DRYER MASTER

DM510

Computerized
Grain Drying
Control System

USER'S GUIDE

Dryer Master DM510

Users Guide

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Reminder

Remember to register your DM510 at dryermaster.com.
**Simply by registering your new DM510 you can automatically
extend your warranty from 1 year to 2 years.**

March 24, 2003

March 11, 2005

March 12, 2007

May 12, 2009

July 12, 2013

January 31, 2015

January 1, 2016

January 10, 2017

March 13, 2018

Dryer Moisture Systems Inc. – About Us

Dryer Moisture Systems Inc. (DMSI) is a process engineering company specializing in on-line product and total process optimization. We offer the benefits of many years of professional process expertise in a broad range of industries and technologies, from food processing to engineered wood products to pharmaceuticals, from basic control and monitoring systems to sophisticated advanced control systems.

Our engineering staff are experts in the design of real time advanced control systems, specifically tailored to the optimization of engineered processes. These control systems are provided on industry standard platforms that are extremely flexible and readily configured by the end user.

In support of our real-time advanced control systems, DMSI provides a full range of hardware and software, engineering services, system commissioning, operator training and extended over the phone remote support. We deliver proven solutions resulting in increased yields, improved and consistent product quality, maximized plant efficiency and more effective use of your operations personnel. DMSI also provides services that allow the monitoring of your process or plant operations from location on or off site.

The Dryer Master DM510 from DMSI continues the commitment to excellence that has made the Dryer Master name the industry standard in grain drying technologies. With your assistance, the DM510 can help:

- Reduce product shrinkage due to over drying
- Reduce energy costs
- Produce a consistent and better product

What is in this manual

Introduction

Drying is one of the most difficult processes to control. It requires constant attention to moisture, temperature, volume and throughput. The DM510 is ideally suited to these operations as it devotes its attention full time to your dryer. The DM510 is a tool that helps the operators, by doing the menial tasks and frees them to make the executive decisions about the drying process. It should be noted that the DM510 Dryer Master only optimizes the dryer's performance.

A good understanding of the drying process helps a great deal in understanding how the DM510 works.

System Components Overview:

A basic description of the parts of the DM510 and how they work together to automatically control your drying.

The DM510 Control Panel

An explanation of what you see on the operations screen, the various keys/buttons used to run the DM510, and the meaning of the status lights.

Operating the DM510

All the basics for operating the DM510.

Step-by-Step Key Instructions (DM510 Function and Usage)

Once you are comfortable with the basics of operating the DM510 you can use this section to explore the full range of possibilities provided by the DM510. This section provides a description of functions that are available when you press each key.

Remote Access:

Introduction to viewing and controlling your DM510 from a smartphone, PC, or tablet.

Appendices

Appendix 1. We have included a number of drying tips we have picked up from our experiences over the last 30 years.

Appendix 2 and 3. Troubleshooting tips for both control and moisture sensor issues.

Your other Guides

All three of the DM510 guides (Installation, Commissioning and User's) are available for download on the Dryer Master website at www.dryermaster.com.

DM510 - A Brief Description

The Dryer Master DM510 from DMSI is the ideal addition to your new or existing continuous flow grain dryer. Simple and easy to operate, the DM510 uses advanced process control to automatically adjust your dryer discharge rate, drying grain more consistently and closer to your target moisture level.

The DM510 is a computer control system that controls grain drying. The system comes complete with an operator panel, sensors to measure the grain moisture and temperature entering and exiting the dryer, a drying air temperature sensor, a moisture sensor chute with rotary feed and remote access via internet capability. An optional printer is also available. The system uses this and other information, to set the optimum grain discharge rate to control the moisture of the product within a narrow tolerance.

The DM510 is capable of being monitored and controlled remotely through a web browser on your smart phone, tablet or desktop PC through DM-Mobile. Simply connect the DM510 to an internet enabled router and then access many of the DM510 functions through your web browser at my.dryermaster.com. DM-Mobile can also be configured to provide you with text on alarm messages so that you can be aware of an issue without having to be at the DM510 panel.

The DM510 provides quick payback by reducing over and under drying resulting in increased yields, energy savings, and providing a better quality dried product.

DM510 - How it Works

As an operator you know that grain drying is a very difficult process to control. You know that your dryer dries faster or slower depending upon drying conditions. Ambient air temperature, wind speed and direction, humidity, time of day, the variety of the grain being dried, and of course, the moisture of the grain all can affect dryer operation.

The Dryer Master DM510 uses sophisticated on-line moisture measurement and moisture control technology to overcome these difficulties. The DM510 uses specially designed on-line moisture and temperature sensors located at the inlet and the outlet of the dryer. These sensors provide continuous moisture and temperature readings to the computer located in the DM510 control panel.

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

The DM510 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 its full attention.

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

With this information, the DM510 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, the DM510 begins to slow down the discharge rate just as the wetter grain reaches the hot zone.

Access to our Customer Support Centre

One of the unique benefits you the operator receive with the DM510 is access to support from the Dryer Master Support center where DMSI has experts in the theory (application to drying), installation and operation of the DM510. Personnel are available to answer questions about the material in this manual and other questions you have pertaining to drying. You can call the support center toll free from the USA or Canada at 1-888-318-0009.

System Components

The standard DM510 system includes the following components:
- DM510 control panel (with remote I/O option)
- Inlet and outlet grain moisture sensors with integrated product temperature sensors
- Calibration push button
- Drying air temperature sensor or signal converter (to access dryer's plenum temp reading)
- Outlet moisture sensor chute with rotary feed (bypass or inline version)
- Internet connectivity capability

There is also an optional printer available for the continuous reporting of dryer operation and results. This can be useful for customers not using the internet connectivity feature.

DM510 Control Panel including I/O:

The DM510 is a computer system complete with user interface keypad and the display screen, I/O system and the capability to provide real time information through an internet connection to an internet capable device. The DM510 Control Panel is typically installed in the control room close to the dryer where it can be readily accessed by the operator. The I/O can be located remotely using a wired connection for short distances or a wireless connection for longer distances (requires optional wireless modems).

The Printer (Optional):

The DM510 uses the printer to provide reports such as: Continuous Averages, Hourly Summaries, and Daily Summaries etc. These are tools that can be used to manage the total drying process.

Inlet Moisture and Temperature Sensor:

The inlet moisture and temperature sensor is installed in the flow of the product before it enters the drying zone (hot zone) of the dryer, typically in the garner or holding bin above the hot zone.

Outlet Moisture and Temperature Sensor & Chute with Rotary Feed:

The outlet moisture and temperature sensor is installed after the exit of the dryer, typically using the outlet moisture sensor chute with rotary feed (either the inline or bypass version).

Calibration Push Button:

The calibration button is installed near the operator sampling point for product exiting the dryer, usually in close proximity to the outlet moisture sensor.

Drying Air Temperature Sensor or Temperature Signal Converter:

A temperature sensor is installed in the heating chamber in close proximity to the dryer's existing drying air temperature sensor to monitor the drying air temperature. Some systems will instead use a temperature signal converter to use the dryer's temperature reading.

Internet Connectivity Capability:

Connect your DM510 to an internet enabled router or wireless hotspot (via Ethernet cable) and you access your system remotely via a desktop PC, smartphone or tablet. Simply use your browser to go to my.dryermaster.com and login using the login information that came with your system.

Equipment Schematic

Inlet Moisture sensor

Dryer

Drying Air Temperature sensor

Router for internet connectivity

or

PLC supporting Modbus Serial RTU

Printer (Optional)

Dryer Control Panel

Drying Rate, Rate setpoint & L/R control switching

Calibration button

Outlet Moisture sensor

*Note: DM510 systems come with either a drying air temp sensor (shown in diagram), **or** a signal converter which uses the dryer's temperature signal. In the latter case the signal converter is typically located at the dryer panel)*

Figure 1- Application Schematic

DM510 User Interface

The user interface incorporates three devices, an LCD display screen, status lights (LED's) and the keypad. The following sections describe the operation and functionality of the three components of the user interface.

Front Panel Layout

Figure 2 - Front Panel Layout

Display Screen

The display screen provides process information for the operator and is located in the upper middle of the door (refer to Figure 2). The Main Operations Screen is the most commonly used screen.

Main Operations Screen
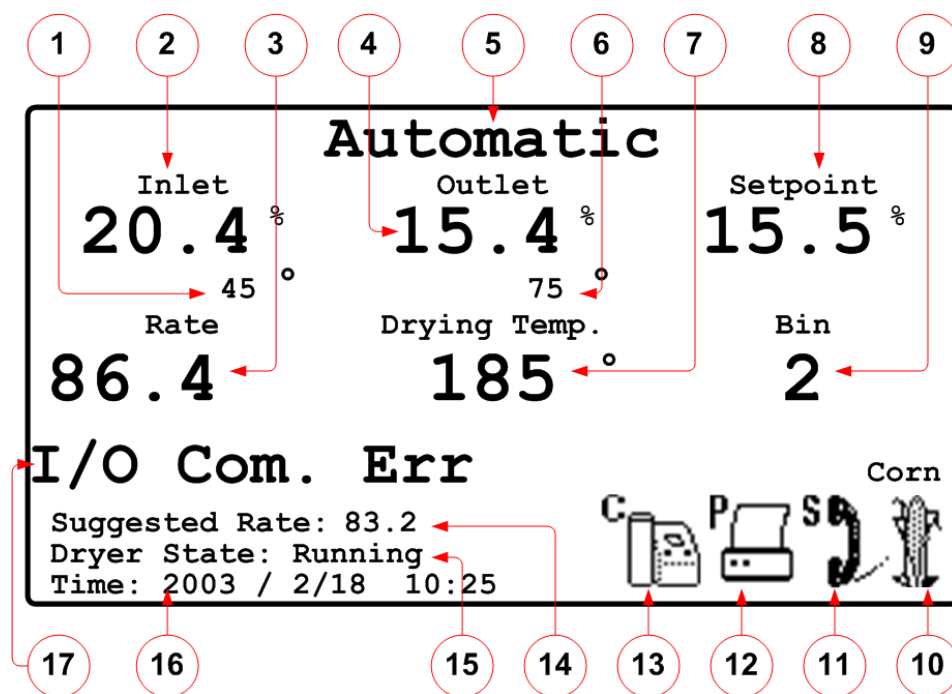
Figure 3- Main Operations Screen

Description of Main Operations Screen displayed items

1. Inlet moisture sensor, product temperature: The temperature of the product at the top of the dryer as measured by the inlet moisture sensor.

2. Inlet moisture sensor, product moisture: The moisture of the product at the top of the dryer as measured by the inlet moisture sensor.

3. Dryer discharge rate: The dryer unload rate as sent to the DM510 by the dryer's unload system.

4. Outlet moisture sensor, product moisture: The moisture of the product leaving the dryer as measured by the moisture sensor.

5. Operation mode: The operator sets the operating mode. The DM510 will display the message once the system is able to operate in the requested mode.

a) 'Local' mode: Dryer in manual operation. The discharge or unload rate is set manually, by the operator, *at the dryer panel*.

b) 'Manual' mode: Dryer in manual operation. The discharge or unload rate is set manually, by the operator, *at the DM510*.

c) 'Automatic' mode: Dryer is in automatic operation. The discharge or unload rate is set automatically by the DM510 to achieve an average target outlet moisture.

6. Outlet moisture sensor, product temperature: The temperature of the product leaving the dryer as measured by the moisture sensor.

7. Drying temperature: The temperature of the air in the dryers drying zone of the dryer. This may be referred to as the APT (Air Plenum Temperature).

8. Moisture set-point: The target moisture for the product leaving the dryer. In Automatic mode the DM510 will attempt to attain this setting by adjusting the dryer's discharge or unload rate.

9. Bin number: The drying bin tracking system permits the user to enter a number for the bin the dryer discharges dried grain into.

10. Product icon: Different products may be dried in the dryer. The products can be selected from a short list. The product being dried is represented by a small picture (icon).

11. Telephone modem icon: The DM510 is able to communicate with the diagnostics services at the Dryer Master Support Center. The communication is initiated by the Dryer Master Support Center and the phone receiver icon is displayed upon successful connection. (*Optional item*)

12. Print icon: The printer icon is displayed when a printing task has been initiated. This icon is displayed while the DM510 prepares the information to be printed and until it is sent to the printer. (*Optional item*)

13. Calibration in progress icon: The calibration in progress icon is displayed when a calibration is started and the 30 seconds of sampling time has expired, for any and all sensors. The outlet sensor(s) shows the sampling time with the flashing sample button.

14. Suggested rate message: The suggested rate message is displayed while the system is in local or manual mode and the system is able to predict a reasonable rate. This value is based on the drying factors, the current inlet and outlet moistures, drying temperature and actual discharge speeds. This value serves as a suggested starting point for manual operation.

15. Dryer state message: For effective automatic operation the DM510 goes through stages. These states are, Standby, Primed, Idle Run, Preheat, Running, Holding and Shutdown. The section in this manual 'Dryer states' provides further explanation.

16. Date and time display: Displays the date and time.

17. Loss of communication message: The message 'I/O Com. Err' displays when the DM510 computer has lost communication with the sensors and other field signals. An alarm and further message will sound within 30 seconds if the DM510 computer is unable to re-establish communication with the I/O system.

Operation mode descriptions

The sample screens show the DM510 drying corn in Local Mode, Manual Mode and Automatic mode.

Local Mode:

All items displayed on the Main Operations screen.

Dryer discharge is controlled *from the dryer panel*.

```
                    Local
      Inlet            Outlet          Setpoint
    20.4 %          15.4 %          15.5 %
          45  °            75  °
      Rate          Drying Temp.          Bin
    86.4              185  °              2

                                          Corn
    Suggested Rate:  83.2
    Dryer State: Running
    Time: 2003 / 2/18   10:25
```
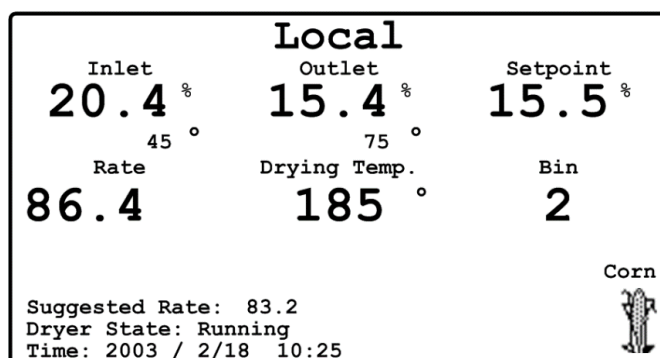
Figure 4- Main Operations Screen (Local Mode)

Manual Mode:

All items displayed on the Main Operations screen.

Dryer discharge is controlled manually *from the DM510 keypad*.

```
                    Manual
      Inlet            Outlet          Setpoint
    20.4 %          15.4 %          15.5 %
          45  °            75  °
      Rate          Drying Temp.          Bin
    86.4              185  °              2

                                          Corn
    Suggested Rate:  83.2
    Dryer State: Running
    Time: 2003 / 2/18   10:25
```
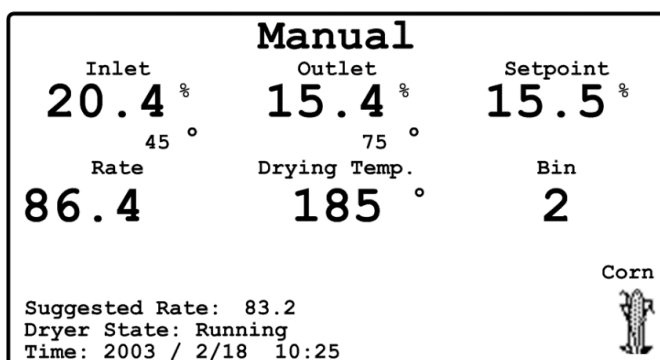
Figure 5- Main Operations Screen (Manual Mode)

Automatic Mode:

All items displayed on the Main Operations screen.

Dryer discharge is controlled automatically by the DM510, based on the moisture set-point.
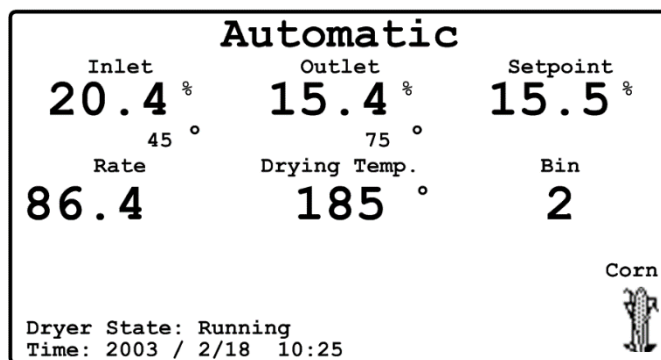
Figure 6 - Main Operations Screen (Automatic Mode)

DM510 Keypad
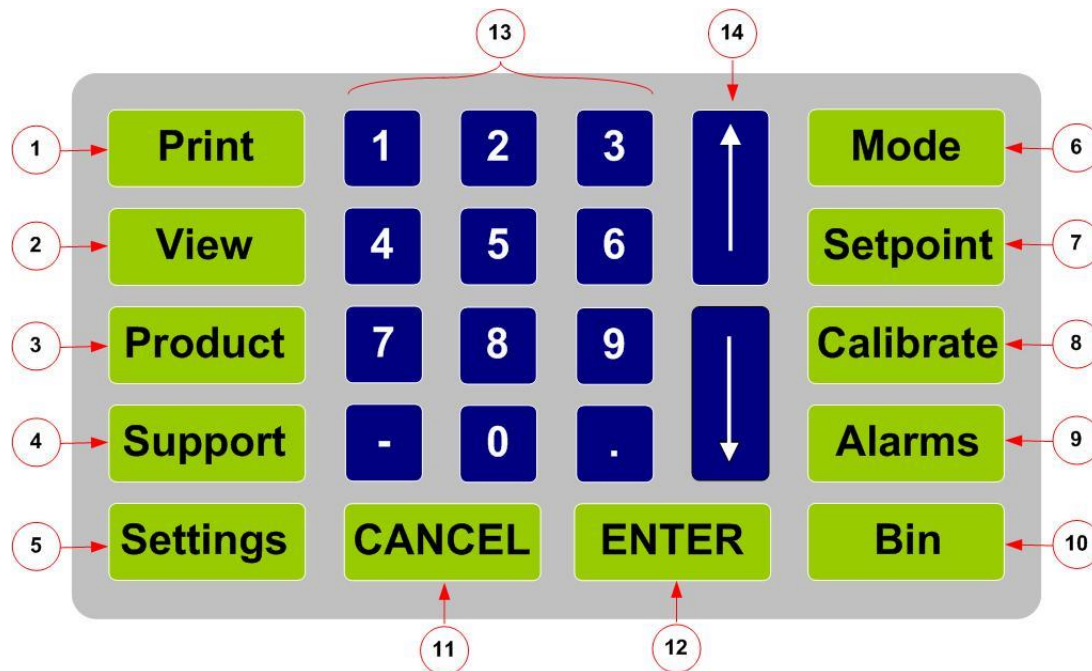
Figure 7 - DM510 Keypad

Description of the Keys/Buttons usage and functions

1. Print: Accesses the 'Print Options' menu. Permits setting of print functions, enables or disables reports and sets the print time. (*Requires optional printer*)

2. View: Accesses the drying history screen.

3. Product: Accesses the 'Product Selection' menu. Permits the selection of the product to be dried.

4. Support: Accesses the 'System Help' menu. Diagnostic screens are available to view the values of various signals and states. There is also a "control overview" with the important control variables. This section is used mainly for control diagnostics with the assistance of the Dryer Master Support Center.

5. Settings: Accesses the 'Settings' menu. Permits the selection of various setup and information screens. For a detailed explanation of the parameters within the screens, refer to Appendix A of this document.

