



DM510

Computerized
Grain Drying
Control System

INSTALLATION GUIDE

Dryer Master DM510

Installation Guide

©Dryer Maser Inc.
115 Ardelt Ave. Bldg. #2, Kitchener, Ontario
Phone 519.725.4700 • Fax 519.885.4300
USA and Canada – Toll free at 1-888-318-0009
E-mail: info@dryermaster.com

Reminder

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

February 28, 2015
January 15, 2016
January 31, 2017
March 30, 2018
January 12, 2019
December 12, 2022

What is in this guide

In this guide you will find the information you will need in order to install a Dryer Master DM510. There is information on both the physical installation and the wiring connections.

Before you start the installation, review the information in this manual as there are a few key decisions you should make before starting the actual installation.

Specifically, you will need to determine where to install the DM510 panel and the two moisture sensors. **It is extremely important for the proper functioning of the DM510 that the sensors be installed according to the instructions and requirements outlined in this guide.** There are several examples shown in this guide, but each situation can be somewhat unique, so if you have questions ask us before beginning the installation.

Once you have completed the installation, the next step will be to use the Commissioning Guide to tailor the DM510 to your particular dryer. **Do not attempt to use the DM510 to control your dryer before completing the commissioning process.**

If you have questions call us at the Dryer Master Customer Support Centre

One of the benefits you receive with the DM510 is access to support from the Dryer Master Support Center where we have 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, or directly at 519-725-4700.**

Index

Index	4
Table of figures	6
Dryer Moisture Systems Inc. – About Us	8
DM510 - A Brief Description	9
DM510 - How it Works	9
System Components.....	10
DM510 Control Panel including I/O:.....	10
Printer (optional):.....	10
Inlet Moisture and Temperature Sensor:	10
Outlet Moisture and Temperature Sensor & Chute with Rotary Feed:.....	10
Calibration Push Button:	10
Drying Air Temperature Sensor or Temperature Signal Converter:.....	10
Internet Connectivity Capability:	10
Installation Configurations (printer optional).....	11
Configuration with Integrated I/O and APT sensor.....	11
Configuration with Remote I/O and APT sensor	12
Configuration with Integrated I/O and Temperature Signal Converter	13
Project Manager Guide and Checklist	14
Installation Overview.....	14
Situation 1 Overview: Installation on new dryer when purchased from dryer manufacturer ...	14
Situation 2 Overview: Retrofit onto an existing dryer	15
Installation Checklist	16
DM510 Control Panel	16
Dryer Master I/O system	16
Inlet Moisture Sensor	17
Outlet Moisture Sensor.....	17
Sample Station (calibration push button)	17
Air Plenum Temperature probe (Temperature Option A)	17
Temperature Signal Converter (Temperature Option B)	18
Relay (Motor Speed Control Option A)	18
Speed Control Interface (Motor Speed Control Option B)	18
Internet connection	18
Electrical Installation Guidelines	19
General.....	19

Wiring	19
Component Summary	21
DMI supplied components and services	21
Customer supplied components and services	21
Dryer Master Moisture Sensors	22
Sensor Types	22
Inlet Moisture Sensor Installation	23
Sensor Location	23
Sensor Installation	24
Outlet Moisture Sensor Installation	27
Sensor Types	27
Outlet sensor mounting requirements:.....	27
Outlet sensor installation options	28
Option 1 By-Pass Method with Rotary Feed Chute – Details.....	28
Option 1a - Bypass Using Sampling Auger	31
Option 2 In-Line Chute Method – Details	33
DM510 Control Panel Installation	35
Control Panel Location.....	35
Control Panel Installation	35
I/O Panel Installation	37
Power and Grounding Requirements	39
DM510 Control Panel	39
Moisture Sensors.....	44
AC Motor Speed Control Interface	44
DC Motor Speed Control Interface.....	44
Control Wiring Requirements.....	45
Motor Controller and Ground Wiring Specifications	45
Multi-Cable Specifications	45
Typical System Multi-Cable Requirements.....	46
Installing Conduit and Pulling Wires	47
Wiring Instructions (Cable Terminations)	48
Tools Required	48

General Wiring Procedure	48
Overview: Typical DM510 wiring connections:	49
Moisture Sensors Wiring Instructions	50
I/O board Jumper locations and functions.....	52
Motor Speed Control Interface Wiring Instructions (for DC drives).....	54
Local/Remote Status Wiring Instructions	56
Fan Status Wiring Instructions	58
Drying Air Temperature Wiring Instructions.....	59
Connecting to a Drying Air Temperature Controller.....	61
Calibration Button Wiring Instructions	63
Remote Alarm Control	64

Appendix 1: Motor speed control wiring diagrams	65
Sample wiring diagrams	65

Table of figures

FIGURE 1- INSTALLATION SCHEMATIC – DM510 W/ INTEGRATED I/O AND APT SENSOR.....	11
FIGURE 2 - INSTALLATION SCHEMATIC - DM510 WITH REMOTE I/O	12
FIGURE 3- APPLICATION SCHEMATIC	13
FIGURE 4 - FIN TYPE MOISTURE SENSOR.....	22
FIGURE 5 - SAMPLE INLET SENSOR INSTALLATION ON A GRAIN HANDLER DRYER.....	23
FIGURE 6 - SENSOR AND MOUNTING PLATE DIMENSIONS	25
FIGURE 7 - ALTERNATE LOCATION FOR INLET SENSOR ON COLUMN DRYER	26
FIGURE 8 - INSTALLATION LOCATION FOR ROUND DRYER	26
FIGURE 9 BYPASS TYPE INSTALLATION	28
FIGURE 10 – OUTLET FIN IN BYPASS CHUTE	29
FIGURE 11 – CALIBRATION BUTTON INSTALL	29
FIGURE 12 – EXAMPLE INSTALLATIONS OF BYPASS CHUTE WITH ROTARY METERING	30
FIGURE 13 - BY-PASS AUGER INSTALLATION	32
FIGURE 14 - BY-PASS AUGER INSTALLATION	32
FIGURE 15 – INLINE CHUTE GRAPHIC	33
FIGURE 16 – INLINE CHUTE INSTALLATION	33
FIGURE 17 - IN-LINE CHUTE.....	34
FIGURE 18 - IN-LINE CHUTE IN A ZIMMERMAN CHUTE	34
FIGURE 19 – IN-LINE CHUTE INSTALLATION EXAMPLE	34
FIGURE 20 - DM510 PRODUCT DIMENSIONS	36
FIGURE 21 - I/O ASSEMBLY REMOVAL	37
FIGURE 22 - COMMUNICATIONS WIRE LAYOUT	38
FIGURE 23 - STAR POINT GROUNDING SYSTEM.....	40
FIGURE 24 - EFFECTS OF SURGE CURRENT IN A STAR POINT GROUND SYSTEM.....	41
FIGURE 25 - EFFECTS OF SURGE CURRENT IN A CONVENTIONAL GROUND SYSTEM	42
FIGURE 26 - DRYER MASTER INTERNAL GROUNDING	43
FIGURE 27 – MULTI-CABLE DIAGRAM.....	45
FIGURE 28 - WIRE PLACEMENT	46
FIGURE 29 - WIRE ENTRY LOCATIONS.....	46
FIGURE 30 - DM510 TYPICAL WIRING CONNECTIONS.....	49
FIGURE 31 - SENSOR HOOK-UP PHYSICAL	51
FIGURE 32 - SENSOR HOOK-UP SCHEMATIC	51
FIGURE 33 – I/O BOARD JUMPER LOCATION	52
FIGURE 34 – I/O BOARD DIGITAL OUT JUMPER CONFIGURATION DESCRIPTION.....	52
FIGURE 35 – I/O BOARD DIGITAL INPUT JUMPER CONFIGURATION DESCRIPTION	52

FIGURE 36 – I/O BOARD ANALOG INPUT JUMPER CONFIGURATION DESCRIPTION.53

FIGURE 37- DM510 TO MSC INTERFACE.....54

FIGURE 38 - DM510 TO MSC INTERFACE.....55

FIGURE 39 - MSC I TO DC MOTOR.....55

FIGURE 40 - MSC DC ISOLATION HOOKUP56

FIGURE 41 - LOCAL/REMOTE STATUS WIRING57

FIGURE 42 - FAN STATUS58

FIGURE 43 - TEMPERATURE SIGNAL CONVERTER59

FIGURE 44 - AIR PLENUM TEMPERATURE SENSOR59

FIGURE 45 - DRYING AIR TEMPERATURE SENSOR WIRING60

FIGURE 46 - APT CONTROLLER ANALOG CONNECTION61

FIGURE 47 - DM510 TO SIGNAL CONVERTER WIRING.....62

FIGURE 48 - CALIBRATION PUSH BUTTON63

FIGURE 49 - REMOTE ALARM.....64

FIGURE 50 - DM510 TO MITSUBISHI FR-D70065

FIGURE 51 - DM510 TO GENERIC VFD (0-10 VDC)66

FIGURE 52 - DM510 TO ALLEN BRADLEY POWERFLEX4066

FIGURE 53 - DM510 TO BALDOR SERIES H267

FIGURE 54 - DM510 TO ALTIVAR 3167

Dryer Master Inc. – About Us

Dryer Master Inc. (DMI) 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, DMI provides a full range of hardware and software, engineering services, system commissioning, operator training and 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. DMI also provides services that allow the monitoring of your process or plant operations from locations on or off site.

The Dryer Master DM510 from DMI 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

DM510 - A Brief Description

The Dryer Master DM510 from DMI 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 standard configuration of 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 monitor, an outlet moisture sensor 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 three important advantages. First, in all modes, the system is always monitoring the dryer. Second, in automatic mode, it continually watches the dryer. It doesn't have to help unload trucks, load trains, or do other jobs around the elevator. The dryer receives its full attention. Third, 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.

System Components

The DM510 system includes the following components:

- DM510 control panel (with remote I/O option)
- Inlet and outlet grain moisture sensors with integral product temperature sensors
- Calibration push button
- Outlet moisture sensor chute with rotary feed (bypass or inline version)
- Drying air temperature sensor or signal converter (to access dryer's temp reading)
- Internet connectivity capability (or optional modem connectivity)

An optional printer for continuous reporting of dryer operation and results is also available.

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 a network capable device. The DM510 Control Panel is typically installed in a location near the dryer where the operators spend much of their time. 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). See I/O Panel Installation page 37

Printer (optional):

The DM510 uses the printer to provide reports such as: continuous averages, hourly and daily reports, and bin summaries. 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 typically installed in a sensor chute with rotary feed (either the bypass or inline version) which is placed in the product flow after it exits the dryer.

Calibration Push Button:

The sample button is installed near the operator sampling point for product exiting the dryer, 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.

Installation Configurations (printer optional)

