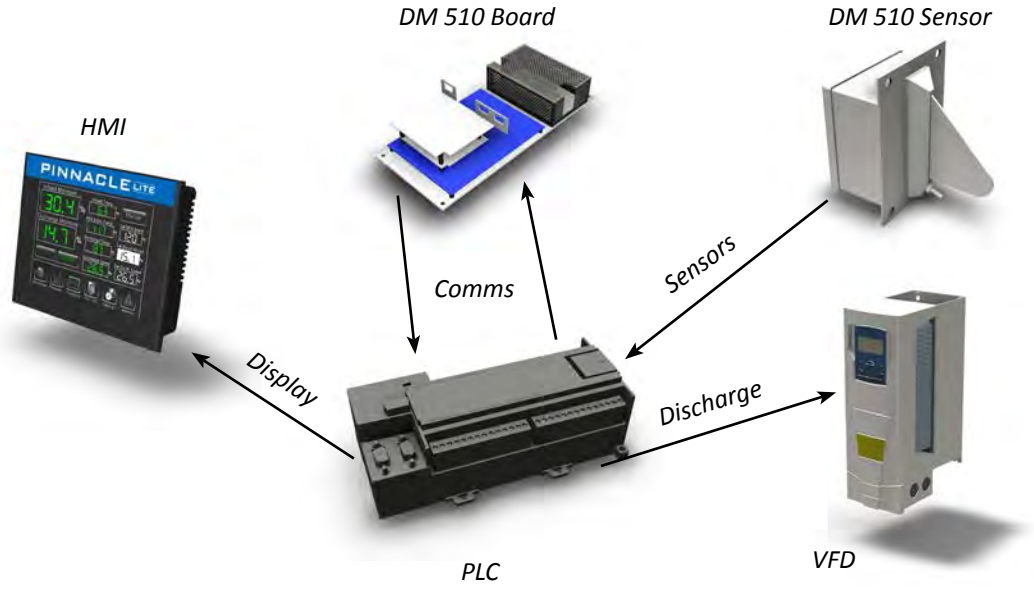
The AccuDry system will remember grain moistures upon startup from the previous shutdown. For example, if you were discharging 15.5% moisture the night prior, and start up with 15.4% the following morning, the system will allow you to quickly enter AccuDry mode.

If the discharge moisture is significantly different from the previous operations moisture, the system will not enable AccuDry until it has gathered sufficient information to run correctly and efficiently.

How AccuDry Works

AccuDry technology utilizes the Dryer Moisture Systems Dryer Master DM510 system. The DM510 system uses specially designed on-line moisture and temperature sensors located at both the infeed and discharge of the dryer. These sensors provide continuous moisture and temperature readings to the PLC, which is shared with the DM510 computer.

The DM510 computer uses this information to build an operating model of your dryer, as infeed moistures and drying conditions change throughout the day; AccuDry continuously calculates and automatically adjusts to the optimum discharge rate for current conditions.



AccuDry has two important advantages. First, in automatic mode, it can continually watch the dryer. It does not have to help unload trucks, load trains, or do any other jobs around the elevator. The dryer receives it's full attention.

Second, it has the benefit of continuous moisture information from both the infeed and discharge of the dryer, giving it a complete picture of all the grain in the dryer, and the grain exiting the dryer.

With this information, AccuDry does not have to wait to react to changes in the outlet moisture. It is able to adjust the discharge rate as the incoming moisture changes. For example, as wetter grain comes into the dryer, AccuDry begins to slow down the discharge rate just as the wetter grain reaches the hot zone.

AccuDry Status

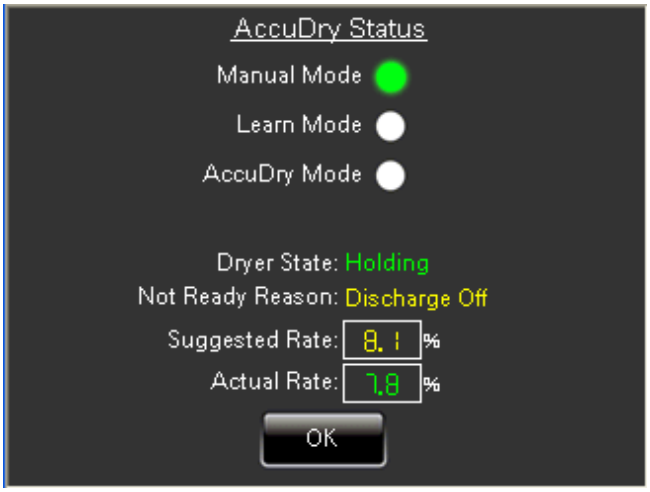
While running in manual mode, you will not be able to enter AccuDry mode until the system is "Ready." The ready state is shown by the color of the AccuDry button as seen below. There are three (3) different states of AccuDry which are as follows:

AccuDry Not Ready (Grayed Out AccuDry Button)

By default, the dryer will not have enough information for you to jump right into AccuDry mode. In order for AccuDry to be "Ready," the system must achieve the following before it will let you enter AccuDry mode:

1. There must not be any alarms present;
2. The dryer must be in the "Running" state of operation, further explanation may be found below;
3. The Actual Discharge Rate must be within 5% of the Suggested Rate;
4. The Discharge Moisture must be within 2% of the Setpoint Moisture and;
5. The AccuDry system must have enough knowledge and runtime, to have a Predicted Discharge Moisture within 2% of the Actual Discharge Moisture.

If you attempt to enter AccuDry Mode before the system is ready, you will encounter the AccuDry Status screen as shown below. This screen will display current mode, the dryer state, the not ready reason, the suggested rate, and you're actual discharge rate. This screen will provide information to better achieve AccuDry readiness, and will get you into AccuDry much faster than guess work in Manual mode (see next page for full breakdown).



Mode Of Operation

At the top of the AccuDry Status screen your current operating mode will be illuminated by a green indicator. These modes include; Manual Mode, Learn Mode, and AccuDry Mode. Manual mode is the default startup mode, where you will be constantly controlling the discharge rate. Learn mode will be illuminated when the dryer is operating (discharge is ON), and the moisture sensors have product being detected. This indicator states that the AccuDry system is "learning" from it's current operating inputs, and will stop "learning" and saving data when the discharge is turned OFF. Lastly is AccuDry mode, for when you are running in AccuDry mode.

Dryer State

The dryer state field indicates the seven (7) stages of operating your dryer. The seven states are as follows;

Stand-By
The dryer fans, discharge, and burner(s) are off. The dryer may not be full (no moisture displayed by the infeed moisture sensor).

Primed
The dryer fans, discharge, and burner(s) are off. The dryer is full (moisture displayed by the infeed moisture sensor).

Idle Running
The dryer fans, discharge, and burner(s) are off. The dryer is full (moisture displayed by the infeed moisture sensor). This feature is only available on systems that make use of the fan switch input.

Shutdown
The dryer is OFF. The fans, the discharge, and burner(s) are off. The dryer is full (moisture displayed by the infeed moisture sensor). This feature is only available on systems that make use of the fan switch input.

Preheat
The dryer fans are on, the burner(s) are on, the discharge is off. The dryer is full (moisture displayed by the infeed moisture sensor).

Running
The dryer fans are on, the burner(s) are on, the discharge is on. The dryer is full (moisture displayed by the infeed moisture sensor). Moisture is displayed at the discharge sensor.

Holding
The dryer fans are on, the burner(s) are on, the discharge is off. The dryer is full (moisture displayed by the infeed moisture sensor). This is a temporary state and it will revert to Manual mode after 25 minutes as a safety precaution.

Not Ready Reason

The not ready field indicates the reason the dryer will not allow you to enter AccuDry mode.

Discharge Off
The discharge is off and must be turned on.

Drying Temp Critical
Plenum temperature is in alarm and must be corrected.

Inlet Moisture Critical
Inlet grain moisture is in alarm and must be corrected.

Outlet Moisture Critical
Discharge grain moisture is in alarm and must be corrected.

Inlet Temperature Critical
Inlet grain temperature is in alarm and must be corrected.

Outlet Temperature Critical
Discharge grain temperature is in alarm and must be corrected.

Burner Off
Burner is OFF and must be lit.

Rate Off
Discharge rate is in alarm and must be corrected.

Fan Off
Fan is OFF and must be turned on.

Model Prediction
AccuDry is gathering data, and the predicted moisture (based on current data) is not acceptably close to the actual discharge moisture. Continue running in manual until enough data is taken to accurately predict correct discharge moistures.

Beta 2 Filling
A technical subset of model prediction. The system is gathering feedback on how your dryer is efficiently drying your particular grain. Continue running in manual until enough data is taken to accurately predict correct discharge moistures.

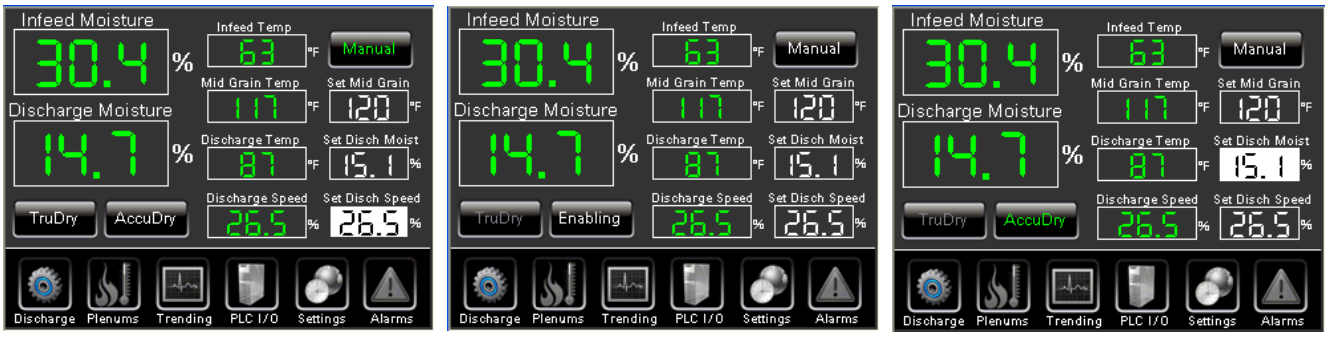
Beta 2 Stabilizing
A technical subset of model prediction as well. The system is fine-tuning feedback based on how your dryer is operating. Continue running in manual until enough data is taken to accurately predict correct discharge moistures.

Target Difference
Moisture setpoint is not acceptably close to the actual discharge moisture. Continue running in manual until discharge moisture is within 2% of setpoint moisture. This is done to alleviate moisture overshoot when switching to AccuDry.

Suggested Rate
The suggested rate field indicates what the AccuDry system would run at that given moment if it were to take over controls of the VFD. It is important to note that this field updates regularly, and will become more and more accurate as the dryer learns for each individual grain type.

Actual Rate
The actual rate field indicates the real-time commanded speed from the PLC to the VFD.

AccuDry Ready (White AccuDry Button)
While running in manual and AccuDry reaches the "Ready" state, the AccuDry button text will change from gray to white. When you now select AccuDry, the button will flash "Enabling..." for a few seconds, and will illuminate the AccuDry text in green lettering; you are now in AccuDry mode.



Once AccuDry mode of operation has been selected, the ability to manually change the speed will be inhibited and the only parameter that can be adjusted will be the discharge moisture setpoint. While running in AccuDry, you will see the speed continuously increase or decrease to maintain the target discharge moisture setpoint. Do not continuously tweak the discharge moisture setpoint, let it try to control to the setpoint value that you previously established.

A Typical Daily Routine

The following steps should be included in your daily routine when using the AccuDry system:

1. Before dryer start-up, check the outlet moisture sensor to ensure it is clean and free of debris. The sensor chute has no obstructions ahead of the sensor, and the flow-metering device is operating.
2. Start your dryer as you have in the past from the dryer control panel. The Pinnacle Lite software will indicate that you are in "Manual" mode.
3. On the main discharge screen, verify your discharge rate and discharge moisture setpoints. Modify them accordingly.
4. After the normal fan and burner startup procedure, as outlined in the Operations Manual, begin discharging.
5. AccuDry can be selected when the AccuDry button is illuminated white. Begin running in AccuDry and double-check the discharge moisture setpoint (now the only setpoint you can change) is correct.
6. AccuDry will now automatically adjust the dryer discharge rate to achieve the displayed product target moisture.
7. Periodically check the moisture sensors to ensure they are clean and there is good product flow. You may turn off your metering for roughly 60 seconds to clear out any fines or beeswings that may have accumulated in the sampling chute.
8. While operating the dryer, calibrate the moisture sensors as required.
9. When you turn off the dryer discharge, AccuDry will automatically revert to "Manual" mode after 25 minutes.

Plenums

The Plenums screens provides interface with the temperature controller(s) that are mounted on or near the gas train of the dryer (if equipped). If the system does not have digital temperature controllers with communications installed, a simple message will be displayed indicating that this feature is not available.

If digital temperature controllers are installed and the dryer is configured for temperature controller communications, you will be able to monitor actual and setpoint values for the plenum temperatures as well as % output of the controller. This is possible because the touch screen is configured to communicate with these temperature controllers through the RS485 ModBus protocol. This means that the value that is displayed on the temperature controller at the dryer is also displayed on the touchscreen in the remote cabinet. There are two primary reasons for this arrangement: (1) It provides more flexibility so that the plenum temperature can be controlled and monitored either at the dryer or at the location of the Remote Control Cabinet and, (2) in the unlikely event that the PLC or the HMI touch screen were to fail, the dryer can still be operated because the temperature controllers are independent from the PLC and HMI and so they will be able to continue operation despite not being able to monitor the controllers' values on the touch screen. Similarly, the VFD that drives the discharge motor can also be used manually without input so that you may continue to dry grain in the event of a PLC or HMI component failure. Refer to the Operations Volume of the manual more information on manual over-ride control of the VFD.

Depending on the number of burners/plenums equipped on the dryer, there will be a corresponding row of values to monitor for each burner. The number of active rows of indication on the Plenums page is determined by the model of the dryer. An inactive (not used) row of plenum temperature data will be grayed out and the plenum numbers are ordered from 1-8 with 1 being at the bottom of the dryer and 8 being at the top. There are two pages which can easily be navigated to/from by using the Next and Back buttons found on the lower corners of the screen. While navigating from one page to the next, note that you will continue to remain in the Plenums chapter as indicated by the color illuminated Plenums icon in the bottom navigation banner.

The setpoint and actual plenum temperatures, controller % output, and the high/low temperature alarms are all visible to the Pinnacle Lite touchscreen. The actual temperature refers to the temperature measured by either the plenum RTD or Thermocouple (dryer model specific) and cannot be changed. The controller's output, a 0% - 100% relative value, is also displayed for reference; this value corresponds to the % opening of the control valve and is not able to be changed because it is done automatically by the controller. The plenum temperature setpoint is the only value that can be changed and represents the target temperature that the burner will strive to maintain. To change the plenum temperature setpoint on the HMI touch screen, simply touch the white setpoint field and enter the desired plenum temperature setpoint. The minimum and maximum temperature allowed for entry will be indicated below the entry field on the keypad; this is based on the program that is saved on the controller. Once the desired plenum temperature setpoint has been keyed in, press Enter and you will return to the previous Plenums screen. You will notice the previous plenum temperature setpoint has been replaced with a read-only field that states "SV" which lets you know the value you entered is being saved to the controller. Because of the communication between the controller and the HMI touchscreen which is utilizing the RS485 ModBus protocol, this may take up to 15 seconds for the value to be successfully saved to the controller.

The plenum temperature controllers function similar to the PID-control loop that controls the dryer's discharge rate. For example, as the temperature in the plenum starts to decrease due to ambient temperatures decreasing at night, the controller will respond by opening the gas control valve more with the goal of increasing the actual plenum temperature to the setpoint. Similarly, if the plenum temperature setpoint is decreased, the gas control valve will be commanded to close slightly to adjust to the new plenum temperature setpoint.

Each controller also has a Reset button associated with it. The purpose of this button is to reset the controller when it has entered into an alarm state. Alarms that occur within the temperature controller are either a high temperature or a low temperature alarm and these will cause pop-ups to occur similar to all other alarms which will be explained further in Section 4 - Troubleshooting. Once the condition causing the alarm has been rectified, the controller can be reset by pressing the Reset button. This will communicate a message to the controller telling it to reset itself and the corresponding alarm entry in the alarm history on the Alarms chapter will be cleared.