6. Mode: Accesses the 'Control Mode' menu. Permits changing between Automatic, Manual and Local control modes.

7. Set-point: Accesses the 'Set-point' menu. Permits the selection of the Moisture Set-point and the Discharge Rate set-point menu.

8. Calibration: Accesses the moisture 'sensor selection' menu. Permits the entry of manual moisture samples for the purpose of calibrating the DM510 moisture sensors.

9. Alarms: Accesses the 'Alarm' menu. Permits setting, changing alarms and limits and to view the alarm summary.

10. Bin: Accesses the 'Bin setting' menu. Provides options for selecting, changing the bin and provides bin report printing options. (*Requires optional printer to get reports*)

11. Cancel: Permits cancellation of an operation, acknowledges alarms, clear entries or return to the previous screen.

12. Enter: Permits confirmation and acceptance of data entries or operation changes.

13. Number Keys: Permits entering of numeric values.

14. Arrow Keys: Permits selection of the previous or next available entry field or screen.

DM510 Status Lights

The DM510 includes Alarm and Mode status lights located to the right and left side of the display. These status lights provide important alarm and operation mode indication at a glance. The intent is to supplement information already displayed on the display screen.

Alarms

Inlet 🔴

Outlet 🔴

Rate 🔴

Drying Temp. 🔴

Grain Temp. 🔴
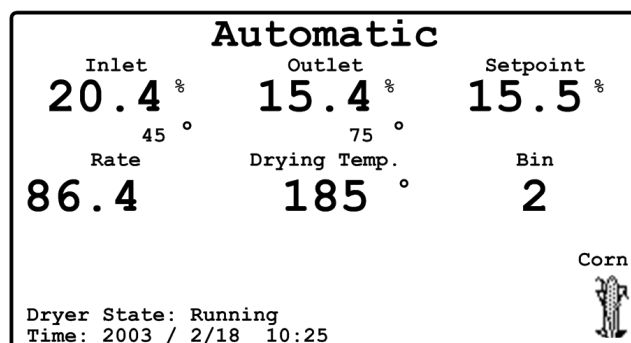
Mode

🟢 Auto

🟢 Ready

🟢 Learn

🟢 Remote

```
              Automatic
     Inlet         Outlet        Setpoint
    20.4 %        15.4 %         15.5 %
        45 °          75 °
     Rate        Drying Temp.      Bin
    86.4            185 °           2

                                      Corn

 Dryer State: Running
 Time: 2003 / 2/18  10:25
```

Figure 8 - Display Screen and Status Lights

Description of the Status lights

1. Alarms:

a) **Inlet:** Alarm for the inlet moisture. The status light will illuminate RED when the high or low moisture limits are exceeded or there is a fault with the sensor. A descriptive message explaining the alarm will be displayed on the main screen along with an alarm sound. The message and sound can be cleared with the push of the 'CANCEL' key but the status light will remain illuminated until the condition is corrected.

b) **Outlet**: Alarm for the outlet moisture. The status light will illuminate RED when the high or low moisture limits are exceeded or there is a fault with the sensor. A descriptive message explaining the alarm will be displayed on the main screen along with an alarm sound. The message and sound can be cleared with the push of the 'CANCEL' key but the status light will remain illuminated until the condition is corrected.

c) **Rate**: Alarm for the dryer's discharge or unload rate. The status light will illuminate RED when the high or low rate limits are exceeded or there is a fault. A descriptive message explaining the alarm will be displayed on the main screen along with an alarm sound. The message and sound can be cleared with the push of the 'CANCEL' key but the status light will remain illuminated until the condition is corrected.

d) **Drying Temp**: Alarm for the drying temperature. The status light will illuminate RED when the high or low rate limits are exceeded or there is a fault. A descriptive message explaining the alarm will be displayed on the main screen along with an alarm sound. The message

and sound can be cleared with the push of the 'CANCEL' key but the status light will remain illuminated until the condition is corrected

e) **Grain Temp**.: Alarm for both the inlet and outlet product temperature. The status light will illuminate RED when the high or low product temperature is exceeded for either the inlet or the outlet product temperature or there is a fault. A descriptive message explaining the alarm will also be displayed on the main screen along with an alarm sound. The message and sound can be cleared with the push of the 'CANCEL' key but the status light will remain illuminated until the condition is corrected

2. Mode:

a) **Auto**: The Auto status light is illuminated when the DM510 is controlling the dryer automatically.

b) **Ready**: The Ready status light is illuminated when the DM510 system has gathered sufficient information to be placed into Automatic mode when this status light is lit, the operator can select Automatic Mode. The supervisor can also select Auto Fast Start. When auto fast start is enabled the operator can select 'Automatic Mode' as soon as the learn status light is lit. Great care must be used with this feature, as the DM510 Dryer Master may not have sufficient information to set the correct discharge or unload rate.

c) **Learn**: The Learn status light is illuminated when the dryer is operating and the moisture sensors have product.

d) **Remote**: The Remote Status light is illuminated when the DM510 system is in control of the dryer's discharge system either manually or automatically. When this status light is NOT illuminated dryer control is from the dryer panel.

DM510 Dryer States

There are seven Dryer States defined by the DM510 Dryer Master. These are 'Stand-By', 'Primed', 'Idle Running', 'Shutdown', 'Preheat', 'Running', and 'Holding'. The dryer state is displayed in the lower left-hand corner of the screen.

Description of the Dryer States

1) **Stand-By**: The dryer fans, discharge conveyor, and burners are off. The dryer may not be full (no moisture displayed by the inlet moisture sensor).

2) **Primed**: The dryer fans, discharge conveyor, and burners are off. The dryer is full (moisture displayed by the inlet moisture sensor).

3) **Idle Running**: The dryer fans are on, the discharge conveyor, and burners are off. The dryer is full (moisture displayed by the inlet moisture sensor). This feature is only available on systems that make use of the fan switch input.

4) **Shutdown**: The dryer is OFF. The fans, discharge conveyor, and burners are off. The dryer is full (moisture displayed by the inlet moisture sensor). This feature is only available on systems that make use of the fan switch input.

5) **Preheat**: The dryer fans are on; burners are on, the discharge conveyor is off. The dryer is full (moisture displayed by the inlet moisture sensor).

6) **Running**: The dryer fans are on; burners are on, the discharge conveyor is on. The dryer is full (moisture displayed by the inlet moisture sensor). Moisture displayed at the outlet sensor.

7) **Holding**: The dryer fans are on; burners are on, the discharge conveyor is off. The dryer is full (moisture displayed by the inlet moisture sensor). This is a temporary state. The DM510 Dryer Master will revert to local mode within 25 minutes and lock out both manual and automatic control from the DM510 Dryer Master as a safety precaution. The DM510 must be reset to clear this lockout.

Using the DM510

This section discusses the basic elements for operating the DM510. For quick reference, you will find much of the information from this section summarized on your Quick Guide a copy of which is located in Appendix 2 of this document. If at any time you have questions about the operation of the DM510 do not hesitate to contact the Dryer Master Support center at 519 746-0223 or toll free at 888-318-0009 (in North America).

Three Ways to Operate

The DM510 Dryer Master can be used in three ways, called Modes of Operation: Local, Manual, and Automatic. It is very important that you understand the differences between the three modes.

Description of the Operating Modes

Local: Every time you start your dryer the DM510 begins in 'Local' mode. In Local mode, the DM510 monitors the drying process and displays information on the screen, but it does not control. In Local mode you operate the dryer from the dryer control panel just as you did before you installed your DM510. Note the "Remote" status light is NOT illuminated.

Manual: In 'Manual', the DM510 monitors the drying process and displays information on the screen, but it does not control. In 'Manual' mode you operate the dryer discharge rate from the DM510.
In 'Manual' mode, you can conveniently change the dryer discharge rate directly from the DM510 panel using the 'Setpoint' key. You will typically use 'Manual' mode at start-up while the DM510 is learning, or while you are drying short runs, once the Ready status light is illuminated, you can switch to 'Automatic' mode.

Auto: 'Automatic' mode is where you want to be most of the time. In 'Automatic' mode, the DM510 makes changes to your discharge rate automatically. These changes are based on the process information it receives from the sensors and its model of your drying process. When you switch to 'Automatic' mode, the DM510 will ask you for target moisture. It will then automatically control the discharge rate to dry as much grain as close to your target moisture as possible.

In 'Automatic' mode, you will find that your job as operator will become that of a supervisor. You will be responsible for setting the target moisture for the DM510, for setting the limits that it operates under and making sure that the moisture sensors are calibrated.

Important
DM510 systems with 'Auto Fast Start' enabled can be switched to Automatic mode as soon as the DM510 determines the dryer is running. Should the DM510 select an inappropriate speed, return the system to Manual mode and wait until the 'Ready' status light is illuminated before selecting Automatic.

Changing Between Modes

Changing between modes is straightforward. Press 'Mode' to display the mode selection menu. Press the up or down arrow keys to highlight your selection followed by the 'Enter' key, or press the number key for the selection.

Selecting '(1) Request Manual' will forward you to the 'Manual Mode' 'Rate Entry' screen. Press 'Cancel' to accept the displayed value and return to the 'Main Operations' screen. Or type in a new value followed by 'Enter' key to return to the 'Main operations' screen using the new rate value.

Selecting '(2) Request Automatic' will forward you to the 'Automatic Mode' 'Target Entry' screen. Press 'Cancel' to accept the displayed value and return to the 'Main operations' screen, or type in a new value followed by 'Enter' key to return to the 'Main operations' screen using the new target value.

Selecting '(3) Request Local (control at Dryer) will return to the 'Main operations' screen, switch to manual operation at the dryer panel and extinguish the Remote Status light.

Choosing a Moisture Setpoint

The DM510 does two things based on the target moisture setpoint that you provide. First, it observes the discharge moisture in relation to the target to create an image of the drying conditions (dryer model) within the dryer. Second, while in Auto, it manipulates the discharge rate to dry as much grain as close to target moisture as conditions allow.

When choosing target moisture, remember that the target moisture is average moisture, not maximum moisture, some grain will come out wetter than the target moisture and some will come out drier.

To change the target moisture, press 'Setpoint' to display the setpoint selection menu. Choose (2) 'Moisture Setpoint' to display the Moisture Setpoint entry display. Enter new target moisture, press 'Enter' to accept the new value and return to the 'Main operations' screen.

Calibrating the DM510 Sensors

Reasons for Calibration

The DM510 controls your drying based on its moisture sensor readings. For proper operation it is important that the DM510 (on-line) moisture sensors agree with your bench top (off-line) moisture tester. This means that for a given sample of grain, both your bench top tester and your DM510 moisture sensor will give a similar moisture reading.

While it may sound straightforward to have the on-line DM510 sensor read the same as your bench top unit, there are a few points that make it a little more complex.
The DM510 measures the moisture in slightly less than ¼ of a cubic foot (7 liters) of product, in corn at 56lbs/bushel (that equates to about 10lbs (4.5Kg) of corn. The bench top sample is usually less than 250 grams. It is possible to have bench top samples that differ significantly from the reading the DM510 sensor provides. Differences in product temperature and the temperature of the bench top tester and test area will contribute to errors. The heating or cooling of exposed product in the bench top tester and test area will change its moisture.

Let's look at an example where an operator takes two moisture samples 20 seconds apart and puts them into two separate containers.

If you take the first sample and put it into your bench top sensor, you will get a moisture reading. Now if you put the same sample back into the tester again, you may get a slightly different reading. This is called equipment error and it occurs because most bench top testers have a +/- 0.2% error range. The DM510 moisture sensors have a similar error of +/- 0.2%, so it is possible for the two sensors to read as much as a 0.4% difference and still both be acceptable.

If you now take the second moisture sample and put it into the bench top tester you will most likely get another reading. This time the difference is because all the grain coming out of the dryer is not exactly the same moisture. (For example, there are usually variations between different columns in the dryer.) This is called sampling error. This is also evident when taking samples from inbound trucks and it is the reason that you probe and sample from different parts of the truck, the idea being to obtain a representative sample to get accurate overall average moisture.

Calibration Procedure

While equipment error cannot be eliminated much can be done to reduce sampling error. This is why the DM510 comes with a sampling button for the outlet sensor. The concept is to have the operator and the DM510 take a similar sample over the time the sample button flashes, a period of about 30 seconds. This more representative sample provides a more accurate result.

We recommend the following procedure for calibrating the outlet sensor.
- Check the dryer to make sure grain is flowing past the sensor
- Push the sample button next to the DM510 outlet sensor (the sample button light will flash for 30 seconds and then remain lit until the sample is entered or cancelled).
- While the light is flashing, take several small samples and put them into a container (DO NOT take just one sample).

• Mix up the sample. Test in the bench top tester. Take 3 or more tests and average them.
• Press 'Calibrate' on the DM510 panel to display the 'Sensor selection' menu. The sensor with the sample waiting will show (Sample Waiting) adjacent to its menu entry. Use the 'arrow' keys to highlight the sensor, press the 'Enter' key to move to the data entry screen.
• The DM510 moisture sensor average for the 30-second test will be displayed.
• Type in your bench top meter result. Press the 'Enter' key to accept the value and return to the 'Main operation' screen. Type in '0' and 'Enter' or 'Cancel' to clear the calibration in progress and return to the 'Main operation' screen.

The DM510 will automatically update its moisture calculation formula. If your bench top reading is more than 1.0% away from the DM510 reading we recommend obtaining a second sample. If the second sample gives a similar result you should enter the calibration and verify the product flow past the sensor.

Note:
The DM510 Moisture sensors are factory calibrated to a standard. New installations can routinely show significantly different readings between the DM510 sensors and the bench top meter. A number of calibrations or an adjustment in the Supervisor Settings Calibration menu will bring the sensors in line.

Calibration Frequency

Continue sampling at the frequency you are accustomed to. Calibrations can be performed any time there is product in the moisture sensor. The DM510 will track the entries and make adjustments as needed regardless of the operating mode. The Dryer Master Support Center can use the information to track the performance of the sensor.

A good way of seeing if the DM510 is in calibration is to keep a list of calibration pairs. Use two columns in which the first column is the bench top reading and the second column is the DM510 reading from the calibration data entry screen. With the corresponding readings beside each other, a glance down the page will tell you if the Dryer Master is calibrated or if there is an outlier reading.

Setting Alarms

The DM510 comes with an alarm feature that can help you monitor your drying. You can set high and low alarm limits for inlet moisture, outlet moisture, drying air temperature, and discharge rate, inlet and outlet product temperature.

Note:
Alarm settings are provided for safety and operator convenience. Alarms can be made ineffective; however the hazard of making these changes must be weighed against the safety of operators and equipment.

For each alarm limit there are two stages of alarm. The first stage is a warning alarm and the second stage is a critical alarm. The warning alarm tells you there may be a situation for you to keep an eye on. In many instances the DM510 will have made changes attempting to correct the situation.

Important:

The DM510 Dryer Master does not try to correct for all situations capable of activating an alarm. Some Dryer Master alarms are for drying environment information only. Operator intervention is often required.

If the DM510 cannot correct the situation, a critical alarm will be reached. This will return the DM510 to Manual or Local mode either immediately or after some time. The action is dependent on the nature of the situation.

Note:

It is very important the critical alarms be set in such a way as to allow a reasonable drying environment without impeding the automatic actions of the Dryer Master

Description of Alarm Limits operation

An example can show this relationship.
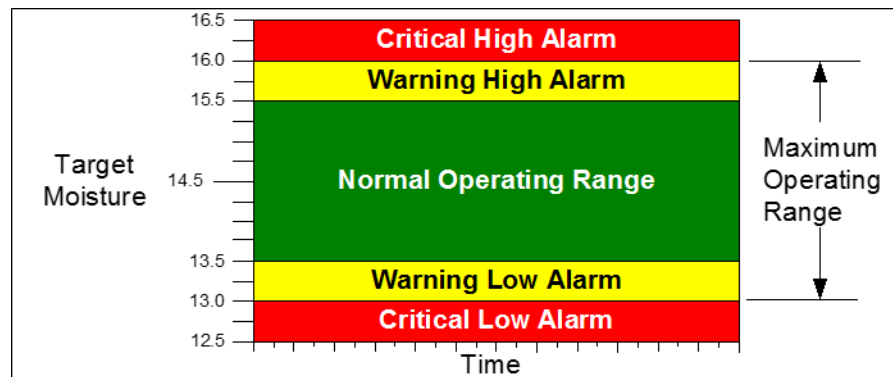
Figure 9 - Alarm Limit Operation

Let's assume that your moisture target is 14.5%, and that you want to be notified if the moisture goes above 15.5%, and if the moisture reaches 16%, you want the DM510 to stop controlling and return to Manual mode. For this example you would set your high outlet moisture warning alarm at 15.5% and your high outlet moisture critical alarm at 16.0%.

The one exception to how alarms are processed is the discharge rate alarm. For the discharge rate, the alarms displayed in the alarm area are the warning alarms only. The critical alarm limits are displayed and set in the Supervisor Setup (Settings key). These alarms will limit the minimum and maximum speeds the DM510 can run your dryer discharge either in automatic or in manual. You should set these limits based on your experience with the dryer, the limits of your grain delivery system and the constraints of your take away system. Remember the DM510 will not and cannot set a discharge rate outside the limits you set in either manual or automatic.

For a complete listing of alarm limits refer to the step-by-step key instructions section.

Changing Products

The DM510 is set to dry eight (8) different products and is typically configured to dry Corn, Beans, Wheat, Canola/Rapeseed or other, Corn Hot or Other, Beans or Other, Sunflower or Other, and Rice or Other. The "or other" designation suggests that the product selection may be used for the named product or any product. For each product a unique list of information and parameters is used, this includes calibration of the moisture sensors for that product. It is therefore important that you dry using the correct product setting.

The product name as well as the graphical representation (icon) of the currently selected product is located at the bottom right corner of the main operations screen. To select/change the product press the 'Product' key. The 'Select Product' menu will display, press the 'arrow' keys to highlight the product, press the 'Enter' key or press the 'number' key adjacent to the selection to accept the choice and return to the 'Main operations' screen.

What to expect when the DM510 is turned on

The start-up sequence of the DM510 takes 1 to 2 minutes. At this time the DM510 CPU tests various components and loads the DM510 Dryer Master system software. The alarm may sound momentarily, the alarm and mode status lights will sequence. The main screen will go blank, followed by the appearance Dryer Master logo, then possibly a continuous alarm and the Main Operations Screen.

With the dryer not running a number of alarms may occur, these may display a message on the 'Main Operations Screen', sound the alarm and possibly illuminate alarm status lights. The alarm sound and message can be cleared with the press of the 'Cancel' key.

The DM510 stores the current operation information and makes Operation Backups on a daily basis and System Backups on a weekly basis. This ensures the DM510 system is able to restart full control within one dryer load after a shutdown or power failure.

Because the DM510 Dryer Master is a computer system, for added security, it requires a computer UPS (Uninterruptible Power Supply) to bridge momentary power outages.

Note:
The DM510 Dryer Master should remain powered for the duration of the drying season. Turning off the DM510 Dryer Master will cause interruptions in system backups that take place at midnight every day.

The First Week of Drying

The Dryer Master Support center can assist you by fine-tuning your new DM510 Dryer Master during the first week of drying, through the following three stages.

Calibrating the sensors.

During the first 24 hours of drying we recommend that you take a minimum of 10 samples and input the results into the DM510. The DM510 should NOT be operated in automatic at this time. Follow the calibration procedure previously described for best results. This will help ensure that the DM510 moisture readings are in line with your Bench Top tester readings and it will also familiarize you with entering calibrations. The objective is to make you comfortable with the moisture readings provided by the DM510.

During this time you should become comfortable with the DM510 operation by setting and changing the discharge rate, in 'Manual' mode, using the DM510 keypad.