Configuration with Integrated I/O and APT sensor

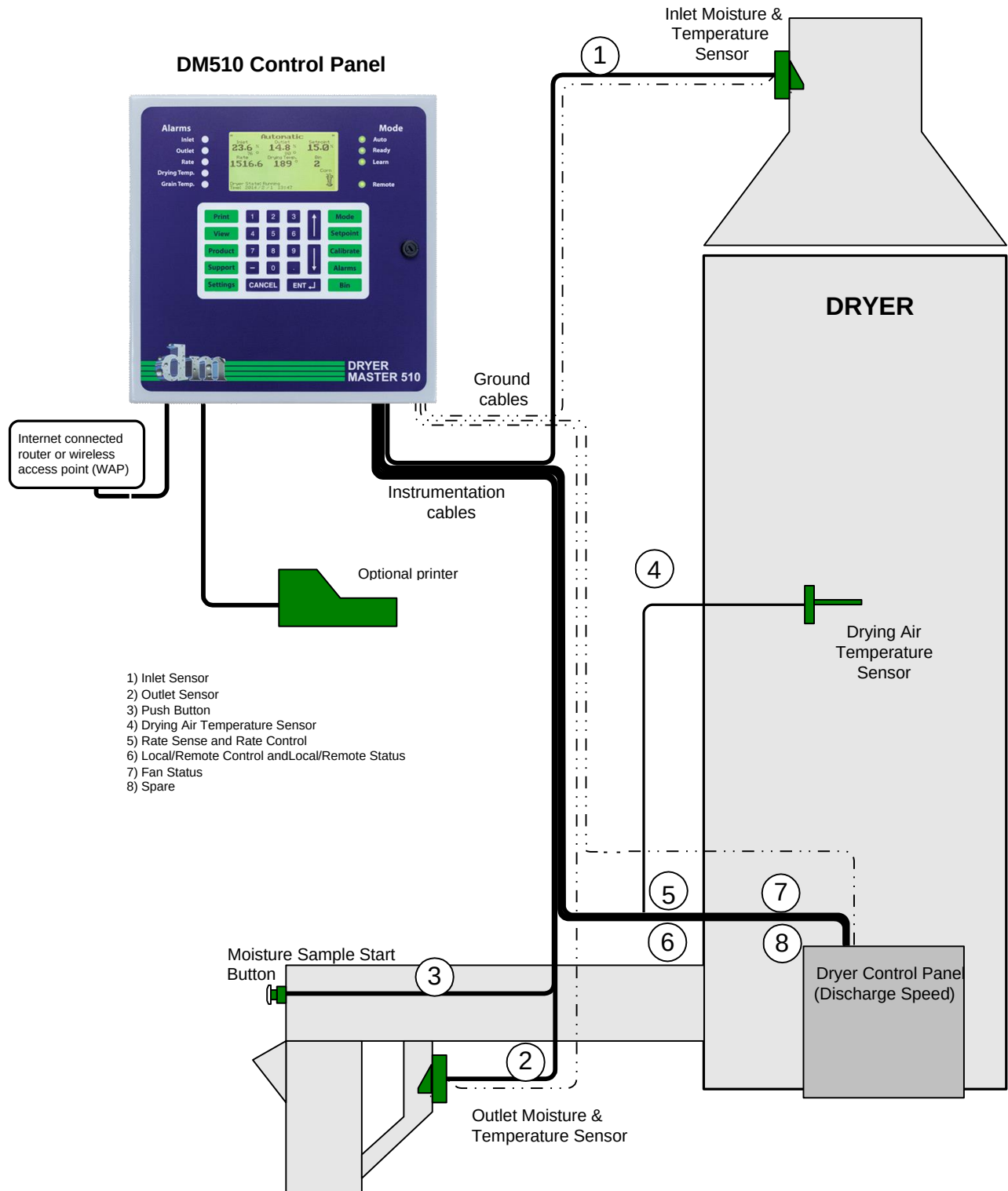


Figure 1- Installation Schematic – DM510 w/ Integrated I/O and APT sensor

Configuration with Remote I/O and APT sensor

See - Figure 21 - I/O assembly removal

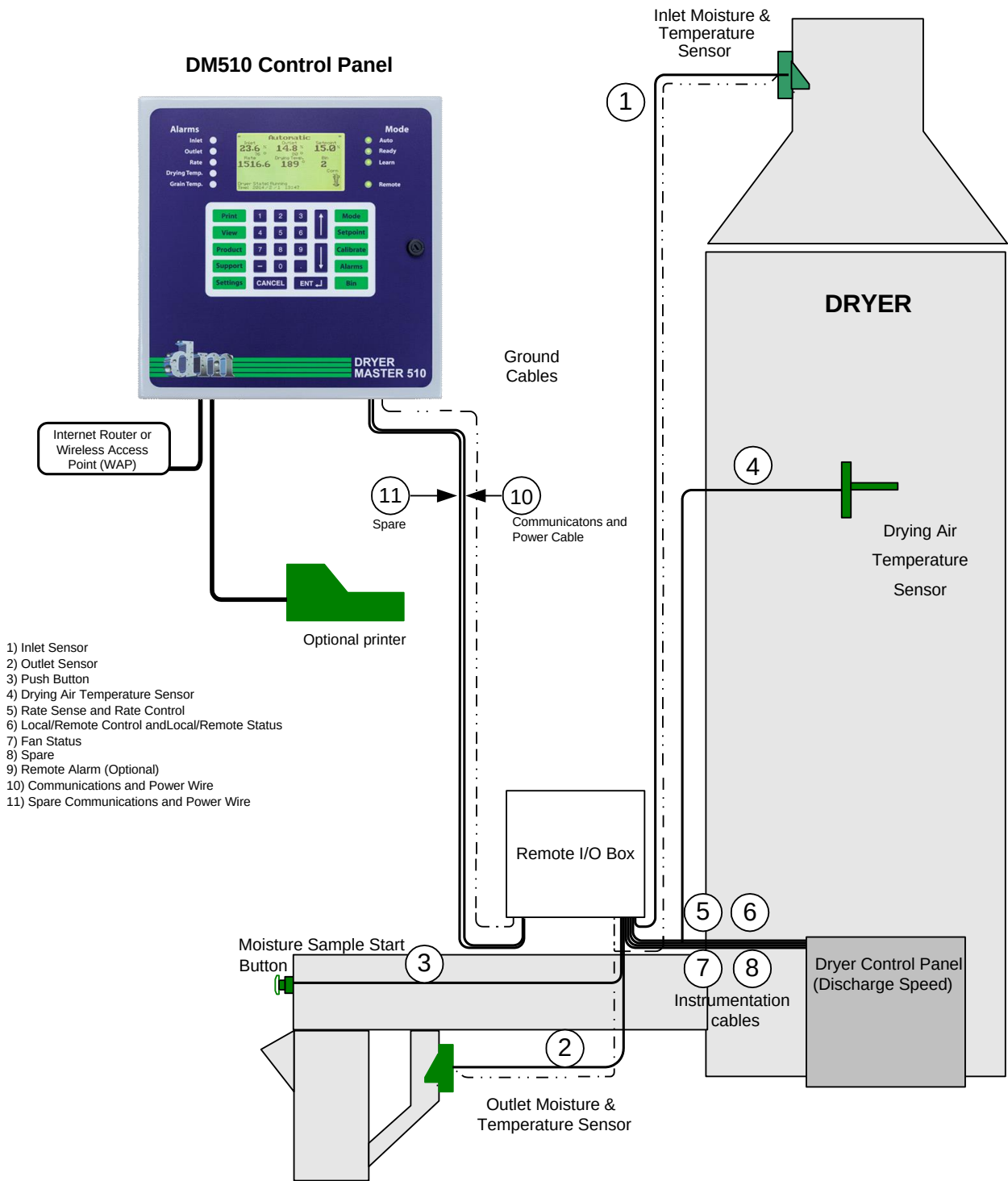


Figure 2 - Installation Schematic - DM510 with Remote I/O

Configuration with Integrated I/O and Temperature Signal Converter

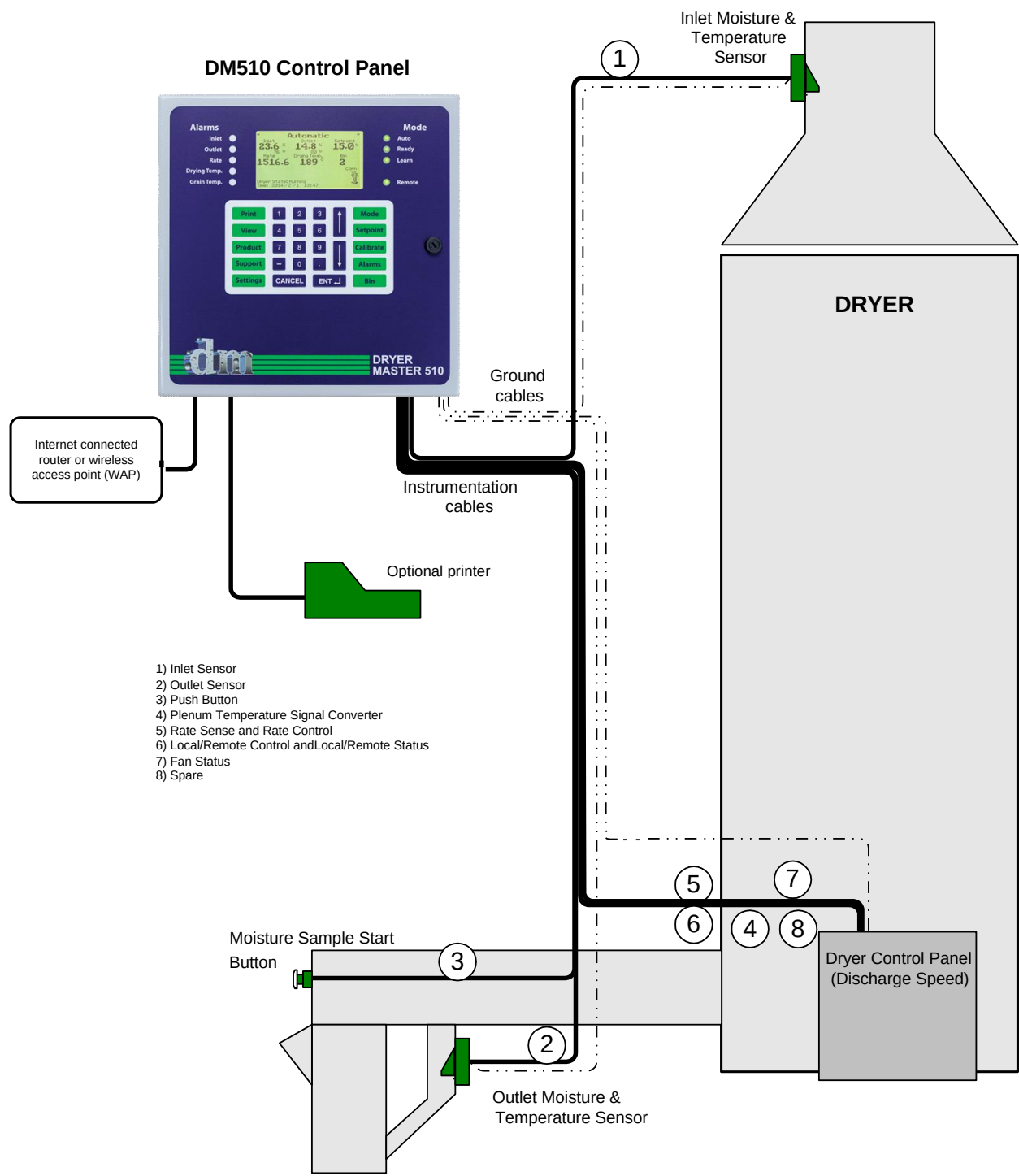


Figure 3- Application Schematic

Project Manager Guide and Checklist

Installation Overview

Introduction:

This section is a guide for site managers. Its purpose is to detail responsibilities in the installation of the Dryer Master DM510 computerized drying control system and a checklist is included to help you track completion of the required steps.

The rest of this manual is intended to cover most standard installations and includes sensor and electrical installation guidelines.

If at any time you have any questions with either the details in this document or the installation please contact the Dryer Master Support Centre toll free at 1-888-318-0009.

If you are installing the DM510 on a new dryer refer to situation #1. For all other situations please refer to situation #2.

Situation 1 Overview: Installation on new dryer when purchased from dryer manufacturer

DMI Responsibilities:

- To ship the equipment to site upon receipt of a purchase order
- To provide over the phone assistance during the installation process and during system start-up
- To assist the site operator(s) by phone during the drying season

Dryer Supplier / System Installer Responsibilities:

- To mount the inlet moisture sensor, the outlet moisture sensor, the drying air temperature sensor (or temperature signal converter), the sample button, and the Dryer Master I/O system
- To install conduit and wire the above devices to the Dryer Master I/O system located in the DM510 or the dryer panel or a separate I/O enclosure
- To connect the field devices (sensors) to the Dryer Master I/O system

Site Responsibilities (please see enclosed checklist and the physical installation guide and conduit and wiring guide for more detailed information):

- To mount the DM510 panel
- To install conduit and run wiring from the dryer panel or I/O enclosure box to the DM510 panel
- To terminate communication cable at the Dryer Master I/O device at the DM510 panel
- To start-up the system with over the phone assistance from the Dryer Master Support Centre
- To arrange an over the phone commissioning time with the Dryer Master Support Centre

Situation 2 Overview: Retrofit onto an existing dryer

DMI Responsibilities:

- To ship the equipment to site
- To provide over the phone assistance during the installation process and during the system start-up
- To assist the site operator(s) by phone during the drying season

Site Responsibilities (please see enclosed checklist and the installation manual for more detailed information):

- To mount the inlet moisture sensor, the outlet moisture sensor, the drying air temperature sensor (or temperature signal converter), the sample button, and Dryer Master I/O system (if not retained in the DM510 cabinet)
- To mount the DM510 panel
- To install conduit and run wiring from the DM510 panel to the Dryer Master I/O system (if applicable)
- To install conduit and run wiring from the field devices to the Dryer Master I/O system
- To terminate connections at the field devices, the Dryer Master I/O system (if so equipped) and at the DM510 panel
- To start-up the system with over the phone assistance from the Dryer Master Support Centre
- To arrange an over the phone commissioning time with the Dryer Master Support Centre

Installation Checklist

The following checklist will help to ensure all steps in the installation process are covered. Once you have completed all the items on this checklist you can move on to Commissioning the DM510. There is a dedicated DM510 Commissioning Manual (included with the manual package) to guide you through the process, but as always you can call the Dryer Master Support Center with any questions. There are some portions of the Commissioning process that can be handled more easily over the phone, so do not hesitate to call us.

DM510 Control Panel

The DM510 control panel is mounted in a “NON HAZARDOUS” environment. The ambient temperature during operation should be maintained between 40° and 105°F (5° to 41°C). The system can function outside of these limits but it may impact product longevity. The system requires an 110VAC or 220VAC 50-60HZ grounded circuit. A circuit with isolated ground in conjunction with approved surge protection equipment will afford extra surge and lightning protection. Surge protection and/or a UPS, if power is unstable, may be of benefit.

The DM510 control panel is to be located in the control room from where the operators currently control operations. For viewing ease it is recommended that the DM510 control panel be mounted so that the bottom of its display screen is at or slightly above average eye level.

- ☐ Meets environmental requirements
- ☐ Meets electrical requirements
- ☐ Panel installed as described in a NON HAZARDOUS environment

Dryer Master I/O system

The Dryer Master I/O system can be left in the DM510 panel or it can be separately mounted in a “NON HAZARDOUS” environment. The I/O board can be installed in the dryer control panel or an electrical enclosure in close proximity to the dryer control panel. The I/O system will function throughout the standard industrial temperature range of 0° to 140°F (-20° to 60°C). The I/O system is powered from the DM510 panel and requires no external power source.

- ☐ Meets environmental requirements
- ☐ Panel installed as described in a NON HAZARDOUS environment
- ☐ For the wireless I/O option only, plug in the supplied power supply to power the wireless modem and the Dryer Master I/O

Inlet Moisture Sensor

The inlet sensor is to be mounted in a location that will provide a representative sample of grain entering the dryer. It should be located where there will be a regular flow of product past the sensor (at no faster than 1 inch per second – slower is fine), and in an area where debris is unlikely to accumulate.

Communication with DMI Engineering personnel could result in revisions to the installation method if readings are not representative. DMI Project Engineering can advise you of modifications to the required installation.

- ☐ Installed the inlet moisture sensor as specified
- ☐ Connected the inlet moisture sensor as specified
- ☐ Installed in a Non Hazardous location

Outlet Moisture Sensor

The sensor is to be mounted in a chute that will provide product flow at a rate of approximately 0.5" to 1" (1.25cm to 2.5cm) per second. The Dryer Master inline and bypass chutes with rotary feed are designed to meet these requirements. If an alternate configuration is used specifications for the chute dimensions and product conveyance methods are provided in separate mechanical drawings.

Communication with DMI Engineering personnel could result in revisions to the installation method if the flow rate is not within specification. DMI Project Engineering can advise you of modifications to the required installation.

- ☐ Installed the sensor chute as specified
- ☐ Installed the outlet moisture sensor as specified
- ☐ Connected the outlet moisture sensor as specified
- ☐ Installed in a Non Hazardous location

Sample Station (calibration push button)

The Sample Station consists of a Normally Open Push Button Contact and a 24 VDC LED Lamp. The Sample Station should be placed in close proximity to the outlet Moisture Sensor. The purpose of the station is to signal the DM510 control panel that a moisture sample has been taken and to tell the operator for how long to take a sample.

- ☐ Installed the Sample Station (Push Button and 24VDC Lamp) as specified
- ☐ Connected the Sample Station (Push Button and 24VDC Lamp) as specified

Air Plenum Temperature probe (Temperature Option A)

The DM510 control panel's hot air plenum temperature sensor is to be installed within 6-12" of the dryer's air plenum temperature sensor.

- ☐ Installed the hot air temperature sensor as specified
- ☐ Connected the hot air temperature sensor as specified

Temperature Signal Converter (Temperature Option B)

The signal converter translates the dryer temperature reading for use by the DM510. Each signal converter comes pre-configured by DMI with enclosed wiring instructions. A copy of the wiring and programming instructions (if required) can be found in Appendix 2

- ☐ Installed temperature signal converter as specified

Relay (Motor Speed Control Option A)

The wiring of the DM510 to the dryer's motor speed control can vary depending upon the make of the drive. Instructions for several common drives are included in Appendix 1. If your drive is not shown contact DMI to obtain a wiring diagram for your drive.

- ☐ Connected the motor speed control / relay / DM510 as specified.

Speed Control Interface (Motor Speed Control Option B)

A number of installations of the DM510 on older dryers with DC drives require the use of the DM510 motor speed control interface. The interface provides isolation and signal conditioning between the DM510 and the speed control.

- ☐ The interface is located in the dryer control panel near the motor speed limit
- ☐ Installed the motor speed control interface as specified
- ☐ Connected the motor speed control interface as specified

Internet connection

If you want to make use of **DM-Mobile** for remote access through your smartphone, tablet or PC to your DM510 you will need to connect your DM510 to an DHCP enabled router or WAP (wireless access point). It is also possible to connect through a wireless hot spot (additional equipment required) – though you should contact the Support Center if you would like to use this route.

Plug one end of the provided Ethernet cable (if you have a longer distance you will need to purchase a longer cable) into the bottom of the DM510 in the location labelled "Router". Plug the other end into your router or WAP. DM-Mobile should automatically connect if the DM510 is turned on.

- ☐ Connected the DM510 to an internet router or WAP.

Electrical Installation Guidelines

General

1. Analog signals from the field must be separated from other signal types and run in conduit
2. Metal conduit is required for electrical noise shielding
3. Communications cables must be run in conduit in plant environments. Surface wiring is permissible in office environments
4. Ensure all field components are identical to those shown on electrical drawings
5. Ensure all field mounted level switches have been installed at specified elevations
6. Ensure all field devices are labelled with their appropriate nameplates
7. All manuals associated with instrumentation are to be available at site and are to be the English version
8. Ensure that all field wiring is tagged at each end
9. All field wiring should be continuity tested. With the panel powered down, each field wire should be individually connected to ground. The continuity to ground can then be measured from the panel
10. Once continuity testing has been done successfully, power can be applied to the panel

Wiring

Eight (8) 4-wire instrumentation cables need to be pulled from the dryer to the DM510 I/O panel to the field instrumentation for the integrated I/O solution. Three (3) 16 AWG (minimum) ground wires should be pulled from the DM510 chassis ground to specific field instrumentation and Dryer's Control panel.

For the remote I/O: two instrument cables (one as a spare) need to be pulled between the remote I/O panel and the DM510 panel plus a 16 AWG (minimum) ground wire. It is recommended that the grounding be a star configuration. (See Figure 23 - Star Point Grounding)

Instrumentation cable for each of the following:

1. from the Inlet Moisture Sensor to DM510 panel
2. from the Outlet Moisture Sensor to DM510 panel
3. from the Sample Station (Calibration Push button) to DM510 panel
4. from the Air Plenum Temperature sensor high temperature wire junction box to DM510 panel (if using an APT sensor). If the signal converter is used, from the signal converter to the DM510 panel.
5. from the Dryer speed control interface to DM510 panel (rate in/out)
6. from the Dryer speed control interface to DM510 panel (local/remote)
7. from the fan status contacts to the DM510 panel (if used)
8. spare from Dryer Electrical panel to DM510 panel (optional)
9. from the remote alarm to the DM510 panel (optional)
10. for Remote I/O: communications and power wire from remote I/O to DM510 panel
11. for Remote I/O: optional spare communications and power wire from remote I/O to DM510 panel

Ground wire for each of the following to the DM510 Panel:

- #G1** from the Inlet Moisture Sensor to DM510 panel
- #G2** from the Outlet Moisture Sensor to DM510 panel
- #G3** from the Dryer electrical panel to DM510 panel
- #G4** from the remote I/O panel to DM510 panel if configured this way

The conduit must enter the DM510 control panel through the supplied entry plug on the bottom right, or bottom, of the cabinet. Any other entry may damage equipment and will void warranty.

Flexible (liquid tight) conduit is to be used at the moisture sensors so that they can be easily removed for servicing.

Component Summary

DMI supplied components and services

Control Panel

DM510 Display panel, Ethernet cable

Sensors

Dryer Master Inlet Moisture sensor
Dryer Master Outlet Moisture sensor
Sample Station (Calibration Push Button)
Air Plenum Temperature Sensor or Temperature Signal Converter
Sensor chute (bypass or inline version)

Other

Relay or Motor speed control interface (optional)
Instrumentation wire (1000')
Printer (optional), power supply and cable,
User Guide
Installation Guide
Commissioning Guide
Laminated Quick Guide
Laminated "What else you should know" Guide

Support

Telephone assistance is available for installation, setup and system support.
The support staff can be reached at 1-888-318-0009.

Customer supplied components and services

Hardware

Connection to the internet via a DHCP enabled router or WAP (wireless access point) for DM-Mobile functionality

Site

Mill work required to install equipment
Equipment Installation
Electrical installation includes running of conduit and pulling of wire
Setup of customer supplied equipment

Miscellaneous

System commissioning (start-up and setup of equipment). Note: phone commissioning assistance from the Dryer Master Support Center is available at 1-888-318-0009.

Dryer Master Moisture Sensors



Note:



It is important that you read all of the installation instructions before proceeding.
The correct operation of the sensor and the Dryer Master depends on the correct installation of the moisture sensors.



Caution!



Welding on or welding near the sensor while it is mounted will void the warranty

Sensor Types

The vast majority of new Dryer Master DM510 installations use the Fin Type moisture sensor at both the inlet and outlet to the dryer. The two sensors provided with a standard system are identical and can be used interchangeably.



Figure 4 - Fin Type moisture sensor

Inlet Moisture Sensor Installation

Sensor Location

The Inlet Sensor should be placed vertically at the inlet to the grain dryer (in or near the garner bin). See Figure 7 - Alternate location for inlet sensor on column dryer and Figure 8 - Installation location for details.

There are two conditions that must be met for the Inlet Sensor to operate correctly.