Similar to the small green and red indicator lights on the face of the temperature controllers, there are also small indicating lights next to the values on the HMI touchscreen. Specifically, you will see a small flashing green box next to the actual temperature value and a either a lower or upper red box next to the setpoint temperature value. The flashing green box indicates that the controller is outputting a signal to the control valve, whereas the red boxes indicate either a high temperature alarm or a low temperature alarm depending on the vertical position (either high or low).

There are Heat/Cool selector switches to specify which plenums are considered heating or cooling plenums. These toggle switches are crucial to AccuDry, as they tell the DM510 Logic Board which plenums are heat or cool. This is important since the virtual heating and cooling volumes used in dryer prediction will vary based on the plenums that are selected respectively. Selecting the type of plenum on this screen will automatically update the volumes in the AccuDry settings. **These can only be toggled when the discharge is OFF.**

Lastly, both the Average Drying Temp and the Average Cooling Temp are displayed at the bottom of the screen. This is done such that when a plenum is changed from heating to cooling the temperature averages will change; thus giving instant feedback to the user on how these changes are directly affecting the dryer temperatures.

Trending

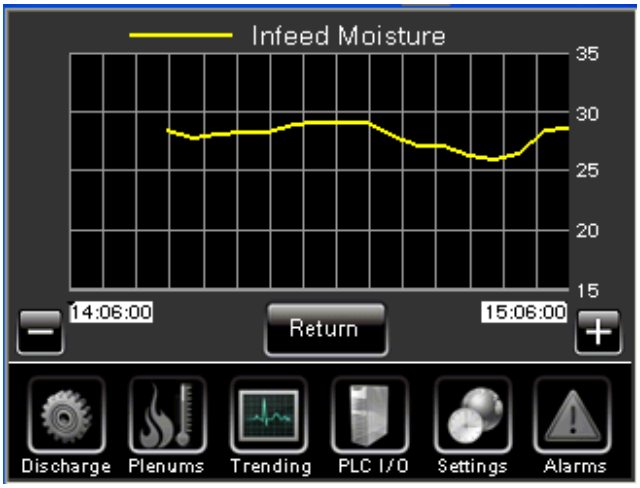
The trending chapter is where you will go to view historical data for discharge speed, mid-grain temperatures, grain moistures, grain temperatures, and plenum temperatures. Each set of data is plotted on an individual historical graph with some interactive features. Although you will be able to access the Trending screens, you will not actually see data trends unless the dryer is currently discharging grain. Upon selecting the Trending chapter, you will be taken to the Data Trending table of contents screen where you can select what trend you want to view.

Depending on what features are equipped on the machine, different sets of buttons will be displayed. If there are no moisture sensors installed, the Grain Moistures or Grain Temps buttons will be grayed out. If there are no temperature controllers with communications installed, the Plenum Temps button will be grayed out. The Mid-Grain Temps and the Discharge Speed button will always be displayed and available to be viewed. Note that only the Average Mid-Grain Temp of the four sensors will be displayed unless logged in as a service technician.

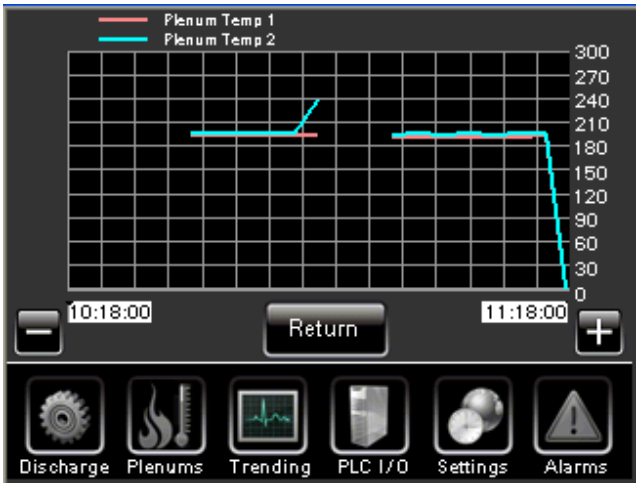
If a printer is installed and enabled on the Features Enable screen, activating the printer on/off is also found on the Data Trending screen by pressing the Printer On / Printer Off button. The function of the printer is discussed further in the Settings section of this manual.

To view a data trend graph, simply select the button corresponding with the trend that you want to view and you will be presented with the graph on a separate screen. All data trend graph screens have the same functions and features, display more or less data depending on the presence of certain options, such as number of plenums/burners, presence of an infeed moisture sensor or other similar features. At the bottom of each graph there will be a "Return" button which will return you to the Data Trending table of contents page. On the bottom of the graph there will be two time values.

These values correspond with the time scaling on the horizontal axis and although they are displayed with black text with a white background, they cannot be directly changed, but rather indirectly by pressing the + or - buttons across the lower horizontal region of the screen. The default time range when the trend is loaded is 60 minutes into the past. Pressing the + or - button will increase or decrease the historical time range by 60 minutes with a limit of up to 12 hours into the data's history. As you change the time scale on one trend it will be reflected on all trends as the same time scale.



For data trends that have multiple values being plotted, such as plenum temperatures, each trend will be color coded with a legend at the top of the screen clearly indicating what line corresponds with what parameter.



PLC I/O

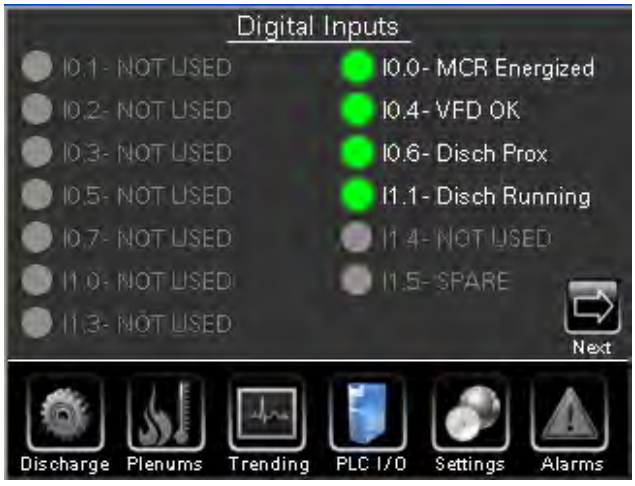
The PLC I/O chapter displays values corresponding to the digital and analog inputs and outputs that are interfaced with the PLC. Analog inputs and outputs refer to values that change in numerical value such as a temperature or a moisture reading, whereas digital inputs or outputs refer to parameters that are discrete and are either on or off, such as a high limit switch.

The purpose of the PLC I/O chapter is for several reasons, some of which include the ability to diagnose issues that may arise or to get additional information pertaining to a particular input or output value. Within the PLC I/O chapter there are four (4) different screens that can be viewed in sequential order which are Digital Inputs, Digital Outputs, Discharge Speed Analog Output, and Moisture / Temperature Analog Inputs. You can navigate from one screen to another by pressing the Next and Back buttons as needed. A fifth screen may be viewed at a service level which pertains to the Mid-Grain Analog Inputs

Digital Inputs

Upon selecting the PLC I/O chapter button, you will be taken to the Digital Inputs screen. Because both digital inputs and digital outputs refer to discrete parameters, their values can be indicated with the equivalent of a colored bulb. If the indicator is white, the input is off, whereas if the indicator is green, the input is on.

The digital inputs that are monitored by the PLC are presented below with a brief description of their purpose. Not all digital inputs are used on all machines, specifically if the dryer is not equipped with the auxiliary alarms feature, several of the digital inputs will be displayed in a grayed out condition and will have the name of Not Used.



I0.1 - Control Power OK
The Control Power OK digital input means that the machine's control power is present in the High Voltage Cabinet from the Remote Cabinet when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature.

I0.2 - Motor Overloads OK
The Motor Overloads OK digital input means that none of the machine's motors have tripped due to overload when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature.

I0.3 - Gas Pressure OK
The Gas Pressure OK digital input means that none of the gas pressure switches have tripped due to high or low gas pressure in the gas train. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature and gas pressure switches are installed (CE/CGA).

I0.5 - Disch Overload OK
The Discharge Overload OK digital input means that the discharge overload switch (rotary bin switch on Tower Dryer or Whisker Switch on Profile Dryer) has not tripped when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature.

I0.7 - Plenum Doors OK
The Plenum Doors OK digital input means that none of the plenum doors have been opened when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature and plenum door switches are installed (CE).

I1.0 - High Limit(s) OK
The High Limit(s) OK digital input means that none of the high limit switches have tripped due to high temperature when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature.

I1.3 LLCs OK
The LLCs OK digital input means that none of the LLC circuits have tripped due to high temperature when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature and LLCs are installed.

I1.0 - MCR Energized
The MCR (Master Control Relay) Energized digital input means that the safety circuit of the machine is completed and the dryer is ready for operation when illuminated green.

I0.4 - VFD OK
The VFD OK digital input is a signal that is sent from the VFD to the PLC indicating that the VFD is properly functioning and is not experiencing any fault conditions.

I0.6 - Disch Prox
The Discharge Proximity digital input is a pulse signal that is sent from the proximity switch to the PLC indicating the rotation of the metering system. This input is used for proof of metering system rotation and to detect a jam condition. The indicator will blink green every time the shaft makes one rotation.

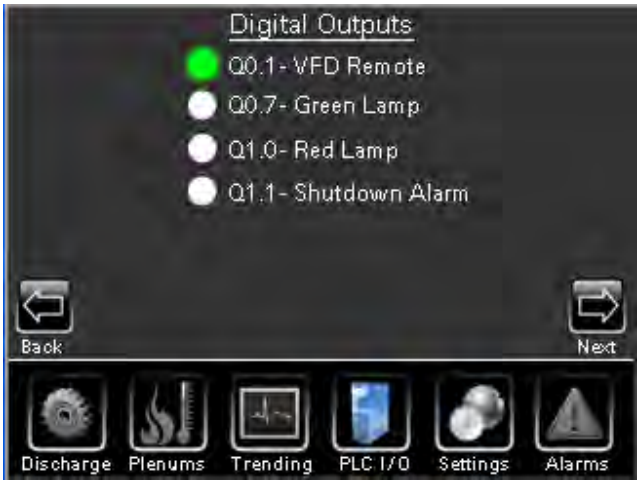
I1.1 - Disch Running
The Discharge Running digital input indicates that the metering system has been commanded to run from the metering switch on the Remote Control Cabinet when illuminated green.

I1.4 - Grain Flow OK
The Grain Flow OK digital input indicates that the grain fill system has sufficient grain when illuminated green. This digital input is only monitored if the machine is equipped with the auxiliary alarms feature.

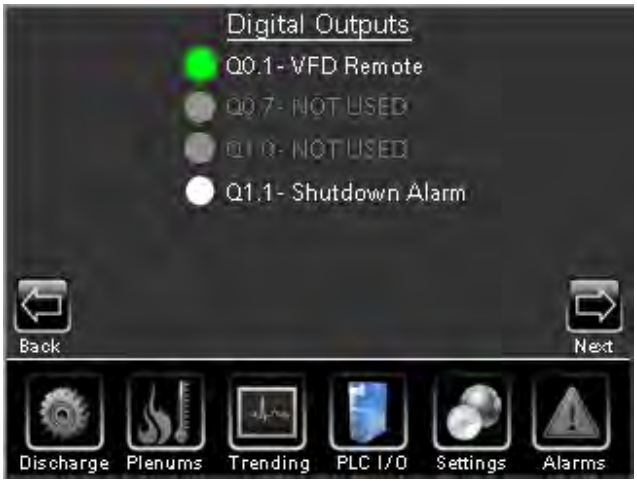
I1.5 - Spare
The spare digital input is reserved for future use and will be illuminated white.

Digital Outputs

Advancing to the next screen from the Digital Inputs by pressing the Next button will take you to the Digital Outputs screen. Similar to the digital inputs, digital outputs refer to discrete parameters and their values can be indicated with the equivalent of a colored bulb. If the indicator is white, the output is off, whereas if the indicator is green, the output is on.



The digital outputs that are commanded by the PLC are presented in the following with a brief description of their purpose. Not all digital outputs are used on all machines, specifically if the dryer is not equipped with the auxiliary alarms feature, some of the digital outputs will be displayed in a grayed out condition and will have the name of Not Used.



Q0.1 - VFD Remote
The VFD Remote digital output commands the VFD that speed control will come from the PLC when illuminated green.

Q0.7 - Green Lamp
The Green Lamp digital output commands the green light on the stack lamp to turn on when illuminated green. The green lamp on the stack light is on continuously when the control power is on and will continuously blink when the discharge is running. This digital output is only available if the machine is equipped with the auxiliary alarms feature.

Q1.0 - Red Lamp
The Red Lamp digital output commands the red light on the stack lamp to turn on when illuminated. The red lamp on the stack light will blink when the dryer has shutdown with a Type "C" alarm or will alternate red/green blinking with a Type "A" alarm while discharging. More information is available on alarms in the Troubleshooting section of this manual. This digital output is only available if the machine is equipped with the auxiliary alarms feature.

Q1.1 - Shutdown Alarm
The Shutdown Alarm digital output causes the safety circuit to be opened and a subsequent dryer shutdown when illuminated green. An example of this occurs when the PLC experiences an alarm condition such as a Mid-Grain Band Delay alarm. More information is available on alarms in the Troubleshooting section of this manual.

Discharge Speed Analog Output

The discharge speed analog output screen provides all pertinent discharge speed information. The scaled discharge speed output % that is defined either manually in Manual mode or automatically in TruDry or AccuDry mode is shown. Note that the corresponding output voltage from the PLC is shown only when logged in as a service technician, this is the analog output voltage that is sent to the VFD for discharge speed control. This value can be verified for troubleshooting purposes by measuring the voltage across the output of the PLC output or by measuring the analog input voltage on the VFD. A tabulation of data for all dryer models is shown on the next page with VFD frequency, metering speed, and discharge rate (bu/hr and metric tonnes/hr) for 0% - 100% in 10% increase.

The VFD frequency is shown to provide an indication of what frequency the discharge metering motor is running at; this value is not read directly from the VFD, but rather it is a calculated value based on the discharge speed %.

The discharge motor speed and the corresponding metering system speed are both shown with units of revolutions per minute (RPM). The metering speed is the speed at which either the metering rolls or sweep system is running at downstream of the discharge gearbox speed reduce.