Verifying the Throughput

The DM510 is collecting operating and performance data from the dryer while operating in 'Manual' mode; after 24 hours there is usually sufficient data for the Dryer Master to recommend a discharge rate. When the Dryer Master recommended rate is similar to that being run, the system is ready to be put into automatic mode. It will also be of benefit if the throughput of the Dryer is verified by running product into a holding bin for a period of time. This will permit the verification of the dryer manufacturer's throughput specification. The throughput is the volume of grain that goes through your dryer, in one hour, at a specific rate. ***The correct holding volumes and throughput are of paramount importance for good Automatic operation***.

Drying in Automatic

When the Dryer Volumes and Throughput have been reviewed and confirmed after the initial 24 hours of operation and the information matches the dryer specifications and installed information, and you are comfortable with the DM510 moisture readings, it is acceptable to use 'Automatic' mode.

Periodically during the drying season the Dryer Master Support Centre may contact you to ensure your DM510 is operating correctly, and to answer any questions you may have. If you have questions or concerns, please do not hesitate to contact the Support Centre at 519 746-0223 or 1-888-318-0009 (Toll free in North America)

A Typical Daily Routine

The following steps should be included in your routine when using the DM510:

1.   Before dryer start-up, check that the outlet moisture sensor to ensure it is clean and free of debris, the sensor chute has no obstructions ahead of the sensor, the flow-metering device if so equipped is operating and the flow restrictor if so equipped is installed.

2.   Start your dryer as you have in the past from the dryer control panel. The DM510 panel will indicate that you are in 'Local' mode.

3.   At the DM510 panel, press the 'Mode' key, select 'Request Manual' mode. The 'Manual Mode' rate entry screen will appear. Press 'Cancel' to accept the displayed discharge rate and return to the 'Main Operations Screen', or type in a new value followed by the 'Enter' key to accept the new value and return to the 'Main Operations Screen'.

4.   While in Manual Mode the rate can be changed via the 'Set-point' key menu.

5.   Automatic can be selected when the Ready Status light is illuminated. To select Automatic press the 'Mode' key and select 'Request Automatic' mode. The 'Automatic Mode' moisture set-point selection screen appears. Press 'Cancel' to accept the displayed moisture set-point and return to the 'Main Operations Screen', or type a new value followed by the 'Enter' key to accept the new value and return to the 'Main Operations Screen'.

6.   While in Automatic Mode the moisture set-point can be changed via the 'Set-point' key menu.

7.   The DM510 will now automatically adjust the dryer discharge rate to achieve the displayed average product target moisture.

8.   Periodically check the moisture sensors to ensure they are clean and there is good product flow.

9.   While operating the dryer, calibrate the moisture sensors as required.

10. When you turn off the dryer, the DM510 will automatically revert to 'Local' mode after some period of time. If this is not occurring the DM510 does not sense the Dryer as being OFF. Verify and correct the DM510 alarm and limit settings.

A Typical Yearly Routine

Start-Up Check List

1) If using DM Mobile (remote access feature) connect the Ethernet cord from your router or wireless access point to the DM510 by plugging it into the port marked "Router" on the bottom of the DM510 panel.

2) If you have the printer option, plug the printer into its power outlet and connect the printer cable to the "Printer" port at the bottom of the DM510

3) Turn the DM510 on. It will take the DM510 a few minutes to go through its start-up sequence.

5) Acknowledge any alarm messages by pressing the Cancel key. (There may be several alarms if the dryer is not running).

6) If this is the first season for your DM510 Dryer Master contact the Dryer Master Support Centre and tell them that you are ready to dry for the season. The Support Centre will help you verify that your equipment is in full working order.

Shutdown Check List

1) Turn the DM510 off using the power switch on the bottom of the control panel. Do not unplug the DM510 from the wall outlet. The ground connection should remain in place for surge protection.

2) If you have the printer option unplug the printer and disconnect the printer cable from the DM510. Store the printer in a moisture and dust free area.

3) Unplug the Ethernet cord from the bottom of the DM510 panel.

DM510 Function & Usage

The system function and usage has been set-up with the most used functions at the beginning of this section. Also note that the key function is affected by the operating state of the system.

'Mode' key
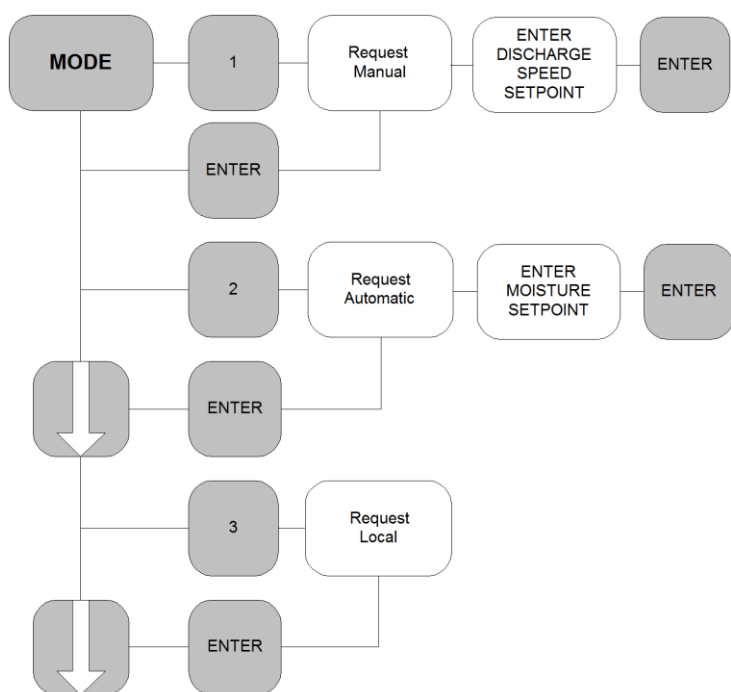
Figure 10- Mode Key Hierarchy

There are 3 operating modes: 'Manual' (Manual control at the DM510), 'Automatic' (DM510 sets the discharge rate) and 'Local' (Manual control at the Dryer Panel). Press 'Cancel' at any time to return to the 'Main Operations Screen'.

Note:
DM510 systems with 'Auto Fast Start' enabled can be switched to Automatic mode as soon as the DM510 determines the dryer is running. Should the DM510 select an inappropriate speed, return the system to Manual mode and wait until the 'Ready' status light is illuminated before selecting Automatic.

Manual: discharge rate control at the DM510

Press the 'Mode' key to display the 'Select Control Mode' menu.

- Press '1' to 'Request Manual' mode

    Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key.
- The 'Manual Mode' Rate set-point entry screen will display.
- The LED Remote lamp will illuminate.

```
 Select Control Mode
   (1) Request Manual
   (2) Request Automatic
   (3) Request Local

   (4) Controller Status



 Use ↑,↓ keys to highlight your choice,
 then press ENTER. Or press the number.
 Press CANCEL to exit.
```
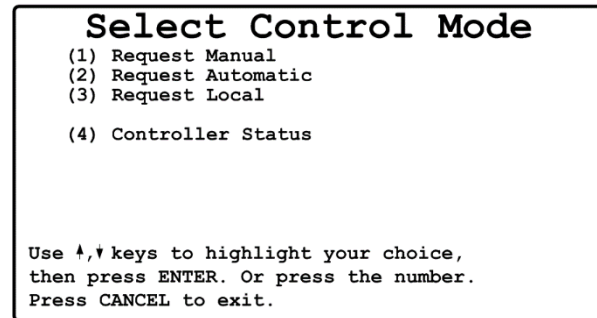
Figure 11 - Select control mode menu (Manual)

- Press 'Cancel' to accept the displayed value and return to the 'Main Operations Screen'.

    Or

- Enter a new rate, press 'Enter' to accept the new value and return to the 'Main Operations Screen'.

```
       Manual Mode
     Enter a rate to use while
          in manual mode:

           87.3


 Press CANCEL to accept the displayed value,
 or enter a new value, then press ENTER.
 Press CANCEL to exit.
```
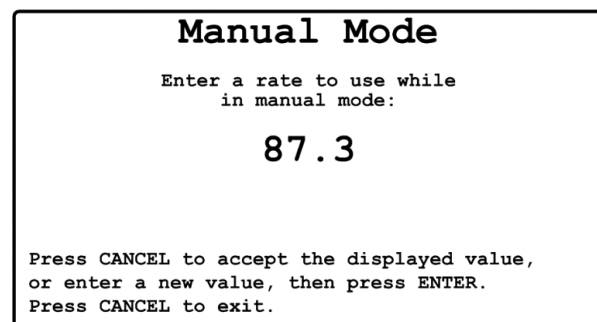
Figure 12- Manual Mode rate entry screen

The DM510 Dryer Master is now setting the discharge rate at the selected value. To change the rate you can either repeat the steps or press the 'Set-point' key to display the 'Set-point Entry menu'

Automatic: discharge rate control at the DM510

When the DM510 is ready for Automatic Mode, the Ready Status light will illuminate. To select Automatic Mode, press the 'Mode' key to display the 'Select Control Mode' menu.

- Press '2' to 'Request Automatic' mode

   Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key.

```
   Select Control Mode
    (1) Request Manual
    (2) Request Automatic
    (3) Request Local

    (4) Controller Status



   Use ↑,↓ keys to highlight your choice,
   then press ENTER. Or press the number.
   Press CANCEL to exit.
```
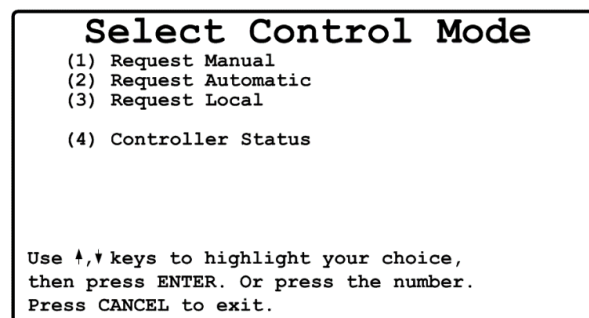
Figure 13 - Select control mode menu (Automatic)

- Press 'Cancel' to accept the displayed value and return to the 'Main Operations Screen'.

   Or

- Enter a new rate, press 'Enter' to accept the new value and return to the 'Main Operations Screen'

```
      Automatic Mode
      Enter a moisture setpoint to use
         While in automatic mode:

            15.5


   Press CANCEL to accept the displayed value,
   or enter a new value, then press ENTER.
   Press CANCEL to exit.
```

Figure 14 - Automatic mode moisture set-point entry screen

Selecting Auto while the DM510 is not ready for Auto will display the 'Not Ready for Auto' screen. It is also indicated by the Ready Status light which will not be illuminated.

The screen will display the reason why the DM510 is not ready for automatic. Press the 'Cancel' key to exit and return to the 'Main Operations Screen'

```
   Not ready for Auto
   Dryer Master passes through a number of
   internal operation modes before it is
   ready to control the Dryer.  This can
   take up to 2 Dryer loads to complete
   The amount of time depends on how
   variable the drying conditions are.

      Actual & Predicted Moisture
        difference is more the 1%


   Press Cancel to exit.
```
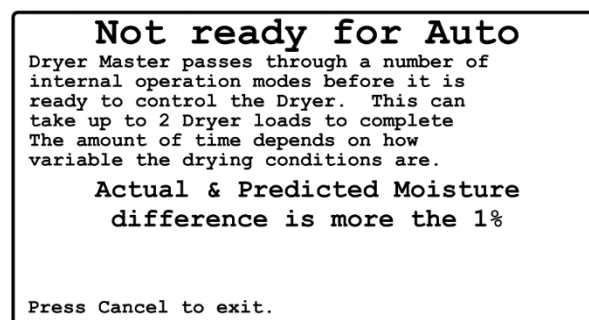
Figure 15 - Not ready for Auto screen

For DM510s with Auto fast start enabled, selecting Automatic while the DM510 is not ready for Automatic, also indicated by the Ready Status light not illuminated, will display the 'Auto Fast Start' caution screen.

This message is only displayed in DM510s with 'Auto Fast Start' enabled, with the Ready Status light not illuminated.

The message will not display with the Ready Status light illuminated.

- Press the 'Enter' key to accept Auto mode and return to the 'Main Operations Screen'.
- Press the 'Cancel key' exit.

```
Auto Fast Start
     Auto Fast Start has been enabled
One needs to take great care and watch
That the system chooses the correct
speed.  In a short time the system will
set a new speed.

If the speed is not reasonable, return
the system to manual mode, select the
correct speed and try again later


Press ENTER to continue,
Press CANCEL to exit.
```
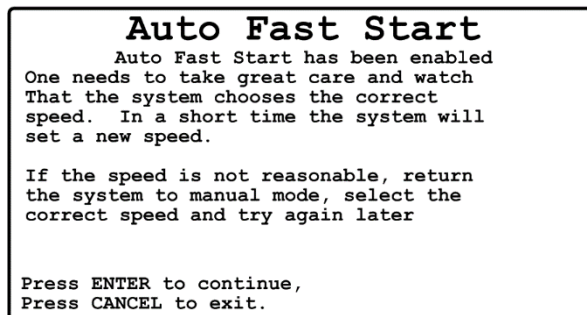
Figure 16 - Auto Fast Start caution screen

Note:

DM510 systems with 'Auto Fast Start' enabled can be switched to Automatic mode as soon as the DM510 determines the dryer is running. Should the DM510 select an inappropriate speed, return the system to Manual mode and wait until the 'Ready' status light is illuminated before selecting Automatic.

Local, discharge rate control at the Dryer Panel

Press the 'Mode' key to display the 'Select Control Mode' menu.

- Press '3' to 'Request Local' mode

  Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key to return to the 'Main Operations Screen' and return discharge rate control to the Dryer Panel.

```
Select Control Mode
   (1) Request Manual
   (2) Request Automatic
   (3) Request Local

   (4) Controller Status




Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```
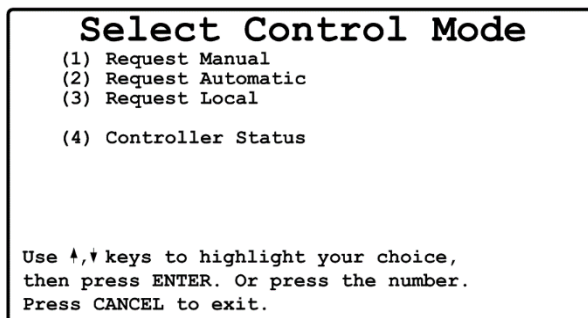
Figure 17 - Select control mode menu (Local)

'Setpoint' Key
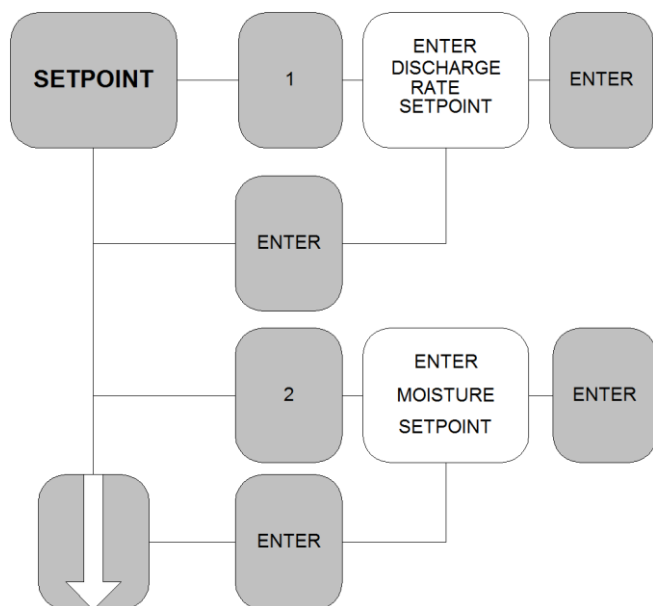
Figure 18 - Setpoint key hierarchy

The DM510 'Setpoint' key menu permits setting/changing both the dryer discharge rate and the moisture setpoint. The Discharge Rate setpoint can only be set/changed In 'Manual' mode (Manual control at the DM510). The Moisture Set-point can be changed in any operation mode. It will however not affect operation unless the system is in 'Automatic' (DM510 set the discharge rate).

Set Discharge Rate

Press the 'Setpoint' key to display the 'Select Setpoint' menu.

- Press '1' to select 'Discharge Rate'

  Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key

```
        Select Setpoint
    (1) Discharge Rate
    (2) Moisture Setpoint




Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```

Figure 19 - Select setpoint menu (discharge rate)

- The 'Discharge Rate' setpoint entry screen will display
- Press 'Cancel' to accept the displayed value and return to the 'Main Operations Screen'.

    Or

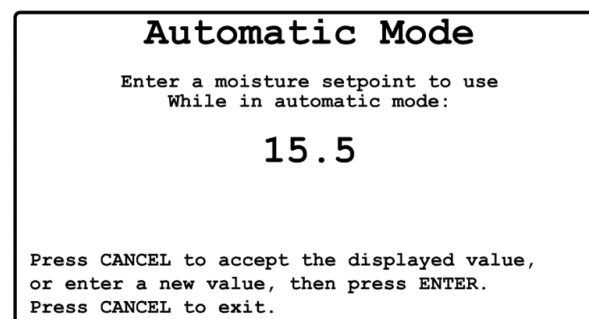- Enter a new rate, press 'Enter' to accept the new value and return to the 'Main Operations Screen'.

```
┌─────────────────────────────────────┐
│          Discharge Rate             │
│                                     │
│        Enter a rate to use while    │
│            in manual mode:          │
│                                     │
│               87.3                  │
│                                     │
│                                     │
│  Press CANCEL to accept the displayed value, │
│  or enter a new value, then press ENTER.     │
│  Press CANCEL to exit.                       │
└─────────────────────────────────────┘
```
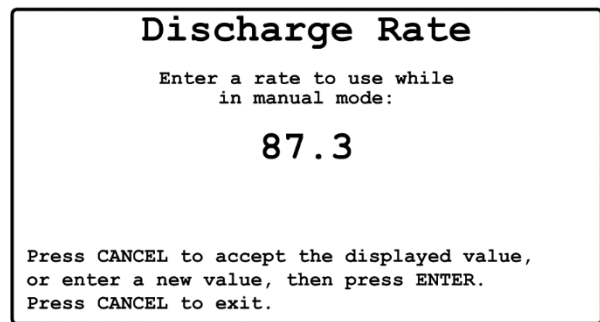
Figure 20 - Discharge rate entry screen

The 'Not in Manual Mode' screen will display when attempting to set/change the discharge rate while in either 'Local' or 'Automatic' mode.

- Press 'Cancel' to return to the 'Main Operations Screen'.

    Or

- Press the 'Mode' key to display the 'Select Control Mode' menu.

```
┌─────────────────────────────────────┐
│          Not in Manual              │
│               Mode                  │
│                                     │
│    Changing the speed setpoint      │
│    can only be done in manual mode. │
│    Use the MODE key to change       │
│    to manual mode first             │
│                                     │
│                                     │
│  Press CANCEL to exit.  MODE to change. │
└─────────────────────────────────────┘
```
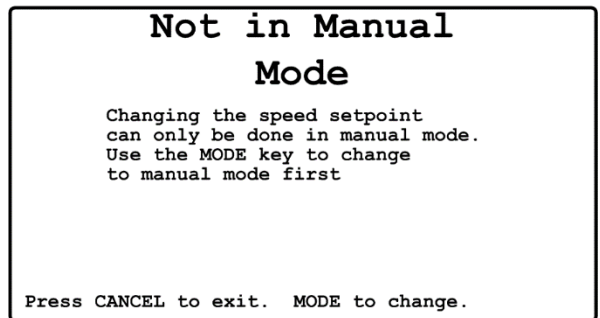
Figure 21 - Discharge rate entry (Not in Manual Mode) caution screen

Set Moisture Setpoint

- Press the 'Setpoint' key to display the 'Select Setpoint' menu.
- Press '2' to select 'Moisture Setpoint'

  Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key
- The 'Moisture Setpoint' entry screen will display

```
       Select Setpoint
   (1) Discharge Rate
   (2) Moisture Setpoint




   Use ↑,↓ keys to highlight your choice,
   then press ENTER. Or press the number.
   Press CANCEL to exit.
```
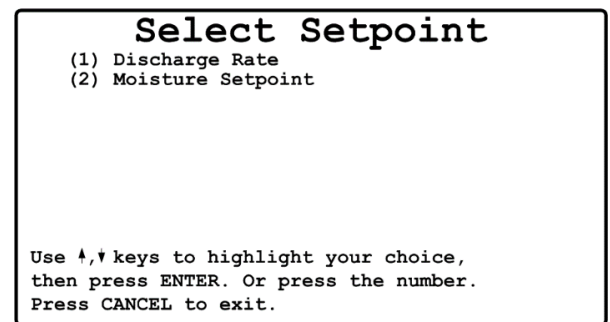
Figure 22 - Select setpoint menu (Moisture Setpoint)

- Press 'Cancel' to accept the displayed value and return to the 'Main Operations Screen'.