1. **The Inlet Sensor must be completely covered by compacted grain at all times.**
2. **The Inlet Sensor must also see a good (representative) sample of the grain.**

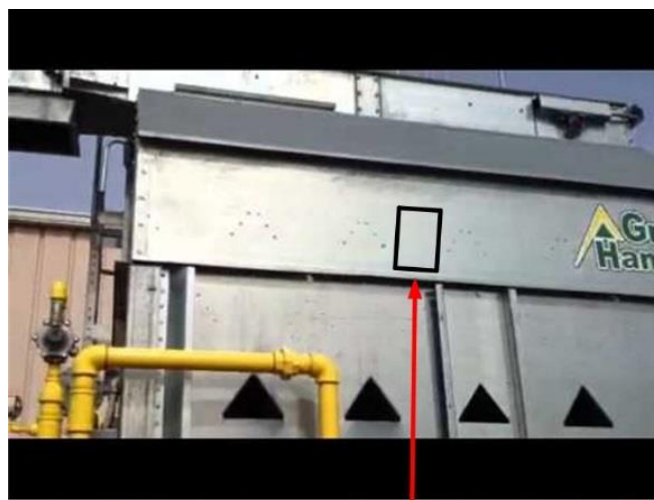
These two conditions are usually met if the Inlet Sensor is located near the centre of the longest vertical side of the garner bin.

However DO NOT locate the Inlet Sensor directly under the inlet spout. Grain that is erratically compacted will dynamically change the relative readings of the inlet sensor contributing to false readings. Inaccurate or false readings of the inlet sensor will adversely affect control of the dryer.

Installation should minimize the probability of steam reaching the sensor. Install the Inlet Sensor at a level above the hot zone higher than the width of the hot zone. For example, if the hot zone is a foot wide leave at least a foot between the hot zone and the sensor. If this is not done, the static pressure in the hot zone can force moisture-laden air past the sensor. Due to the cold state of the sensor, moisture will condense from the air onto the sensor resulting in false readings. Inaccurate or false readings of the inlet sensor will adversely affect control of the dryer.

If the sensor is placed in a location such that it will get an excess of fines or trash this will contribute to errors or false readings. Inaccurate or false readings of the inlet sensor will adversely affect control of the dryer.

Install the Inlet Sensor in a place where water cannot run down the surface of the sensor. In the dryers which have an open top allowing rain to penetrate the grain (or excessive cold) will cause condensation to form on a fin sensor. The sensor needs to be moved to the surge hopper or other more appropriate location.



Install inlet (wet) sensor in vertical wall of roof section at least two ducts away from end wall and as low as possible.

Figure 5 - Sample inlet sensor installation on a Grain Handler dryer

Sensor Installation

**Note:**

Locate the sensor where it is in constant contact with the compacted grain. If the sensor is not in constant contact with compacted grain and becomes empty or becomes partially empty, the DM510 will trigger an alarm condition. The DM510 may (as a result of the alarm) relinquish automatic control.

1. Refer to Figure 7 - Alternate location for inlet sensor on column dryer and Figure 8 - Installation location.
2. Cut an opening through the side of the garner bin the same size or slightly larger than the opening in the mounting plate (Figure 6 - Sensor and mounting plate dimensions) making sure that the completed installation will be level.
3. Weld or bolt the mounting frame to the outside wall of the garner bin to cover the hole such that the sensor can be mounted through the plate without binding.
4. Bolt the Sensor to the mounting frame. Make sure that the sensor is mounted such that the wire entry will be down.

**If you are unsure of where to install the sensor contact the Dryer Master Support Center.
It is preferable to do it right the first time.**

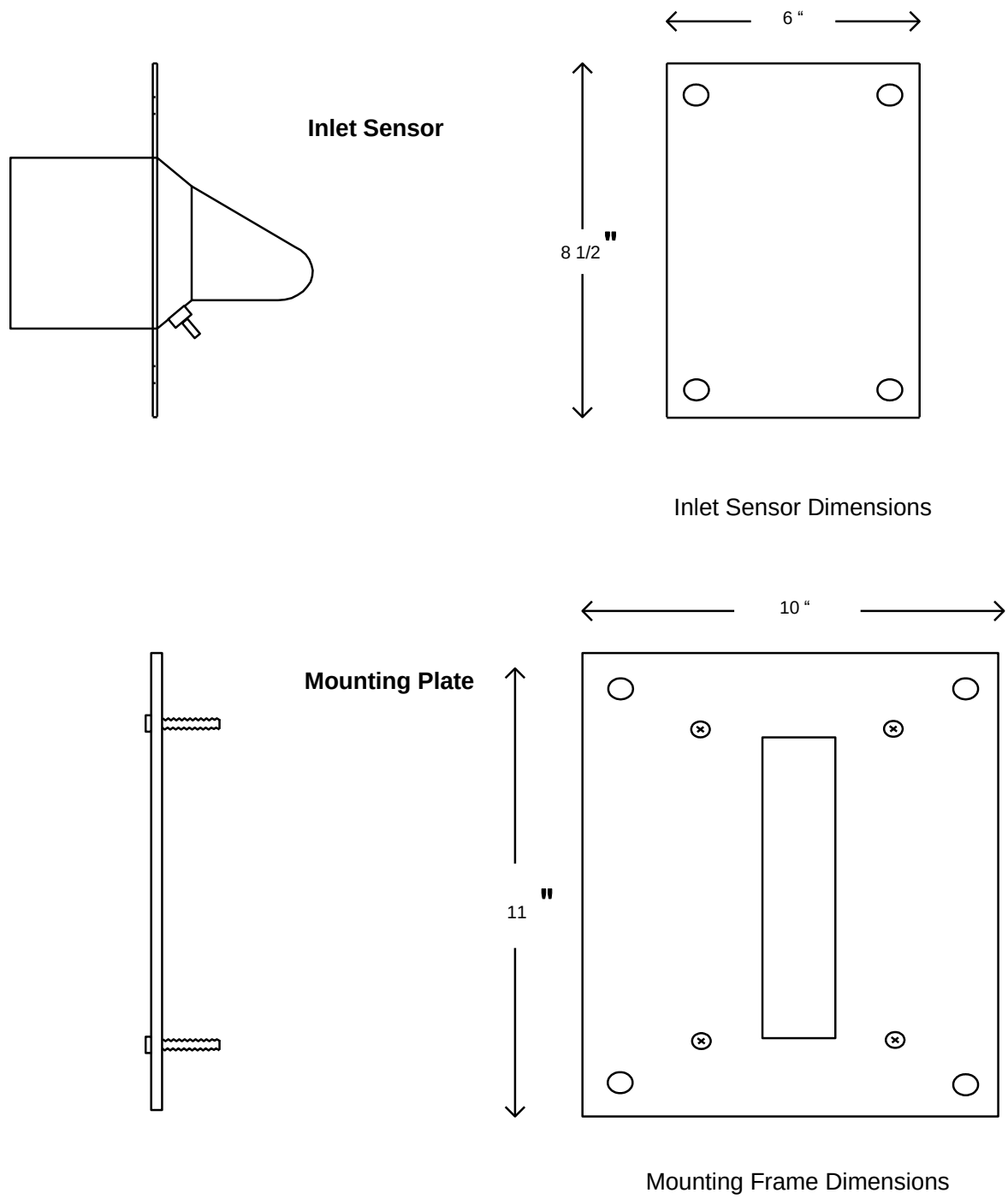


Figure 6 - Sensor and mounting plate dimensions

Additional Sensor Location Diagrams

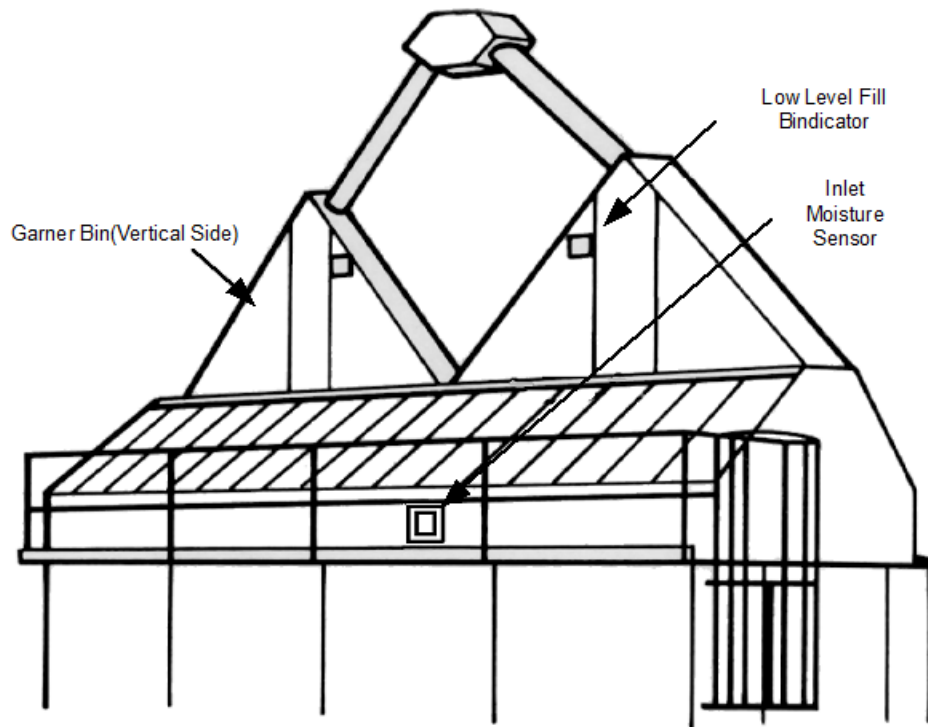


Figure 7 - Alternate location for inlet sensor on column dryer

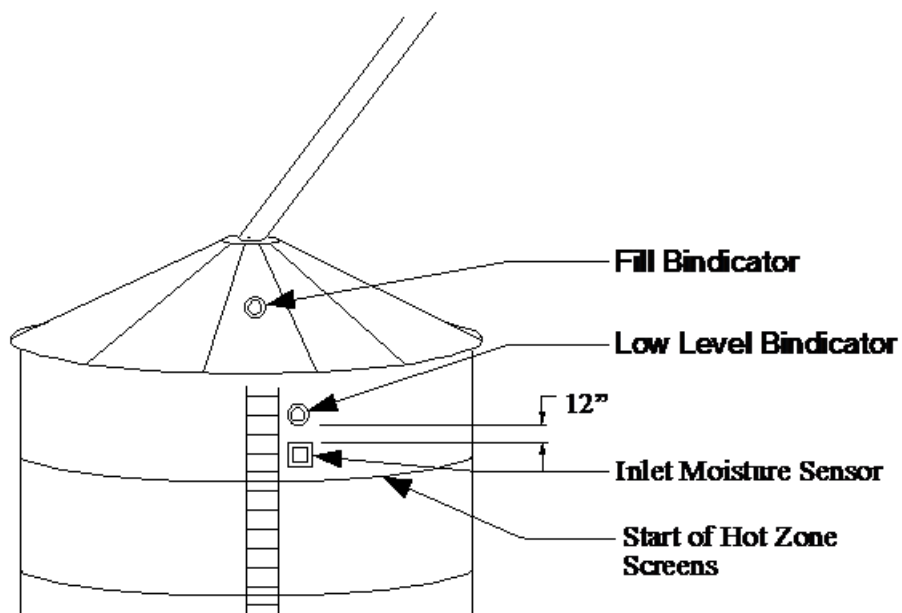


Figure 8 - Installation location for round dryer

Outlet Moisture Sensor Installation

Sensor Types

The standard fin type outlet moisture sensor for new installations is identical to the inlet fin sensor. The two sensors are typically interchangeable.

The standard configuration of the DM510 includes the choice of either a bypass or an inline chute with rotary feed. It is strongly recommended that one of these chutes be employed.

In general, the standard requirements for the outlet sensor are that it be mounted vertically in compacted flowing grain moving at less than 1 inch (2.5 cm) per second. The chutes with rotary feed meet these requirements by metering product past the sensor at a steady rate (at approximately 40-50 bu. per hour.)

Installation requirements are outlined below. If at any time you have questions about the preferred option for installing the outlet sensor contact us at the Dryer Master Support Center.

Outlet sensor mounting requirements:

Any outlet sensor installation needs to fulfill a number of requirements as outlined below (the two versions of the Dryer Master rotary feed chutes are designed to meet these requirements)

1. The chute needs to hold a compacted yet flowing sample of grain (minimum possible airspace between kernels). The chute chamber cross section should be at least 6" by 6" (15.25 cm X 15.25 cm).
2. Sample size needs to be large enough to have statistical relevance.
3. Sensor needs to be mounted in a **vertical** position to minimize the influence of fines on the moisture reading
4. Operator must be able to physically confirm the product flow through the sensor chute
5. Operator needs to be able to sample product at the sensor for calibration purposes
6. Operator should be able to shut the flow of grain off in the sensor chute to service the sensor and/or clear debris
7. Operator should use a metering device to restrict/meter flow.
8. Flow rate must be fast enough to keep the measured sample relevant yet slow enough to ensure product compaction and minimize mechanical wear (less than 1" per second)
9. Sensor chute must remain completely full and overflowing to give consistent readings, even at the lowest unload rate expected in use.
10. When the dryer is off the sensor chute chamber should be empty so that wet product does not remain in contact with the sensor for extended periods. To do this the rotary feed on the sensor should be wired so that it is the last thing to turn off after the dryer discharge stops.

Outlet sensor installation options



Note:



The installation of the outlet sensor is critical. A poorly installed outlet sensor will reduce the effectiveness of the DM510. Locate the sensor where it will stay full. If the sensor becomes empty, incorrect moisture will be recorded, resulting in poor control of the drying process.



Warning:



Welding on or near the sensor while it is mounted will invalidate the warranty

Option 1 By-Pass Method with Rotary Feed Chute – Details

With the bypass method, a portion of the grain leaving the dryer is bypassed from the main stream to where it passes by the sensor and then is returned to the main flow.

The Dryer Master rotary feed bypass chute accomplishes this. The chute requires 16 inches (40.5 cm) of vertical space.

Install the chute so that there will be a continuous flow of grain and the chute will remain full.

Ensure that the grain flowing through the chute is a good representative sample of the grain to be tested. Place the sensor in a location where it will NOT get an excess of fines or trash as this will contribute to errors or false readings. Inaccurate or false readings of the outlet sensor will adversely affect control of the dryer by the Dryer Master.

Locate the Sensor so it can be **safely** accessed for cleaning and taking grain samples.

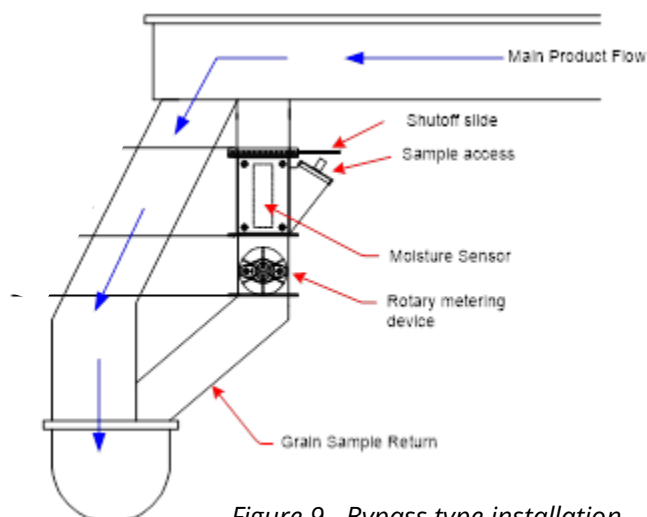


Figure 9 Bypass type installation

Do not cut holes in the Outlet Sensor. Use only the existing wire entry location. Entry at any other location voids the warranty.

Ensure the sensor chute empties completely when shutting down. Make electrical connections such that the chute power is tied to the elevator control circuit. The elevator is typically the last item shut down in the shutdown sequence.

The Bypass Chute

- Dimensions: 18 1/2" L x 8 1/2" W x 16" H (46.3 cm X 21.6 cm X 40.5 cm)
- Upper mounting flange 8 1/2" x 8 1/2" (21.6 cm X 21.6 cm)
- Built in sampling access
- Motor is IP66, 25W, 115VAC single phase, 0.43FLA reversible motor with 180:1 gear reduction (230VAC also available if required)
- The panels for the four sides of the chute are interchangeable and can be mounted in any configuration without impacting flow (but the chute **should be vertical**)

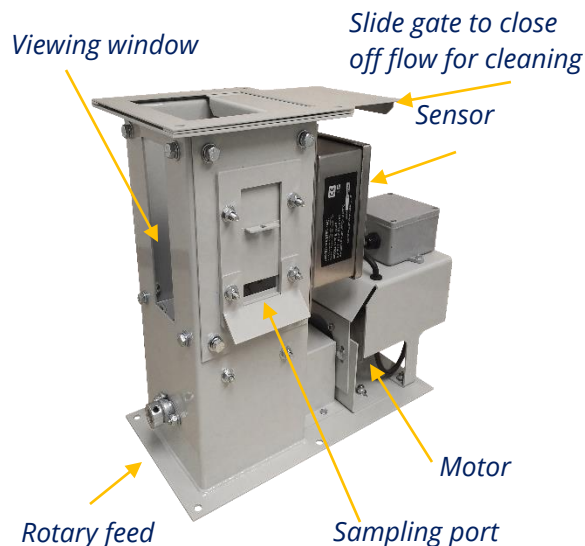


Figure 10 – Outlet Fin in bypass chute

Installation Considerations:

1. There are 4 interchangeable panels for the four sides of the chute assembly (viewing window, sampling port, sensor install, and blank) which can be mounted in any configuration.
2. The calibration button is available mounted on a plate that can be attached directly to the chute.
3. Ideally the sensor housing and chute assembly should be free of grain when the dryer is not running. This avoids having stagnant grain gumming up the assembly.