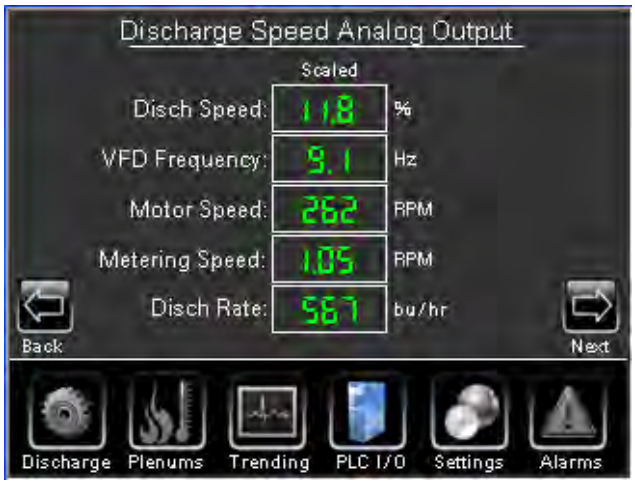
Discharge Speed (%)

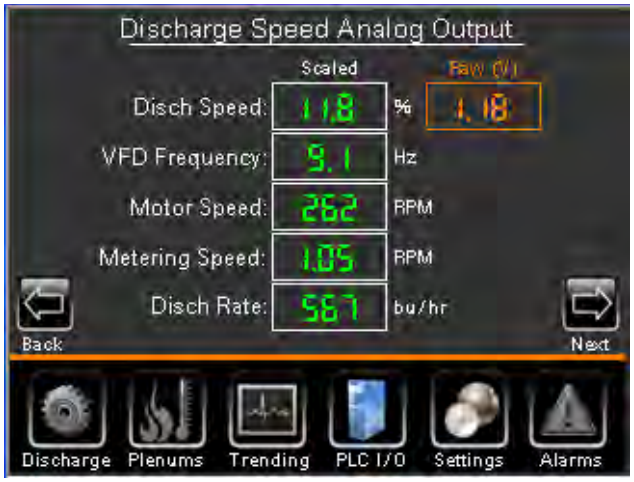
	0%				10%			
	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)
L1250	5.0	0.6	83	1.9	10.5	1.2	175	4.1
L1350		0.8	176	4.1		1.7	369	8.6
L2550								
L2650								
L2700								
L3100		1.6	351	8.2		3.4	738	17.2
L3105								
L4145								
L5175								
L6205								
CF 320 / 320C	5.0	0.6	42	1.0	10.5	1.2	87	2.0
CF 420 / 240C			62	1.5			131	3.1
CF 520 / 520C			83	1.9			175	4.1
CF 620 / 620C								
CF 720								
CF 730			104	2.4			219	5.1
CF 820 / 820C			126	2.9			264	6.1
T2030 / 2030V	5.0	0.6	104	2.4	10.5	1.2	219	5.1
T2440 / 2440V			126	2.9			264	6.1
T2850 / 2850V			146	3.4			307	7.2
10520	5.0	0.6	93	2.2	11.7	1.3	219	5.1
10630								
10730								
10840			110	2.6			257	6.0
101050								
101275								
10530	5.0	0.6	172	4.0	8.5	1.0	293	6.8
10740			241	5.6			411	9.6
10950			310	7.2			528	12.3
101160			379	8.8			645	15.0
101375			448	10.4			762	17.8
2000	5.0	0.6	345	8.0	10.5	1.2	725	16.9
2400			414	9.6			869	20.3
2700			483	11.3			1014	23.6
3000	5.0	0.2	496	11.6	10.5	0.4	1042	24.3
3500			558	13.0			1173	27.3
4000			621	14.5			1303	30.4
4800			683	15.9			1433	33.4

	20%				30%			
	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)
L1250	16.0	1.8	266	6.2	21.5	2.5	358	8.3
L1350		2.6	562	13.1		3.4	756	17.6
L2550								
L2650								
L2700								
L3100		5.1	1125	26.2		6.9	1511	35.2
L3105								
L4145								
L5175								
L6205								
CF 320 / 320C	16.0	1.8	133	3.1	21.5	2.5	179	4.2
CF 420 / 240C			200	4.7			269	6.3
CF 520 / 520C			266	6.2			358	8.3
CF 620 / 620C								
CF 720								
CF 730			333	7.8			448	10.4
CF 820 / 820C			402	9.4			540	12.6
T2030 / 2030V	16.0	1.8	333	7.8	21.5	2.5	448	10.4
T2440 / 2440V			402	9.4			540	12.6
T2850 / 2850V			469	10.9			630	14.7
10520	18.4	2.1	344	8.0	25.1	2.9	469	10.9
10630								
10730								
10840			405	9.4			552	12.9
101050								
101275								
10530	12.0	1.4	414	9.6	15.5	1.8	535	12.5
10740			580	13.5			749	17.4
10950			745	17.4			963	22.4
101160			911	21.2			1176	27.4
101375			1076	25.1			1390	32.4
2000	16.0	1.8	1104	25.7	21.5	2.5	1484	34.6
2400			1325	30.9			1780	41.5
2700			1546	36			2077	48.4
3000	16.0	0.7	1588	37.0	21.5	0.9	2135	49.7
3500			1787	41.6			2401	55.9
4000			1986	46.3			2668	62.1
4800			2184	50.9			2935	68.4

	40%				50%			
	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)
L1250	27.0	3.1	450	10.5	32.5	3.7	541	12.6
L1350		4.3	949	22.1		5.2	1142	26.6
L2550								
L2650								
L2700								
L3100		8.6	1898	44.2		10.4	2284	53.2
L3105								
L4145								
L5175								
L6205								
CF 320 / 320C	27.0	3.1	225	5.2	32.5	3.7	271	6.3
CF 420 / 240C			337	7.9			406	9.5
CF 520 / 520C			450	10.5			541	12.6
CF 620 / 620C								
CF 720								
CF 730			562	13.1			677	15.8
CF 820 / 820C			678	15.8			816	19.0
T2030 / 2030V	27.0	3.1	562	13.1	32.5	3.7	677	15.8
T2440 / 2440V			678	15.8			816	19.0
T2850 / 2850V			791	18.4			952	22.2
10520	31.8	3.7	594	13.8	38.5	4.4	719	16.8
10630								
10730								
10840			699	16.3			847	19.7
101050								
101275								
10530	19.0	2.2	655	15.3	22.5	2.6	776	18.1
10740			918	21.4			1087	25.3
10950			1180	27.5			1397	32.5
101160			1442	33.6			1708	39.8
101375			1704	39.7			2018	47.0
2000	27.0	3.1	1863	43.4	32.5	3.7	2243	52.2
2400			2236	52.1			2691	62.7
2700			2608	60.8			3140	73.1
3000	27.0	1.1	2681	62.4	32.5	1.3	3227	75.2
3500			3016	70.2			3630	84.6
4000			3351	78.0			4033	93.9
4800			3686	85.9			4437	103.3

	Discharge Speed (%)																			
	60%				70%				80%				90%				100%			
	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)	VFD Freq (Hz)	Metering Speed (RPM)	Disch Rate (bu/hr)	Disch Rate (tonnes/hr)
L1250	38.0	4.3	633	14.7	43.5	5.0	724	16.9	49.0	5.6	816	19.0	54.5	6.2	908	21.1	60.0	6.8	999	23.3
L1350		6.1	1335	31.1		6.9	1529	35.6		7.8	1722	40.1		8.7	1915	44.6		9.6	2109	49.1
L2550																				
L2650																				
L2700																				
L3100		12.1	2671	62.2		13.9	3057	71.2		15.7	3444	80.2		17.4	3830	89.2		19.2	4217	98.2
L3105																				
L4145																				
L5175																				
L6205																				
CF 320 / 320C	38.0	4.3	317	7.4	43.5	5.0	362	8.4	49.0	5.6	408	9.5	54.5	6.2	454	10.6	60.0	6.8	500	11.6
CF 420 / 240C			475	11.1			543	12.7			612	14.3			681	15.9			750	17.5
CF 520 / 520C			633	14.7			724	16.9			816	19.0			908	21.1			999	23.3
CF 620 / 620C																				
CF 720																				
CF 730			791	18.4			906	21.1			1020	23.8			1135	26.4			1249	29.1
CF 820 / 820C			954	22.2			1092	25.4			1230	28.6			1368	31.9			1506	35.1
T2030 / 2030V	38.0	4.3	791	18.4	43.5	5.0	906	21.1	49.0	5.6	1020	23.8	54.5	6.2	1135	26.4	60.0	6.8	1249	29.1
T2440 / 2440V			954	22.2			1092	25.4			1230	28.6			1368	31.9			1506	35.1
T2850 / 2850V			1113	25.9			1274	29.7			1435	33.4			1596	37.2			1757	40.9
10520	45.2	5.2	845	19.7	51.9	6.0	970	22.6	58.6	6.7	1,095	25.5	65.3	7.5	1,220	28.4	72.0	8.3	1,345	31.3
10630																				
10730																				
10840			994	23.2			1,141	26.6			1,289	30.0			1,436	33.4			1,583	36.9
101050																				
101275																				
10530	26.0	3.0	897	20.9	29.5	3.4	1018	23.7	33.0	3.8	1139	26.5	36.5	4.2	1259	29.3	40.0	4.6	1380	32.1
10740			1256	29.3			1425	33.2			1594	37.1			1763	41.1			1932	45.0
10950			1615	37.6			1832	42.7			2049	47.7			2267	52.8			2484	57.9
101160			1973	46.0			2239	52.2			2505	58.3			2770	64.5			3036	70.7
101375			2332	54.3			2646	61.6			2960	68.9			3274	76.3			3588	83.6
2000	38.0	4.4	2622	61.1	43.5	5.0	3002	69.9	49.0	5.6	3381	78.8	54.5	6.3	3761	87.6	60.0	6.9	4140	96.4
2400			3146	73.3			3602	83.9			4057	94.5			4513	105.1			4968	115.7
2700			3671	85.5			4202	97.9			4733	110.3			5265	122.6			5769	135.1
3000	38.0	1.6	3773	87.9	43.5	1.8	4319	100.6	49.0	2.0	4865	113.3	54.5	2.3	5411	126.0	60.0	2.5	5957	138.8
3500			4244	98.9			4859	113.2			5473	127.5			6087	141.8			6701	156.1
4000			4716	109.8			5398	125.7			6081	141.6			6763	157.5			7446	173.4
4800			5187	120.8			5938	138.3			6689	155.8			7440	173.3			8191	190.8

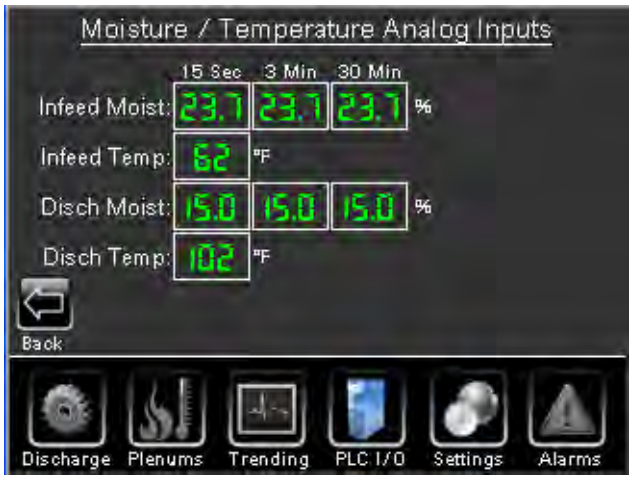


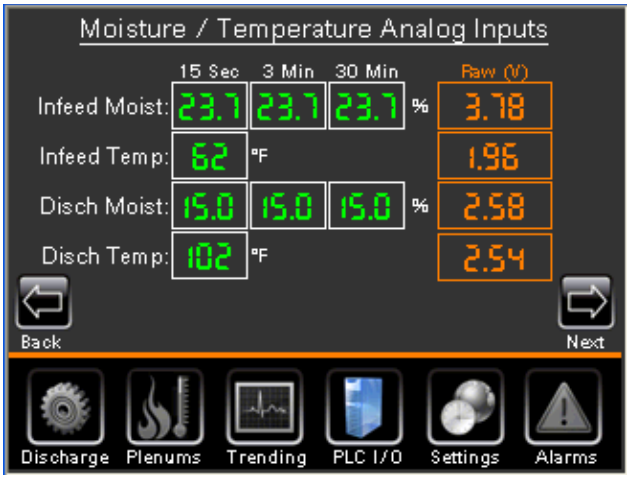


The calculated discharge rate is displayed in bu/hr, however the grain quantity units can be toggled to metric tonnes/hr as well by making a change on the Dryer Configuration screen in the Settings chapter; this will be explained further in the Settings section of this manual. The discharge rate is calculated based on the quantity of grain that is discharged with each revolution of the metering system and is referred to as the discharge capacity with units or bu/rev or m3/revolution. The default value for this parameter is model specific and has been approximated based on past experience, as shown in the following table. It is important to understand that this value can be adjusted for a more accurate discharge rate indication. A further explanation on how to adjust this parameter will be found in the Settings section of this manual.

	Discharge Capacity	
	bu/rev	(m3/rev)
L1250	3.667	0.12918
L1350		
L2550		
L2650		
L2700		
L3100		
L3105		
L4145		
L5175		
L6205		
CF 320 / 320C	1.217	0.04287
CF 420 / 240C	1.825	0.06429
CF 520 / 520C	2.433	0.08571
CF 620 / 620C		
CF 720		
CF 730	3.042	0.10717
CF 820 / 820C	3.667	0.12918
T2030 / 2030V	3.042	0.10717
T2440 / 2440V	3.667	0.12918
T2850 / 2850V	4.278	0.15071

	Discharge Capacity	
	bu/rev	(m3/rev)
10520	2.708	0.09540
10630		
10730		
10840	3.187	0.11227
101050		
101275		
10530	5.000	0.17857
10740	7.000	0.25000
10950	9.000	0.32143
101160	11.000	0.39286
101375	13.000	0.46429
2000	10.000	0.35714
2400	12.000	0.42857
2700	14.000	0.49340
3000	40.000	1.42857
3500	45.000	1.60714
4000	50.000	1.78571
4800	55.000	1.96429





Moisture / Temperature Analog Inputs

If a discharge moisture sensor is installed on the dryer, a next button on the Discharge Speed Analog Output screen will appear and when selected will take you to the Moisture / Temperature Analog Inputs screen. If the machine is equipped with an infeed sensor, the infeed moisture and temperature values will be displayed in addition to the discharge moisture and temperature values.

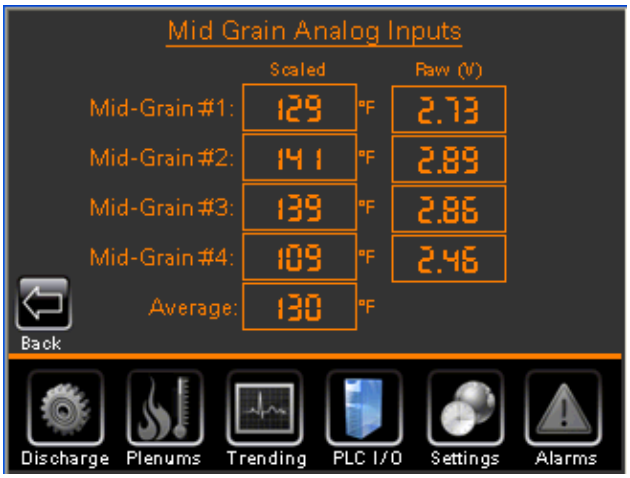
Similar to other analog signals monitored by the PLC, raw voltages for the moisture sensors are displayed for both the moisture and the temperature only at a service technician level. Each moisture sensor measures two voltages, one that is correlated to the grain temperature and one that is correlated to the moisture. Grain temperature is measured because the moisture reading is temperature compensated; this will be explained more in the Settings section of this manual. The correlation of voltage to temperature is based on the calibration curve provided by the sensor manufacturer and cannot be changed. The correlation of voltage to moisture is based on a calibration as well, however there are multiple calibration options available which will be explained in the Settings section of this manual.

In addition to the raw voltages that are displayed for the grain temperature, the actual temperature value is also displayed in either degrees F or degrees C, based on the unit setting on the Dryer Configuration screen of the Settings chapter.

For the grain moistures, three different values are shown: a 15-sec historical average, a 3-min historical average, and a 30-min historical average. Each of these different values are used for specific purposes; the 15-sec historical average is used on the single-point calibration procedure(s), the 3-min historical average is used for display and trending purposes, and the 30-min historical average is used for the AccuDry mode of operation.

Mid-Grain Analog Inputs

If you are logged in as a service technican, you have the ability to advance to the next screen from the Moisture/Temperature Analog Inputs. This will take you to the Mid-Grain Analog Inputs screen. Here you will be able to monitor each mid-grain temperature value as well as the raw voltage from the temperature transmitter.



Displaying these voltages in their raw form makes diagnosing a faulty temperature transmitter or a faulty resistance temperature device (RTD) easier. The scaling on the temperature transmitters are 0 to 5V which corresponds to -75 to 300 degrees Fahrenheit. You will also find the average mid-grain temperature displayed on this screen; this is the same value that is displayed on the Discharge screen and what is used for the TruDry mode of operation. The average mid-grain temperature is an equally weighted average of all four mid-grain temperatures, however the PLC will automatically adjust and re-calculate if any of the temperatures correspond to either a faulty RTD or a faulty transmitter.

Section 3

Settings

The Pinnacle Lite control system has features that are customizable with several settings that can be changed as necessary. These settings are thoroughly discussed throughout this section of the manual.