  Or

- Enter a new moisture setpoint, press 'Enter' to accept the new value and return to the 'Main Operations Screen'

```
      Moisture Setpoint
      Enter a moisture setpoint to use
          While in automatic mode:

              15.5


   Press CANCEL to accept the displayed value,
   or enter a new value, then press ENTER.
   Press CANCEL to exit.
```
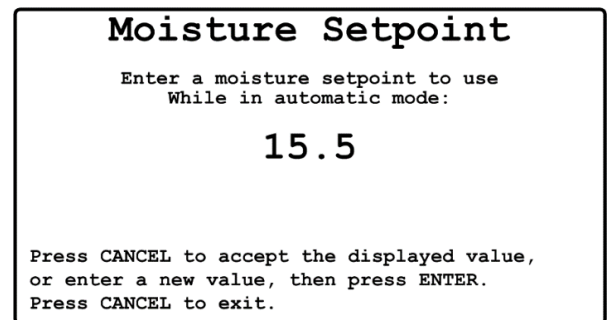
Figure 23 - Moisture Setpoint entry screen

'Calibrate' key

Calibrate Key Hierarchy, Outlet Sensor (calibration button pressed & illuminated)

Calibration started
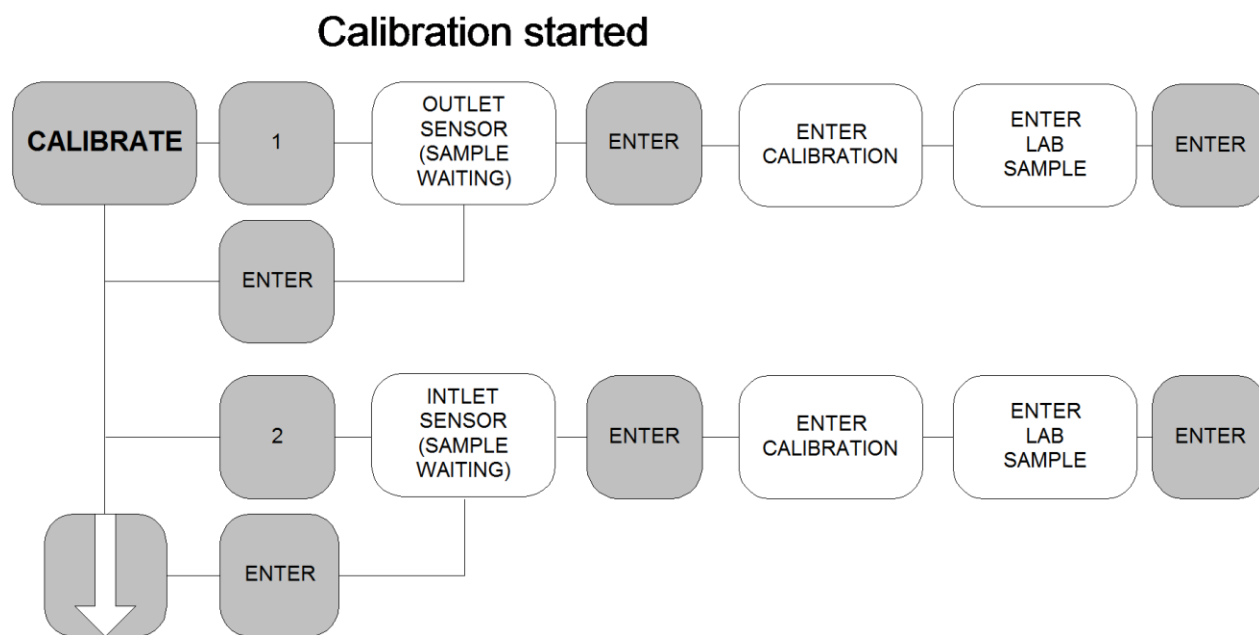
Figure 24 - Calibrate key hierarchy (calibration started)

Moisture sensor calibration involves a number of steps. For the outlet sensor the sample button at the sensor is pressed to start the sample procedure. The button will flash for the next 30 seconds while a manual sample is gathered. The gathered sample is tested on a Bench Top manual tester for entry into the DM510.

The inlet calibration is not as critical and it is nearly impossible to gather a sample at the location of the inlet sensor. Inlet calibration involves estimating the moisture at the sensor. The inlet sample is gathered at ground level prior to elevating into the dryer. The calibration sequence is started from the DM510 calibrate menu after sufficient time has passed for the product to reach the sensor.

Calibration in progress Icon is displayed on the 'Main Operations Screen' when moisture calibrations are in process.

Main Operations screen with Calibration in progress Icon

The Calibration Icon is displayed after the sensor sampling time has elapsed, 30 seconds after the calibration is started. Only one Icon is displayed for both the inlet and outlet calibrations.

```
                     Automatic
      Inlet            Outlet           Setpoint
     20.4 %          15.4 %            15.5 %
        45 °             75 °
      Rate          Drying Temp.          Bin
     86.4             185 °               2

                                         Corn

                            C
     Dryer State: Running
     Time: 2003 / 2/18  10:25
```
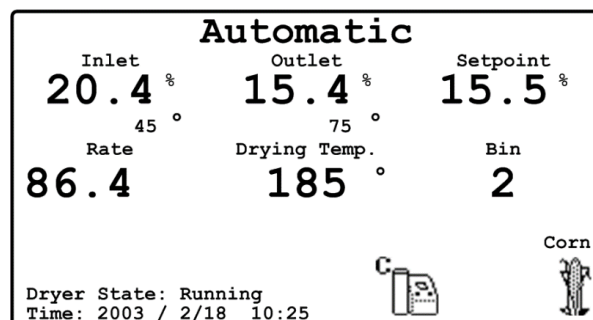
Figure 25 - Main operations screen (Calibrate icon displayed)

Calibrating the Outlet Sensor

The Outlet Sensor Calibration button has been pressed, a sample has been gathered and its moisture has been tested by the Bench Top tester as outlined in the Calibration Procedure.

- Press the 'Calibrate' key to display the 'Select Sensor' menu.
- The calibration in progress is displayed as (Sample Waiting). To continue with the calibration procedure use the 'arrow' keys to highlight the selection, press the 'Enter' key to continue.
- Press 'Cancel' to return to the 'Main Operations Screen'.

```
                Select Sensor
          Outlet (Sample Waiting)
          Inlet




     Use ↑,↓ keys to highlight your choice,
     then press ENTER.
     Press CANCEL to exit.
```
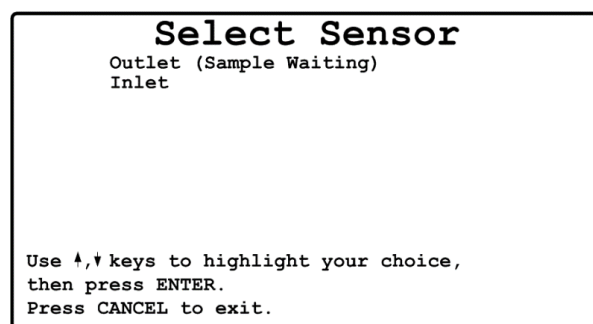
Figure 26– Select Sensor Menu (Outlet Sample Waiting)

The On-line Reading is the average moisture the DM510 observed over the 30 seconds of time the calibration button flashed.

- Enter the Bench top test result, press the 'Enter' key to accept and return to the 'Main Operations Display'.
- Pressing the 'Cancel' button will cancel the calibration in progress and return to the 'Main Operations Display'.
- Enter the complete reading you obtained manually with the decimal point (for example if the reading was 16.2 % it must be entered as 16, the decimal point, and 2). The reading will appear in the highlighted area. It is important that you verify the reading before pressing the 'Enter' key to accept the reading.

```
               Outlet Sensor
                Calibration
             On-line Reading:
               15.3 %
             Manual Reading:
               0.0 %
     Enter the manual offline reading,
     then press ENTER. Enter 0.0 to cancel.
     Press CANCEL to exit.
```

Figure 27- Outlet Sensor Calibration entry screen

In the event that the decimal is missed and the reading is entered as 162 the DM510 will record the value but will not affect the calibration upon returning to the 'Main Operations Screen'. The incorrect entry will effectively be the same as canceling the calibration.

Calibrate Key Hierarchy, (calibration not started)

Calibration not started
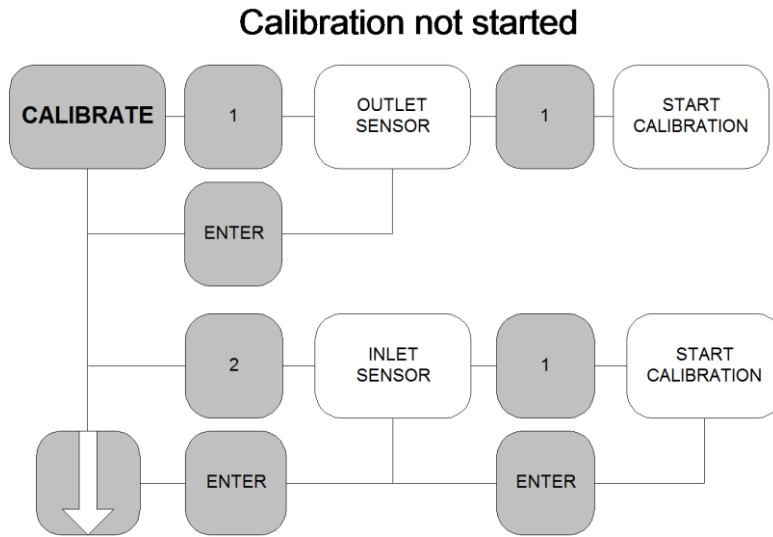
Figure 28 - Calibration not started hierarchy

The Calibration menus change slightly if a calibration has not been started. The inlet sensor has no calibration button and the inlet calibration is started at the DM510.

Starting the Inlet Sensor Calibration

- Press the 'Calibrate' key to display the 'Select Sensor' menu.
- Press the 'arrow' keys to highlight 'Inlet',
- Press the 'Enter' key to display the 'Inlet Calibration' start menu.

```
            Select Sensor
        Outlet
        Inlet




   Use ↑,↓ keys to highlight your choice,
   then press ENTER. Or press the number.
   Press CANCEL to exit.
```
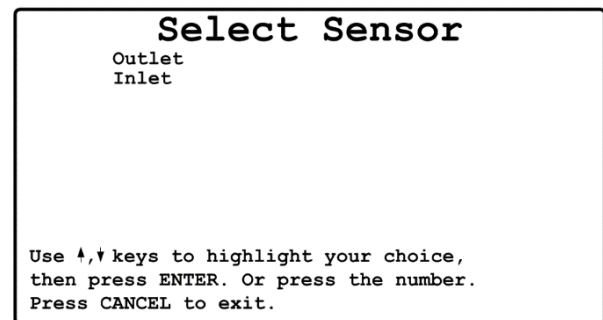
Figure 29 - Select Sensor Menu (No Samples Waiting)

Press the 'Enter' key to start the calibration and return to the 'Main Operations Screen'.

- The calibration in progress Icon will appear on the 'Main Operations Screen'

```
          Inlet Calibration
        Start Calibration




   Use ↑,↓ keys to highlight your choice,
   then press ENTER. Or press the number.
   Press CANCEL to exit.
```
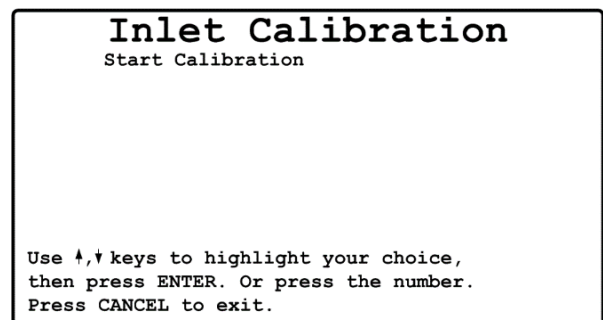
Figure 30- Inlet Calibration Menu (Start Calibration)

Calibrating the Inlet Sensor

As previously discussed, the Inlet reading is not as critical. The DM510 is more interested in seeing inlet moisture trends. If the inlet reading reflects the product entering the dryer and is within 2 or 3% of the actual value no calibration is necessary. If you are calibrating the sensor, try to time the starting of the calibration with the time the product arrives at the sensor.

- Press the 'Calibrate' key to display the 'Select Sensor' menu.

A calibration in progress is displayed as (Sample Waiting).

- To continue with the calibration procedure use the 'arrow' keys to highlight the selection, press the 'Enter' key to continue.
- Press 'Cancel' to return to the 'Main Operations Screen'.

```
         Select Sensor
         Outlet
         Inlet (Sample Waiting)




Use ↑,↓ keys to highlight your choice,
then press ENTER.
Press CANCEL to exit.
```
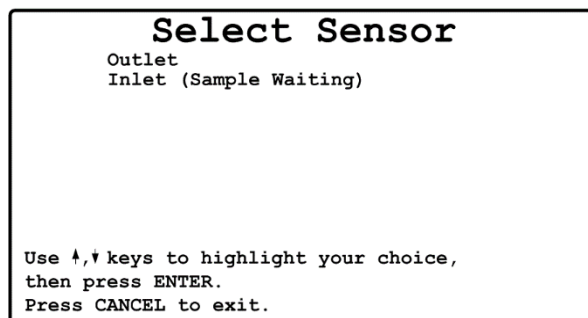
Figure 31- Select Sensor Menu (Inlet Sample Waiting)

The On-Line Reading is the average moisture the DM510 observed over the 30 seconds sample period.

- Enter the Bench top test result,
- Press the 'Enter' key to accept and return to the 'Main Operations Display'.
- Pressing the 'Cancel' button will cancel the calibration in progress and return to the 'Main Operations Display'.

```
         Inlet Sensor
         Calibration
         On-line Reading:
            23.3 %
         Manual Reading:
            0.0  %
Enter the manual off-line reading,
then press ENTER. Enter 0.0 to cancel.
Press CANCEL to exit.
```
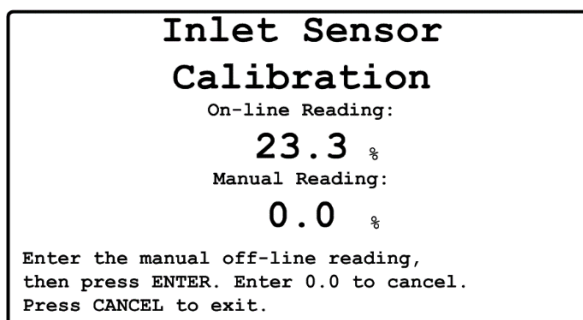
Figure 32- Inlet Sensor Calibration entry screen

Enter the complete reading you obtained manually with the decimal point (for example if the reading was 23.2 % it must be entered as 23, the decimal point, and 2). The reading will appear in the highlighted area. It is important that you verify the reading before pressing the 'Enter' key to accept the reading.
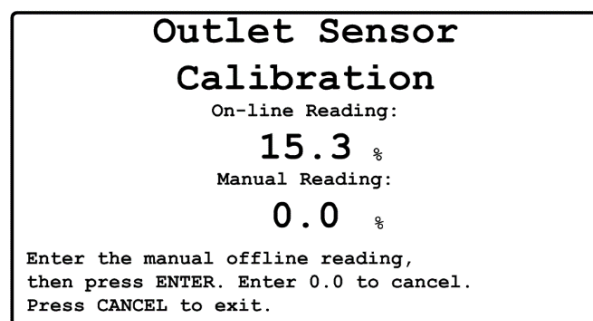
In the event that the decimal is missed and the reading is entered as 232 the DM510 will record the value but will not affect the calibration upon returning to the 'Main Operations Screen'. The incorrect entry will effectively be the same as canceling the calibration.

'Alarms' key
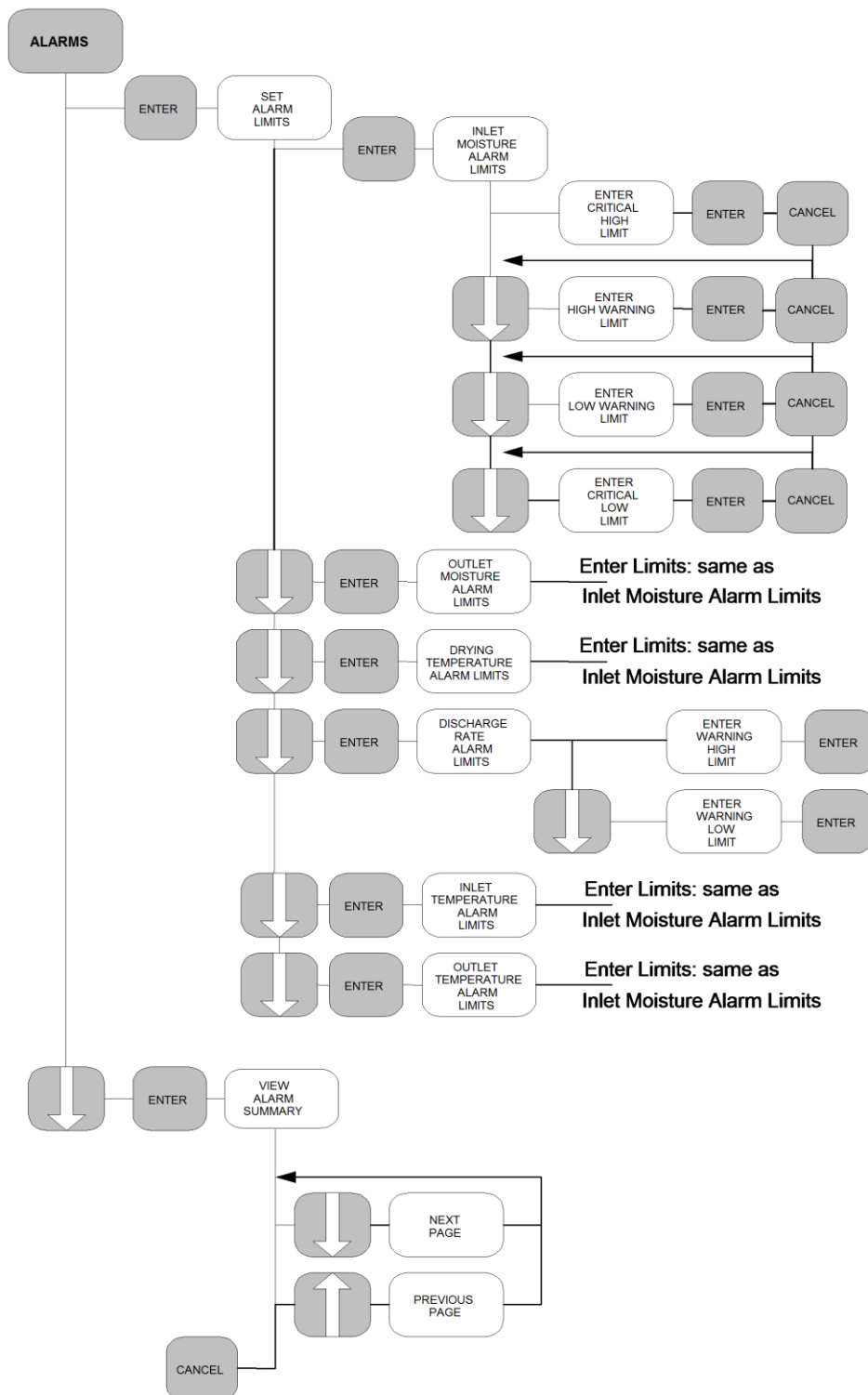
Figure 33 - Alarm key Hierarchy

The alarms are divided into two categories, warning alarms and critical alarms. All alarm limits are changeable by the operator. Warning alarms are provided to warn the operator that something is exhibiting peculiar behavior and may require corrective action. Critical alarms are set to announce that corrective action must be taken and in some cases will disable Automatic mode if no corrective action is taken. There are also control limits set in the supervisor and installer setup menus that may affect the setting of the alarm limits.