To do this, the motor for the rotary feed should be wired so that it is the last thing that shuts off after the dryer shuts down. Having the motor turn on and off with the dry conveyor or elevator will usually accomplish this.

4. To ensure proper flow, the transition piece mounted to the bottom of the chute should be the same size as the hole leaving the chute (6"X6" or 15.25 cm X 15.25 cm).

Figure 11 – Calibration button install



Installation Procedure

1. Remove the Outlet Sensor from the 6" square (15.25 cm square) chute before bolting the chute in place.
2. Make the necessary changes to the discharge system of the dryer so that there is room for the chute and rotary feeder.
3. Install the shut off slide gate above the sensor to shut off the flow to the sensor to allow cleaning out and or servicing the sensor.
4. Install bars across the opening to the sensor in the direction of grain flow. This will prevent large objects from entering the sensor.
5. Mount the chute in a vertical position.
6. Bolt the fin sensor back into the chute.
7. Attach the calibration button mounting plate to the bypass chute.



Figure 12 – Example installations of bypass chute with rotary metering

Option 1a - Bypass Using Sampling Auger

The moisture sensor is installed in a by-pass where a portion of the grain is directed through the bypass. The grain flows through the sensor and then back into the system (Figure 13 - By-Pass auger installation). This method is used when there is less than 18" (46 cm) of vertical space at the bottom of the dryer. The fin sensor is installed in a square chute. A small slow-moving auger (30-60 bu./hr.) restricts the flow of grain so the chute remains full of compacted grain at all times.

1. Install the chute so that there will be a continuous flow of grain.
2. Make sure that the chute will always be full of grain.
3. Make sure that the grain flowing through the chute is a good representative sample of the grain to be tested. Place the sensor in a location where it will NOT get an excess of fines or trash which would contribute to errors or false readings. Inaccurate or false readings of the outlet sensor will adversely affect control of the dryer by the Dryer Master.
4. The flow of grain through the chute should be less than one inch per second or less than 60 bu./hr. in a 6" by 6" chute (15.25 cm X 15.25 cm).
5. Locate the Outlet Sensor so it can be safely accessed for cleaning out and taking grain samples.

A four-inch sampling auger is recommended. Several other options are available; see Table 1: Gear reductions for metering devices. All gear reductions given are based on a chute that is six inches by six inches. For the best flow characteristics, it is recommended that the auger be opened to the full width of the chute. This will also reduce transition complexity. Verify the auger flow and gear box required. The table is an approximate guideline.

Metering Device	Approximate rpm	Gear reduction for 1500 rpm motor
6" screw conveyor standard pitch	5.5	270:1
6" screw conveyor ½ pitch	11	135:1
4" screw conveyor standard pitch	17	88:1
4" screw conveyor ½ pitch	39	44:1
4" flex screw conveyor	17	88:1

Table 1: Gear reductions for metering devices

Installation Procedure

1. Remove the Outlet Sensor from the 6" square (15.25 cm square) chute while installing and welding the transitions
2. Make the necessary changes to the discharge system of the dryer so that there is room for the chute, sampling auger and slide gate.
3. Install the slide gate above the sensor to shut off the flow to the sensor to allow cleaning out and/or servicing the sensor
4. Install the Chute and Sensor so the operator can inspect and clean the sensor. It must be possible to do these tasks easily and safely while the dryer is operating.
5. Install bars across the opening to the sensor in the direction of grain flow. This will prevent large objects from entering the sensor.
6. Mount the chute in a vertical position.
7. For greatest sensitivity and accuracy, it is recommended to bolt the chute such that the fin of the sensor will be oriented in the same direction as the shaft of the auger.

8. Run grain through the sampling chute and ensure the grain flows evenly past the fin. Also ensure that the auger is drawing grain from all areas of the chute. The auger has to be at least 6" below the fin to ensure this happens.

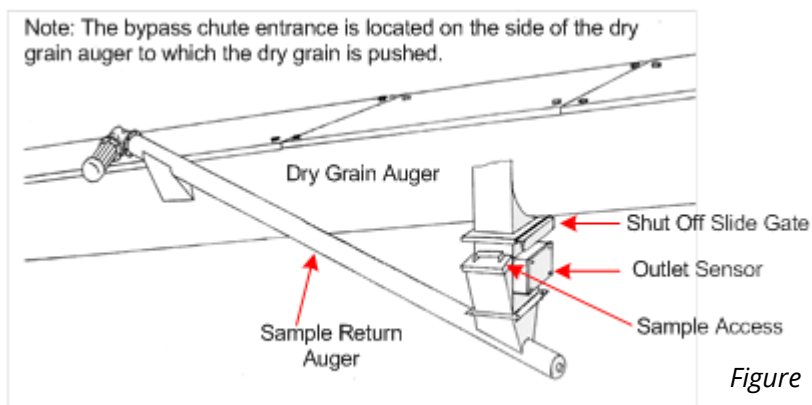


Figure 13 - By-Pass auger installation

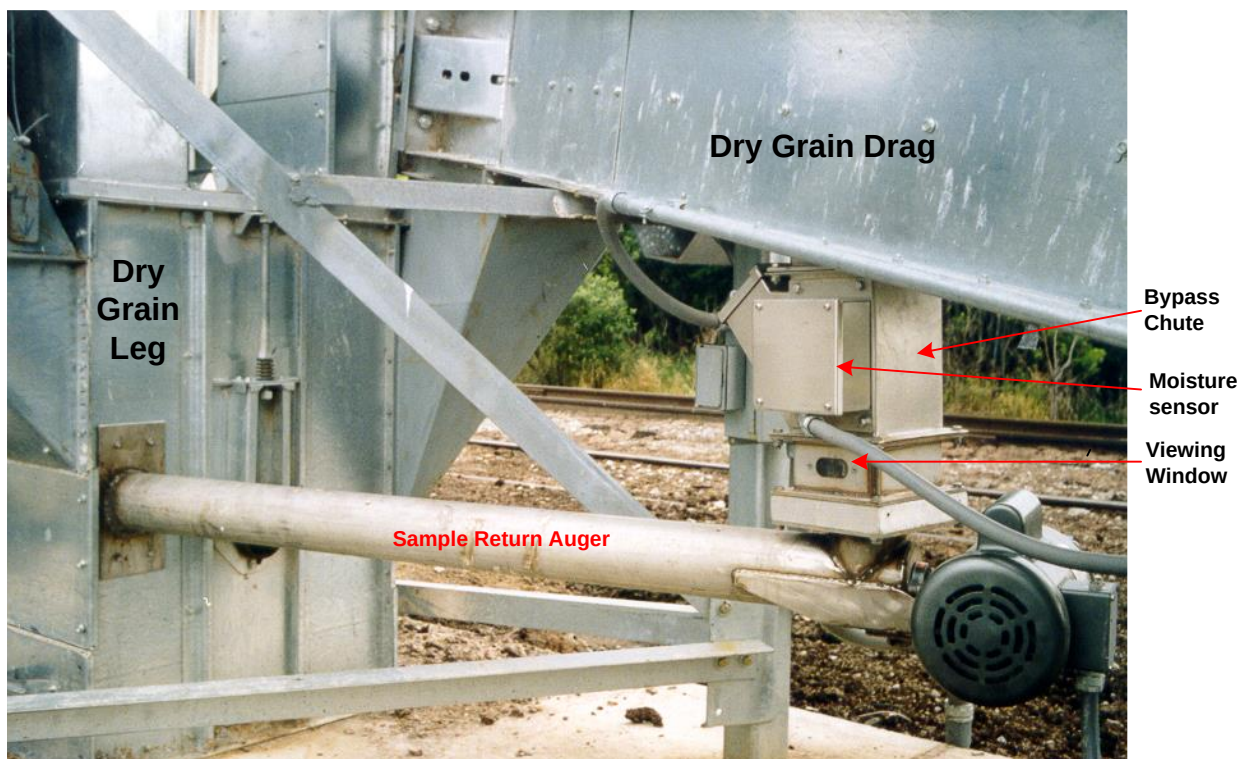


Figure 14 - By-Pass auger installation

Option 2 In-Line Chute Method – Details

The Dryer Master In-Line chute with rotary feed is designed so that the moisture of the grain can be measured without having to divert a portion into a bypass. Some dryer manufacturers can supply a chute that will fit under their dryer to accommodate an outlet fin sensor to get a similar effect. A similar type device can be fabricated on site.



Figure 16 – Inline Chute installation

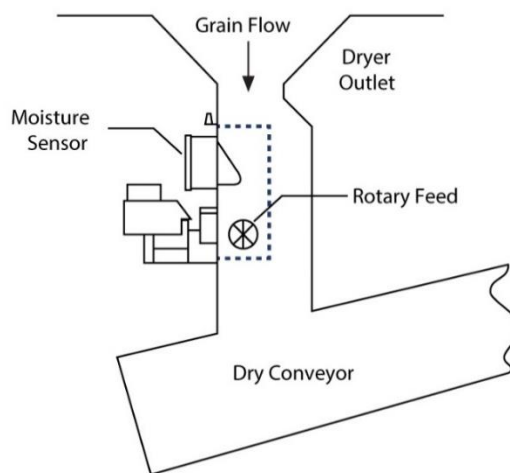


Figure 15 – Inline Chute Graphic

A moisture sensor is installed in a 6" x 6" (15.25 cm X 15.25 cm) chute mounted within a larger chute that handles the full flow of grain from the dryer. The flow through the sensor chute is restricted and metered using a rotary feed. The grain that does not flow through the sensor chute flows past in the main part of the chute. This method requires a minimum of 16" of vertical space not including necessary transitions. Normally the sensor is installed under the dryer between it and the dry grain auger or drag.

Install the Chute and Sensor in a continuous flow of grain and **where the chute will remain full.**

Install the Chute and Sensor so the operator can inspect and clean the sensor. It must be possible to do these tasks easily and **safely** while the dryer is operating.

Installation Procedure

1. If necessary, adjust the discharge system of the dryer so that a chute 16" high by (minimum) 16" square can be installed (Size will depend upon bushels being discharged).
2. Make sure that the centre of the flow of grain is directed at the Sensor's location and will keep the sensor full.
3. Weld or Bolt the main chute to the bottom of the dryer.
4. Create a transition between the bottom of the chute and the dry grain drag or auger.
5. Bolt the Sensor to the outside surface of the frame. (For an example, see Figure 19.)
6. An access is provided for the operator to safely inspect flow and to take samples. To clear an obstruction the sensor or the chute will have to be removed.

Do not cut holes in the outlet sensor. Use only the existing wire entry location. Entry at any other location voids the warranty.

In-Line Chute

The chute is designed to be used in an inline type installation of the outlet moisture sensor. In an inline type installation a portion of the total product flow passes through the 6"X6" chute with the rest flowing over the sides in the larger chute.

- Overall 18 1/4" X 10 1/4" X 18 1/2" (HXWxD) (46.3 cm X 25.4 cm X 47 cm)
- Inside chute 6"X6" (15.25 cm X 15.25 cm)
- Mounting plate is 18 1/4" X 10" (46.3 cm X 25.4 cm)
- Motor is IP66, 25W, 115VAC single phase, 0.43FLA reversible motor with 180:1 gear reduction (230VAC also available)
- Slide gate to close off flow
- Sampling port and viewing window

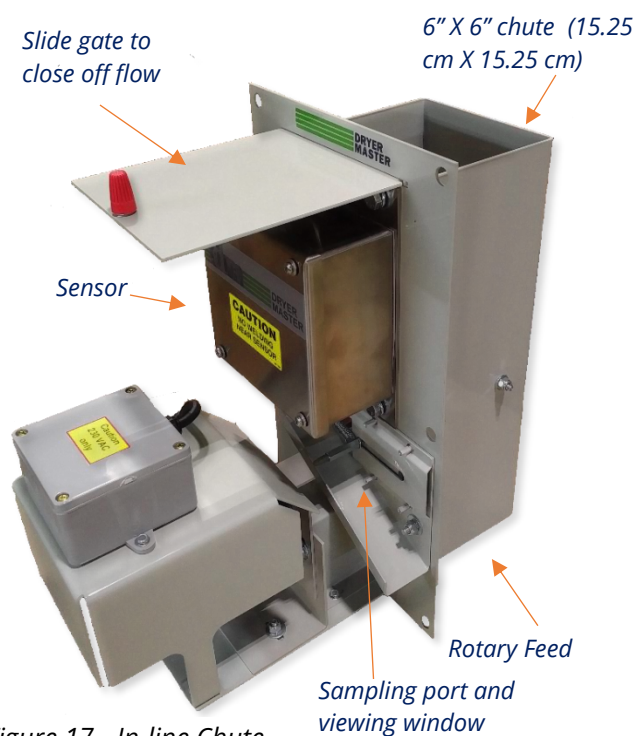


Figure 17 - In-line Chute



Figure 19 - In-line Chute installation example



Figure 18 - In-Line chute in a Zimmerman chute

DM510 Control Panel Installation

Control Panel Location

The DM510 Control Panel must be located in a reasonably well-controlled and secure environment. Use the following guidelines to locate the best position for the DM510 Control Panel where:

- It is protected from the weather. (And is as free from dust as possible if the optional printer is used).
- The ambient temperature during operation will be between 40° and 105°F (5° and 40°C).
- Someone can hear the alarm buzzer.
- The bottom of the display screen (LCD) is slightly above average eye level.
- Locate DM510 in a room where the dryer operators will spend most of their time or will be processing moisture samples.
- If the DM510 is mounted against an uninsulated outside wall, provide ½" (12.7mm) insulating panel (wood).

Control Panel Installation

Refer to Figure 21 – DM510 Control Panel Dimensions while doing the following:

1. Drill all holes and insert ¼" (6mm) bolts with washers into bottom holes. Leave space between washer and wall
2. Slide cut-out slots in bottom mounting tab on Controller under washers
3. Align top holes. Insert screws and washers in top mounting tab, level the box and tighten all screws



Caution

Do not cut holes in the DM510 Control Panel. Cuttings getting inside the panel can cause serious damage. Use only existing wire entry locations. The warranty is void if additional holes are made in the DM510 Control Panel.



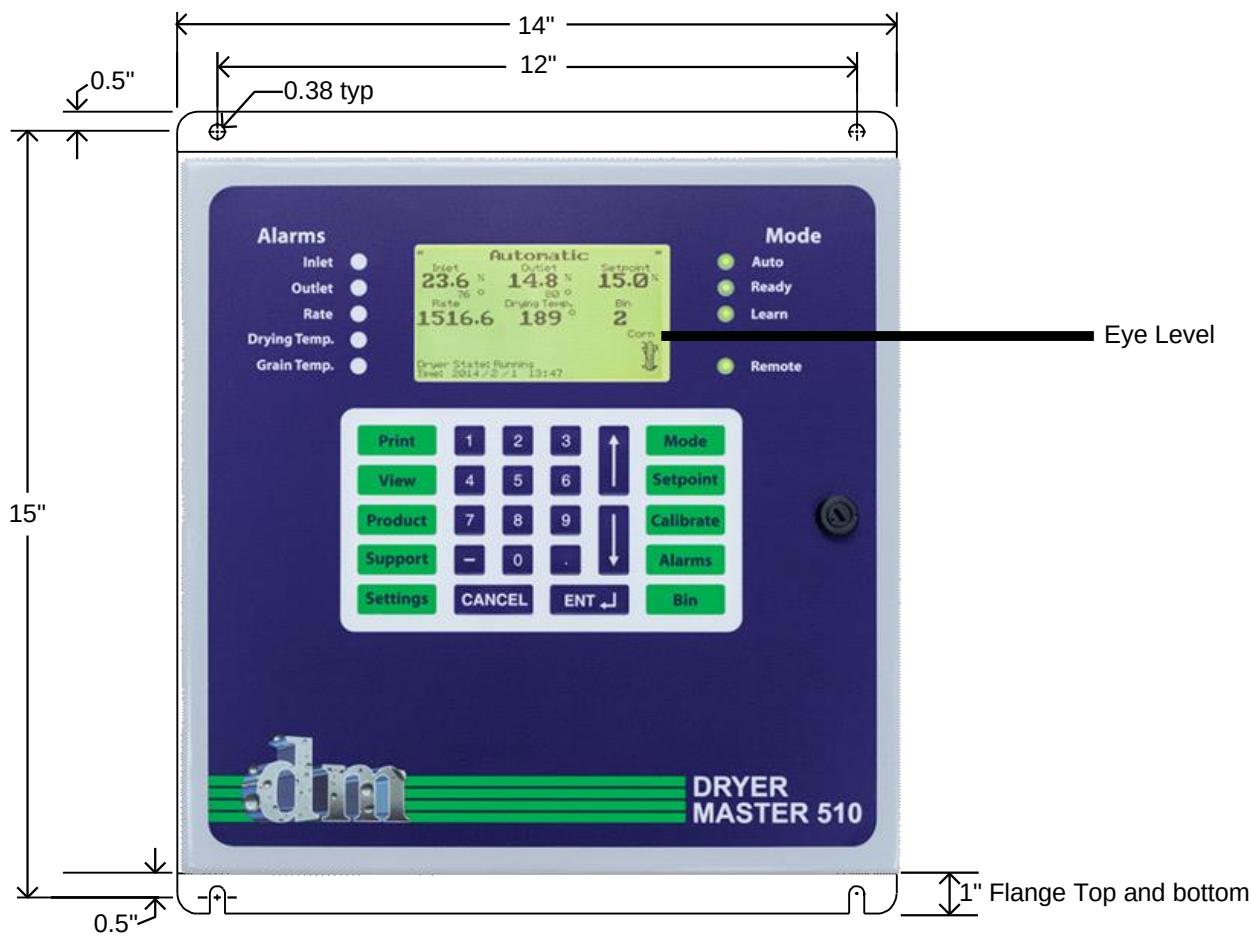


Figure 20 - DM510 Product Dimensions

I/O Panel Installation

The DM510 may be operated with the I/O panel remotely located. Mounting the DM510 I/O panel in a remote enclosure creates a remote I/O panel.