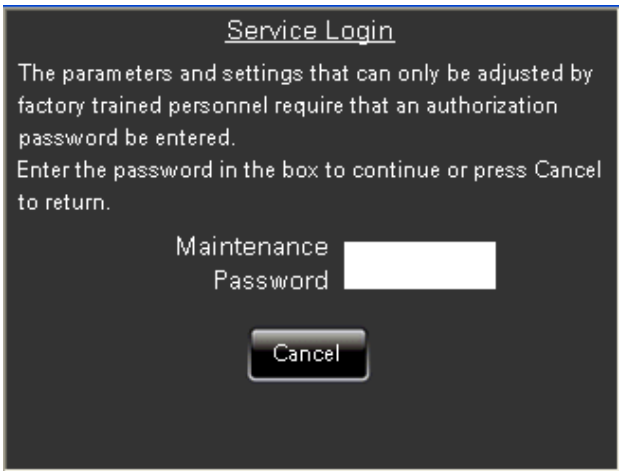
Table of Contents

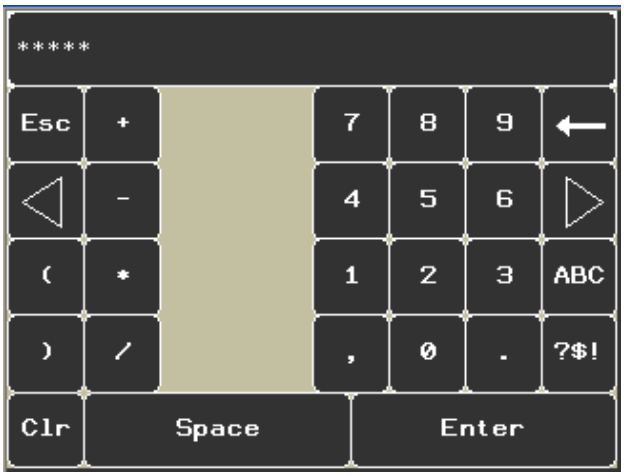
Upon selecting the Settings chapter navigation button, you will be taken to the Settings Table of Contents screen in which several buttons will be found.

Some areas of the Settings chapter are restricted for dealer service personnel or Mathews Company personnel use only. These service-level screens are color coded with an orange background and can only be accessed by logging in with a password. Buttons that lead to screens which are service-level will be grayed out when not logged in. After logging in, the buttons that lead to screens that are service-level will now be active and illuminated with orange text indicating that they are service-level screens. There will also be an orange bar displayed above the lower navigation tabs for ease of identifying your current log-in state.

In order to gain access to service-level screens, select the Service Login button in the lower left-hand corner of the screen and the log-in screen will appear.

Touch the white entry box to bring up the keyboard where the password can be entered. Once the password is entered, touch Enter to be returned to the Login screen where you touch Continue to log-in.





Upon successful log-in, you will be presented with the additional orange illuminated buttons which correspond to the service-level settings screens:

All buttons across the top and along the left side of the Settings Table of Contents are accessible without service level log-in. The four screens that require service-level log-in are Features Enable, Factory Settings, Temp Controllers, TruDry PID Values, AccuDry Controller (If Enabled) , and HMI Settings.

Alarm Setpoints (TruDry)

The alarm setpoints screen provides you with the ability to change limits and other values that correspond to alarm values. The alarms that these setpoints correspond to will be explained further in the Troubleshooting section of this manual.

In TruDry mode of operation, the alarm setpoints that you will see is Mid-Grain Band, Mid-Grain Band Delay, Discharge Moisture Low Limit, and Dicharge Moisture High Limit.

Mid-Grain Band

The mid-grain band alarm setpoint is the maximum allowed temperature band that the average mid-grain temperature can deviate from . If the actual grain temperature is below the lower band when the discharge is running in TruDry, a mid-grain band alarm will occur after 30 seconds. If the actual grain temperature is above the upper band, a mid-grain band delay will occur after 30 seconds regardless if the discharge is running or not.

Mid-Grain Band Delay

The mid-grain band delay is a time duration that will delay the shutdown of the dryer after the mid-grain band warning alarm has occurred. If the mid-grain band delay is set to 10 minutes, the dryer will shutdown 10 minutes after the mid-grain temperature warning alarm has occurred.

Discharge Moisture Low Limit

The discharge moisture low limit alarm set point is a discharge moisture value that will trigger an alarm when the value drops below the discharge moisture low limit set point for a duration of 5 minutes.

Discharge Moisture High Limit

The discharge moisture high limit alarm set point is a discharge moisture value that will trigger an alarm when the value exceeds the discharge moisture high limit set point for a duration of 5 minutes.

Alarm Setpoints (AccuDry)

The alarm setpoints screen provides you with the ability to change limits and other values that correspond to alarm values. The alarms that these setpoints correspond to will be explained further in the Troubleshooting section of this manual.

Mid-Grain Band

The mid-grain band alarm setpoint is the maximum allowed temperature band that the average mid-grain temperature can deviate from . If the actual grain temperature is below the lower band when the discharge is running in TruDry, a mid-grain band alarm will occur after 30 seconds. If the actual grain temperature is above the upper band, a mid-grain band delay will occur after 30 seconds regardless if the discharge is running or not.

Mid-Grain Band Delay

The mid-grain band delay is a time duration that will delay the shutdown of the dryer after the mid-grain band warning alarm has occurred. If the mid-grain band delay is set to 10 minutes, the dryer will shutdown 10 minutes after the mid-grain temperature warning alarm has occurred.

Dryer Master (DM) Shutdown Delay

You have the ability to enable the dryer to shutdown on eight (8) alarms pertaining to grain moistures and temperatures. This delay is the amount of time the dryer will wait to open the MCR circuit after the alarm has been tripped.

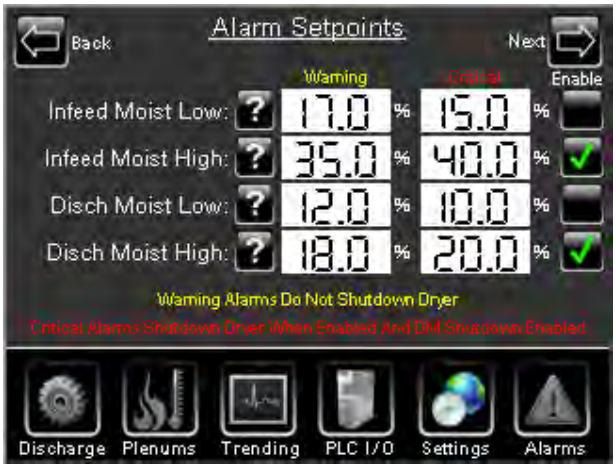
Enable DM Shutdown

This is a toggle switch allowing the Dryer Master board to shut down the dryer when selected alarms have reached this critical alarm setpoints. These alarms can only be displayed and toggled to shut down the dryer when the Enable DM Shutdown box is checked. Those alarms can be viewd by clicking the next button.

Moisture / Temperature Alarm Setpoints

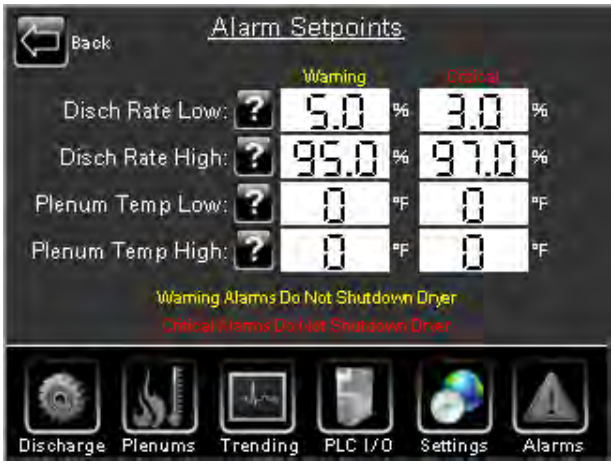
The next two screens of alarm setpoints pertain directly to the Dryer Master board alarms. All setpoints are easily modified by the user to increase alarm precision and/or fine tune the grain moisture and temperature to each individual installation and runtime environment.

For each alarm limit there are two states of alarm. The first stage is a warning alarm and the second stage is a critical alarm. The warning alarm alerts the user of a situation they may want to keep an eye on. In many instances the dryer will have made changes attempting to correct the situation. If the dryer cannot correct the situation, a critical alarm will be reached. This will either shut down the dryer, after the specified delay time, if the "Enabled DM Shutdown" is selected and the individual shutdown "Enable" is checked, or prompt a critical alarm without shutting down if the "Enabled DM Shutdown" is not selected.



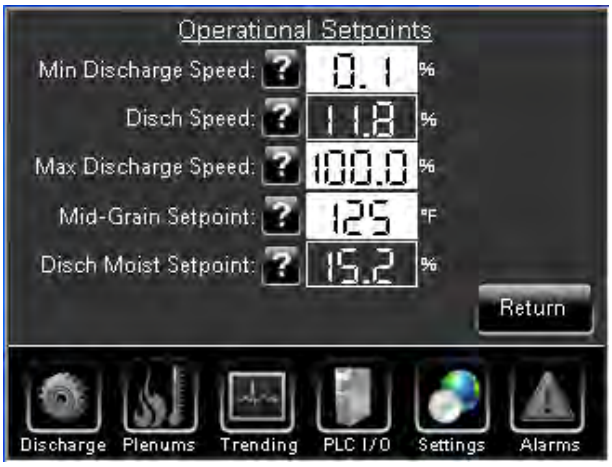
Discharge Rate / Plenum Temp Alarm Setpoints

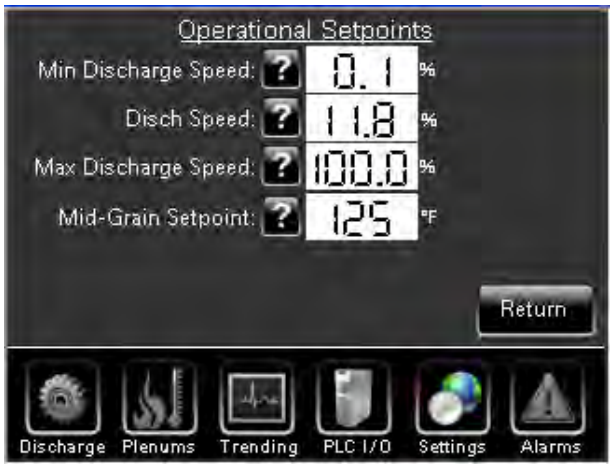
The discharge rate and plenum temperature alarm setpoints are similar to the grain moisture and temperture alarms, however these four (4) alarms will NOT shut down the dryer. These alarms will simply prompt the user with alert pop-ups.



Operational Setpoints

The operational setpoints screen provides you with the ability to change operational values that affect the performance of the machine.





Min Discharge Speed

The Minimum Discharge Speed set point is the lowest possible discharge speed allowed by the dryer. This value is used in conjunction with either the TruDry or AccuDry mode to increase or decrease the allowable speed range that the PLC utilizes when commanding the discharge speed. A table of suggested minimum and maximum values is found in the operation section of this manual.

Discharge Speed

The Discharge Speed setpoint is the speed at which the dryer will operate when in manual mode of operation. This setpoint is that same parameter that can be changed from the Discharge screen; it is displayed on the operational setpoint so that it can be viewed while making adjustments to the min and max speed and to also provide one additional area where the speed can be changed from.

Max Discharge Speed

The Maximum Discharge Speed set point is the highest possible discharge speed allowed by the dryer. This value is used in conjunction with either the TruDry or AccuDry mode to increase or decrease the allowable speed range that the PID-controller utilizes when commanding the discharge speed. A table of suggested minimum and maximum values is found in the operations section of this manual.

Mid-Grain Setpoint

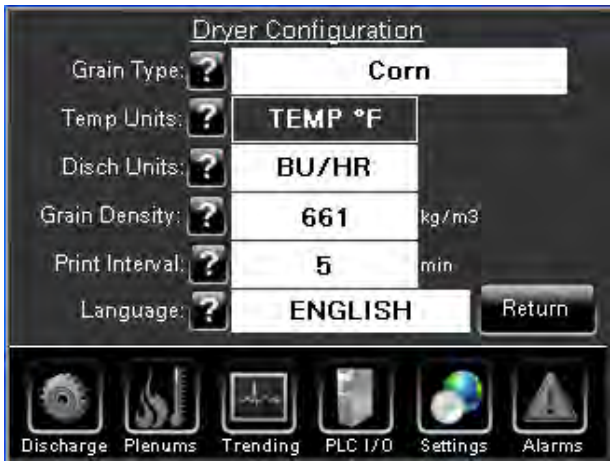
The Mid-Grain Setpoint refers to the target mid-grain temperature that will be used when running in the TruDry mode of operation. This is the same mid-grain setpoint that can be changed directly from the Discharge screen as well.

Discharge Moisture Setpoint

The discharge moisture setpoint refers to the target moisture that will be used when running in the AccuDry mode of operation. This is the same discharge moisture setpoint that can be changed directly from the Discharge screen as well.

Dryer Config

The Dryer Configuration sub-chapter allows you to make customized settings changes to the Pinnacle Lite system which include grain specifics, units of measure, and other customizable features.



Grain Type

The Grain Type that is being dried can be selected from a drop down list of options so that you may keep track of what grain is currently being processed. The DM Board uses this value to determine the appropriate preset parameters to be used when drying different grains.

Temperature Units

The temperature units that are displayed for mid-grain temperatures, grain temperatures, and plenum temperatures can be changed by toggling between degrees Fahrenheit and degrees Celsius. Note that this settings change applies to values that are displayed on the touchscreen, however for inputs, the value will remain as-is, just with the new units. For example, if the average mid-grain temperature is 120 deg F, when the unit change is made, the new value will be displayed as 49 deg C because 49 deg C is the same temperature as 120 deg F and this is the measured average mid-grain temperature. However, the opposite will occur for setpoint values. If the mid-grain temperature setpoint is 120 deg F, when the unit change is made, the new mid-grain temperature setpoint will be 120 deg C.

Discharge Units

The discharge units parameter can be toggled between bu/hr or metric tonnes/hr. This parameter setting affects how the discharge rate is displayed on the Discharge Speed Analog Output screen.

Grain Density

The Grain Density parameter is needed because when the discharge units parameter is changed from bu/hr to metric tonnes/hr, the grain density allows for conversion from a volumetric grain flow rate to a mass flow rate.

Print Interval

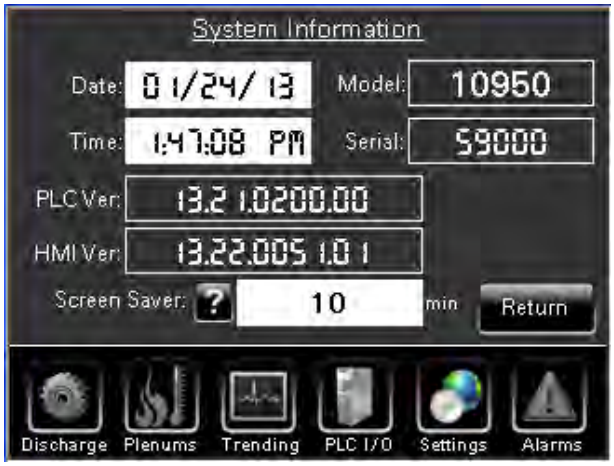
The Print Interval parameter is a time interval that determines how frequent the printer will print a line of data. This parameter input is only displayed and applicable if a printer is installed, the printer option is enabled on the Features Enable screen of the Settings chapter, and the print function is activated on the Trending screen. The data that the printer will print at the specified interval includes the date, time, 3-min average discharge moisture, the discharge grain temperature, and the discharge moisture historical average.

Language

The HMI can be displayed in different languages. In order to switch between languages, the user must first log in and check the 'Foreign Language' box in the Features Enable page under the Settings chapter. Once this box is checked, the dryer configuration page will display a language option box at the bottom of the page. By pressing on this box the user can toggle between the different languages available.

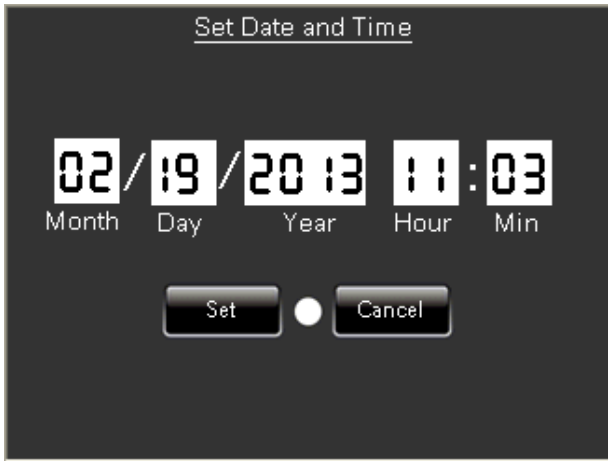
System Information

The System Information sub-chapter provides system specific information that includes the date and time, serial number of the machine, model number, software version information, and the screen saver delay time.