Note:
It is important to set alarms and limits to inform and contain operation within the operating parameters of the dryer and facility. The DM510 default settings may not be safe settings for your application.

Alarms are announced 3 ways, the DM510 alarm beeper will sound, a message will display on the 'Main Operations Screen', and for some conditions the alarm light will illuminate.

To clear the alarms press any key. Both the DM510 alarm beeper and the message will clear. The alarm light will remain illuminated until conditions return to normal. In the event the DM510 is not on 'Main Operations Display' while an alarm is occurring complete the task at hand and return to the 'Main operation Screen' to view the alarm message and cancel the alarm by pressing any key.

Setting & Changing Alarms Limits

Press the 'Alarms' key to display the 'Alarms' menu.

- Press '1' to select 'Set Alarm Limits'

Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key

```
                Alarms
    (1)  Set Alarm Limits
    (2)  View Alarm Summary




Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```

Figure 34 - Select Alarms Menu (Set Alarm Limits)

The 'Alarm Limits' selection menu will display

Only the Inlet Moisture alarms entry will be described in detail. The other menus are similar in form and should be reviewed and set as required.

- Press '1' to select 'Inlet Moisture'

Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key

The 'Inlet Moisture Alarms' selection menu will display

- Press the 'Cancel' key to return to the 'Main Operations Screen'.

```
           Alarm Limits
        (1) Inlet Moisture
        (2) Outlet Moisture
        (3) Drying Temperature
        (4) Discharge (Rate)
        (5) Inlet Temperature
        (6) Outlet Temperature



    Use ↑,↓ keys to highlight your choice,
    then press ENTER. Or Press the Number.
    Press CANCEL to exit.
```
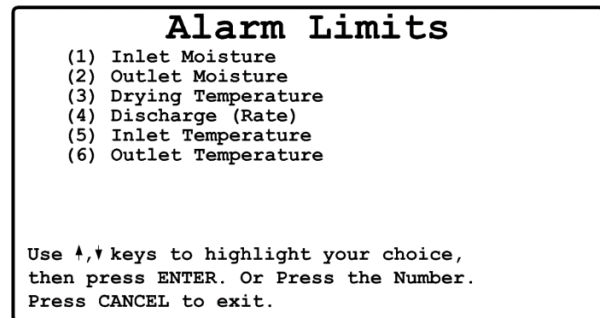
Figure 35- Alarm Limits Menu

- Press the 'arrow' keys to highlight the selection.
- Type in a new value followed by the 'Enter' key.
- Press the 'Cancel' key to return to the previous menu.

```
        Inlet Moisture
           Alarms
  Critical High              45.0
  Warning High               40.0
  Warning Low                15.0
  Critical Low               15.0


    Use ↑,↓ keys to highlight your choice.
    Enter a new value, then press ENTER.
    Press CANCEL to exit.
```
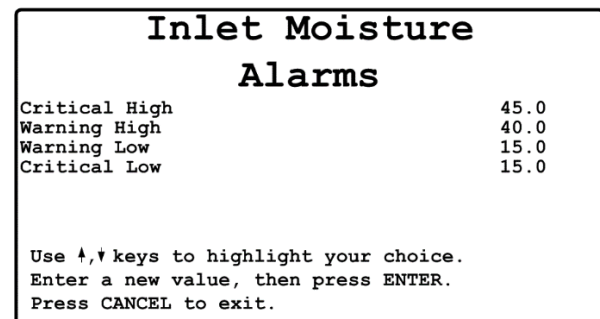
Figure 36- Inlet Moisture Alarms

Viewing Alarm Summary

The alarm summary is an information screen. Its function is to provide view only access to previous alarm events.

- Press the 'Alarms' key to display the 'Alarms' menu.
- Press '2' to select 'View Alarm Summary'

    Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key
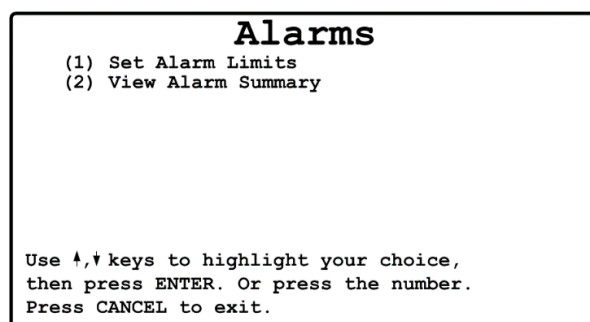
```
                  Alarms
     (1)  Set Alarm Limits
     (2)  View Alarm Summary




     Use ↑,↓ keys to highlight your choice,
     then press ENTER. Or press the number.
     Press CANCEL to exit.
```
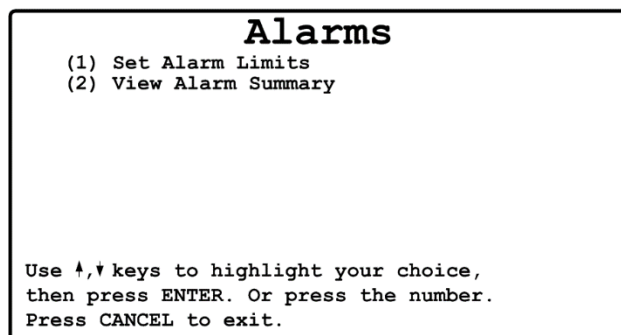
Figure 37- Select Alarms Menu (View Alarm Summary)

The 'Alarm summary' screen will display

- Press the 'arrow' keys to scroll through the alarms.

The Screen will scroll one page at a time.

- Press either the 'Enter' or the 'Cancel' key to return to the 'Main Operations Screen'

```
  Time              Alarm
13:10:00  Inlet Moisture OK
13:28:23  Alarm Acknowledgement
12:30:10  Warning Inlet Moist Low
13:40:10  Outlet Moisture OK
14:14:12  Alarm Acknowledgement
14:14:54  Outlet Moisture Critical Low
14:15:24  Warning Outlet Moisture Low
14:30:34  Discharge Rate OK
14:30:38  Rate Output OK
14:41:00  Rate Output at high limit
          Friday September, 23
       Use ↑,↓ keys to move forward
       and backward in time. Press
         ENTER or CANCEL to exit.
```

Figure 38- Alarm Summary screen

'Bin' key (*Reports require optional printer*)

Figure 39- Bin key Hierarchy

The Bin number tracking system is a feature for tracking the product exiting the dryer. The DM510 can track the average moisture and approximate quantity of product placed into the bins. The information can be printed to provide a hard copy record approximating the average moisture and quantity of product in the bin. (*Requires optional printer*)

Switching Bins, Printing final Bin Report (the bin is full)

The Bin that the current dried product is being sent to becomes full and you wish to switch to another bin and print a report for the product that is now being sent to the new bin.

- Press the 'Bin' key to display the 'Bin Number' menu.
- Press '1' to switch to the 'Bin Select' screen

Note, once selected, the information is printed and the record is cleared. There is no option to exit.

- Press the 'Cancel' key to exit and return to the 'Main Operations Screen'.

```
        Bin Number
        Select an Action:
(1) Switch to a new bin.  Bin    0 is full.
    (Print a final Report)
(2) Switch to a new bin.  Bin    0 will be added
    to later
(3) Print a bin report.




Press CANCEL to exit.
```

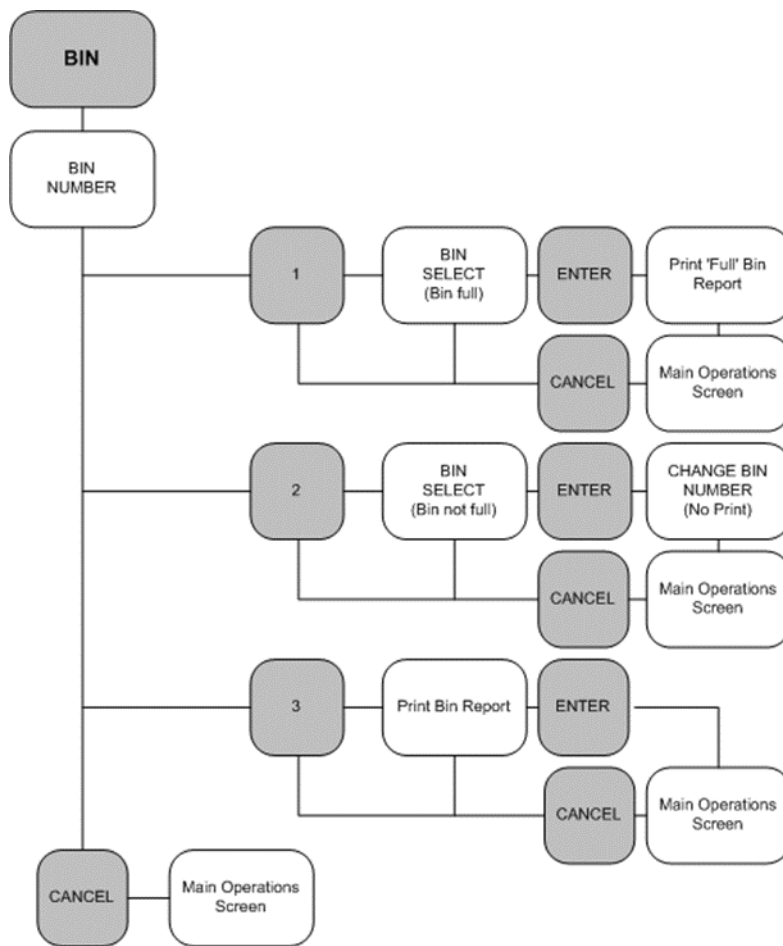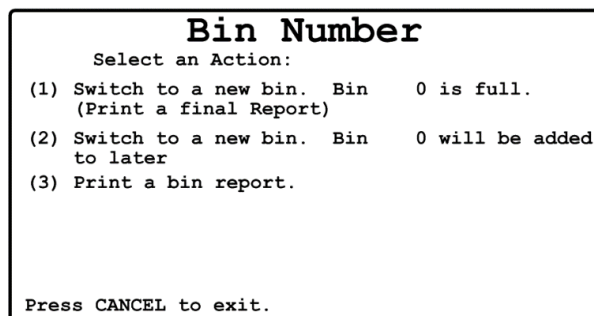*Figure 40- Bin Number option selection menu (Bin full, print report)*

- Enter a new bin number and
- Press the 'Enter' key to return to the 'Main Operations Screen' and print a report.

The DM510 will take a few minutes to compile the information and print the report.

> Or

- Press the 'Cancel' key to clear the information for the Bin number shown.

```
        Bin Select

        Bin Number:
             0



Enter a new bin number, then press
ENTER. To clear the totals of the
Bin without changing press CANCEL.
```

Figure 41- Bin Selection screen

Switching Bins, No report to be printed at this time.

The Bin that the current dried product is being sent to for some reason other than being full is switched to another bin and you wish to print a report at a later interval.

- Press the 'Bin' key to display the 'Bin Number' menu.
- Press '2' to switch to the 'Bin Select' screen
- Press the 'Cancel' key to exit and return to the 'Main Operations Screen'.
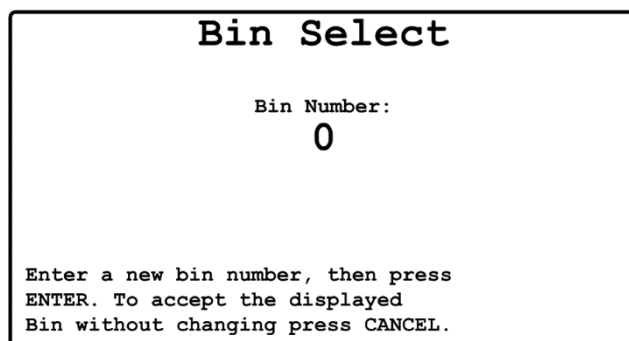
```
        Bin Number
        Select an Action:
(1) Switch to a new bin.  Bin    0 is full.
    (Print a final Report)
(2) Switch to a new bin.  Bin    0 will be added
    to later
(3) Print a bin report.




Press CANCEL to exit.
```

Figure 42- Bin Number option selection menu (No printed report)

- Enter a new bin number and press the 'Enter' key to accept the new Bin and return to the 'Main Operations Display'.

    Or

- Press the 'Cancel' key to return to the 'Main Operations Display' without changing the Bin.

```
         Bin Select


         Bin Number:
              0



Enter a new bin number, then press
ENTER. To accept the displayed
Bin without changing press CANCEL.
```

Figure 43- Bin Selection screen
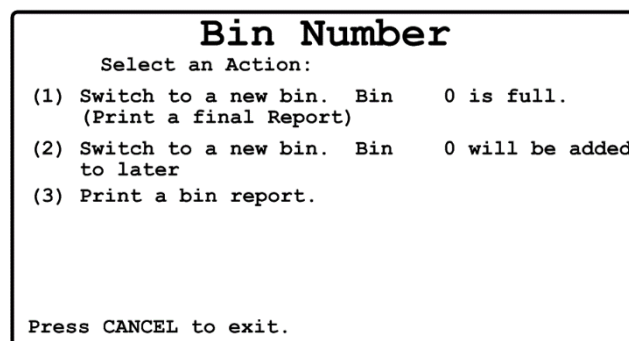
Printing a bin report.

An interim Bin report can be printed at any time.

- Press the 'Bin' key to display the 'Bin Number' menu.
- Press '3' to switch to the 'Bin Select' screen

Note, once selected, either the default or newly selected bin information is printed. There is no option to exit without printing.

- Press the 'Cancel' key to exit and return to the 'Main Operations Screen'.
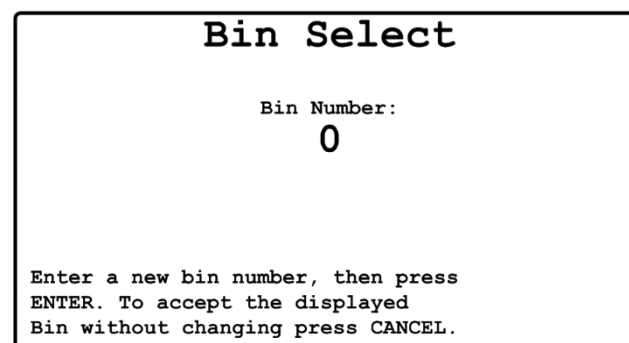
```
         Bin Number
       Select an Action:
(1) Switch to a new bin.  Bin    0 is full.
    (Print a final Report)
(2) Switch to a new bin.  Bin    0 will be added
    to later
(3) Print a bin report.



Press CANCEL to exit.
```
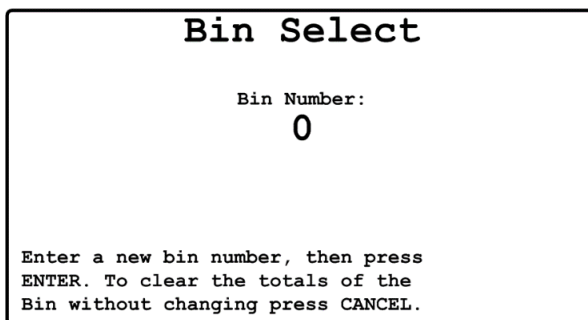
Figure 44 - Bin Number option selection menu (printed report

- Press the 'Cancel' key to return to the 'Main Operations Screen'. The displayed bin numbers report will print shortly.
- Enter a new bin number and
- Press the 'Enter' key to accept the new Bin and return to the 'Main Operations Display'. The Bin report will print shortly.
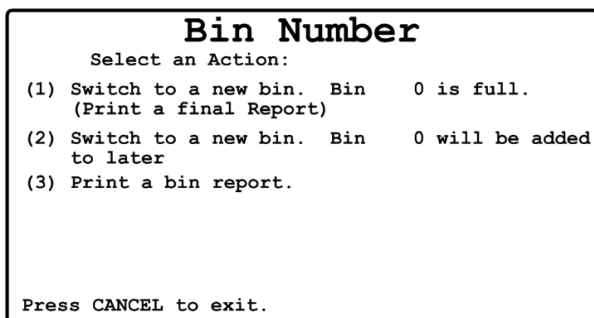
```
         Bin Select


         Bin Number:
              0



Enter a new bin number, then press
ENTER. To accept the displayed
Bin without changing press CANCEL.
```

Figure 45- Bin Selection screen

Bin Summary Report.

The bin report is the DM510's accumulated drying statistics for the selected bin.

Bin number & Report type

Date and time range of
information used to compile
report. If the Bin has been
added to a number of times this
is the overall time.

Production rate is based on
production information
installed in the supervisor
setup. If no information is
printed the item is not installed

Calculated Average outlet
moisture.

Calculated Average Inlet
moisture.

Calculated Average moisture
removal.

Calculated Average discharge
Rate.

Calculated Average moisture
target.

Calculated Average drying
temperature.

Calculated Average Outlet
& Inlet product temperatures

Calculated statistics of the
percentage of product that is
within 0.5% of the moisture
target and within 1.0% of the
target.

BIN SUMMARY
Bin# 55 Complete Summary
From: 08:07 PM, July 6, 2000
To: 08:23 AM, June 6, 2000
Approximate Production: 30,000 Bushels
Outlet Moisture: 15.4%
Inlet Moisture: 24.3%

Moisture Removal   8.9%
Discharge Rate: 69.9
Target Moisture   15.5%
Drying Temperature: 169
Outlet Temperature   64
Inlet Temperature: 68
+/- 0.5% of Target: 85%
+/- 1.0% of Target: 98%

Figure 46- Bin Summary report (report items description)

'Print' key (*requires optional printer*)

The DM510 has the capability to print a variety of reports. Before setting up printing ensure that the printer is plugged into the printer port of the DM510 and is ON.

The printer data connector is labeled Printer and is located on the lower panel of the DM510. Use only the supplied data cable to connect the DM510 to the printer. Plug the printer into a power outlet, and turn it on. For additional information regarding the printer such as loading paper, please refer to the documentation provided with the printer. You can also call the Support Centre for assistance.
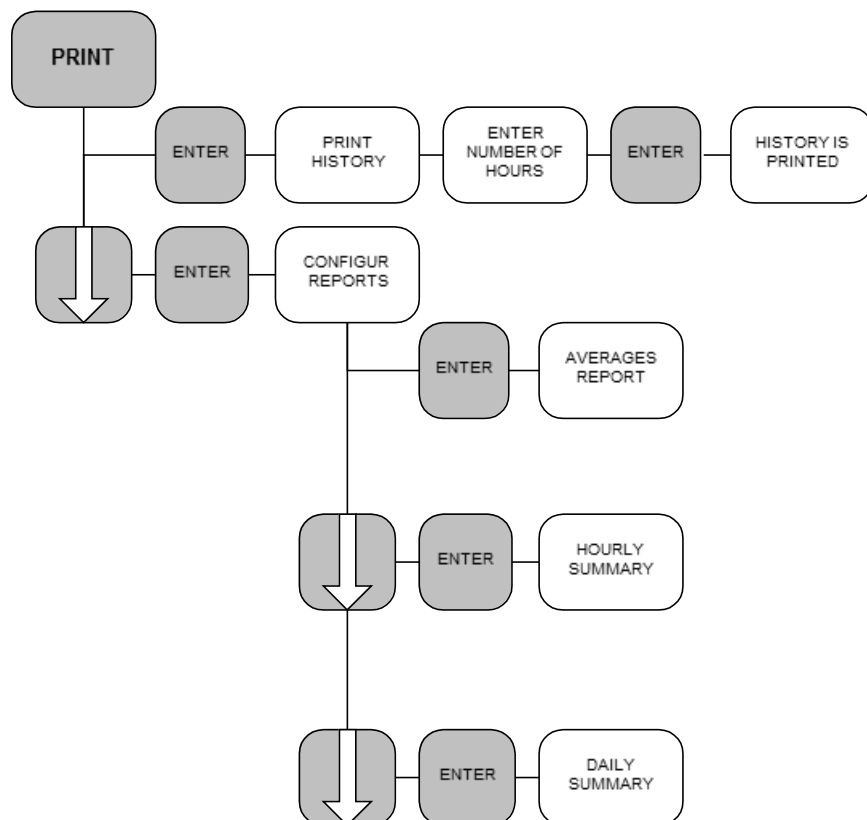
Figure 47 - Print Key Hierarchy

Print Options

Press the 'Print' key to display the 'Print Options' menu:

- Press '1' to select the 'Print History' options menu.

  Or

- Press '2' to select the 'Configure Print Reports' options menu.

  Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key

```
        Print Options
(1) Print History
(2) Configure Print Reports




Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```
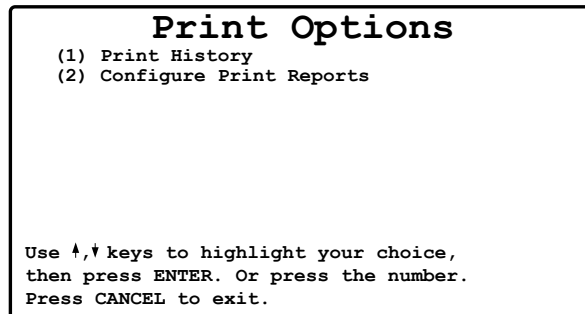
Figure 48- Print Options

- Press the 'number' key to select the history print option and return to the 'Main Operations Screen'

  Or

- Press the 'arrow' keys to highlight the selection followed by the 'Enter' key to select the option and return to the 'Main Operations screen'.