Mount this panel in such a way that:

- The wiring from the sensors can be easily completed without discomfort.
- It is protected from the weather in a NEMA 4 box or in the dryer control panel.
- The ambient temperature during operation will be between 40° and 105°F (5° and 40°C).
- The I/O panel is away from high potential voltage and all unprotected Multi-cables coming in from remote sensors are not near high power cable areas. Or it is physically protected with metal shielding.
- Wiring is done in accordance with local electrical codes and environmental conditions.

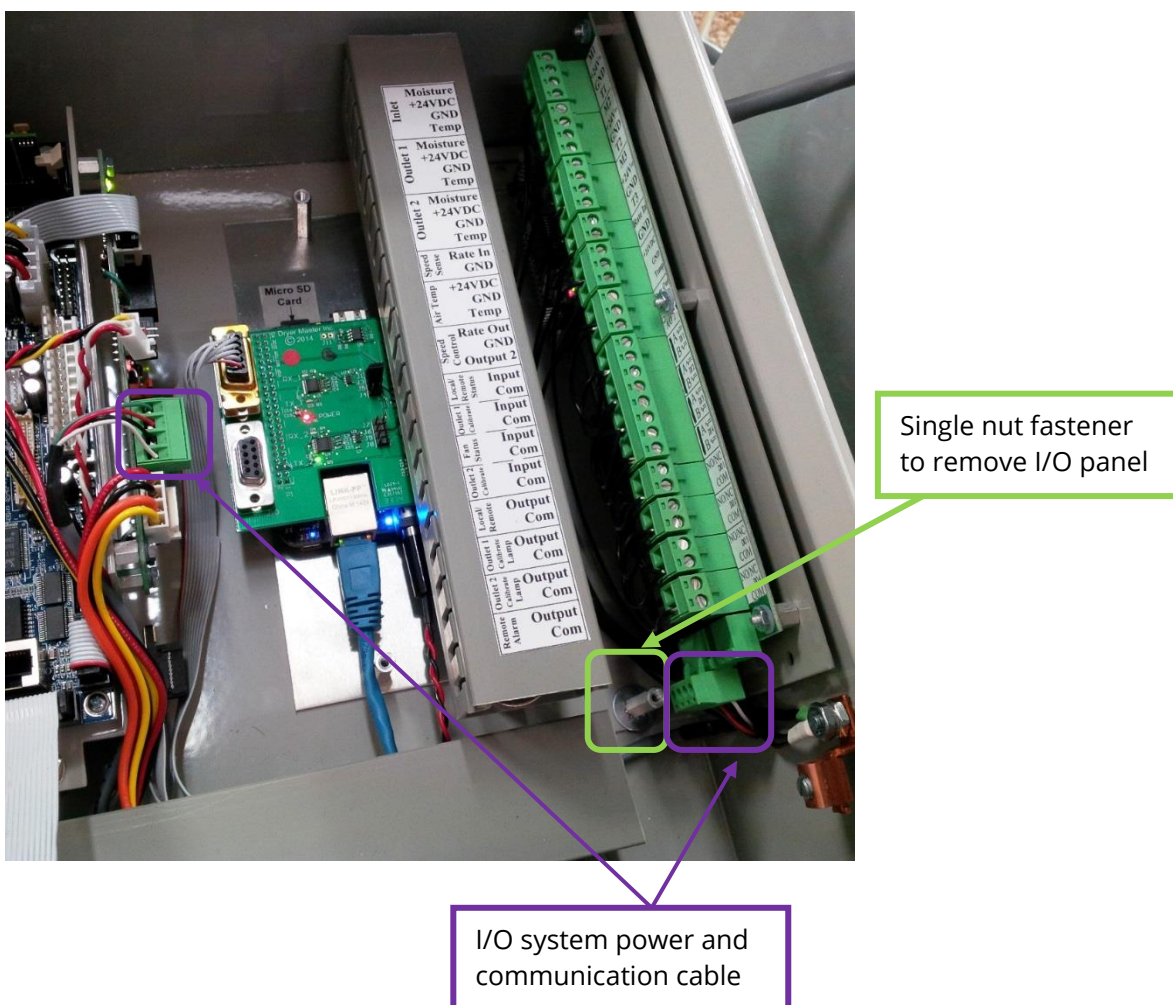


Figure 21 - I/O assembly removal

The cables required between the DM510 and I/O panel are 2 Multi-cables. One for communications, one for a spare and a minimum 16-gauge green ground wire from the DM510 chassis ground to the DM510 I/O Panel chassis ground.

The communication cable is created by removing the connections from the cable present in the DM510, noting the positions. Note the location of the individual conductors (see Figure 21 - I/O assembly removal) Remove the end connectors. Cut two Multi-cables that are long enough to reach between the DM510 and the location of the I/O panel. One will replace the current cable and the second will be a spare. Mark them to identify them from each other. Pull these cables along with a 16 AWG. Green ground wire into the conduit between the DM510 and the I/O panel. Rewire the end connectors as noted below and connect them to the noted location as they were connected in the original configuration. See Figure 22 – Communications Wire Layout for details.

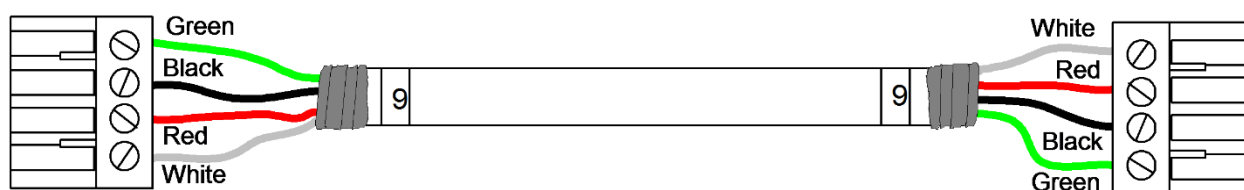


Figure 22 - Communications Wire Layout

Conduit required to house the cables between the DM510 and the I/O panel is $\frac{1}{2}$ ". The wire entry points in the bottom of the DM510 are sized for a $\frac{3}{4}$ " conduit.

Power and Grounding Requirements

**Important:**

All electrical installations must meet local electrical code requirements.

DM510 Control Panel

Power

The DM510 can be powered with 85 to 264 VAC, 47 to 440 Hz or 120 to 370 VDC. The Dryer Master requires less than 175 watts that should be provided with a dedicated, isolated grounded circuit.

Grounding AC Power

The DM510 must be provided with a good earth ground. It is recommended that a UPS (Uninterruptible Power Supply) be used for best surge and lightning protection. An isolated ground connected directly into the control panel will assure the equipment is grounded even if it is unplugged. **Damage caused by electrical surges and lightning are not warrantied.**

System Grounding Configuration

**Note:**

Although the information in this section is provided in an attempt to reduce damage to the Dryer Master due to lightning strikes, it will not necessarily eliminate all lightning damage.

A typical electrical installation includes a number of electrical devices or equipment each with its own ground connection. The relationship between these ground connections will affect the overall performance of the system especially during a transient event such as lightning strikes.

Star Point Grounding

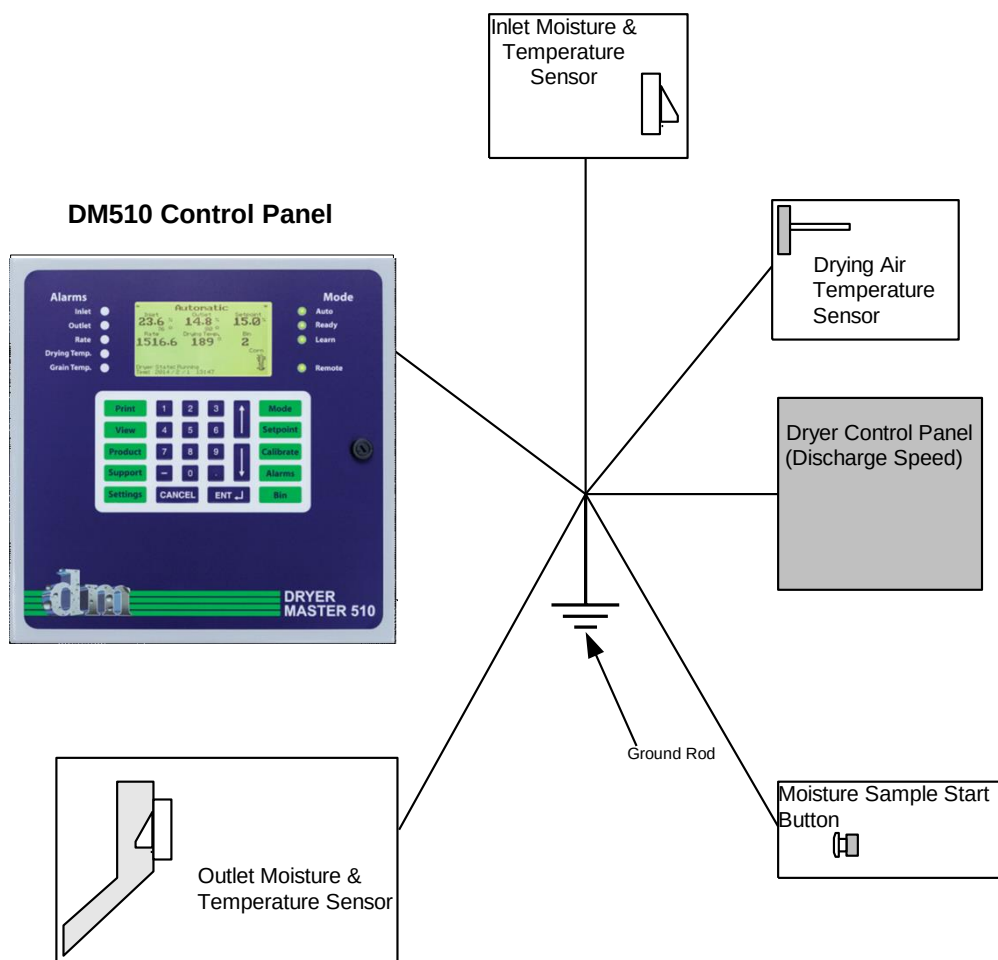


Figure 23 - Star Point Grounding System

If all the devices in an electrical system are connected to a common point from which a cable runs to ground, the result is a star-point earth ground system. This is illustrated in Figure 23 - Star Point Grounding. For simplicity, only the ground wiring is shown and not other wiring that normally interconnects the devices.

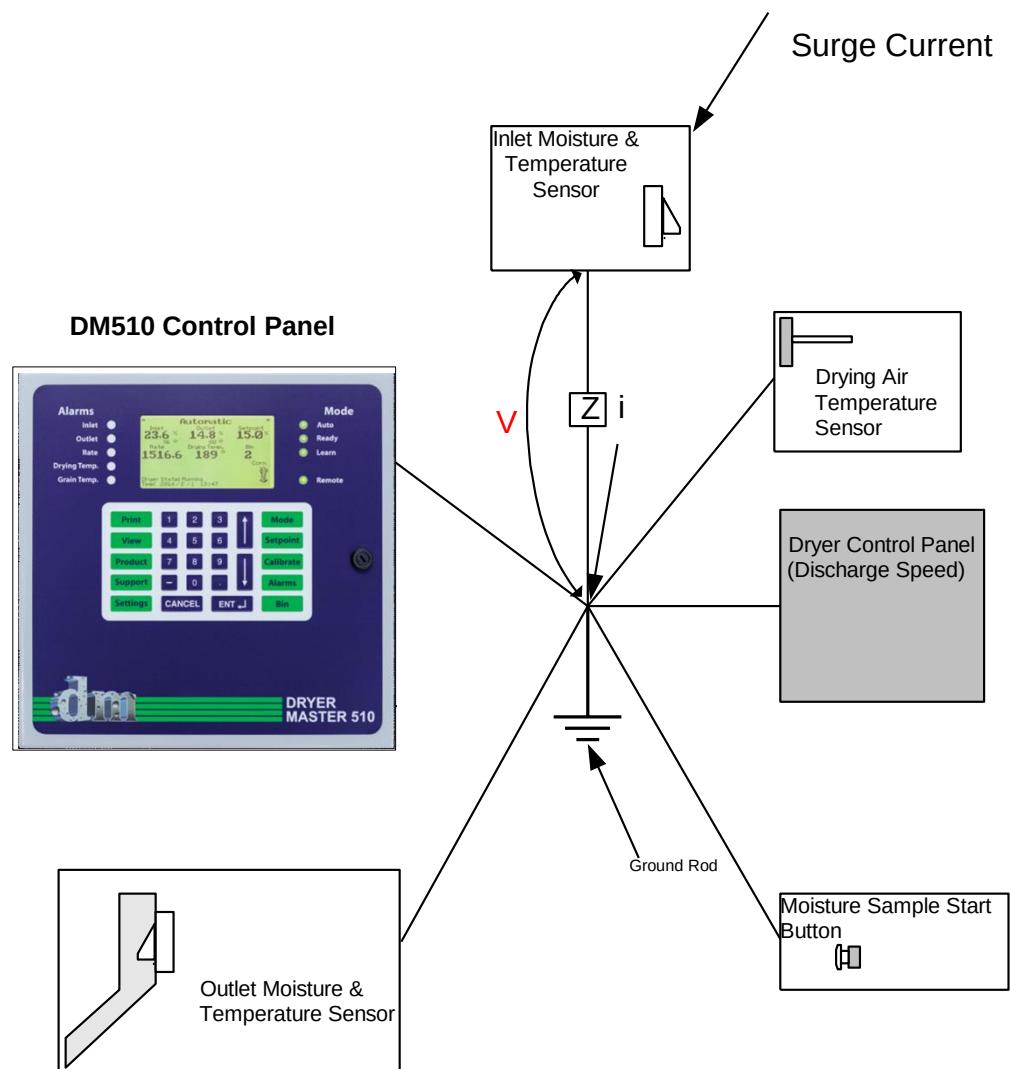


Figure 24 - Effects of surge current in a Star Point ground system

The purpose of any ground system is to keep all connected equipment at the same ground potential. Figure 24 - Effects of surge current in a Star Point ground system illustrates the effect of a surge event in one of the connected devices. The current flow (i) induces a voltage across the ground conductor (V) between the device and the star connection. This voltage potential will be impressed on all devices connected to the star but will be small in magnitude in a well-designed system. A larger voltage will be seen on the conductor between the star connection and the earth ground connection but will have little consequence on the connected equipment as each device will see an equal rise in ground potential. This limits current conduction through sensitive equipment due to differences in ground potential.

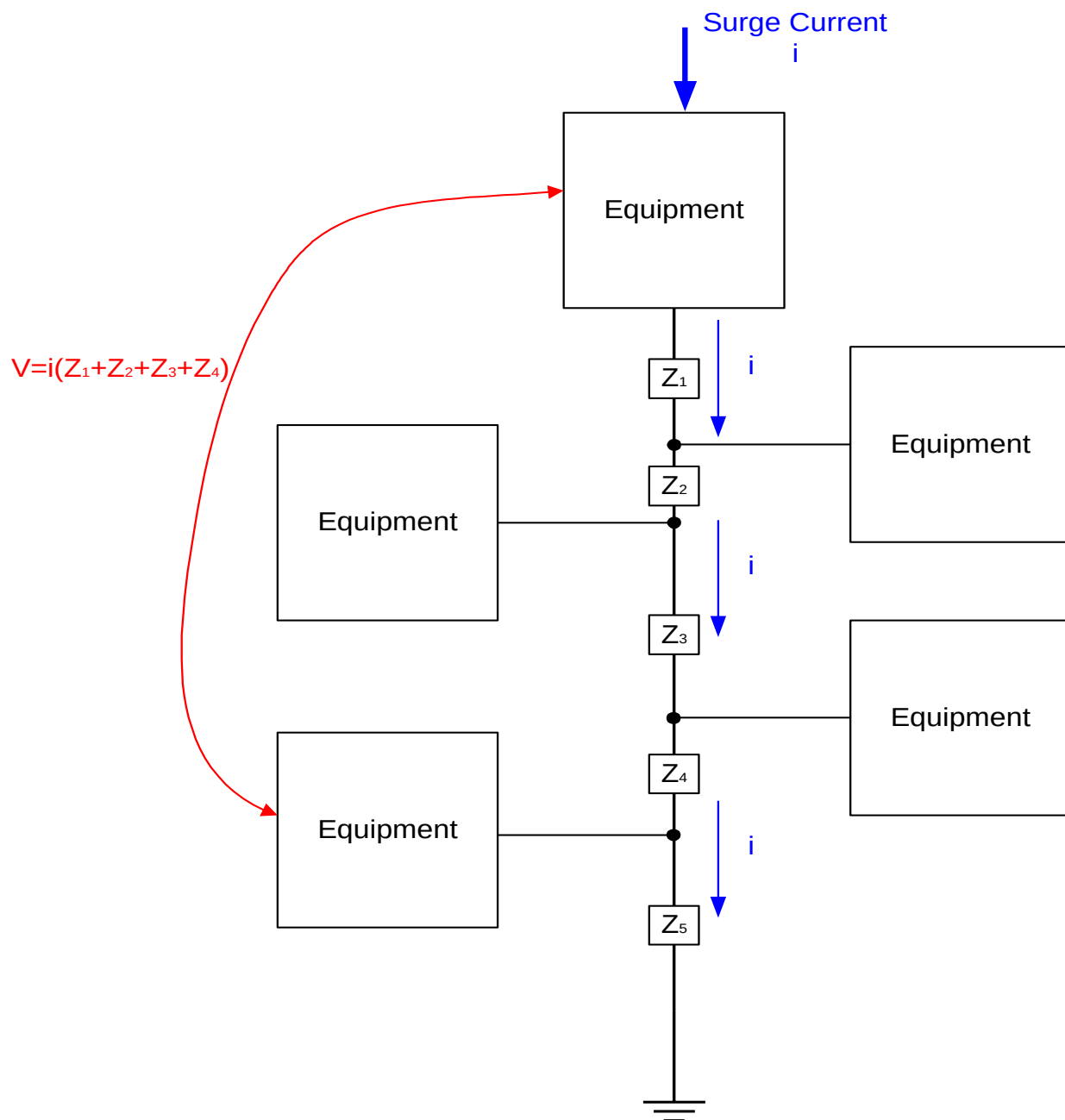


Figure 25 - Effects of surge current in a conventional ground system

When ground connections are made at various points along a ground conductor the effect is much different. Figure 25 - Effects of surge current in a conventional ground system illustrates that current flow in the ground wiring results in increasing differences in ground potential in each piece of equipment connected downstream from the surge event. The result can be current flow between devices as a result of a difference in ground potential.