Date / Time

Both the date and time used by the system is set on the System Information screen. The date and time is used to track alarm occurrences, as well as trending and printing actions. To set the date and/or time, select the white background of either the date or time field to bring up a separate pop-up window where you can set the month, day, year, hour, and minute.



Model

The Model number of the dryer is shown for reference on the System Information screen, however it is set on the Factory Settings screen and should not ever need to be changed.

Serial

The Serial number of the dryer is shown for reference on the System Information screen, however it is set on the Factory Settings screen and should not ever need to be changed.

PLC Version

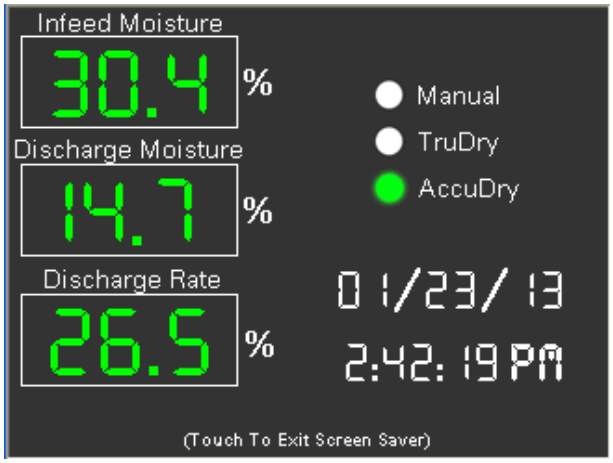
The PLC Version field refers to the current PLC software version that is loaded on the system. This parameter cannot be changed and is read directly from the PLC.

HMI Version

The HMI Version field refers to the current HMI software version that is loaded on the system. This parameter cannot be changed and is read directly from the HMI.

Screen Saver

The screen saver field refers to the amount of time the HMI will wait before displaying the screen saver. This value can be changed from a minimum of one (1) minute, to a maximum of sixty (60) minutes. The screen saver can also be displayed by holding down the discharge button on the chapter list.

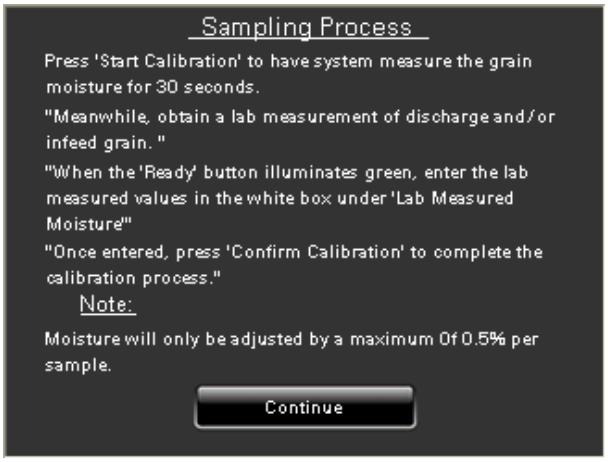


Sensor Calibration (AccuDry Enabled System)

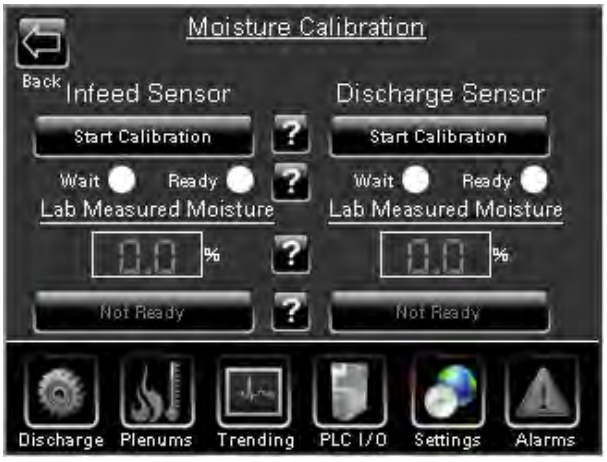
The moisture sensors that are used on the dryer are special devices that measure the capacitance of the grain passing over the sensor which correlates to a voltage that is then calibrated to a moisture value. Furthermore, the moisture sensor also measures the grain temperature because grain temperature is an important parameter to monitor while drying, but also because the temperature is used to compensate the measured grain moisture; this temperature compensation step is done either within the PLC or the sensor so that the moisture value that is displayed on the touch screen is a temperature compensated moisture which reflects what is measured with third party moisture testers.

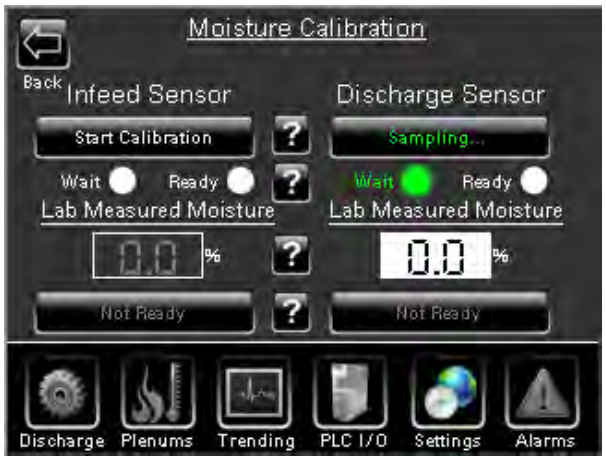
If AccuDry is enabled, the calibration process for the sensor is automated:

Notice that there will be an option to skip the walk through and simply begin calibration. By clicking the walkthrough you will be prompted with a list of things you will be doing during the calibration process.

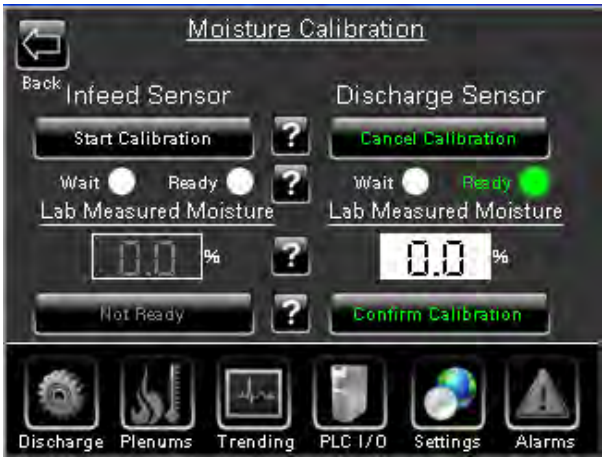


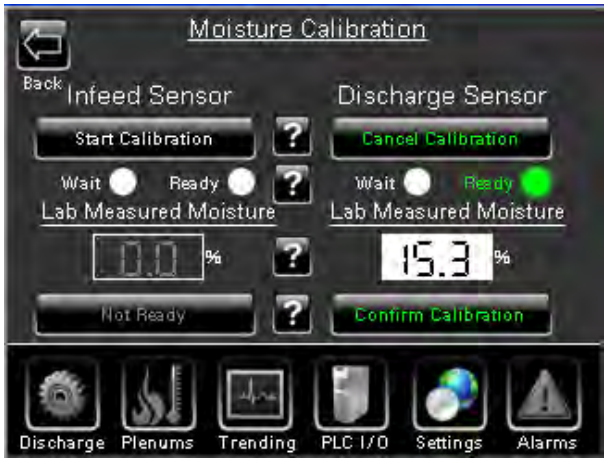
After hitting the "Continue" button you will be taken to the Moisture Calibration main screen. This screen will have calibration routines for both your infeed and discharge sensors. Calibration will begin by selecting "Start Calibration" on your desired sensor. The button will now display "Sampling," at which point you will gather a sample of grain for calibration. It is important that you do this right after beginning the calibration process because for the next 30 seconds, the system will be taking an average of grain moistures at that sensor. For best results, comparing like grain to measured grain is desired.





You will now notice a white box will appear for you to enter the "Lab Measured Moisture". This is the reading that you have measured on your moisture tester. Enter the moisture that your tester has given you. Now press confirm calibration, and your sensor will be calibrated accordingly.



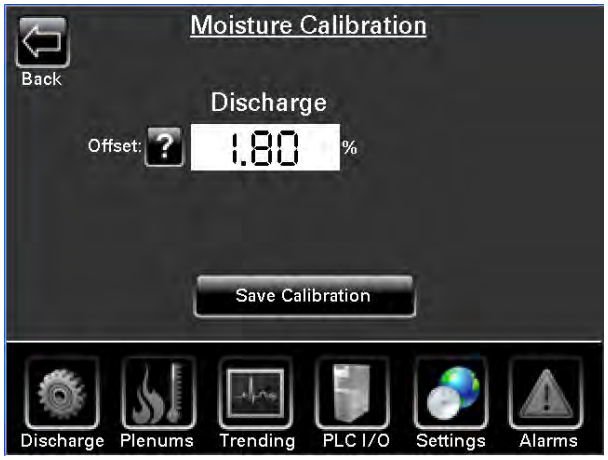


It is important to note that the calibration will only make a 0.5% adjustment for each individual calibration performed. This is done to protect the system from a user entering an extremely large or small number and drastically changing the sensor.

Non-AccuDry Enable Systems

Accurate calibration equations are critical for reliable and consistent operation, for Non-AccuDry enabled systems without a Dryer Master Sensor, the Pinnacle Lite software is equipped with three different calibration methods: (1) Single Point, (2) Advanced Linear, and (3) Advanced Polynomial. Additionally, for Non-AccuDry enabled systems with a Dryer Master sensor, there is an additional calibration method. Regardless of what calibration method is utilized, the end result is that there will be an equation that correlates the moisture sensor's voltage to an uncompensated moisture value. It is referred to as an uncompensated moisture because the moisture measured by the sensor needs to be compensated from a reference temperature to the actual grain temperature.

Below is the calibration screen for a Non-AccuDry system that has a DM sensor installed. The value entered as the offset is the incremental change the sensor will compensate. The default value is 0%. So if the sensor is reading 14.5% but the lab measurement says 16.0%, entering an offset value of 1.5% will have the sensor now read 16%.



If logged in, the user will be able to see the DM sensor slope value as shown below. The sensors moisture value is the product of the slope and voltage reading plus the offset. While this slope value can be changed, it is recommended to first consult with a qualified technician before doing so.

If the dryer is configured with a discharge moisture sensor in the Features Enable section, the Sensor Calibration button on the Settings Table of Contents screen will be enabled and you will be taken to the Discharge Sensor Calibration selection screen.

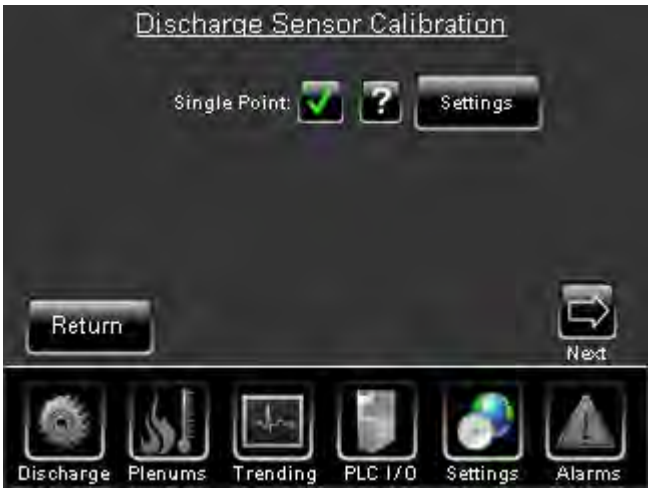
Here you will select what calibration method will be applied to the discharge moisture sensor. If the machine is equipped with an infeed moisture sensor, there will be a next button which when selected, will take you to the equivalent set of screens to setup the infeed moisture sensor as well. The Features Enable section where the discharge moisture sensor is enabled also has a toggle to indicate what model moisture sensor is being used (FP21C, FP32C, or DM) . The Pinnacle Lite software needs to know what sensor is being used because the temperature-voltage relationship is different and the smaller FP32C sensor will enable the advanced linear and advanced polynomial calibration methods. The discharge sensor calibration screen displayed will depend on what sensor is installed. Below are the displays that correlate to the installed sensor.

FP 32C Enabled

FP 21C Enabled

Single Point Calibration

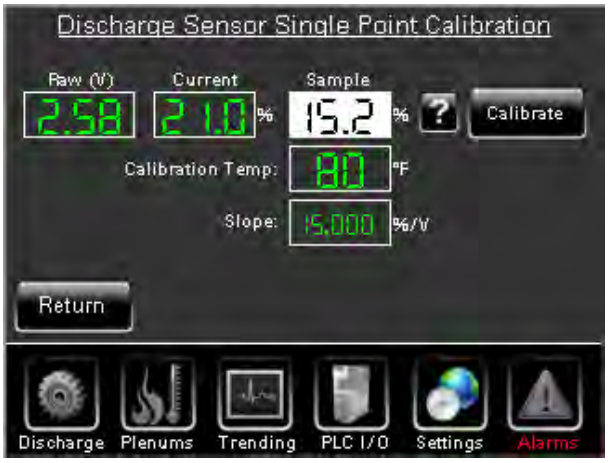
The Single Point calibration method establishes a simple relationship between sensor voltage and grain moisture. Additionally, when using the single point calibration method, it is assumed that 0.00V corresponds to 0% moisture (uncompensated). For example, if it is known that the grain's moisture is 16.2% and the sensor's voltage is reading 1.15V, the calculated calibration will be 14.09 %/V which is referred to as the "slope". This is a simple linear relationship that calculates the moisture as 14.09 %/V, so if the sensor's voltage changes to 1.05V, the calculated moisture will then change to 14.8% which is calculated as the product of the "slope" and the current voltage or 14.09%/V x 1.05V = 14.8%.



The benefit of using the Single Point Calibration is that it is easy to quickly setup the moisture sensor, however the limitation is that it will not be accurate over a wide moisture range.

In order to apply a single point calibration to your moisture sensor, make sure the Single Point method is selected and navigate to the Single Point Settings screen. On this screen you will see the current voltage being measured by the moisture sensor as well as the current moisture being calculated from the current single point calibration slope being used. The calibration slope will be shown on the screen as well as the calibration temperature that is in effect. Lastly, the sample moisture value is shown.

To establish and apply a new calibration slope, pull a sample of grain as close as possible to the moisture sensor. This will ensure that the voltage that is read off the touch screen corresponds with the grain that is passing over the sensor. Once that sample is taken, measure the sampled grain's moisture in your third party moisture tester, enter the value in the sample input box and select the Calibrate button. Once the Calibrate button is pressed, the new slope will be calculated as well as the new calibration temperature which is taken as the current grain temperature measured from the sensor.



After the calibrate button is pressed, you will then start to see the current moisture value change because the new calibration slope is now in effect.

Advanced Linear Calibration

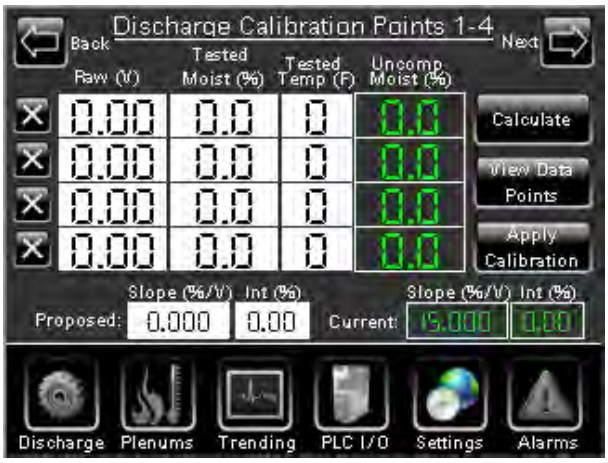
Because of the limitations of the Single Point calibration method, the Pinnacle Lite software also includes an Advanced Linear calibration method which is based on more than one data point. Up to 8 data points can be used to establish an advanced linear calibration equation and the way in which you input the data points into the touch screen allow you to view the calibration data before applying it.