The print Icon will display on the 'Main Operations screen' and printing will commence.

```
        Print History
(1) 4 Hours
(2) 8 Hours
(3) 12 Hours
(4) 24 Hours
(5) 48 Hours
(6) All History



Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```
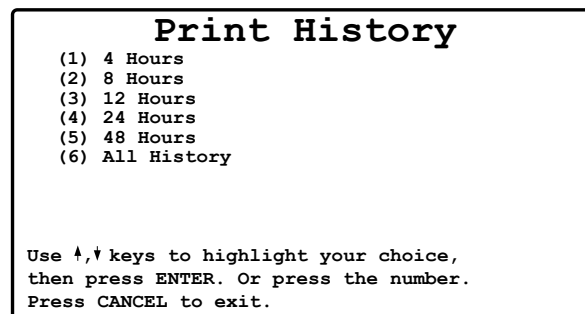
Figure 49- Print History Menu

Note:

Once History printing has been selected it cannot be cancelled. Ensure the printer is on and has paper before printing history.

- Press the 'number' key to select the item to configure.

  Or

- Press the 'arrow' keys to highlight the selection followed by the **'Enter'** key

```
      Configure Reports
(1) Averages Report
(2) Hourly Summary
(3) Daily Summary




Use ↑,↓ keys to highlight your choice.
then press ENTER. Or press the number.
Press CANCEL to exit.
```
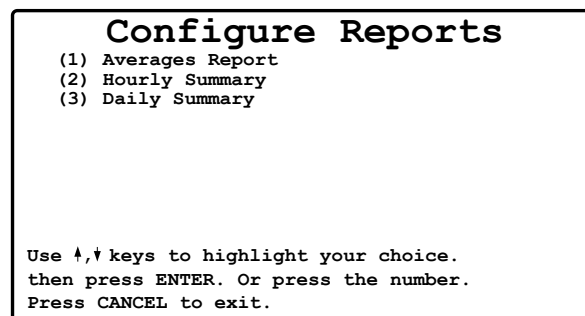
Figure 50- Configure Print Reports Menu

Averages Report

The Averages report is a compilation of operation over the selected interval. The information is printed continuously at the selected interval.

- Press the **'arrow'** keys to highlight the selection (Status or Interval) .
- Press the **'Enter'** key to accept the selection.
- With the status value highlighted press the **'Enter'** key to toggle the status between 'On' and 'Off'
- Press the **'Cancel'** key to return to the previous menu.

```
        Select Value
  (1)  10 Minutes
  (2)  20 Minutes
  (3)  30 Minutes
  (4)  60 Minutes
```

Figure 51- Configure Averages Report

- Press the **'number'** key to select desired averages printing interval.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key to accept the selection and return to the previous menu.
- Press the **'Cancel'** key to return to the previous menu without changes.

```
     Averages Report
            Status:
             On
           Interval:
        10 Minutes

  Use ↑,↓ keys to highlight your choice,
  then press ENTER.
  Press CANCEL to exit.
```

Figure 52 - Configure Averages Report (select print interval)

The averages report is the typical printing choice. It provides the user a summary of the operation every printing period.

Note:

Enabling any printing option without the printer installed may eventually result in the Control software exiting. Ensure the printer is installed, turned ON, and has paper before selecting any printing functions.

The Averages Report format:

Time	In	SP	Out	Rate	Drying	Mode
5:00	32.1W	15.5	15.5	95.4C	180	Local
5:10	29.3W	15.5	15.5	95.4C	180	Manual
5:20	22.6	15.5	15.5	66.4	180	Manual
5:30	24.2	15.5	15.7	65.3	180	Auto
5:40	23.9	15.5	15.9	63.4	180	Auto
5:50	24.5	15.6	15.4	64.3	180	Auto
6:00	24.5	15.6	15.2	64.3	180	Auto
6:10	24.5	15.6	15.1	64.3	180	Auto
6:20	24.3	15.5	14.9	65.3	180	Auto
6:30	24.5	15.6	15.0	64.3	180	Auto
6:40	24.3	15.5	15.2	65.3	180	Auto

Figure 53 –Averages Report (example printout)

Time   = Report print interval

In   = Average Inlet moisture

SP   = Moisture Setpoint

Out   = Average Outlet moisture

Rate   = Dryer discharge rate

Drying = Drying temperature

Mode   = DM510 operation mode

DM510 Operation modes:

Local   = Operation from Dryer panel

Manual = Manual control, Operator sets discharge rate at DM510

Auto   = Automatic control, DM510 sets discharge rate.

In the printout, a value immediately followed by the letter **'W'** indicates a warning alarm occurred during the reporting period. A value immediately followed by the letter **'C'** indicates a critical alarm occurred during the reporting period.

Hourly Summary

The Hourly Summary report is a compilation of operation for the previous hour. The information is printed continuously at the selected time.

- Press the **'arrow'** keys to highlight the selection (Status or Interval) Press the **'Enter'** key to accept the selection.
- With the status value highlighted press the **'Enter'** key to toggle the status between **'On'** and **'Off'**
- Press the **'Cancel'** key to return to the previous menu.

```
┌─────────────────────────────────┐
│      Hourly Summary             │
│              Status:            │
│              On                 │
│            Interval:            │
│      Print Reports On The Hour  │
│                                 │
│  Use ↑,↓ keys to highlight your choice, │
│  then press ENTER.              │
│  Press CANCEL to exit.          │
└─────────────────────────────────┘
```

Figure 54 - Configure Hourly Summary report

- Press the **'number'** keys to select desired Hourly report print time.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key to accept the selection and return to the previous menu.
- Press the **'Cancel'** key to return to the previous menu without changes.
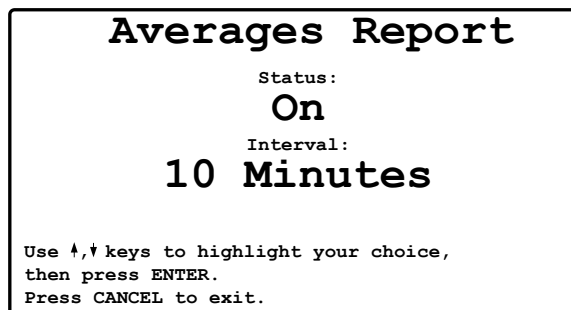
```
┌─────────────────────────────────┐
│         Select Value            │
│  (1) Print Reports on the Hour  │
│  (2) 15 Minutes after the Hour  │
│  (3) 30 Minutes after the Hour  │
│  (4) 45 Minutes after the Hour  │
│                                 │
│                                 │
│                                 │
└─────────────────────────────────┘
```

Figure 55 - Configure Hourly Summary (select print time)

The Hourly Summary report format:

The report values are the calculated averages for the Hour ending at the report print time.

6:00 a.m.

Inlet Moisture:	23.8 %
Outlet Moisture:	15.4 %
Moisture Target:	15.5%
Discharge Rate:	50.7
Drying Temperature:	150
Inlet Temperature:	69.7
Outlet Temperature:	69.3

Figure 56 - Hourly Summary Report
(example printout)

Time	=	Report print time
Inlet Moisture	=	Average inlet moisture
Outlet Moisture	=	Average Outlet moisture
Moisture Target	=	Average moisture setpoint
Discharge Rate	=	Average Dryer discharge or unload rate
Drying Temperature	=	Average Drying temperature
Inlet Temperature	=	Average Incoming Product temperature
Outlet Temperature	=	Average Outlet Product temperature

Daily Summary

The Daily Summary report is a compilation of dryer operation for the 24-hour period ending at the selected time. The information is printed daily at the selected time.

- Press the **'arrow'** keys to highlight the selection. For the **'Hour'** & **'Minute'** selection type in a new value followed by the **'Enter'** key.
- With the status value highlighted press the **'Enter'** key to toggle the status between **'On'** and **'Off'**
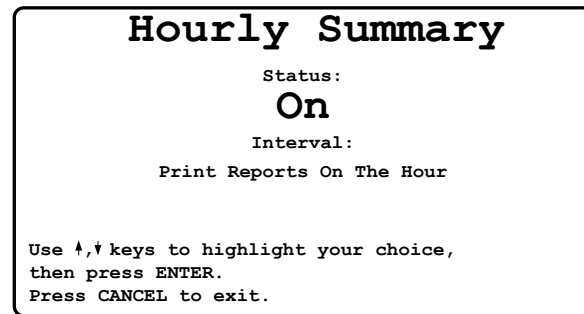- Press the **'Cancel'** key to return to the previous menu

```
              Daily Summary
                     Status:
                       On
                Daily Summary Print Time:
    Hour (0-23)                                  18
    Minute (0-59)                                 0


    Use ⬆,⬇ keys to highlight your choice.
    Enter a new value, then press ENTER.
    Press CANCEL to exit.
```
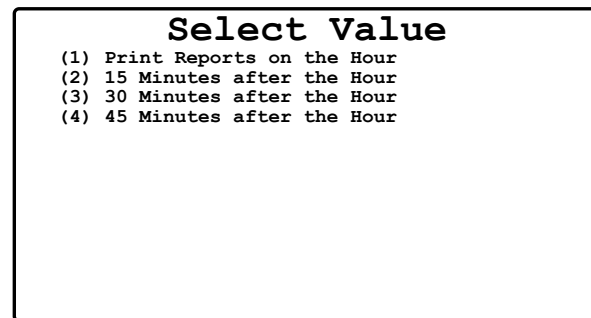
Figure 57 - Configure Daily Summary report

The Daily Summary report format:

The report values are the calculated averages for the 24 Hour period ending at the report print time.

Report Time
Dryer state
Report date
Average Inlet product temperature
Average outlet moisture within
Average outlet moisture within
Average outlet moisture
Average inlet moisture
Average moisture removal
Average discharge rate
Average drying temperature
Average moisture setpoint
Percent of time in automatic
Approximate production volume

```
Daily Averages
Thursday July 6, 2000   Dryer Running      Time:   24H 0M
Inlet  Temperature:     68
+/- 0.5% of Target:     85%
+/- 1.0% of Target:     98%
Outlet Moisture:        15.4%
Inlet Moisture:         25.6%
---------------------------------------

Moisture Removal:       10.2%
Discharge Rate:         70.5
Drying Temperature:     148
Target Moisture:        15.5
Time in Auto:           93%
Approximate Production:     XXX Bushels
```
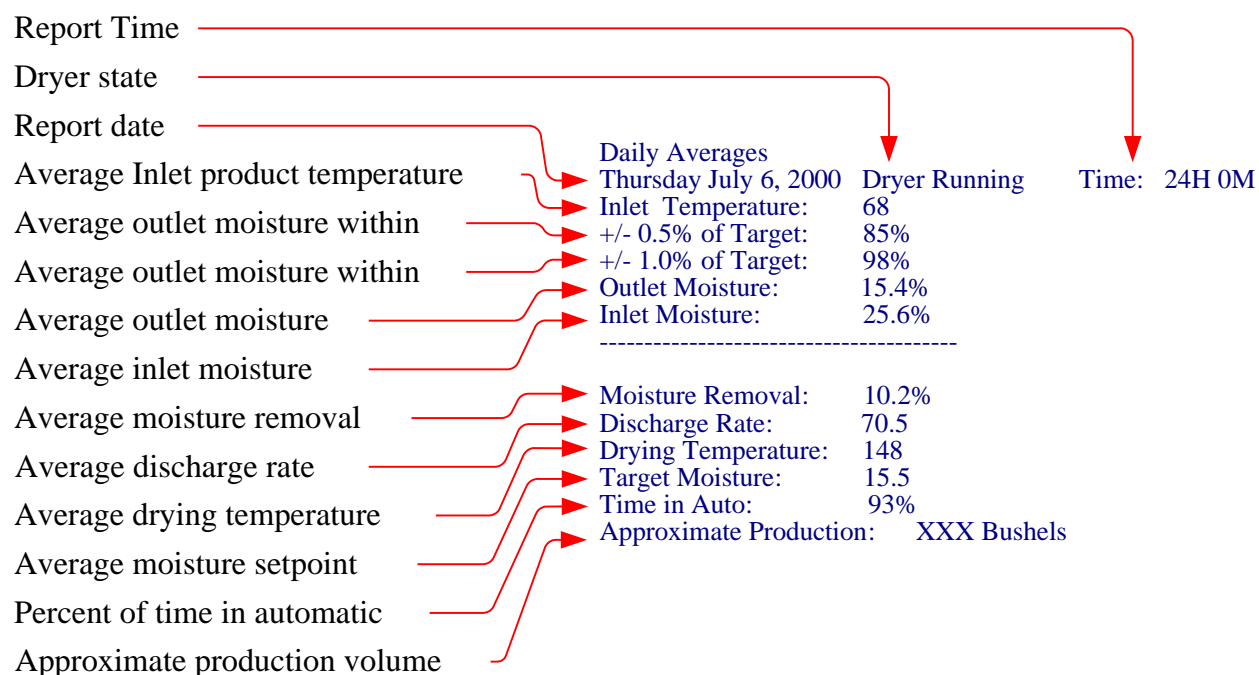
Figure 58 –Daily Summary Report (example printout)

'View' key

The DM510 provides an online operations history display screen.

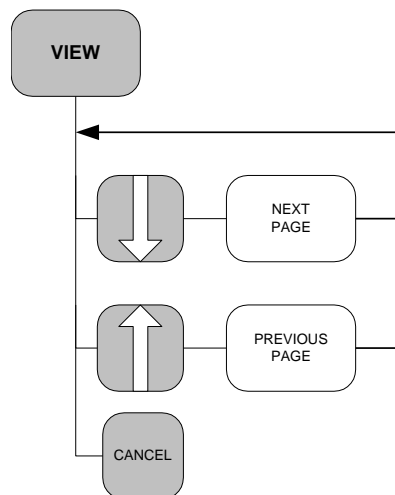## The View key Hierarchy:

Figure 59 –View Key Hierarch

View History screen

Press the **'View'** key to display the history display screen.

Press the **'arrow'** keys to move forward and backwards in history one page at a time.

Press the **'Cancel'** or **'Enter'** key to return to the **'Main Operations Screen'**.

View screen displayed items description.

```
 Time      In%      Out%      SP%      Rate      Mode
13:10    10.8  C  15.4       15       83        Man
13:20    23.8     12.2  W   15       20   C    Man
13:30    23.9     15.5       15       83        Man
13:40    24.0     15.6       15       83        Man
13:50    24.8     15.4       15       83        Man
14:00    24.5     15.5       15       83        Auto
14:10    25.2     15.4       15       85        Auto
14:20    26.1     15.7       15       87        Auto
14:30    25.7     15.3       15       87        Auto
14:40    23.8     15.4       15       88        Auto
             Friday September, 23
        Use ↑,↓ keys to move forward
        and backward in time. Press
           ENTER or CANCEL to exit.
```

Figure 60 - View History display screen

The historical information is displayed in columns with the newest record at the bottom. Ten records at 10-minute intervals are displayed per page. The date for the page is displayed below the data table. The information includes:

Time = Time record was created

In% = Inlet Moisture

Out% = Outlet Moisture

SP = Moisture Setpoint

Rate = Dryer discharge or unload rate

Mode = DM510 Operation mode

The 'W' and 'C' displayed next to the values are warning or critical alarms that occurred during that history record. View the alarms summary for detailed information about alarms.

'Product' Key

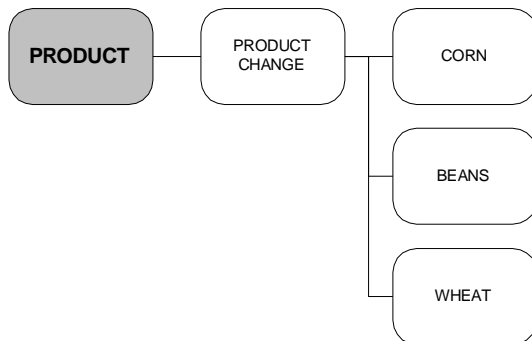## The Product key Hierarchy:

Figure 61 - Product Selection Key Hierarchy

Select Product

The DM510 can track up to 8 different products with unique and different dryer parameters and sensor calibration values.

Press the **'Product'** key to display the 'Select Product' menu:

- Press the **'number'** keys to select the product and return to the **'Main Operations Screen'**

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key to accept the selection and return to the **'Main Operations Screen'**
- Press **'Cancel'** to exit and return to the **'Main Operations Screen'**

```
         Select Product
  (1)  Corn
  (2)  Bean
  (3)  Wheat
  (4)  Canola Rapeseed or Other
  (5)  Corn Hot or Other
  (6)  Beans or Other
  (7)  Sunflower or Other
  (8)  Rice or Other


Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```
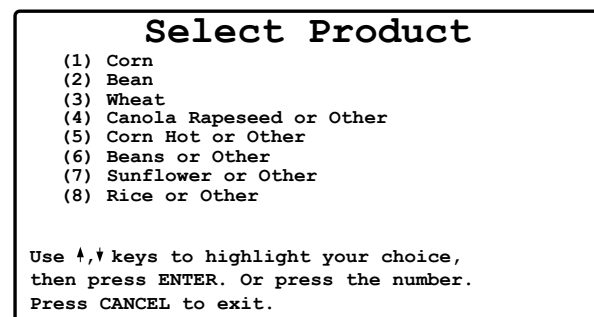
Figure 62 - Product Selection Menu

The Main Operations screen will display the product Name and Icon in the lower right corner.