The conclusion is that ground system configuration plays an important role in surge protection. Therefore, Dryer Master installations must attempt to minimize the effects of improper grounding by ideally installing the grounds as a star-point system.

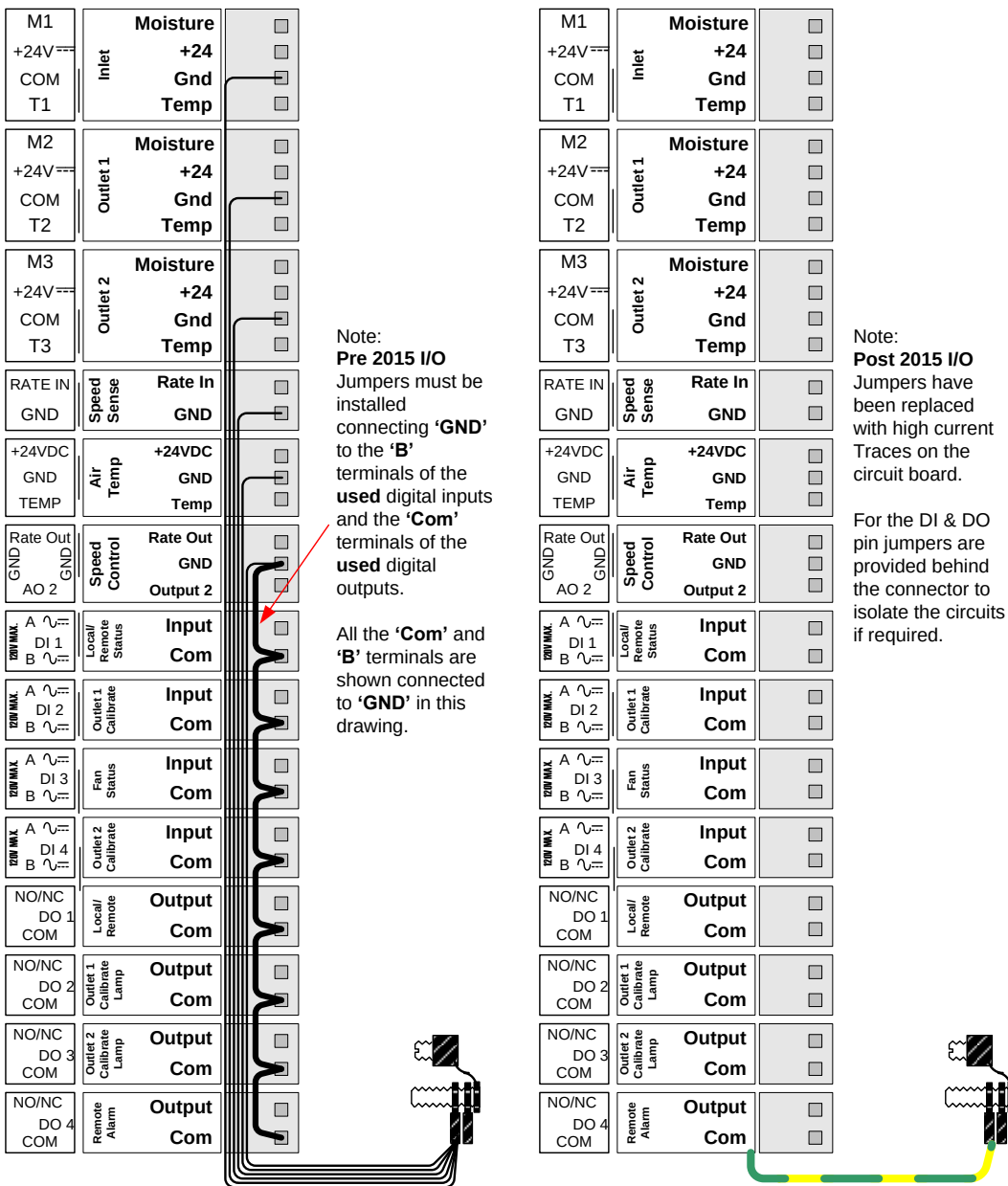


Figure 26 - Dryer Master internal grounding

Figure 26 - Dryer Master internal grounding shows the internal grounding that is installed in the DM510. This is done to enhance the grounding capabilities by connecting the ground wires that power the remote sensors to the ground lug in the DM510 chassis. It is important that these wires remain in place along with the new wires placed at these locations during the installation process. These wires provide an extra path for surge current to dissipate.

Moisture Sensors

Power

The low voltage power required by the moisture sensors is supplied by the DM510.

Grounding

The sensors require a good ground to function dependably. Run a minimum 16-gauge green ground wire from each sensor chassis ground to the DM510 I/O Panel. These grounds should be connected to the green ground wire located in the vertical wire channel beside the I/O assembly.

AC Motor Speed Control Interface

Most AC Motor Speed Controls can provide a 0-5V or 0-10V output for speed monitoring and a 0-10V input for remote speed control. These signals are normally isolated and can be connected directly to the DM510 Control Panel. Refer to the motor speed control manufacturer's manual for details.

Local/Remote Control

A 24V relay is required to switch between the local control signal and the DM510 speed input.

DC Motor Speed Control Interface

Discharge Rate Monitoring

The Motor Speed Control Interface converts the 0 to 90/180 VDC output from the motor speed control to an isolated 0 to 5 V signal for the DM510 Discharge Rate Sense input.



Note:



This method is used for non-isolated DC speed controls only.

Discharge Rate Control

The Motor Speed Control Interface converts the 0 to 10 VDC grounded signal supplied by the DM510 Control Panel to an isolated 0 to 10 V signal to remotely set the customer's motor speed control. The existing speed dial on the dryer motor controller must operate between 0 and 10 volts maximum.

Local/Remote Control

The Motor Speed Control Interface provides local/remote switching facility that can disconnect the manual speed dial on the dryer and allow the DM510 to control the discharge rate. Power for this purpose is provided from the DM510 Control Panel.

Control Wiring Requirements

**Note:**

All electrical installations must meet local electrical code requirements



Motor Controller and Ground Wiring Specifications

Use approved wire meeting local electrical code requirements between the Motor Speed Control Interface and the motor speed controller. 16-gauge wire is sufficient for all ground wires.

Multi-Cable Specifications

One multi-cable with the following specifications is required between each sensor and the DM510 Control Panel. See below for details.

- Two-pair shielded, minimum 22 AWG (.644 mm or 23 SWG) stranded tinned copper conductors and drain wire (e.g. Beldon #8723).
- PVC jacket rated for 140°F (60°C). The Dryer Master supplied wire is rated to 105°C.
- Colour code: black, red, green, white (recommended).
- In areas where the temperature will exceed 140°F, use a wire with a higher jacket rating (e.g. Beldon #88723).

**Caution**

All multi-cable must be run in areas where the maximum temperature does not exceed 105°C (220°F). Use Teflon coated wires in areas that exceed this limit.

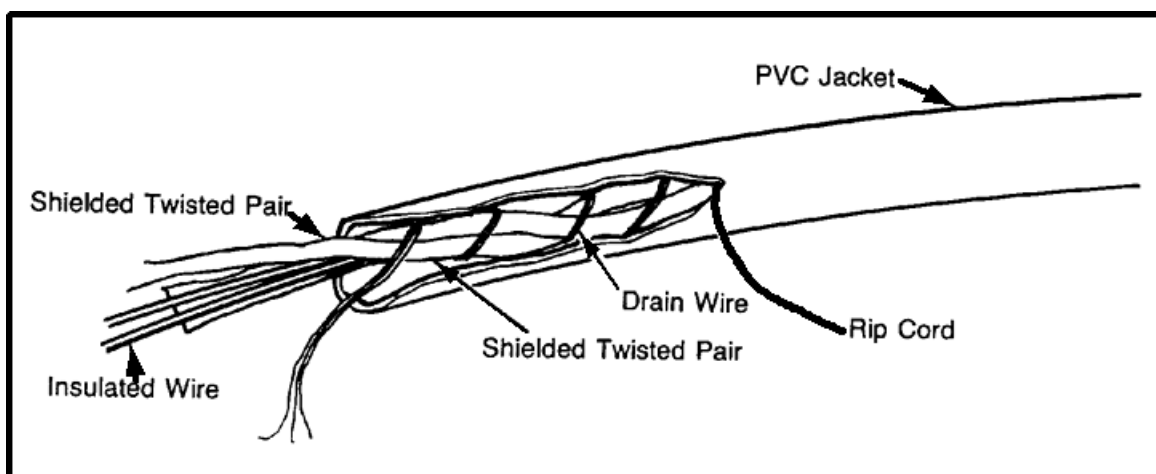


Figure 27 – Multi-Cable Diagram

Typical System Multi-Cable Requirements

See Figure 28 - Wire placement for a list of the multi-cable requirements and wire placement for a DM510 system with ALL options. To accommodate this number of cables (10 cables at .170" or 4.318 mm diameter) a $\frac{3}{4}$ ", 19.05mm conduit is required. There are two cable entry locations at the bottom right hand side of the cabinet sized for a $\frac{3}{4}$ ", 19.05mm conduit for ease of installation. See Figure 29 - Wire Entry Locations

Number	Quantity	From	To
1	1 Multi-Cable + 1 ground	Inlet Moisture Sensor	DM510 Control Panel
2	1 Multi-Cable + 1 ground	Outlet Moisture Sensor	DM510 Control Panel
3	1 Multi-Cable	Remote Calibration Button	DM510 Control Panel
4	1 Multi-Cables	Drying Air Temperature Sensor	DM510 Control Panel
5 and 6	2 Multi-Cables + 1 ground	Motor Speed Control Interface and Local/Remote Status	DM510 Control Panel
7	1 Multi-Cable	Fan Status (optional)	DM510 Control Panel
8	1 Multi-Cable	Spare	DM510 Control Panel
9	1 Multi-Cable	Remote alarm (optional)	DM510 Control Panel
10 and 11	2 Multi-Cable	I/O Panel	DM510 Control Panel

Figure 28 - Wire placement

1 If your system came with a supplied drying air temperature sensor (Figure 29 - Air Plenum Temperature Sensor) install it near the existing temperature sensor and use the included High Temperature Teflon coated wire. If your system came with a signal converter (Figure 30 - Temperature Signal Converter) install the signal converter as per the instructions in Appendix 2.

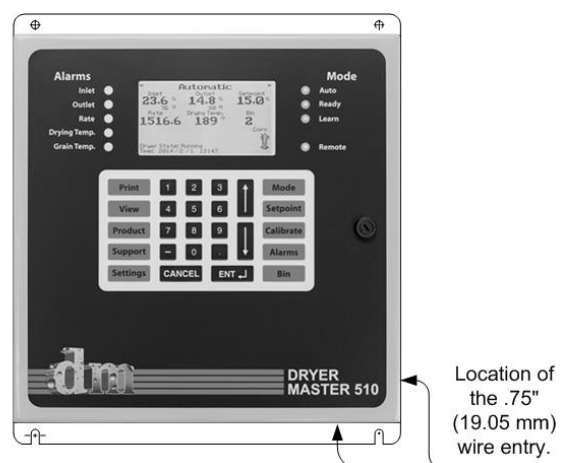


Figure 29 - Wire Entry Locations

Installing Conduit and Pulling Wires

It is recommended that you use metal conduit for electrical noise shielding and mechanical protection although approved cable tray is also acceptable. A $\frac{3}{4}$ ", 19.05mm conduit is adequate for the number of wires required (10 cables at .170" or 4.318 mm diameter). Refer to Figure 1- Installation Schematic – DM510 w/ Integrated I/O and APT sensor for typical conduit layout. When installing the conduit, follow these guidelines:

- Install all wiring in accordance with local electrical codes and environmental conditions.
- Tag each wire with the same number at each end (See figure 11). This will aid with identifying the routing and connections during installation and service.
- Install the conduit into the DM510 Control Panel through the supplied entry plug. See Figure 29 - Wire Entry Locations



Caution Warranty Information



Entry through any other way voids the warranty, and may allow condensation from the conduit to drip into the DM510 Control Panel, or metal shavings may cause a short circuit on the DM510 system board

Remember that it is easy to damage Multi-Cable when pulling into a conduit. Careful installation when doing this will save time and money.

When cutting Multi-Cable and placing it in the conduit, allow:

- An extra 24" (75 cm) at the DM510 Control Panel end
- An extra 12" (30 cm) at the Sensor end

It is recommended that you install a spare Multi-Cable for future upgrades and options.



Caution



Do not place Multi-Cables in any conduit that is carrying electrical power. Do not run unprotected Multi-Cable in or near high power cable areas.

Wiring Instructions (Cable Terminations)

Tools Required

You will need the following tools to prepare and terminate the Multi-Cable:

- Wire Strippers
- Cable Strippers
- Side Cutters
- Small needle nose pliers
- Crimping tool for insulated connectors
- Small screwdriver 1/8" (3mm)

General Wiring Procedure

The following steps demonstrate how to prepare the Multi-Cable without causing damage to the individual conductors.

1. At the DM510 Control Panel end, cut all Multi-Cables so that each will reach 3" (7 cm) past the furthest connector on the interface board making sure that all the wire numbers are placed such that they will be visible for reference.
2. Use the wire strippers to remove ½" of the PVC outer jacket and expose the ripcord (if the cable is so equipped). Use the needle nose pliers to pull ripcord so the desired length of wire is exposed. Cut off the original ½" of the cable as it may have been nicked when the PVC jacket was removed and could cause problems at a later date.
3. Remove the insulation using cable strippers. The use of a knife is not recommended because of the risk of damaging the insulation of the conductors.
4. Use the side cutters to trim the jacket, ripcord and foil shield. **DO NOT CUT OFF THE DRAIN WIRE** at the DM510 Control Panel end. Use the side cutters to cut the rest of the wires to a uniform length.
5. When all wiring has been completed, join all the drain wires together at the DM510 Control Panel end. The shields should be connected to the grounding pigtail provided in the vertical cable tray located beside the I/O board within the DM510 cabinet. Only one end of the shield wire is to be connected to ground. Connect all these wires to the ground wire provided by the DM510 Control Panel.

Overview: Typical DM510 wiring connections:

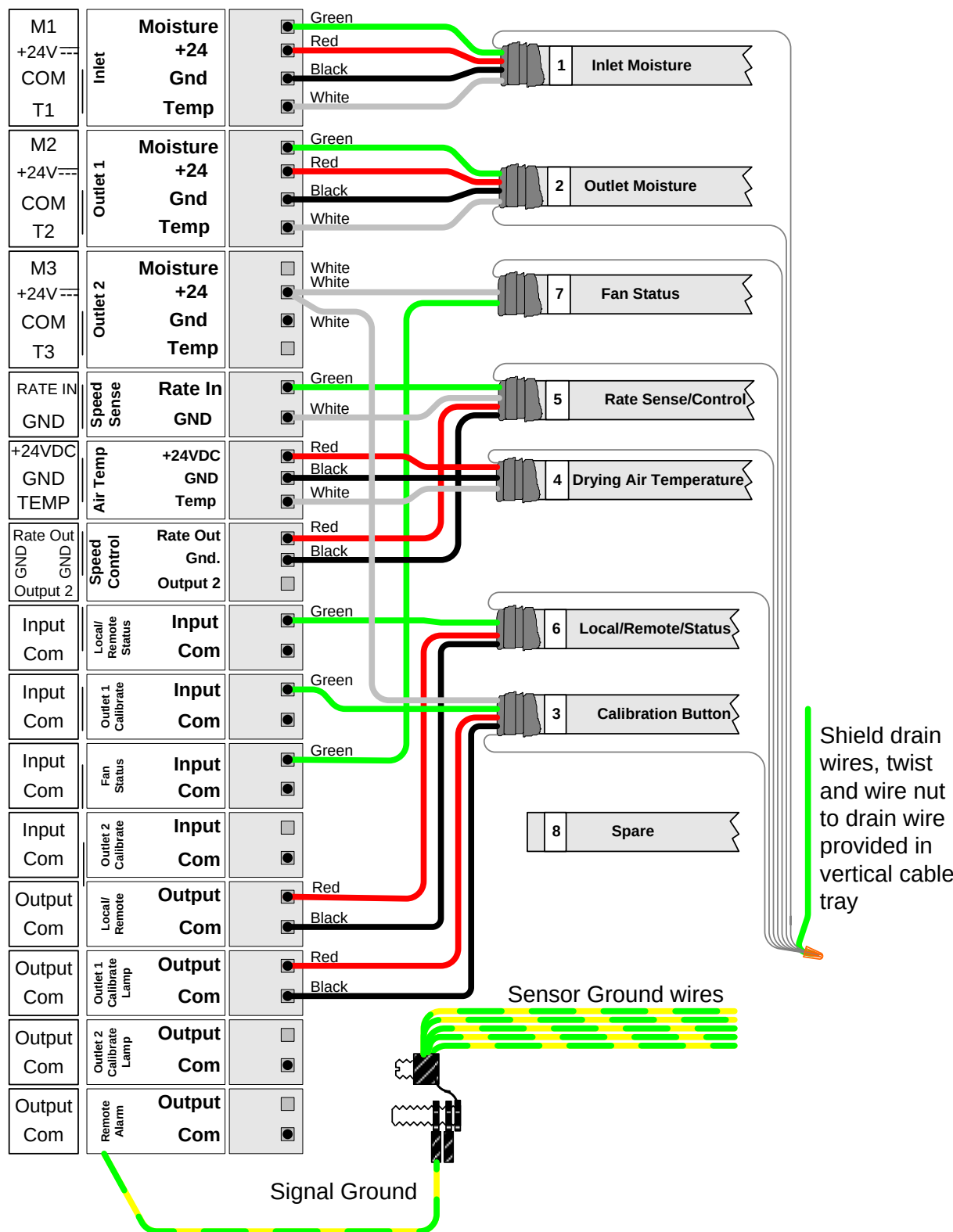


Figure 30 - DM510 typical wiring connections

Moisture Sensors Wiring Instructions



Important



During the following procedures, the drain must be grounded at the DM510 I/O Panel and isolated from the ground at the field end.