The principal behind the Advanced Linear Calibration method is that a collection of sensor voltages, tested moistures, and tested temperatures are plotted over the desired range of the sensor. For example, if the target discharge moisture is 15.5%, then you will likely want to establish a calibration that ranges from as low as 13% up to 18%. The ideal time to collect this data is when the dryer is first being put into operation at the start of a drying session. The more tested samples the better, as long as they are spread out over the desired range - be aware that two data points at 13% and 17% will produce much better results than five data points between 14.5% and 15.5%.

When you are ready to collect a sample, it is important to pull a sample of grain as close as possible to the moisture sensor which will ensure that the voltage that is read off the touch screen corresponds with the grain that is currently passing over the sensor. When you do pull a sample of grain, be sure to record the moisture sensor's voltage from the touch screen (15-sec average on the Analog Input screen). After you have recorded the voltage, measure the grain's moisture and temperature at least 3-5 times taking an average of the values. You will likely see that each time you test the grain moisture, you will get a different value from your third party moisture tester which is normal and expected. Once you have the voltage, moisture, and temperature values for the collected sample, record it on a log sheet such as what is shown below:

Date/Time	Sensor Voltage	Grain Temp	Grain Moist

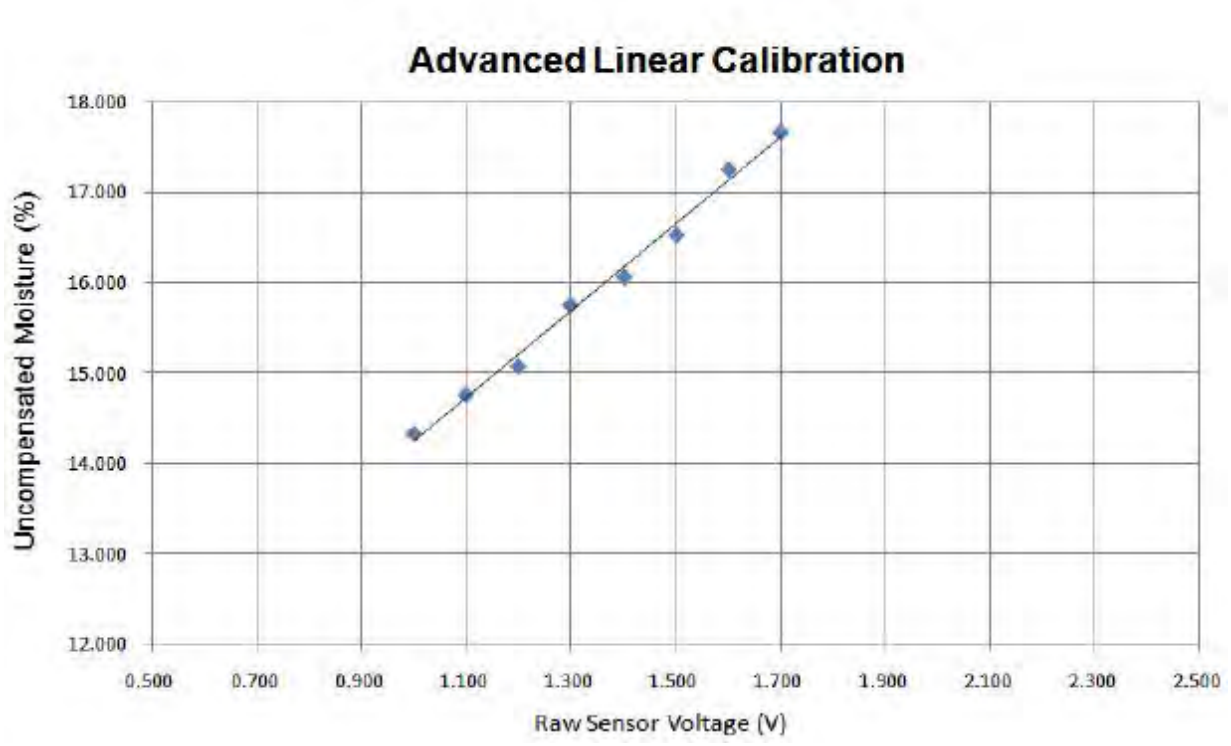
You can also skip logging on a sheet of paper and enter it directly on the touchscreen by enabling the Advanced Linear Calibration method and selecting the Settings button.



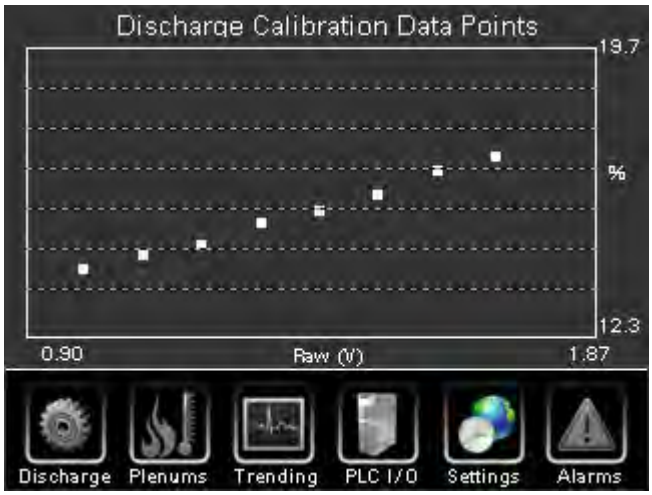
Here you will see a table that allows for entry of the previously mentioned voltage, moisture, and temperature values collected for up to 8 samples. The first screen contains input for samples 1-4 and pressuring the Next button in the upper right hand corner will take you to the second screen which allows samples 5-8 to be input.

Based on the tested temperature, the uncompensated moisture will be calculated as shown in the read-only column. To clear the values of a sample row, simply press the x button to the left of the values. When clearing a row of sample data, it will then be excluded from the calculated calibration equation.

Because you now have the ability to enter multiple data points, the slope of the calibration will be calculated, as previously mentioned in the Single Point Calibration method, as well as an "intercept" value. At any point you can see what slope and intercept values currently being used by looking in the lower right hand corner where they are presented in green on a dark background. After all of your samples are entered in the table, press the Calculate button and a linear regression will be performed on the samples entered. A linear regression will calculate the slope and intercept of a trend line that passes thorough the data points previously input. Graphically, this can be represented as follows:



The sample data points are plotted as uncompensated moisture values on the vertical axis with the corresponding raw sensor voltage on the horizontal axis. The trend line shown above is drawn as close as possible through the data points and the corresponding slope and intercept of the line is then taken to be the calibration equation once the calibration is applied. After the slope and intercept are calculated, the values will be shown in the lower left hand corner as proposed values. In order to determine if entered samples produce a reasonable calibration curve, you can select the View Data Points button which will show a scatter plot of the entered samples.



Note that when viewing the plotted data points, the values should always produce a line that slopes from the lower left corner to the upper right hand corner as shown above. Once the values are determined to be acceptable, the proposed calibration can be applied by pressing the Apply Calibration button. Once this is done, the Current Calibration will be copied from the Proposed Calibration values and the moisture will now be calculated from the new calibration.

You are also able to perform the same process in a spreadsheet program of your choice if more than 8 samples are collected. Instead of entering the samples individually and calculating the slope and intercept on the touch screen, you can enter the slope and intercept directly in the white input boxes in the lower left hand corner.

The advantage of the Advanced Linear Calibration method is that it covers a wider range of moisture and, as a result, is more accurate and reliable when compared to the Single Point calibration method. The limitation is that it requires some dedicated time to get the calibration accurate for a particular grain to be dried.

Advanced Polynomial Calibration

Because of the limitations of the Single Point and Advanced Calibration methods, the Pinnacle Lite system offers a third method that allows for the input of the sensor manufacturer's certified calibration constants. This is the easiest method to apply and is the most accurate. Enabling the Advanced Polynomial Calibration option and selecting the Settings screen will display the advanced polynomial constants which are provided by the sensor manufacturer for a particular type of grain and sensor type.

Similar to third party moisture testers, updated calibration data is occasionally made available for different grain types used with different sensor types. The default values that are loaded are for standard Corn being used with a moisture sampler that is equipped with the FP32C moisture sensor. Updated and/or new calibration constant for use with the Advanced Polynomial Calibration method will periodically be made available for other grains or hybrid varieties of Corn.

In the event that these constants need to be changed or updated, simply touch the value and enter the updated value. This should only be done as directed by your dealer or Mathew Company personnel.

Although this calibration data is provided by the sensor manufacturer, it is possible that there may be a discrepancy between the correlation of sensor voltage and the moisture reading on the sensor. This discrepancy would be due to the type, variety or hybrid of grain that was used to perform the certified calibration by the sensor manufacturer. In the event that there is a consistent discrepancy, for example, consistently 1.3% low or high from what your 3rd party moisture sensor is reading, there is a feature that you can employ to close the gap of this discrepancy. On either the discharge calibration selection screen or the infeed calibration selection screen, you will see the up and down arrows (when Advanced Polynomial is selected) which allows you to make minor adjustments to the offset of the sensor. If your display is consistently showing the measured grain moisture to be 1.3% lower than your 3rd party moisture tester, you will want to add a positive offset adjustment, by increasing to +1.3%. After a few minutes, you will see the results of the adjustment and your moisture display should be more consistent with your 3rd part testing equipment.

Dryer History

The Dryer History screen is where you will see past operating data that includes an hour counter, grain quantity counter (bushels or metric tonnes), and a discharge grain moisture historical average (if equipped with a discharge moisture sensor).

The hour meter and the grain dried meter have both a total lifetime and a resettable value which only accumulates when the dryer's discharge metering system is running. The Resettable Hours meter and the Resettable Dried meter can both be reset by selecting the Rest Hours button and the Reset Grain button respectively. The Total Dried and Resettable Dried meter are based on the discharge capacity that was previously discussed in the Discharge Speed Analog Output section of this manual. Therefore, the accuracy of the Total Dried and Resettable Dried meters is based on the accuracy of the discharge capacity parameter. When the Discharge Units parameter is changed from bu/hr to metric tonnes/hr on the Dryer Configuration screen, the Total Dried and Resettable Dried value will change from bushels to metric tonnes.

If the dryer is equipped with a discharge moisture sensor, the Dryer History page will also show a historical moisture average that can be reset as well. This value represents a historical average of the discharge grain moisture which will also be printed on the printer if the dryer is equipped. To reset the historical average, simply select the Reset Historical Moisture button and a new historical moisture will begin to be calculated.

Features Enable

The Features Enable screens are service-level and password protected. Access to these screens is accomplished by following the login procedure previously outlined in this manual.

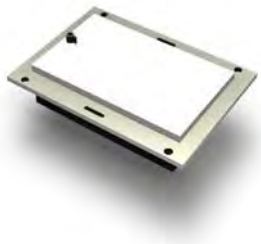
The purpose of the Features Enable screen is to select what options the dryer is equipped with. These settings will be done during system software configuration and testing at the Mathews Company facility, however your dealer or Mathews Company service personnel may make adjustments based on addition of upgrades or retrofits.

Once service-level login credentials have been accepted, select the Features Enable button and you will be taken to the first of two Feature Enable screens.

On the first Features Enable screen, the presence of AccuDry technology may be enabled. By selecting this box, the software will automatically check both an infeed and discharge DryerMaster sensor; both of these sensors are required for AccuDry.

Below the AccuDry enable check box, you will see the Temperature Controller Communications enable check box. If the machine has digital temperature controllers and are wired and configured for communication with the HMI touch screen, this box will need to be checked. This enables communication with the temperature controllers and allows for further configuration which will be explained in the Temperature Controllers section of this manual.

Further down on the Features Enable screen, the presence of a moisture sensor on the discharge and the infeed of the dryer can be selected. The option to select an infeed moisture sensor requires the presence of a discharge moisture sensor. Once a discharge moisture sensor is selected, you will have the option to specify what type of sensor is installed. Correctly selecting the model of the moisture sensor will ensure that the proper temperature scaling is used and the presence of the specific moisture sensor will either enable the Advanced Linear, Advanced Polynomial calibration, or the Dryer Master Calibrations. The same applies to the infeed sensor as well. In order to determine the correct moisture sensor installed on your machine, see the images below to correctly identify the physical sensor with the model.



FP21C Moisture Sensor

FP32C Moisture Sensor

DM 510 Moisture Sensor

The Printer Installed check box shall be checked if there is a printer installed which has been explained in different sections of this manual. Once the Printer Installed check box has been selected, the options, including turning the printer function on/off, will now be available.

Selecting the Next button will take you to the second Features Enable screen which will include enabling the ability to bypass the discharge proximity switch, enabling the ability to change the language, and to select what alarm monitoring will be enabled.

The Bypass Prox Switch enable will allow the discharge to run unmonitored without checking for the presence of a rotating discharge metering shaft. This feature is only used as directed by M-C service personnel or for demonstration purposes on tabletop Pinnacle Lite demonstration units.

If the machine is equipped accordingly, enabling the Main Auxiliary Alarms checkbox will tell the system to monitor the additional alarm inputs previously explained in the digital input and digital output section of this manual, which include: I0.1 - Control Power OK, I0.2 - Motor Overloads OK, I0.3 - Gas Pressure OK, I0.5 - Disch Overload OK, I0.7 - Plenum Doors OK, I1.0 - High Limit(s) OK, I1.3 LLCs OK, I1.4 - Grain Flow OK, Q0.7 - Green Lamp, and Q1.0 - Red Lamp.

Once the Main Auxiliary Alarms checkbox has been enabled, additional options will appear which include the Gas Pressure Switch Alarms (All CE/CGA Dryers), Plenum Door Switch Alarms (CE Profile Dryers), and the LLC Alarms (Towers and Optional Profiles).

The Foreign Language enable will allow the user to change the HMI language from a simple drop-down menu located in the Dryer Config Screen (mentioned earlier in this manual). The current languages supported are English, Russian, and Slovakian.

After all Features Enable changes have been made, be sure to select the Save Settings button so that the settings are saved to the non-volatile EEPROM memory of the PLC. This will ensure that in the event of a power loss, the dryer does not have to be completely reconfigured.

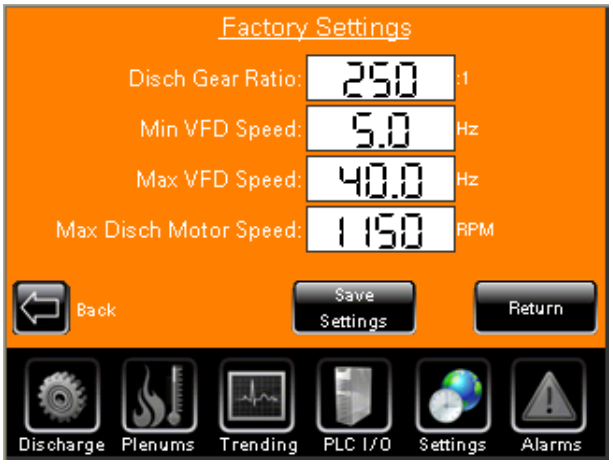
Factory Settings

The Factory Settings screens are service-level and password protected. Access to these screens is accomplished by following the login procedure previously outlined in this manual.

The purpose of the Factory Settings screens is to set the machine's serial number, model number, and other operational settings.

Once service-level login credentials have been accepted, select the Factory Settings button and you will be taken to the first of two Factory Settings screens:

Selecting the Next button will take you to the second screen of the Factory Settings screen:



Every value on the first and second Factory Settings screens can be input manually, however the default values are determined based on the model number. When the model number is selected on the first screen, the Burner Quantity, Discharge Capacity, Discharge Gear Ratio, Minimum VFD Speed, Maximum VFD Speed, and Maximum Discharge Motor Speed parameter will all be updated with values that correspond to the model number selected. These values can be overwritten, however this should only be done when instructed to do so by your dealer or Mathews Company service personnel. The only parameter that is not automatically updated based on the model number selected from the drop down list is the Serial Number. Entering the Serial Number will be done during system software configuration and testing at the Mathews Company facility.

Fan Quantity

The Fan Quantity parameter is set so that the system knows the maximum number of digital temperature controllers it expects to see are available. This will be explained more in the Temperature Controller section.