Corn   Beans   Wheat
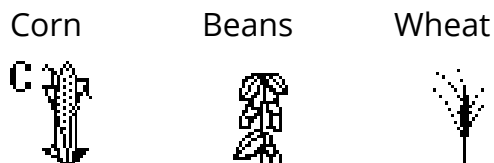
Figure 63- Product Icons

'Support' Key

The Support key Hierarchy:

The 'Support' key menus provide access to system diagnostics to help with troubleshooting.
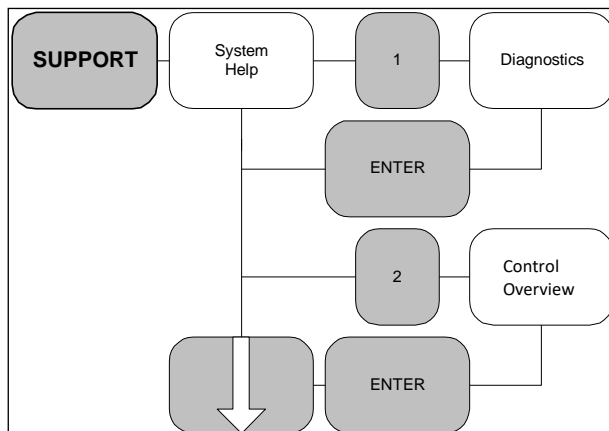
Figure 64- Support key hierarchy

Support (System Help):

Press the **'Support'** key to display the 'System Help' menu.

- Press the **'number'** key to select the item.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key
- Press *'Cancel'* to return to the **'Main Operations Screen'**.

Figure 65- Support System Help menu

Diagnostics	See Select **'Diagnostics'** to display the **'Diagnostics'** screens
Control Overview	See Select **'Control Overview'** to display the **'Control Overview'** screens

Diagnostics Screen 1:

- Press the **'Down arrow'** key to select 'Diagnostics Screen 2'
- Press the **'Up arrow'** key for previous screen
- Press **'Cancel'** to return to the **'Main Operations Screen'**.

```
       Diagnostics Screen 1
Inlet Sensor Signal            6.09    Vdc
Inlet Sensor Temperature       96.8    °
Outlet Sensor 1 Signal         3.13    Vdc
Outlet Sensor 1 Temperature    88.2    °
Outlet Sensor 2 Signal         0.00    Vdc
Outlet Sensor 2 Temperature    0.00    °
Discharge Rate Input           38.28
Discharge Rate Output          38.22
Calculated Residence time    5642.8    sec


CANCEL = exit,↟Up = prev,↡Down = next
```
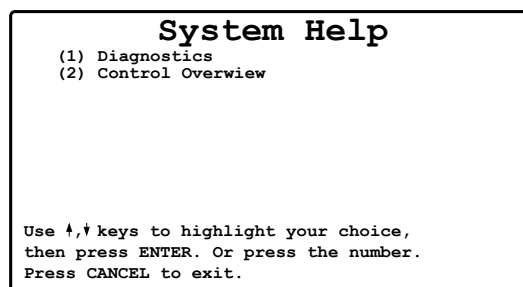
Figure 66 - Support System Diagnostics Screen 1

Inlet Sensor Signal	0-10 Vdc signal from sensor. 0.5 to 0.8 is typical empty voltage. Greater than 9.50 Vdc is either extremely wet or damaged sensor.
Inlet sensor Temperature	Temperature as read by the inlet sensor temperature probe.
Outlet Sensor 1 Signal	0-10 Vdc signal from sensor. 0.5 to 0.8 is typical empty voltage. Greater than 9.50 Vdc is either extremely wet or damaged sensor.
Outlet sensor 1 Temperature	Temperature as read by Outlet sensor1 temperature probe.
Outlet Sensor 2 Signal	Only present on systems with 2 outlet sensors. 0-10 Vdc signal from sensor. 0.5 to 0.8 is typical empty voltage. Greater than 9.50 Vdc is either extremely wet or damaged sensor.
Outlet sensor 2 Temperature	Only present on systems with 2 outlet sensors. Temperature as read by Outlet sensor 2 temperature probe.
Discharge Rate Input	Calibrated rate. Same as on main screen
Discharge Rate Output	Signal Dryer Master sends to dryer to run at the requested speed. Should be equal to **Discharge Rate Input**.
Calculated Residence Time, in seconds	Calculation is based on dryer volumes and throughput and the current running speed.

Diagnostics Screen 2:

- Press the **'Down arrow'** key to select 'Diagnostics Screen 3'
- Press the **'Up arrow'** key to select ' the previous screen
- Press **'Cancel'** to return to the **'Main Operations Screen'**

```
       Diagnostics Screen 2
Inlet Calibration Button            0
Outlet 1 Calibration Button         0
Outlet 2 Calibration Button         0
Local Remote Override               0
Dryer Fan Status                    0
Dryer Discharge                     1
Dryer Burner Status                 1
Dryer Full Status                   1
Mode Select                        -1


CANCEL = exit,↟Up = prev,↡Down = next
```

Figure 67- Support System Diagnostics Screen 2

Diagnostics Screen 3:

- Press the **'Up arrow'** keys to select the previous screen
- Press **'Cancel'** to return to the 'Main Operations Screen'

```
       Diagnostics Screen 3
Inlet Calibration Lamp              0
Outlet 1 Calibration Lamp           0
Outlet 2 Calibration Lamp           0
Alarm Active                        0
Local Remote                        1




CANCEL = exit,↑Up = prev,↓Down = next
```

Figure 68 - Support System Diagnostics Screen 3

Inlet Calibration Button	No longer used, virtual
Outlet 1 Calibration Button	Toggles from 0 to 1 when button is pressed. Only active when sensor is connected and product is present
Outlet 2 Calibration Button	Toggles from 0 to 1 when button is pressed. Only active when sensor is connected and product is present.
Local Remote override	Toggles to 1 if override system is installed. Normally not used.
Dryer Fan Status	Toggles to 1 if installed. Normally not used
Dryer Discharge	Toggles to 1 if control, Manual or Automatic, is at Dryer Master.
Dryer Burner Status	Virtual state. Dryer temperature is above burner off temperature setting in Supervisor setup, control limits.
Dryer Full Status	Virtual state. Generated when product is present at inlet moisture sensor
Mode Select	Virtual state. 0 = Local, 1 = Manual, -1 = Automatic

Control Overview:

- Press the **'Up arrow'** key for 'Control Update".
- Press '**Down arrow**' key for previous screen.
- Press **'Cancel'** to return to the 'Main Operations Screen'.

```
         Control Overview
Model Beta 1                     0.000000750
Model Beta 2                    -0.000020000
                model     actual     setpoint
Rate            50.94      51.54        51.57
Moisture        14.45      14.37        14.50
Model Difference %          0.09         2.00
Target Difference %         0.13         2.00
Dryer Time (minutes)       69.8


CANCEL = exit,↑Up = next,↓Down = prev
```

Figure 69 – Control Overview

Model Beta 1	Control Model Beta 1		
Model Beta 2	Control Model Beta 2		
	Model	**Actual**	**Setpoint**
Rate	Control Model suggested or predicted rate	Actual rate as displayed on the main screen	The requested rate in Manual or Automatic.
Moisture	Control Model predicted moisture	Actual Moisture as displayed on the main screen.	The moisture target or setpoint.
Model Difference		Calculated difference between the control model predicted moisture and the actual moisture	Maximum allowed difference for ready function to be initiated
Target Difference		Calculated difference between the target or setpoint and the actual moisture	Maximum allowed difference for ready function to be initiated
Dryer Time in Minutes	Calculated time in the dryer. This value is derived from the discharge rate and the dryer volumes and throughput. If this number is wrong correct the dryer volumes and throughput numbers.		

Control Update:

- Press the **arrow keys** to highlight your selection.
- Press **Enter** to select**.**
- Enter the new value and press Enter.
- Press '***Cancel'*** to Exit.

```
          Control update
Model Beta 1                    0.000000750
Model Beta 2                   -0.000020000
               model     actual     setpoint
Rate                                   51.57
Moisture                               14.50
Model Difference %                      2.00
Target Difference %                     2.00


 Use ↑,↓ keys to highlight your choice,
  then press ENTER. Or press the number.
 Press CANCEL to exit.
```

Figure 70 – Control Update

Note:

Do not modify the Model Beta numbers without explicit instructions from the Dryer Master Support Center

'Settings' Key

System Settings:

The 'Settings' key menus gain access to the system setup information. The critical items are password protected and are not intended for the casual user. DMSI or the Dryer Master Support Center will provide the passwords to gain entry to either the Supervisor setup or the Installer Setup menus.

Press the **'Settings'** key to display the 'Settings Type' menu.

- Press the **'number'** key to select the item.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key
- Press **'Cancel'** to return to the **'Main Operations Screen'**.

```
        Setting Type
   (1)  Supervisor Setup
   (2)  Installer Setup
   (3)  Set Date & Time
   (4)  Product Information




   Use ↑,↓ keys to highlight your choice,
   then press ENTER. Or Press the Number.
   Press CANCEL to exit.
```
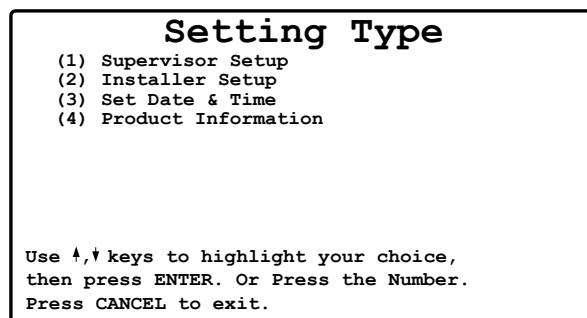
Figure 71 - Settings type menu

Note:

Item (1) is the Supervisor setup. This Item is password protected to deter the casual user from inadvertently making changes. Item (3) and (4) is available to the casual user. Refer to the Commissioning Manual for information on item (2) Installer Setup.

Supervisor Setup:

- Type the **'password'** followed by the **'Enter'** key to gain access.

- Press **'Cancel'** to return to the **'Main Operations Screen'**.

```
        Supervisor
         Password

        ┌─────────┐
        │█████████│
        └─────────┘


Enter the password, then press ENTER.
Press CANCEL to exit.
```

Figure 72 - Settings (Supervisor Password entry) screen

Note:

The Supervisor password is intended to keep some critical operations settings from being accidentally changed by the casual user. The password is "123" and is needed by the operator or supervisor to set and adjust operating limits.

- Press the **'number'** key to select the item.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key

- Press **'Cancel'** to return to the **'Main Operations Screen'**

```
       Supervisor Setup
   (1) Control Limits
   (2) Alarm Actions
   (3) Calibration
   (4) Hangup Modem
   (5) deg F deg C conversion
   (6) System Shutdown


Use ↑,↓ keys to highlight your choice,
then press ENTER. Or press the number.
Press CANCEL to exit.
```
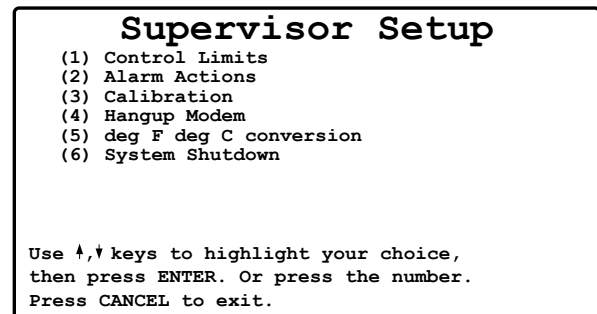
Figure 73 - Settings (Supervisor Setup) menu

Control Limits:

- Press the **'arrow'** keys to highlight the selection. Type in the **'value'** followed by the **'Enter'** key

- Press **'Cancel'** to return to the **'Previous Menu'**.

```
          Control Limits
Max Discharge rate in Auto          100.0
Min Discharge rate in Auto            7.0
Discharge Off Rate                    5.0
Burner Off Temperature              110.0

Auto Fast Start (safety delay overide)
0 = Normal, 1 = Fast Start              0


 Use ↑,↓ keys to highlight your choice.
 Enter a new value, then press ENTER.
 Press CANCEL to exit.
```

Figure 74 - Settings (Supervisor Setup) Control Limits menu

Note:

The Control Limits are CRITICAL for proper system operation. Review and adjust as required.

Max Discharge rate in Auto	This is the maximum discharge or unload rate that can be set by the DM510 Dryer Master. Set this value to a reasonable maximum that will not compromise safe Dryer operation. When setting this value ensure the conveying system is able to manage the volume of product.
Min Discharge rate in Auto	This is the minimum discharge or unload rate that can be set by the DM510 Dryer Master. Set this value to a reasonable minimum that will not compromise safe Dryer operation.
Discharge Off Rate	The DM510 Dryer Master uses this value along with drying temperature to determine the dryer state. Set this value to slightly less than the 'Minimum Discharge rate in Auto' value. Control will be severely compromised if this value is set so that the DM510 does not obtain an OFF indication.
Burner Off Temperature	The DM510 Dryer Master uses this value along with discharge or unload rate to determine the dryer state. Set this to a value greater than the maximum expected ambient temperature but less than the minimum drying temperature. Control will be severely compromised if this value is set so that the DM510 does not obtain an OFF indication.
Auto Fast Start	In normal operation the DM510 Dryer Master determines when it is ready for Automatic operation. This process can take from a few minutes to a dryer load or more. The Auto Fast Start feature bypasses the DM510 feature that determines stable operation. With Auto fast start the DM510 Dryer Master can be placed into Automatic before the 'Ready light' is illuminated. A warning message with instructions will be displayed when selecting Automatic before the 'Ready light' is illuminated.

Alarm Actions

- Press the **'arrow'** keys to highlight the selection. Type in the **'value'** followed by the **'Enter'** key

  Or

- Press the **'Enter'** key to toggle the states.

- Press **'Cancel'** to return to the **'Previous Menu'**.

```
          Alarm Actions
Set Remote Alarm activation delay
Time is in seconds                    300
Enter a new value, then press ENTER.

Set Rate to Minimum while in remote

and the Burner shuts Off              NO
and the Inlet is empty for 25 min.    NO
and the Dryer Fan shuts Off           NO

 Use ↑,↓ keys to highlight your choice,
 then press ENTER.
 Press CANCEL to exit.
```

Figure 75 - Settings (Supervisor Setup) Alarm Actions menu

Note:

The Alarm Actions are CRITICAL for proper system operation. Review and adjust as required. The Dryer Master is not a substitute for improperly functioning Dryer safety equipment. If in doubt do not enable these items.

Remote Alarm Activation Delay	The DM510 Dryer Master provides a contact for an external remote alarm. The delay provides the user with time to cancel the system alarm before the remote alarm is activated. **NOTE: THE TIME IS SET IN SECONDS.**
Set Rate to minimum when the burner shuts OFF	**IMPORTANT** *This feature, when enabled, ('YES' displayed and the 'Remote light' illuminated) will reduce the dryer discharge rate to the minimum value previously entered in the 'Control Limits' menu 'Min Discharge rate in Auto' value. The Burner OFF trigger is either the 'Burner Off Temperature' value or a wired connection.*
Set Rate to minimum when the inlet has been empty for 25 minutes.	**IMPORTANT** *This feature, when enabled, ('YES' displayed and the 'Remote light' illuminated) will reduce the dryer discharge rate to the minimum value previously entered in the 'Control Limits' menu 'Min Discharge rate in Auto' value.*
Set Rate to minimum when the Dryer Fan shuts OFF.	**IMPORTANT** *This feature, when enabled, ('YES' displayed and the 'Remote light' illuminated) will reduce the dryer discharge rate to the minimum value previously entered in the 'Control Limits' menu 'Min Discharge rate in Auto' value.* *This feature only functions if the Dryer Fan run signal is wired to the DM510 Dryer Master. The DM510 will not properly control the discharge if enabled without the Dryer Fan signal available*

Calibration

- Press the **'arrow'** keys to highlight the selection. Type in the **'value'** followed by the **'Enter'** key

- Press **'Cancel'** to return to the **'Previous Menu'**

```
          Calibration

Inlet calibration bias (offset)        8.00
Outlet 1 calibration bias (offset)     1.5
Outlet 2 calibration bias (offset)     1.5
Rate to Bushels/Hr conversion          0.00



 Use ↑,↓ keys to highlight your choice.
 Enter a new value, then press ENTER.
 Press CANCEL to exit.
```

Figure 76 - Settings (Supervisor Setup) Calibration menu

IMPORTANT:

Adjusting the calibration values impacts the displayed moisture readings. A change in the moisture readings will have an impact on control. It is best to return the DM510 to manual control before making adjustments to the sensor calibrations.

Inlet calibration bias (offset) Outlet 1 calibration bias (offset) Outlet 2 calibration bias (offset)	The displayed value is a bias or offset applied to the combined temperature and dielectric signals returned from the DM510 moisture sensor. Adjusting this value has a direct impact on the displayed moisture value on the **'Main Operations Screen'** The DM510 calibration procedure also has an impact on this and other values when calibrations are performed.
	Before adjusting this value cancel any calibration in progress and note the displayed bias value.
	Example Inlet calibration adjustment.
	DM510 Inlet reading = **26.5%**
	Manual test = **21%**
	The DM510 needs to read 5.5% lower.
	26.5 - 21 = 5.5
	Reduce the **'Inlet calibration bias (offset)'** value by **5.5**
	8 – 5.5 = 3.5
	Outlet adjustments are similarly made. To increase the displayed moisture reading the displayed bias value will need to be increased by the required amount. To decrease the displayed moisture reading the displayed bias value will need to be decreased by the required amount. It should be noted that the bias value could be a negative value.

RATE TO BUSHELS/HR CONVERSION	This is the conversion of the discharge or unload rate to bushels per hour.
	To calculate this value requires 3 items.
	1) Product volume = bushels
	2) Time = minutes
	3) Discharge rate = DM510 rate
	For example
	If the dryer discharges **4500** Bushels in **1 hr 37minutes** at a discharge rate of **80%** then the conversion factor is **34.7925.**
	1) **1 hr 37 minutes** = **60** + **37** = **97** minutes 2) Bushels/minutes = **4500** / **97** = **46.39** **3)** Bushels/hour = **46.39 * 60** = **2783.4** **4)** Bushels/hour / rate = **2783.4** / **80** = **34.7925**
	The value to be entered as the **'Rate to Bushels/Hr Conversion'** factor is **34.7925**.
	The Accuracy of the value depends on the accuracy of the measurements. This is in the 'Approximate Production' output in the printed 'Bin Summary' and the 'Daily Summary'

Hang-up Modem (only for systems with an optional modem)

Pressing '5' from the 'Supervisor Setup' screen will cause the DM 510 to hang up the modem and return to the Main Operations Screen. This procedure is usually done in conjunction with support centre operations and help. It is intended to clear the modem Icon in the event of a bad disconnect or interrupted modem communication session.

Deg F to deg C conversion

The **'Deg F deg C conversion'** menu permits changing the temperature scale between Fahrenheit and Celsius

- Press the **'number'** key to select the item.

  Or

- Press the **'arrow'** keys to highlight the selection followed by the **'Enter'** key
- Press **'Cancel'** to return to the **'Previous Menu'**

```
     Temperature Scale
    (1) Fahrenheit
    (2) Celcius

 Selecting either (1) Fahrenheit or
 (2) Celsius will convert both the
 Temperature scale and all of the
 Temperature alarm settings and limits.
 Please review all of the Dryer
 Temperature alarm settings and limits.


 Use ↑,↓ keys to highlight your choice,
 then press ENTER. Or press the number.
 Press CANCEL to exit.
```
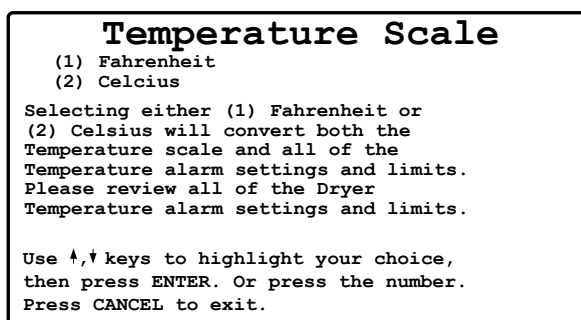
Figure 77 - Settings (Supervisor Setup) Temperature Scale menu

---

Note:

Changing from Fahrenheit to Celsius or vice versa will also convert all the temperature alarm settings and temperature limits to factory default values. It will be necessary to review and adjust temperature alarm settings and temperature limits after a conversion has been made

---

System Shutdown

System shutdown is a controlled shutdown of all the system software much like the shutdown of a personal computer. The system will display the Dryer Master Logo and exit all software. It is safe to turn off the power when the Dryer Master Logo is displayed.