While wiring the sensors refer to Figure 32 - Sensor hook-up schematic. Both the Inlet and Outlet Moisture Sensor Multi-Cables should be wired as follows:

The Moisture Sensor End

1. Follow the instructions given in the section "General Wiring Procedure" to strip the PVC jacket and expose 4" (10 cm) of wire.
2. Cut off the foil shield and the drain wire at the sensor end of the cable.
3. Tape over the exposed ends of the foil shield and drain wire so that they are insulated from contact with the metal work and the circuit board.
4. Strip ½" (7mm) and twist (colour to colour) and crimp to the wires exposed in the moisture sensor using the crimp connectors provided in the sensor.
5. Join the ground wire in the moisture sensor to the ground wire from the DM510 Control Panel using a wire nut.

The DM510 Control Panel End

1. The Multi-Cables from the Moisture Sensors connect to the DM510 Control Panel termination. Attach them using the connectors as indicated in Figure 31 - Sensor hook-up physical
2. Connect the Multi-Cable drain wire and the 18-gauge ground wire from the Moisture Sensors to the ground wire in the DM510 Control Panel.

Notes:

Sensor Signal specification

Red	= 18 to 28 VDC, 20mA
Black	= Signal return & DC GND.
Green	= Moisture signal
White	= Temperature signal

Maximum Wire length DM510 to sensor = 300 meters, 1000 feet. Additional lightning protection is recommended when exceeding 60 meters, 200 feet.

DM510 Control Panel

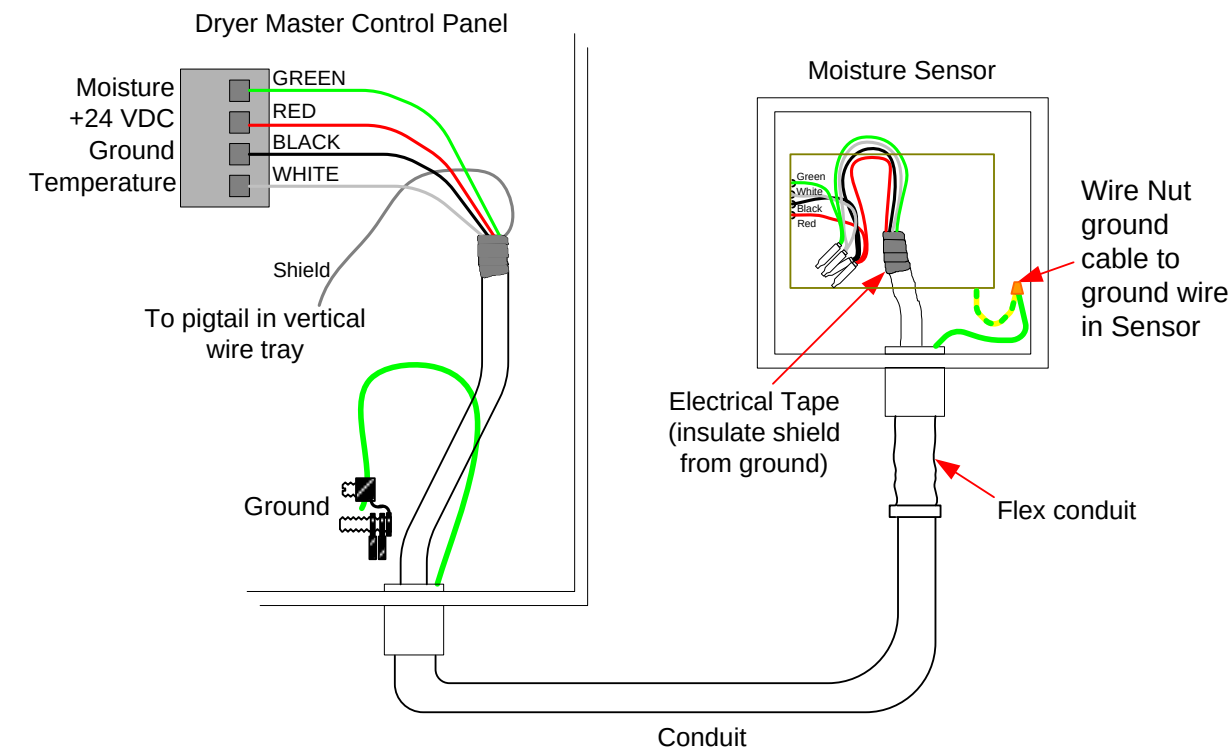


Figure 31 - Sensor hook-up physical

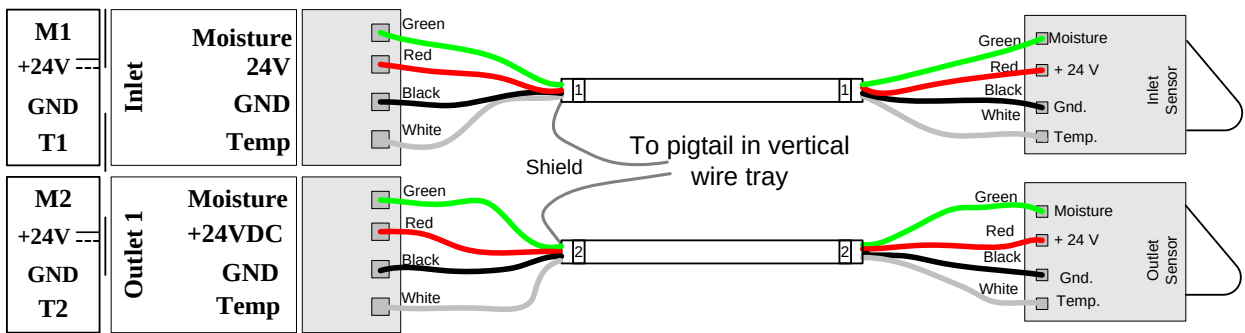


Figure 32 - Sensor hook-up schematic

I/O board Jumper locations and functions

These jumpers are found on the I/O board next to the terminal connections. These jumpers are in the correct position by default. No adjustments are required for standard configurations.



Figure 33 – I/O board jumper location

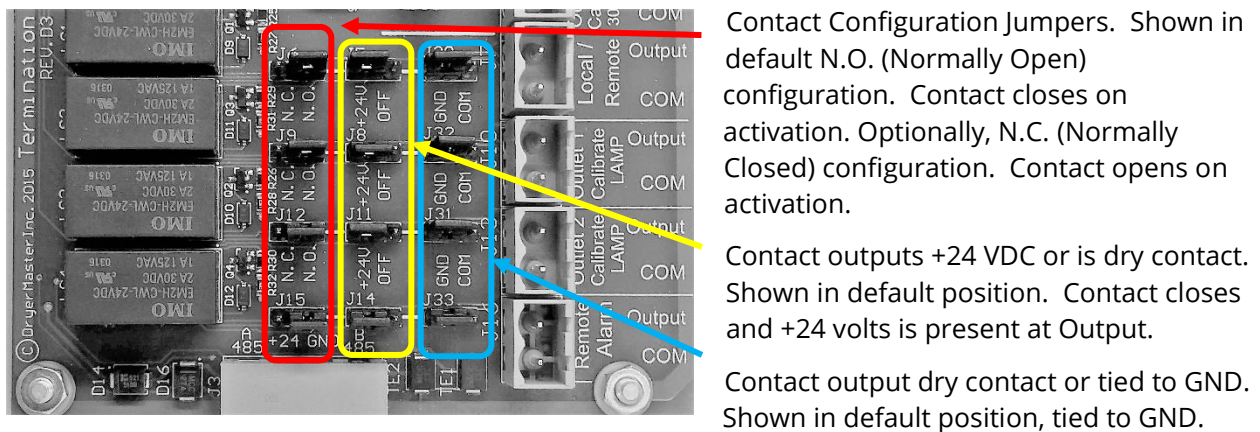


Figure 34 – I/O board Digital Out jumper configuration description.

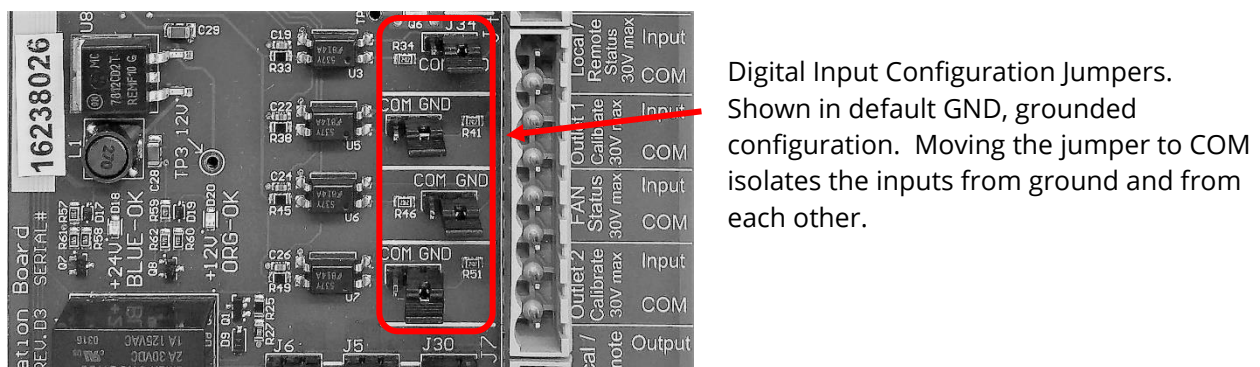
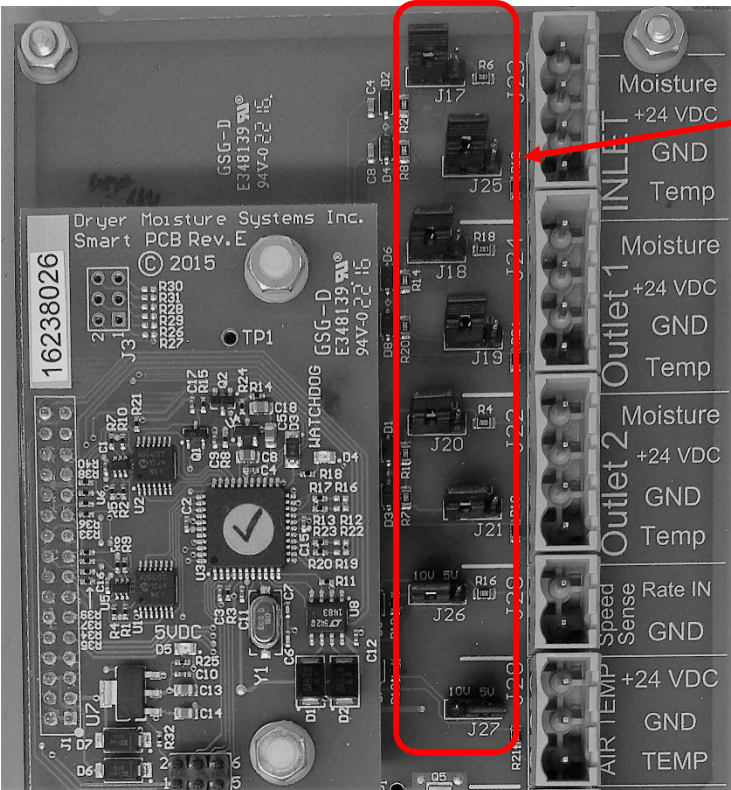


Figure 35 – I/O board Digital Input jumper configuration description.



Analog Input Configuration Jumpers. Shown in default 10V position for the first 7 channels. Channel 8 the temperature channel is in the 5V position by default.

Figure 36 – I/O board Analog Input jumper configuration description.

Motor Speed Control Interface Wiring Instructions (for DC drives)

Note: Dryers with discharge systems powered by DC motors may have speed controls where the speed signals and potentiometer signals are live to power. These systems make use of the Dryer Moisture Systems Inc. Motor Speed Control Interface to isolate the speed control signals.

If the Dryer Master Motor Speed Control Interface is used, it should be mounted near the motor speed control for the dryer. The dimensions of the interface are 3" x 5". It is usually mounted inside the dryer's control panel. Make sure that the installation is in a dry, weather-tight area.

DC Motor Speed Control Interface

Local/Remote Control

The Local/Remote Control allows the DM510 Control Panel to initiate switching of the motor speed control between local speed pot and the DM510 Control Panel. Below is a list of the multi-cable requirements for a DM510 system with ALL options.

Connections from DM510 to Motor Speed Control Interface:

Function	From: DM510		To: Motor Speed Control Interface	
Local/Remote Relay	DM510 Local/Remote	Output	MSC Interface T3	Local/Remote
Local/Remote Relay	DM510 Outlet 2	GND	MSC Interface T4	Local/Remote
Rate Sense	DM510 Speed Sense	Rate In.	MSC Interface T1	Rate Sense
Rate Sense	DM510 Speed Sense	GND.	MSC Interface T2	Rate Sense
Rate Control	DM510 Speed Control	Rate Out	MSC Interface T5	Rate Control
Rate Control	DM510 Speed Control	GND	MSC Interface T6	Rate Control

Figure 37- DM510 to MSC Interface

The DM510 Speed Sense must be set to 0-5 VDC or 0-10 VDC depending what is being sent from the Dryers speed control. Most frequency drives output 0-10 volts as a speed signal. Changing the range is accomplished by placing the jumper on J26. Shorting pins 1 and 2 selects a 0-5 volt range while shorting pins 2 and 3 selects a 0-10 volt range. The default is 0-10 volt range.

The Local/Remote output must be set for 24 VDC, NO output. Placing the jumpers on J5 and J6 does this. Shorting pins 1 and 2 of J5 will give the 24 VDC while shorting pins 2 and 3 of J6 gives the NO condition.