Discharge Capacity

The Discharge Capacity parameter is what the system uses to determine how many bu/hr or metric tonnes/hr the system is discharging. This also determines the total amount of grain dried which is viewed when looking at the Dryer History screen. The only time this parameter should be changed is when adjustments need to be made based on measured operational data. If it is determined that the displayed bu/hr meter or metric tonnes/hr meter shown on the Discharge Speed Analog Output screen is inaccurate, the following procedure should be followed to calibrate the discharge capacity:

1. Run the discharge constant for a set duration of time (minimum 30 min) and record the Metering Speed (RPM) from the Discharge Speed Analog Output.
2. Multiply the recorded Metering Speed (RPM) by the number of minutes the test was conducted. This will be the number of revolutions that the metering system turned over the course of the test.
3. Determine how much grain was discharged from the dryer by either unloading the grain to a truck which can be weighed or (b) determining how much of a particular bin was filled during the time duration of the test. If bin volume is used, the total number of bushels or cubic meters will then be obtained. If grain weight is used, convert to volume based on the test weight of the grain.
4. Once the total volume of grain has been determined, divide that value by the number of revolutions calculated in step number 2 above. This value will now have units of bu/rev or m3/rev depending on what units are being used.
5. Update the Discharge Capacity parameter on the Factory Settings screen and select the Save Settings button.

Once this procedure has been followed, the discharge capacity has now been calibrated.

Discharge Gear Ratio

The Discharge Gear Ratio is the ratio between the speed of the discharge metering motor and the actual speed of the metering shaft. For some machines this is a combination gear ratio that is based on multiple gear reducing components. This value should never need to be changed unless the dryer is being expanded to a larger model and the metering system gearbox/sprocket components are changed.

Minimum VFD Speed

The Minimum VFD Speed setting will correlate with what has been programmed on the discharge metering VFD. This value allows for the calculation of the VFD Frequency displayed on the Discharge Speed Analog Output screen.

Maximum VFD Speed

The Maximum VFD Speed setting will correlate with what has been programmed on the discharge metering VFD. This value allows for the calculation of the VFD Frequency displayed on the Discharge Speed Analog Output screen.

Maximum Discharge Motor Speed

The Maximum Discharge Motor Speed setting will correlate with what has been programmed on the discharge metering VFD. This value allows for the calculation of the Motor Speed displayed on the Discharge Speed Analog Output screen.

TruDry PID Values

The TruDry PID Values screen is service-level and password protected. Access to this screen is accomplished by following the login procedure previously outlined in this manual.

The purpose of the TruDry PID Values screen is to set the Proportional, Integral, and Derivative parameters of the TruDry PID control loop.

Once service-level login credentials have been accepted, select the TruDry PID Values button and you will be taken to the TruDry PID Values screen.

Please note that changes to these parameters will drastically impact the operation of the dryer when running in TruDry mode and any settings changes should only be done when instructed by Mathews Company service personnel.

On the left side, values for the Proportional, Integral, and Derivative parameters can be adjusted. On the right side you will see the mid-grain temperature setpoint, the actual mid-grain temperature, and the commanded output, which when multiplied by 100%, corresponds to the discharge rate (%). The default values for the Proportional, Integral, and Derivative parameters are recommended to be used. If fine-tune adjustments need to be made, the following explains the impact of each parameter:

Proportional

The Proportional parameter determines the gain of the control loop based on the difference between the setpoint and the actual value. Adjustment of this parameter will increase or decrease the gain when a difference between the setpoint and actual value is established.

Integral

The Integral parameter determines the responsiveness of the control loop from a time standpoint. Adjustment of this parameter will cause the control loop to become more or less responsive.

Derivative

The Integral parameter determines the amount of dampening that the control loop will exhibit. Adjustment of this parameter will increase or decrease the amount of overshoot that is observed by the control loop.

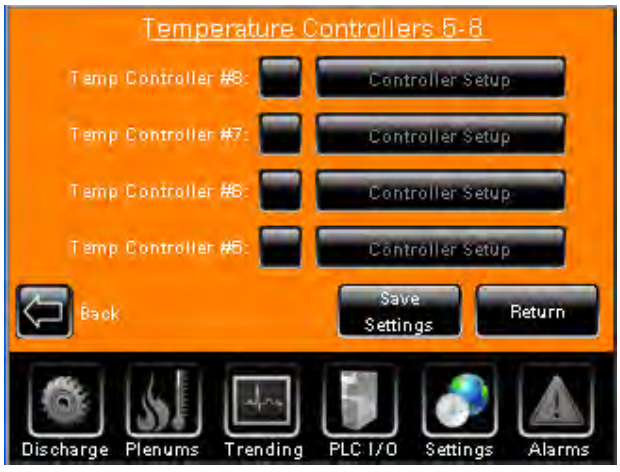
Temperature Controller

The Temperature Controllers screens are service-level and password protected. Access to these screens is accomplished by following the login procedure previously outlined in this manual.

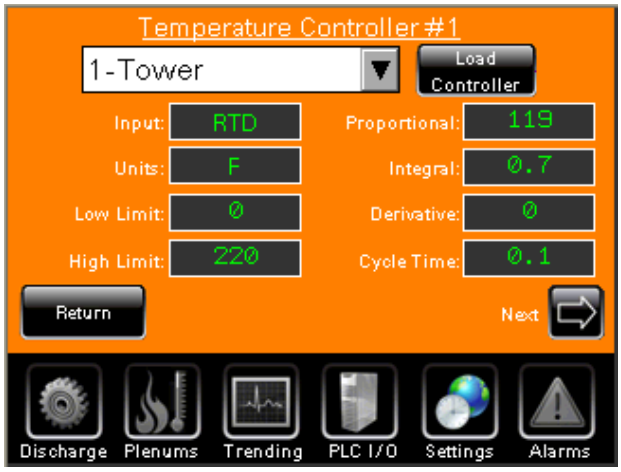
The purpose of the Temperature Controllers screens is to enable and set-up what fans have burners with digital temperature controllers (if equipped with digital temperature controller communications). If temperature controller communications is not enabled in the Factory Settings screen, this sub-chapter will not be available.

Once service-level login credentials have been accepted, select the Temp Controllers button and you will be taken to the first Temperature Controllers screen.

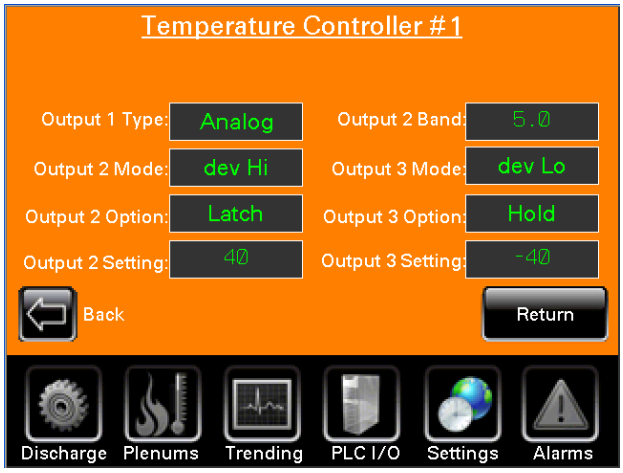
Selecting the Next button will take you to the second screen of temperature controllers for plenums 5-8 if applicable.



On both of the Temperature Controllers screens, you will see rows which includes an enable checkbox and a Controller Setup button for each possible temperature controller. There are a possible of up to 8 fans/ burners on a single dryer, however the number of temperature controllers that can be setup is limited to less than or equal to the fan quantity as defined on the Factory Settings page. The temperature controllers are numbered 1-8 with 1 being on the bottom of the dryer 8 being on the top.



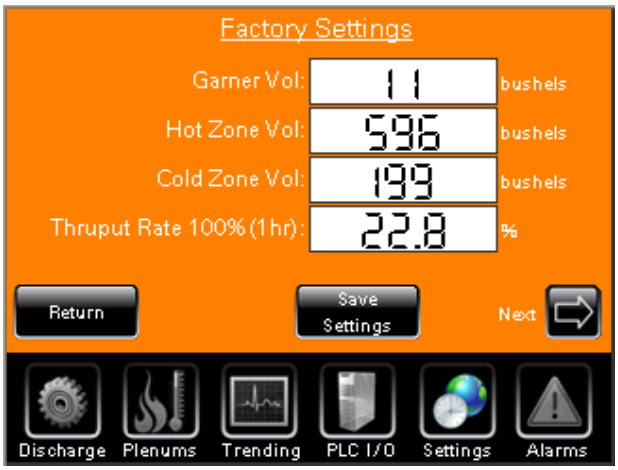
Enabling a temperature controller with the green check in the box will allow the values to not be grayed out on the Plenums screen but now showing the actual temperature, set point temperature, and controller output %. Furthermore, selecting the Controller Setup button will take you to a page to load the proper program or make adjustments to the program that is loaded on the temperature controller. After all required temperature controllers have been enabled, be sure to select the Save Settings button so that the settings are saved to the non-volatile EEPROM memory of the PLC.



The parameters that are loaded and adjustable from the Controller Setup screen coincide with the temperature controller default values found in the Operations Manual. These values are saved to the temperature controller during system software configuration and testing at the Mathews Company facility and should not ever need to be changed.

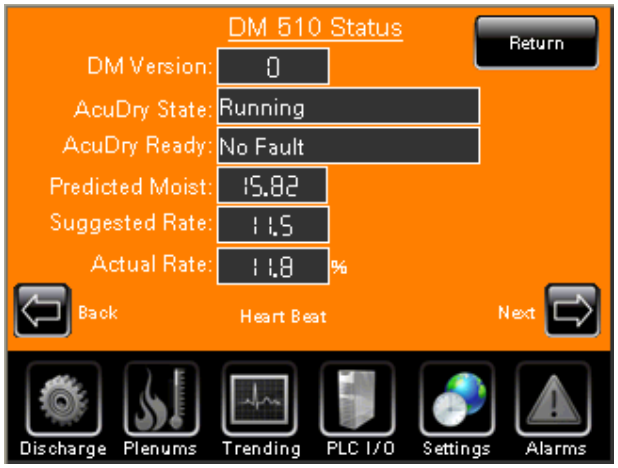
AccuDry Controller

Upon clicking the AccuDry Controller button, you will initially be taken to the AccuDry Factory Settings page. This page displays the four (4) critical values for the AccuDry system to operate effectively. These values are; Garner Volume, Hot Zone Volume, Cold Zone Volume, and Throughput rate. Athough these can be input manually, these values will be automatically generated by selecting a dryer model on the general "Factory Settings" screen.

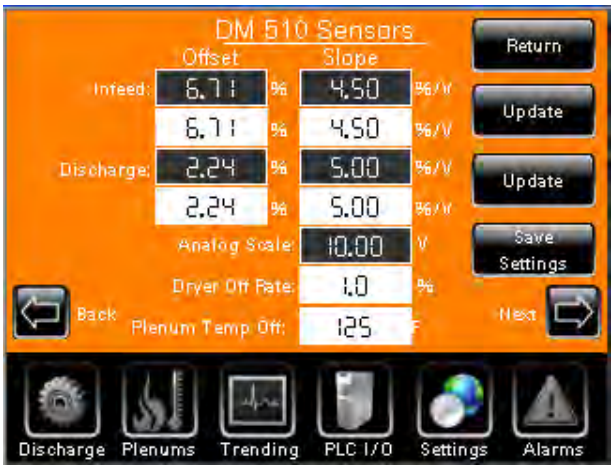


These values are dryer specific and the AccuDry system uses these values to best determine the rate at which the dryer should be operating. These values also play a crucial role in how the AccuDry predicted moisture value is calculated. Although these valves can be input manually they can be automatically generated by selecting a dryer model on the general "Factory Settings" screen.

DM 510 Status screen, this screen provides all data being sent from the Dryer Master board to the PLC in regards to the readiness of the AccuDry system. All values here can also be seen on the Not Ready Pop-Up screen when attempting to enter AccuDry mode if the system is Not Ready. Additionally, the DM Heart Beat indicator shows a green flashing dot, which indicates whether or not the DM board is both powered ON and communicating with the PLC.



Selecting the next button will take you to the DM 510 Sensors screen. This screen is where Mathews Company employees, and trained service technicians may manually adjust the DM sensors. This is done to alleviate the need to calibrate multiple times upon initial setup, due to the 0.5% restriction placed on normal calibration routines. The installer may simply enter the desired offset with a single touch of the button, and see the saved values in the white display fields.



This screen also displays the Analog Scale, which refers to the scaling of sensor inputs on the PLC. This can be used for installing older sensors to a Dryer Master system in certain extreme cases. Also, the installer may define the Dryer Off Rate on this screen. This is the minimum rate at which the dryer will operate, and it is recommended to remain at 1.0%. This parameter is used to signal the DM510 that the dryer is not discharging and should not be taking any more data. If this is different than the Operational Setpoint Minimum Discharge Rate, then there is a risk that the system will be calculating dryer operations while shutdown; hurting the overall re-startup time for the next drying run. If you wish to modify this parameter of the system it is strongly urged that you contact a Mathews Company Engineer or Mathews Company Service Technician before doing so.

Lastly, there is a field for entering the Plenum Temp Off temperature. This value is used by the DM 510 board in determining whether or not the burners are lit.

The last screen in the AccuDry Controller screens is the DM 510 Diagnostics Screen. This screen is used by only Mathews Company Engineers. This screen displays Beta2 values used on the algorithm inside the DM Board.

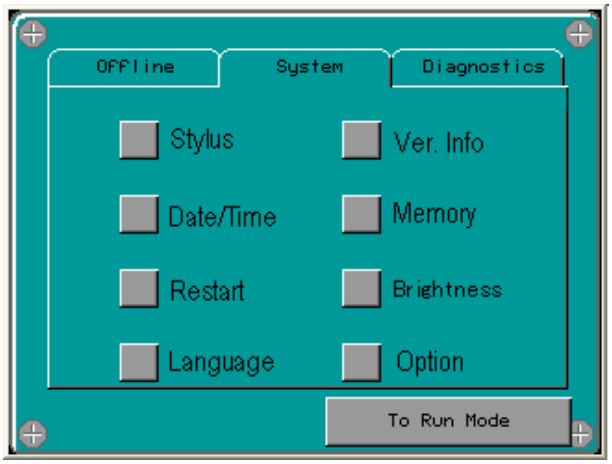
The Beta2 Value is a feedback from the sensors comparing the predicted moistures versus the actual measured values. This feedback determines how the dryer will control the discharge speed, and should not be modified.

If desired, an installer may use this field to gain access to AccuDry Mode within a series of minutes, regardless of the Dryer State. By consulting with a Mathews Company Engineer it is possible to modify the feedback such that the dryer will "Learn" at a much faster rate, and enter AccuDry much quicker than the initial start-up time of 2-3 hours.

The suggested and actual discharge rates are displayed here for real-time feedback on how the Beta2 change is affecting the system.

HMI Settings

On the second Factory Settings screen you will see a button entitled HMI Settings. Selecting this button will enter the HMI touchscreen control panel which should only be accessed by Mathews Company service personnel.



Section 4

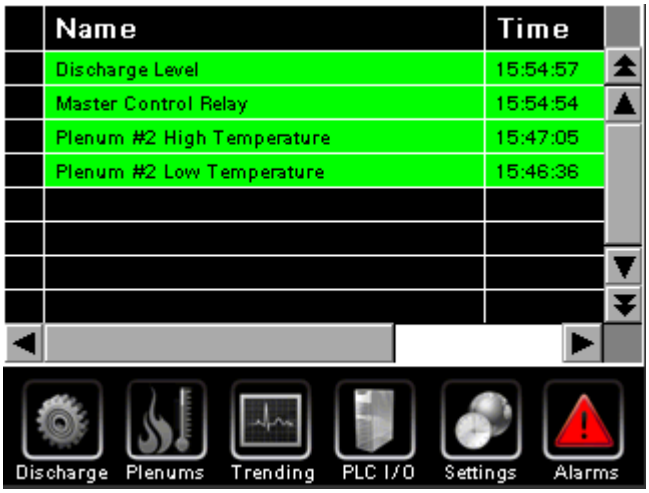
Troubleshooting

Alarms are presented to the user in three ways: (1) As pop ups when the alarm condition occurs, (2) A recorded event in the Alarms chapter, or (3) By means of the red and green stack light mounted to the High Voltage cabinet (if equipped).