To restart turn the system off, wait 5 seconds, turn the system ON.

Changing System Date & Time

- Press the **'arrow'** keys to highlight the selection. Type in a new **'value'** followed by the **'Enter'** key

- Press *'Cancel'* to return to the **'Main Operations Screen'**

```
        Set Date & Time

Date is:         mm/dd/yy
                 9/22/01
Time is:          HH/MM
                  14: 7


 Use ↑,↓ keys to highlight your choice.
 Enter a new value, then press ENTER.
 Press CANCEL to exit.
```

Figure 78 –Settings Set Date & Time screen

Product Information

```
        Dryer Master

        Dryer Master Inc.
        Kitchener, Ontario, Canada

        Telephone  519 725-4700
        Fax        519 885-4300
          www.dryermaster.com

               System Type
         Dryer Master Model DM510
           Version yyyyddd
Press CANCEL to exit
```

Figure 79

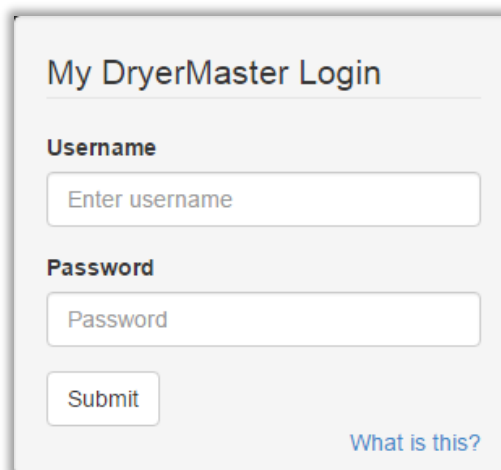*Figure 80 - Product Information screen*

DM Mobile – Remote Access

DM Mobile gives you access to much of the functionality of the DM510 without having to be physically present at the DM510 panel.

To use DM Mobile the DM510 should be on and should be connected to an internet enabled router with an Ethernet cable (or alternatively to a wireless access point configured on your network). Then, simply use the web browser on your smart phone, tablet or desktop PC and go to **my.dryermaster.com**.

You will see the login page as shown to the right. Next, enter the Username and Password that came with your system. If you cannot locate the login and password information, contact the Dryer Master Support Center.

The first time you log in we suggest you go to the preferences section to fill in your basic information. This is also where you can configure "notify on alarm" functionality.

The DM Mobile Main Operations Screen displays similar information to the DM510 screen.

With DM Mobile you can change modes and setpoints directly from your screen. In addition, alarms will show as orange or red text depending upon the alarm (orange for warning, red for critical).

We are continuing to enhance the DM Mobile software so the current version may look different than the version on this page.
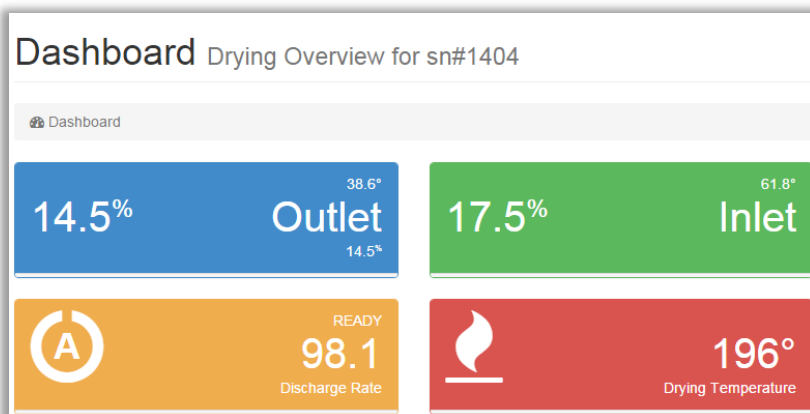

Figure 81 - Main Operations Screen

There is also a YouTube video available that goes over the core functionality of DM Mobile (on YouTube search for "Dryer Master DM Mobile").

Appendix 1: Hints for Better Drying

Start-up and Shutdown

There are costs associated with start-up and shutdown of the drying operation. Typically, a dryer that is shut down will still be filled with grain. During the shutdown period, residual heat and normal convection of ambient air will continue to dry the grain. However, the moisture changes will not be the same throughout the dryer.

As a result, at start-up, there is a tendency to produce over-dried product before the drying process can be stabilized. It is recommended, therefore, that dryer shutdowns and start-ups be kept to a minimum. One method to accomplish this is to accumulate enough grain before start-up to allow for a longer drying run. An alternative is to prolong the drying run by lowering the burner temperature.

In the event that a shutdown is necessary, develop procedures for shutdown and start-up that minimize the effects on the grain remaining in the dryer. Keep the following in mind:

After you turn the heat off, don't leave the fans running for longer than necessary. Running the fans dries the grain even without the burners running.

If your dryer takes a long time to cool down, leave the discharge system running for some of the cool down time.

When starting the dryer select a start-up discharge speed similar to that used when the dryer was shut down. Consider the drying conditions are they similar?

When you start-up the dryer, remember the grain in the dryer may be over dried. The idea is to pick a good speed for the grain coming into the dryer.

Drying Air Temperature (Air Plenum Temperature) (APT)

Maintain a constant drying air temperature. If an adjustment is required, make the adjustment in one step. Then wait one dryer load to allow the dryer to stabilize. Avoid making repeated temperature adjustments. The DM510 will observe and adjust for drying air temperature (APT) changes but only after the results have begun leaving the dryer.

Tempering

When grain with varying moisture levels is held in a tank for a period of time (typically 12 hours), the moisture distribution will equilibrate. This is referred to as tempering.

Large dryers cannot respond quickly to large, abrupt changes in the moisture content of the incoming grain. Although the DM510 will significantly reduce these kinds of effects, the response limitation of the dryer will still result in undesirable variations in output moisture levels.

If there is an opportunity to temper the grain before feeding it into the dryer, abrupt changes will be less likely.

The tempering process may also apply after you dry. That is, a storage period will tend to further remove some of the unevenness of the moisture content, before shipping.

If tempering tanks are not available, you can still improve performance by avoiding receiving wet grain into the same bin that you are currently using for drying.

Cleaning

When foreign material and fines are present in significant quantities in the grain entering the dryer, they can result in inaccurate dryer response and higher drying costs.

Fines can be present in varying quantities and will affect the accuracy of grain moisture measurements. Since the fines are drier than the grain, they create an inaccurate impression of the actual moisture level in the grain. This can result in a higher moisture content being noted in the grain when the fines are removed.

If fines and foreign material are present in significant quantities, the grain should be cleaned *before* drying rather than after drying. Cleaning *before* drying will improve drying efficiency and, reduce the probability of blocking the dryer screens. Cleaning *before* drying will also reduce the chance of plugging the moisture sensors, reduce the risk of fire, and provide more accurate readings from the moisture sensors.

Bench Top Moisture Meter Calibration

The bench top moisture meter is the standard that the DM510 sensors are calibrated against. If the manual reading from your bench top moisture meter is not accurate, then the DM510 moisture reading will not be accurate. Accuracy of the manual reading depends on maintenance and measuring procedures. Most meter manufacturers specify that the meter should be checked annually by a qualified service person. These checks will ensure that the meter is accurate. Also, ensure the DM510 sensors are clean and grain is flowing properly into the sensor.

Sampling Techniques

- Follow these practices to ensure a good sample is obtained for sensor calibration:
- Ensure the sample used in the manual reading is a good representative sample of the grain exiting or entering the dryer. Collect the sample at the same time the DM510 is sampling. (Review the calibration procedure in the 'Calibrating the DM510 Sensors' section of this manual)
- Follow the bench top moisture meter manufacturer's procedures for measuring moisture content.
- Ensure the temperature of the moisture meter cell is close to the temperature of the grain being measured.
- Use care in applying the procedures accurately (weighing and pouring the sample, and reading the temperature of the grain).
- Test the product immediately. Do not leave it in an unsealed container waiting to be tested.
- If the temperature of the product is significantly different then the temperature of the manual tester seal the product in an air tight container and wait for the temperature to equilibrate before testing the product.

Airflow

The dryer design assumes that airflow for a given fan speed will be consistent throughout the dryer. Blocked screens as a result of rust and fines can affect airflow. This in turn has an impact on dryer efficiency and the DM510 performance.

Discharge System

The discharge system must be checked and maintained to operate as designed. This will ensure that the product is removed in a uniform manner from the dryer. It can be beneficial to test the dryer throughput at the start of the season. Any change in equipment or calibration of the discharge system equipment will likely require an adjustment to the DM510 Dryer Master volume and throughput setup.

Burner

Burners cannot meet performance specification if neither the burner controls nor the burners are regularly serviced. An unserviceable thermostat or poorly adjusted burner control system will not keep the heat at a constant temperature. A dirty burner or a burner control problem may prevent the burner from reaching its maximum designed output, or prevent it from maintaining a consistent gas pressure.

Product Quality

Varying product quality can have an effect on Dryer and DM510 performance. Light crops tend to dry more easily than heavy crops. This can result in a situation where columns in a dryer have over dried product while others are wet. The DM510 can only attempt to average the product exiting the dryer. This behavior can result in poor DM510 moisture sensor to bench top meter calibration agreement and generally poor moisture control.

Appendix 2: Troubleshooting - Control

The DM won't go into Automatic

First make sure that the green Ready light is lit. If the light is not lit then the DM does not yet have enough accurate information to take over control. If you have been running for more than two dryer loads and the Ready light has still not come on call the Dryer Master Support Center.

Trying to go into Automatic when the system is not READY will provide the operator with a message to indicate the reason why the system will not go into Automatic

Why won't the DM go Ready?

There are a couple of possible reasons. The first thing to do is to make sure that there are no alarm lights lit (the red LEDs on the top left of the panel). The DM can not go Ready if any critical alarm is active.

Next to go Ready the DM has to meet a few conditions. First the current outlet moisture has to be within 2 % of the moisture setpoint (target) and second the predicted outlet moisture (by the Dryer Master model) must be within 2% of the actual moisture, [You can check the predicted exit moisture by pressing Support, then Diagnostics, then Up Arrow. The bottom number in the PEM column is the predicted exit moisture] and of course no alarms can be on.

Note even if the DM Ready light goes on you should always check that the suggested rate on the screen is reasonable before going into Automatic.

Why does the DM speed up / slow down when I go to auto ?

Often when you first start up for the day the first grain that comes out of the dryer can be over dried after having sat in the dryer for a while. So if you are running below target for the first hour and then go into automatic the DM is going to want to run above target for a while to have some under dried grain to mix with the over dried grain and give you your overall target moisture once everything has tempered in the bin. If you don't want this to happen at start up then start with a lower target moisture and then move it up gradually to where you want it to be. In this way the DM will not try to compensate as much for your over dried grain.

In the same way, if you have been running above target for a while and then switch to Automatic the DM will want to slow down to come below target to give you an average moisture that is close to target.

The DM uses rate manipulation to reduce the variation at the outlet to get more grain dried closer to target. These rate changes are more dramatic when the difference between the inlet and outlet moistures is small.

The discharge rate won't go above "X ", or below "Y".

Check whether the maximum and minimum discharge rate settings are correct.

a) Press Settings
b) Press "1" for Supervisor Setup
c) Enter the Password "123"
d) Press "1" for Control Limits
e) Verify that the Maximum and Minimum Discharge rates in Auto are correct. (These are the maximum and minimum rates that the DM will use in Automatic mode.)

The DM worked great in wheat, but not in corn.

Check that the volumes and throughput have been correctly entered for each product. In the DM each product has its own settings that need to be configured.

a) Make sure you are in the right product (Use the Product key to change products)
b) To check the values press the Settings key
c) Press "2" for Installer Setup,
d) Enter the password – "4628"
e) Press "3" for Dryer Volumes and Throughput
f) The default values are 1.0, 2000, 1000, and 50 for the four entries. If you see those values most likely the DM has not yet been set up for this product.

The moisture is above target and yet the DM wants to speed up (or the reverse).

By the time the grain is coming out of the dryer it is too late to make a speed adjustment to change this moisture. Instead the DM is focused on what is in the dryer, what is coming into the dryer, and any change in drying conditions. For example, if the exit moisture is above target but the inlet moisture is falling the DM may want to speed up the dryer to make sure this incoming dry grain is not over dried by too much.

All the grain is not coming out at the moisture setpoint (target).

The DM can only help you maximize the performance of your dryer. It helps you run at the best discharge rate for the mix of grain in the dryer, but it can not break the laws of physics. The DM will try to dry your grain to your average moisture set point. Some grain will be above and some below the set point, but on average the total average should be very close to the set point over a few dryer loads.

In Local mode the dryer speed control and the DM speed control do not read the same.

Call the DM support Center and we will help you retune the calibration of the dryer motor speed control and the DM

The DM takes a long time to get Ready

Check to see that the following settings are correctly implemeted: "Dryer discharge off rate" and "Burner off temperature". If these are not correct the DM may not have known the dryer was off and kept calculating numbers for its model. This means the model will need a dryer load or two to correct its information.

To check the Settings:

a) Press the Settings key
b) Press "1" for Supervisor set-up
c) Enter the password "123"
d) Press "1" for Control Limits.
e) Check the "Dryer discharge off rate". It should never be "0". It should be above zero, but below where you would run the dryer while drying. So for example if you usually run at a rate of 20-60, set the value at "5"
f) Check the Burner off temperature. This should be set about 30F below the low temperature you would dry at. So if you normally dry at 180F, set it at 150F. It must also always be above ambient temperature and well above the plenum temperature after the cool down cycle.

Appendix 3: Troubleshooting - Moisture Sensors

The inlet sensor is reading 1% too high. Should I calibrate?

No. As long as the inlet reading is within 1-2% of actual that is fine. The DM is most concerned with the *change* in the inlet moisture not the actual reading. If you calibrate quite frequently the DM will think that these are real changes and react accordingly.

The outlet moisture keeps moving up and down. Why?

All kernels do not come out of the dryer at the same moisture. This is the normal variation that you normally don't see if you only take hourly samples. By continuously looking at the real time moistures as they move up and down the DM is able to have more accurate averages with which to make control decisions. You may also see that moisture variations tend to be more pronounced on round tower dryers as the different columns may dry and unload at different rates.

When I start up for the day the calibration is off?

It is usually best to wait an hour or so after you start up to begin calibrating the sensors. This is because the first grain coming out of the dryer (and that has been sitting in the dryer for a few hours) has a different moisture gradient (the difference in moisture between the inner part of the kernel and the moisture at the outer part) in the kernel than does grain that has just recently gone through the hot zone. You should avoid calibrating the outlet moisture sensor anytime the moisture is more than 1% away from target.

The moisture sensor reads empty, but there is product in the sensor.

It may be that the product is dry enough that it is below the low end of the sensor sensing range (below 10-12%) – and so reads "empty" on the screen. If, at higher moistures it reads OK, then this is likely the issue.

If product is flowing too quickly past the sensor the sensor may read empty. Product flow past the sensor should ideally be at less than 1 inch (2.5cm) per second.

If neither of these explain the issue, there may be an issue with the sensor itself – in which case please contact the Dryer Master Support Center.

The moisture sensor is reading frozen

This typically happens when the temperature sensor on the moisture sensor fails (although it can also happen if the outside temperature is below -30). Contact the Dryer Master Support Center.

The inlet sensor is reading 45%

This can be due to surface moisture on the sensor and this can happen when you first start up in the morning and there has been condensation on the sensor. This should resolve itself once the grain flowing past the sensor wipes away the moisture. This can happen during extended preheats.

A second possibility is that the inlet sensor has been installed where it is getting steam coming up from the hot zone. In this case it may be necessary to reposition the sensor.

A third possibility is that there may be an issue with the sensor itself. If the issue does not resolve itself contact the Dryer Master Support Center.

The moisture sensor won't stay calibrated.

First, make sure that you are taking your moisture samples in a consistent way over the 30 seconds that the calibration button is flashing.

Second, try separating your manual sample into three parts, testing each part, and then taking the average of the three readings to enter into the DM.

Note that variations in the amount of FM (foreign material) and or severe changes in bushel/test weight can impact calibration.

In addition, some models of dryers can have significant variation in moisture from column to column.

If you still have this issue, contact the Dryer Master Support Center.

# Appendix 4: Troubleshooting DM Mobile

I can't connect to the DM510:

The DM510 is designed to automatically connect with the DM Mobile cloud server when it is connected to the internet. If it loses a connection it will continue to try to reestablish the connection and in almost all cases will be able to do so. However there are situations that can require a reboot of the DM Mobile hardware, or the internet connection hardware (router/wireless access point).

To begin with, open the door to the DM510. Roughly in the middle of the box you will see a small green board (about 2 in X 2.5 in). In the middle of the board is a red power light. Just above that there should be 2 lights (yellow and green) flashing (see picture).

If the 2 lights are flashing you should normally be able to connect. If you cannot connect with the lights flashing, call the Dryer Master Support Center.

If the lights are not flashing, and <u>you have connected in the past</u>, try the following:

1. Unplug the power cord from the bottom of the small green board (see purple circle in picture). Wait five seconds and then plug back in. Wait about a minute and the 2 lights should start to flash.
2. If the lights do not start to flash, the next step is to reboot your router or your wireless access point.
3. If this doesn't correct the issue, next try rebooting the DM510 panel. Turn off the power switch on the bottom of the panel. Wait 20 seconds and then turn it back on. Wait a minute or two to see if the lights flash.
4. If none of these options solve the issue, contact the Support Center.
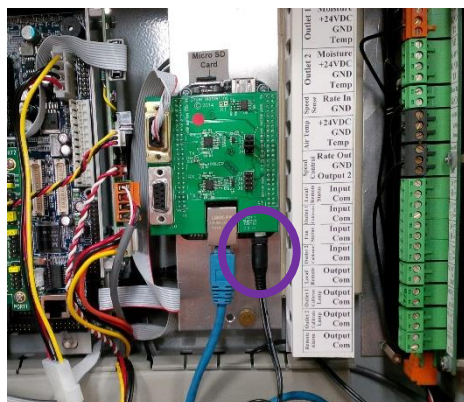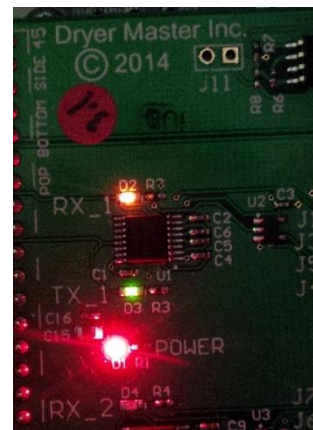
If the lights are not flashing, and <u>you have not connected in the past</u>, try the following:

1. Make sure that the Ethernet cord is plugged in at both ends (at the DM510 panel and at your router or wireless access point).
2. Check that you do have an active internet connection, by for example connecting a laptop to the connection.
3. Try resetting DM Mobile as in Step 1 above (unplug and plug back in).
4. If the steps above do not resolve the issue, contact Dryer Master Support to perform additional troubleshooting.

What is my login information?

A sheet with your **Login id** and **Password** should have been in with the package with this User Guide. If you cannot find it, give the Dryer Master Support Center a call.

I can't find the DM mobile web page.

Make sure you are entering **my.dryermaster.com** into your browser address bar. Do not use www in the address.

I am not getting texts on alarms.

On the preferences page make sure that the phone number you entered is in the required format. It should be entered as +1 area code number (eg: +15551212). It is a long distance text from our server, so the + and the 1 are required.