Alarm Pop-Ups and History

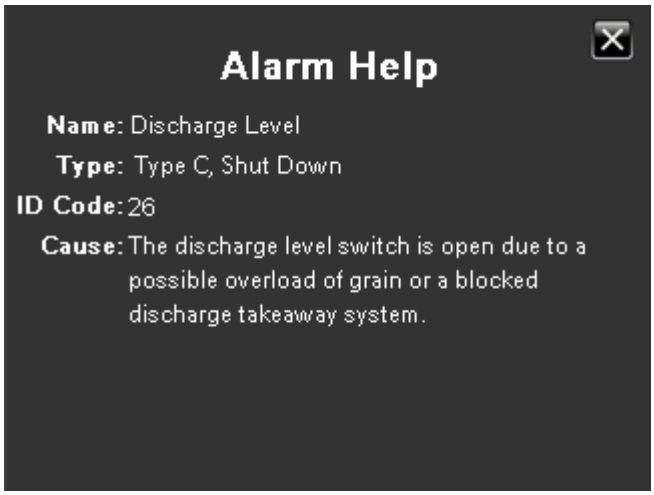
When an alarm condition occurs, a popup will appear on the screen detailing the reason for the alarm and what type of alarm it is. Press the "Accept" button to acknowledge the alarm and return to the previous screen.

To navigate to the alarm history, press the Alarms icon on the bottom navigation bar. The alarm history shows a brief description of the alarm as well as the date it was recorded:



The alarms are in reverse chronological order so that the most recent alarms will always appear at the top. Alarms that have been acknowledged are shown in yellow. Alarms that have been resolved appear in green. Scroll to the right using the scroll bar or arrows to show the date/time of the alarm and the date/time that it was accepted from the initial pop up. Selecting a row from the alarm history list will pull up a screen that

explains the type of alarm, the ID code of the alarm and the cause of the alarm.



Resetting Alarms

Not all alarms that are presented as pop-ups and stored in the alarm history list behave the same way. Specifically, the temperature controller alarms which are explained in greater detail in the Temperature Controller Alarms section. Also, some alarms are latching or non-latching. Latching alarms require you to reset them as explained further in this section. Non-latching alarms do not require the alarm to be reset, but rather they will "self heal", meaning once the condition causing the alarm has been rectified, the alarm entry will be cleared.

An alarm event has basically three states which refer to the color of the highlighting on the alarm history list. When the alarm first occurs, the highlighting will be red. Normally you would not see this condition because during this state of the alarm, you will be instantly presented with the pop-up which forces you to accept/acknowledge the alarm. Once you accept the alarm on the pop-up, the highlighting color on the alarm history list will now be yellow. In order to clear the alarm, you will need to rectify the situation which is causing the alarm to occur. Once the condition causing the alarm has been rectified, the alarm will either clear itself or you will need to press the alarm reset button which is done by pressing the Alarms chapter button while you are on the alarm history list screen.

Alarms will fall into one of two categories, either a Type "A" alarm which is a warning only (yellow background pop-up) or a Type "C" Alarm which is a shutdown alarm (red background pop-up).

If equipped with the Auxiliary Alarms feature, the stack light mounted on the High Voltage cabinet will also indicate alarms. The red lamp on the stack light will blink when the dryer has shutdown with a Type "C" alarm or will alternate red/green blinking with a Type "A" alarm while the discharge is running.

A list of all alarms names, alarm type, ID codes, and cause is presented in the following table. Note that the following alarms are only active if the machine is equipped with the Auxiliary Alarms Feature: Control Power, Motor Overload(s), Low/High Gas Pressure, Discharge Level, Plenum Door(s), High Limit(s), Linear Limit Fire Alarm, and Grain Fill Timeout.

Temperature Controller Alarms

The temperature controllers not only control the temperature in the plenum, but it also provide low temperature and high temperature alarms. When the plenum temperature drops below the low temperature setpoint or rises above the high temperature setpoint, an alarm condition will occur. The low and high temperature setpoint parameters are established in the program loaded on the controller. If the low or high temperature alarms occur while the burner is lit, the controller will shutdown the dryer and a Type "C" alarm will be displayed on the HMI touchscreen. However, if the low or high temperature alarms occur while the burner is not lit, no action is taken, however the Pinnacle Lite HMI touchscreen will display a Type "A" alarm. The low temperature alarm is non-latching and the controller will reset itself once the condition causing the alarm has been rectified. High temperature alarms are latching and will require the controller to be reset. See the following examples for further information.

High Temperature Alarm with the Burner Not Lit

If the burner is not lit and the temperature controller experiences a high temperature condition, you will see a Type "A" alarm pop-up (warning only).

After accepting the alarm and navigating to the Plenums screen, you will see the alarm state of the controller with the blinking "-AL-" message in the actual temperature field, the red high temperature alarm light to the left of the setpoint field and the alarm reset button illuminated red.

Because the high temperature alarm is latching, the controller will need to be reset once the condition causing the alarm has been rectified. In this case, either waiting for the temperature to decrease back to within the allowable temperature band, or simply increasing the plenum temperature setpoint. For the sake of this example, the plenum temperature setpoint will be increased. After the setpoint and actual temperature are within the allowable range, the temperature controller will need to be rest by pressing the red illuminated reset button. This button will send a command to the controller to reset and after a short period of time (up to 15 seconds), you will see everything go back to normal. Pressing the reset button will automatically reset the alarm in the alarm history as well.

Low Temperature Alarm with the Burner Not Lit

If the burner is not lit and the temperature controller experiences a low temperature condition, you will see a Type "A" alarm pop-up (warning only).

After accepting the alarm and navigating to the Plenums screen, you will see the alarm state of the controller with the blinking "-AL-" message in the actual temperature field and the red high temperature alarm light to the left of the setpoint field. The reset button will not be illuminated red because the controller will automatically reset itself once the condition causing the alarm has been rectified

Because the low temperature alarm is non-latching, the controller will automatically reset itself once the condition causing the alarm has been rectified, however you will still need to navigate to the alarms screen and press the alarm reset button to reset the alarm from the alarm history. For the sake of this example, the plenum temperature setpoint will be decreased. After the setpoint and actual temperature are within the allowable range, automatically reset itself and after a short period of time (up to 15 seconds), you will see everything go back to normal.

High Temperature Alarm with the Burner Lit

If the burner is lit and the temperature controller experiences a high temperature condition, you will see a Type "C" alarm pop-up and the dryer will be shutdown.

After accepting the alarm and navigating to the Plenums screen, you will see the alarm state of the controller with the blinking "-AL-" message in the actual temperature field, the red high temperature alarm light to the left of the setpoint field, the setpoint field grayed out and the alarm reset button illuminated red. The setpoint field is grayed out because when a high or low temperature condition occurs while the burner is lit, the Master Control Relay (MCR) will become de-energized and power is lost to the temperature controller.

Once the MCR is re-energized by re-engaging the control power on the Remote Control Cabinet, after 15 seconds the grayed out setpoint will become active again; this is done to prevent an attempted writing of data to the temperature controller when it is not powered up.

Because the high temperature alarm is latching, the controller will need to be reset once the condition causing the alarm has been rectified. In this case, either waiting for the temperature to decrease back to within the allowable temperature band, or simply increasing the plenum temperature setpoint. For the sake of this example, the plenum temperature setpoint will be increased. After the setpoint and actual temperature are within the allowable range, the temperature controller will need to be rest by pressing the red illuminated reset button. This button will send a command to the controller to reset and after a short period of time (up to 15 seconds), you will see everything go back to normal. Pressing the reset button will automatically reset the alarm in the alarm history as well.

Low Temperature Alarm with the Burner Lit

If the burner is lit and the temperature controller experiences a low temperature condition, you will see a Type "C" alarm pop-up and the dryer will be shutdown.

After accepting the alarm and navigating to the Plenums screen, you will see the alarm state of the controller with the blinking "-AL-" message in the actual temperature field, the red high temperature alarm light to the left of the setpoint field, and the setpoint field grayed out. The setpoint field is grayed out because when a high or low temperature condition occurs while the burner is lit, the Master Control Relay (MCR) will become de-energized and power is lost to the temperature controller.

Once the MCR is re-energized by re-engaging the control power on the Remote Control Cabinet, after 15 seconds the grayed out setpoint will become active again; this is done to prevent an attempted writing of data to the temperature controller when it is not powered up.

Because the low temperature alarm is non-latching, the controller will automatically reset itself once the condition causing the alarm has been rectified, however you will still need to navigate to the alarms screen and press the alarm reset button to reset the alarm from the alarm history. For the sake of this example, the plenum temperature setpoint will be decreased. After the setpoint and actual temperature are within the allowable range, automatically reset itself and after a short period of time (up to 15 seconds), you will see everything go back to normal.

Low Temperature Alarm During Start-Up After Shutdown

Normally the plenum temperature setpoint is substantially higher than the ambient temperature before the burner in the plenum is lit. For example, if the ambient temperature is 65 deg F and the plenum temperature setpoint is 220 deg F, this would normally be considered a low temperature alarm condition, however one of the features of the controller is that it inhibits the low temperature alarm during the initial burner ramp-up in the plenum. This means that you will not receive a low temperature alarm unless the temperature has gotten within the setpoint and dropped back down below the low temperature setpoint. This is a nice feature, however please note that although this low temperature alarm is inhibited on the first time the burner is lit, a burner shutdown/cooldown with a consecutive ramp back up will cause the low temperature alarm. In order to avoid this condition, it is required to re-cycle the power to the controller which is done by momentarily pressing the corresponding air pressure light button and the high limit button (on the Remote Control Cabinet) simultaneously. This will erase the controller's history and the low temperature inhibit feature will now be available again to permit an alarm-free start-up.

Alarm List

The following table summaries all of the possible alarms that can be generated by the Pinnacle Lite Control System:

Alarm Number	Alarm Name	Alarm Cause
1	Master Control Relay	The Master Control Relay has become de-energized due to lost power or a tripped safety circuit.
2	Linear Limit Fire Alarm	Linear Limits Circuit is Open - One of the LLC switches has opened due to high temperature.
10	Motor Overload(s)	Overload has been detected for one of the motors, check the motor circuit protector or soft starter if equipped.
16	Grain Fill Timeout	Infeed grain fill is insufficient to maintain grain level.
19	Burner High Limit Switch	The burner high temperature switch has been activated
25	Discharge VFD	The Discharge VFD has detected a fault due to a possible overload of the metering system.
26	Discharge Level	The discharge level switch is open due to a possible overload of grain or a blocked discharge takeaway system.
28	Discharge Jam / Proximity Switch	The discharge metering system has possibly stopped running because the proximity sensor is not detecting rotation.
35	Mid-Grain Band	The mid-grain temperature has exceeded or dropped below the mid-grain band alarm setpoint for a duration of 30 seconds
36	Mid-Grain Band Delay	The mid-grain temperature has exceeded or dropped below the mid-grain band alarm setpoint for the duration of the mid-grain band delay

Alarm Number	Alarm Name	Alarm Cause
37	Mid-Grain Temperature Probe #1	Mid-grain temperature probe #1 has failed or become disconnected.
38	Mid-Grain Temperature Probe #2	Mid-grain temperature probe #2 has failed or become disconnected.
39	Mid-Grain Temperature Probe #3	Mid-grain temperature probe #3 has failed or become disconnected.
40	Mid-Grain Temperature Probe #4	Mid-grain temperature probe #4 has failed or become disconnected.
41	Mid-Grain Temperature Transmitter #1	Mid-grain temperature transmitter #1 has failed or become disconnected.
42	Mid-Grain Temperature Transmitter #2	Mid-grain temperature transmitter #2 has failed or become disconnected.
43	Mid-Grain Temperature Transmitter #3	Mid-grain temperature transmitter #3 has failed or become disconnected.
44	Mid-Grain Temperature Transmitter #4	Mid-grain temperature transmitter #4 has failed or become disconnected.
48	Low/High, Gas/Fuel Pressure	Low gas/fuel pressure or high gas/fuel pressure detected in the gas/fuel train.
49	Plenum Door(s)	An open plenum door has been detected with the control power on.
51	Plenum #1 High Temperature	The temperature in plenum #1 has exceeded the high temperature setpoint.

Alarm Number	Alarm Name	Alarm Cause
52	Plenum #2 High Temperature	The temperature in plenum #2 has exceeded the high temperature setpoint.
53	Plenum #3 High Temperature	The temperature in plenum #3 has exceeded the high temperature setpoint.
54	Plenum #4 High Temperature	The temperature in plenum #4 has exceeded the high temperature setpoint.
55	Plenum #5 High Temperature	The temperature in plenum #5 has exceeded the high temperature setpoint.
56	Plenum #6 High Temperature	The temperature in plenum #6 has exceeded the high temperature setpoint.
57	Plenum #7 High Temperature	The temperature in plenum #7 has exceeded the high temperature setpoint.
58	Plenum #8 High Temperature	The temperature in plenum #8 has exceeded the high temperature setpoint.
61	Plenum #1 Low Temperature	The temperature in plenum #1 has dropped below the low temperature setpoint.
62	Plenum #2 Low Temperature	The temperature in plenum #2 has dropped below the low temperature setpoint.
63	Plenum #3 Low Temperature	The temperature in plenum #3 has dropped below the low temperature setpoint.
64	Plenum #4 Low Temperature	The temperature in plenum #4 has dropped below the low temperature setpoint.

Alarm Number	Alarm Name	Alarm Cause
65	Plenum #5 Low Temperature	The temperature in plenum #5 has dropped below the low temperature setpoint.
66	Plenum #6 Low Temperature	The temperature in plenum #6 has dropped below the low temperature setpoint.
67	Plenum #7 Low Temperature	The temperature in plenum #7 has dropped below the low temperature setpoint.
68	Plenum #8 Low Temperature	The temperature in plenum #8 has dropped below the low temperature setpoint.
70	Control Power	The Control Power has been turned off.
111	High Discharge Moisture	The AccuDry moisture control system has experienced high discharge moisture.
112	Critical High Discharge Moisture	The AccuDry moisture control system has experienced critical high discharge moisture.
113	High Discharge Temperature	The AccuDry moisture control system has experienced high discharge temperature.
114	Critical High Discharge Temperature	The AccuDry moisture control system has experienced critical high discharge temperature.
115	Low Discharge Moisture	The AccuDry moisture control system has experienced low discharge moisture.
116	Critical Low Discharge Moisture	The AccuDry moisture control system has experienced critical low discharge moisture.

Alarm Number	Alarm Name	Alarm Cause
117	Low Discharge Temperature	The AccuDry moisture control system has experienced low discharge temperature.
118	Critical Low Discharge Temperature	The AccuDry moisture control system has experienced critical low discharge temperature.
121	High Infeed Moisture	The AccuDry moisture control system has experienced high infeed moisture.
122	Critical High Infeed Moisture	The AccuDry moisture control system has experienced critical high infeed moisture.
123	High Infeed Temperature	The AccuDry moisture control system has experienced high infeed temperature.
124	Critical High Infeed Temperature	The AccuDry moisture control system has experienced critical high infeed temperature.
125	Low Infeed Moisture	The AccuDry moisture control system has experienced low infeed moisture.
126	Critical Low Infeed Moisture	The AccuDry moisture control system has experienced critical low infeed moisture.
127	Low Infeed Temperature	The AccuDry moisture control system has experienced low infeed temperature.
128	Critical Low Infeed Temperature	The AccuDry moisture control system has experienced critical low infeed temperature.
131	High Plenum Temperature	The AccuDry moisture control system has experienced high plenum temperature.

Alarm Number	Alarm Name	Alarm Cause
132	Critical High Plenum Temperature	The AccuDry moisture control system has experienced critical high plenum temperature.
133	Low Plenum Temperature	The AccuDry moisture control system has experienced low plenum temperature.
134	Critical Low Plenum Temperature	The AccuDry moisture control system has experienced critical low plenum temperature.
135	Dryer OFF	The AccuDry moisture control system has determined that the dryer is off.
141	High Discharge Speed	The AccuDry moisture control system has experienced high discharge speed.
142	Critical High Discharge Speed	The AccuDry moisture control system has experienced critical high discharge speed.
143	Low Discharge Speed	The AccuDry moisture control system has experienced low discharge speed.
144	Critical Low Discharge Speed	The AccuDry moisture control system has experienced critical low discharge speed.

Section 5

Notes