DM510 to Motor Speed Control Interface Wiring

Dryer Master DM510

MOTOR SPEED CONTROL INTERFACE

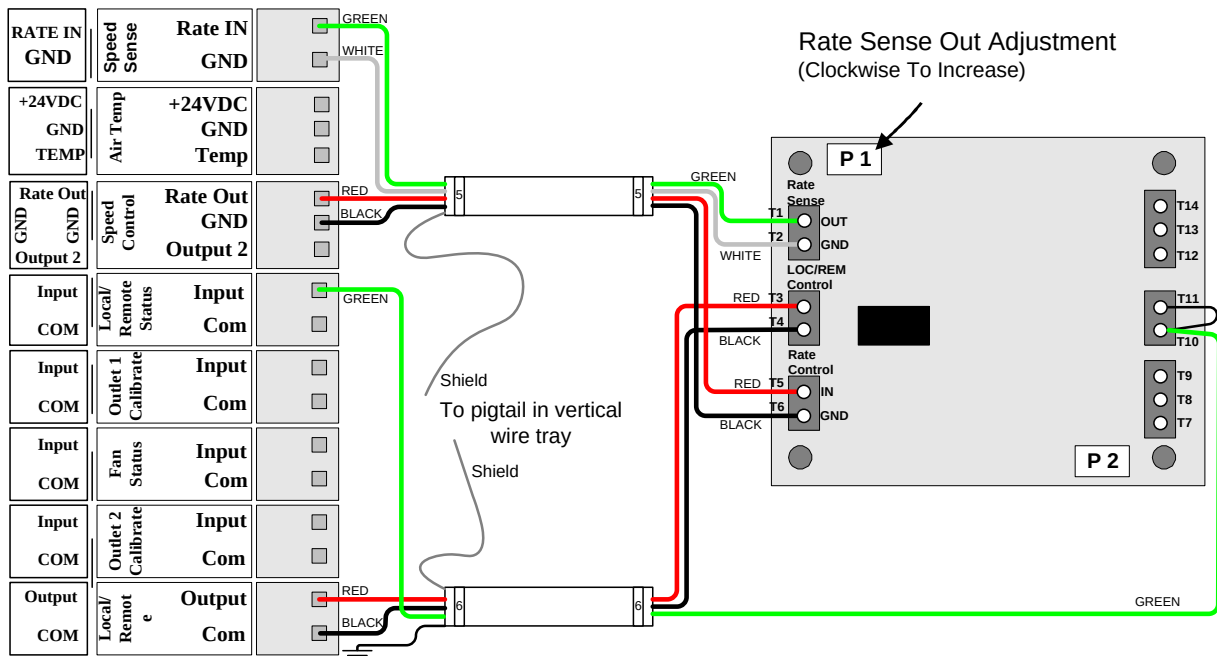


Figure 38 - DM510 to MSC Interface

Connections from Motor Speed Control Interface to Motor Speed Control:

Function	From: DMI Motor Speed Control Interface	To: Motor Speed Control
Rate Sense Input (If DC Motor is 180 VDC)	MSC Interface ARM 180 VDC T14	DC Motor Speed Control A+
Rate Sense Input (If DC Motor is 90 VDC)	MSC Interface ARM 90VDC T13	DC Motor Speed Control A+
Rate Sense Common	MSC Interface ARM T12	DC Motor Speed Control A-
Rate Control	MSC Interface Wipe Out T9	DC Motor Speed Control Pot Input Wipe
Rate Control	MSC Interface Wipe In T8	Speed Pot Wipe
Rate Control	MSC Interface Com T7	DC Motor Speed Control Pot Input Low Speed Pot Low

Figure 39 - MSC to DC Motor

DC Motor Speed Control Interface Wiring

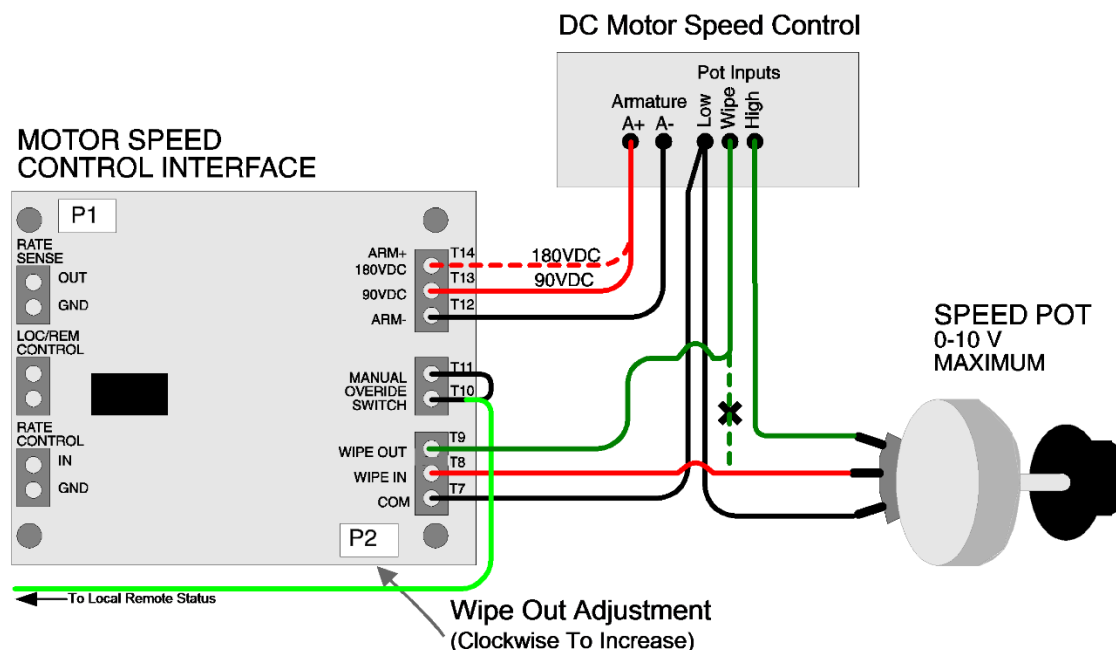


Figure 40 - MSC DC Isolation Hookup

AC Motor Speed Control Interface

Most AC Motor Speed Controls can provide a 0-5V output for speed monitoring and a 0-10V input for remote speed control. If these signals are isolated they can be connected directly to the DM510 Control Panel

Local/Remote Status Wiring Instructions

The Motor Speed Control Interface provides a local/remote switching facility that can disconnect the manual speed dial on the dryer and allow the DM510 to control the discharge rate. It is necessary for the DM510 to understand the status of this functionality. This is achieved by wiring up the spare dry contact from the local/remote relay used to switch local control signal and the DM 510 speed input in the case of an AC motor.

AC Motor Local/Remote Status Wiring

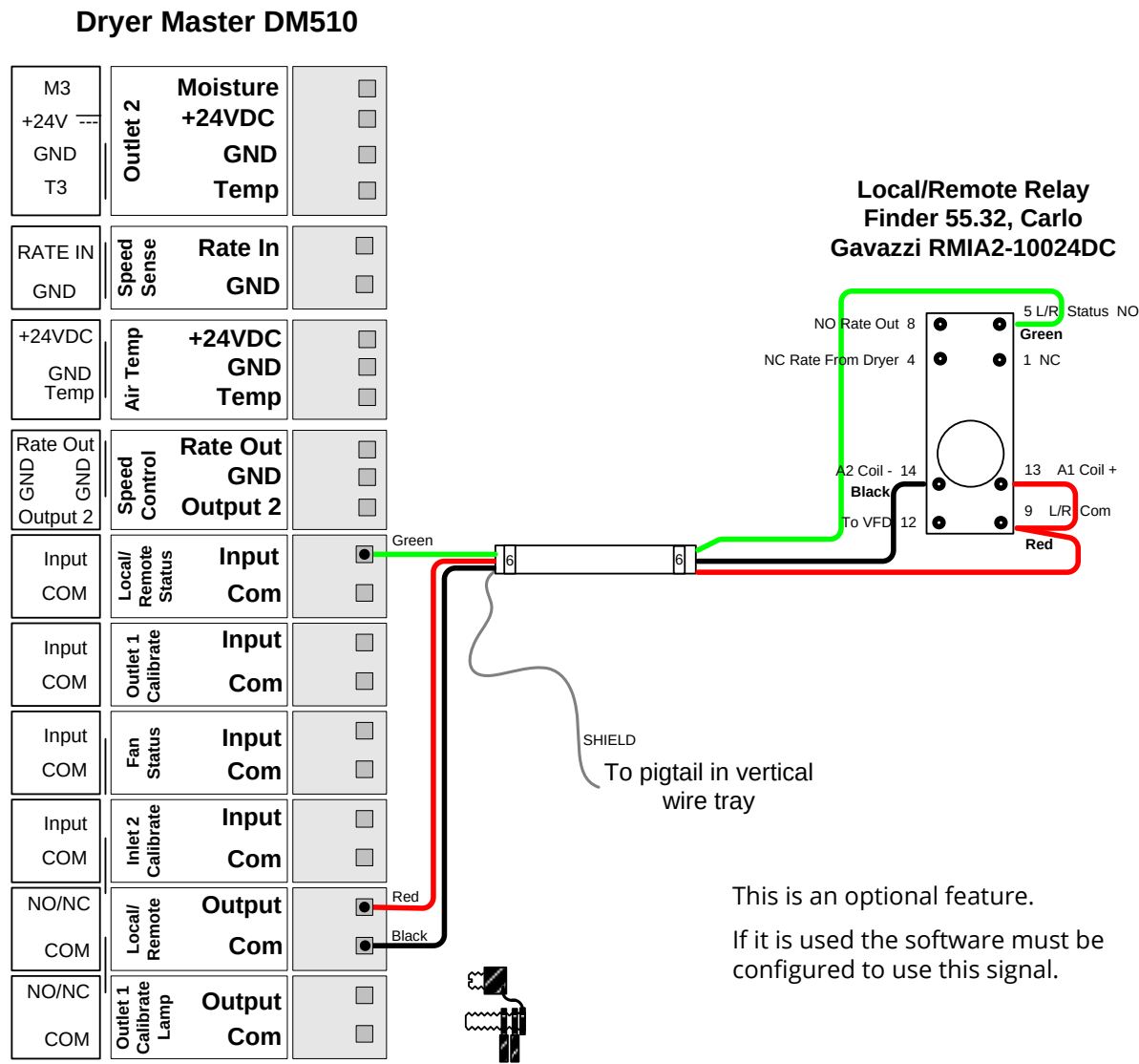


Figure 41 - Local/Remote Status Wiring

If you are using the Dryer Master Motor Speed Control Interface, the local/remote status function is provided at T10 and T11

Fan Status Wiring Instructions

It is necessary for the DM510 to realize the status of the Dryer Fans. This is to inform the Dryer Master what drying state the dryer is operating in. This is achieved by wiring up a spare dry contact (if no dry contact is available use a second relay) from the fan starter to the Dryer Master fan status in the manner demonstrated in the drawing Figure 42 - Fan Status

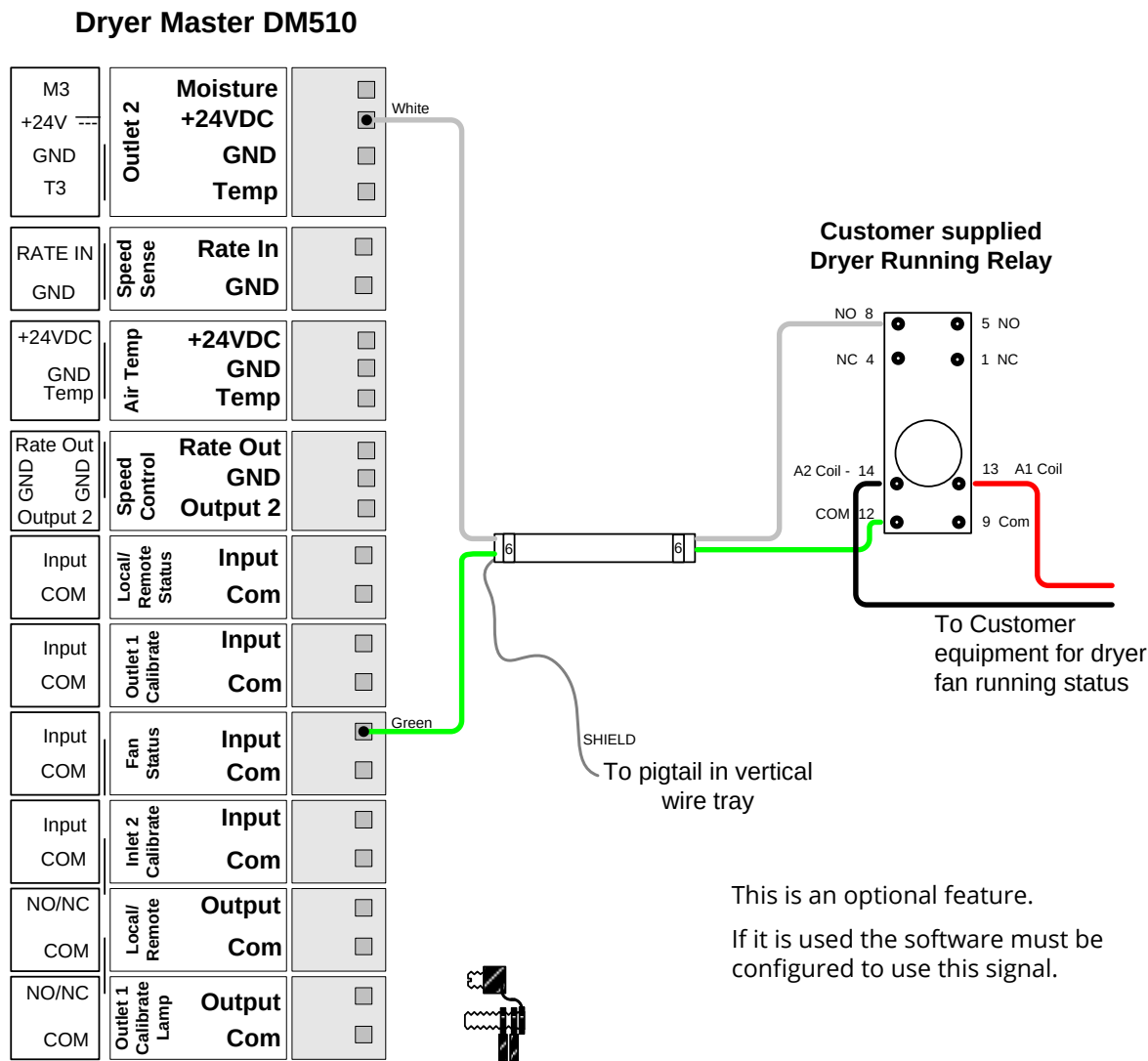


Figure 42 - Fan Status

Drying Air Temperature Wiring Instructions



Caution



All multi-cable must be run in areas where the maximum temperature does not exceed 105°C (220°F). Use Teflon coated wires in areas that exceed this limit.

There are three options for providing the DM510 with a drying air temperature reading. In most cases the decision about which option to use is made at the time of ordering the DM510 system.

1. A Dryer Master Air Plenum Temperature Sensor to be located in the dryer
2. A signal converter that utilizes the dryer temperature information
3. Using a signal from a temperature controller with a digital or analog output



Figure 44 - Air Plenum Temperature Sensor



Figure 43 - Temperature Signal Converter

Connecting to a Drying Air Temperature Sensor

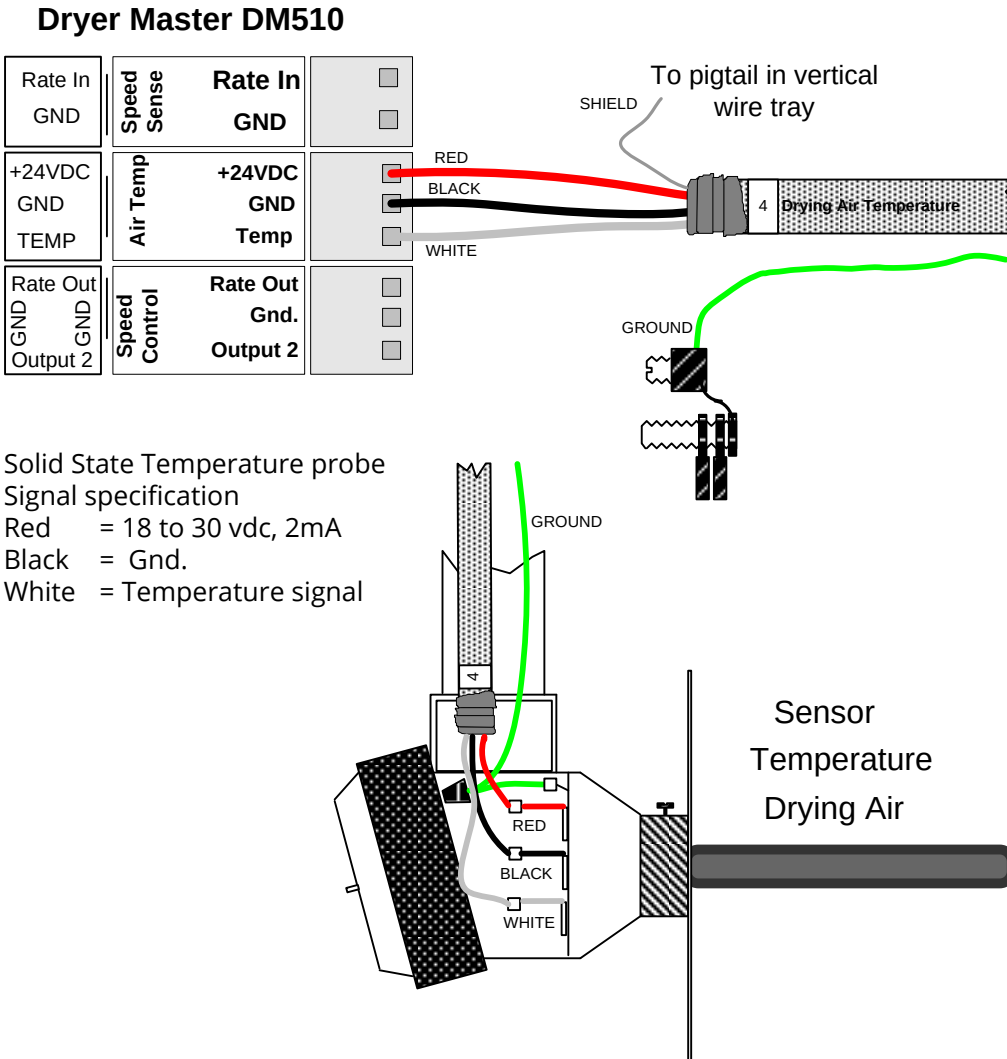


Figure 45 - Drying Air Temperature Sensor Wiring

This device measures the temperature of the drying air in the air plenum. If the temperature controller for the dryer does not have a scaled output use the Drying Air Temperature Sensor supplied with the DM510. For both options remember to attach the Multi-cable shield to ground at Dryer Master end and insulate it on the other end.

Mount the Drying Air Temperature Sensor within one foot of the existing temperature sensor in the hot zone of the dryer. Both sensors should be at the same height. Use high temperature wire from the Drying Air Temperature Sensor to the outside of the hot zone. At this point the standard two pair shielded cable can be used.

Hint

Caulk the conduit entry into the hot zone of the dryer with silicone. This avoids a hot draft heating up the conduit near your splice.

Connecting to a Drying Air Temperature Controller

There are two possible methods to connect to a Temperature Controller within the dryer control panel. First is a direct analog connection and second is a RS485 connection. Consult your Temperature Controller manual to determine which one you have. Run one Multi-cable between the Dryer Master and the Temperature Controller. Check the temperature controller manual for the correct termination.

Connecting to a Temperature Controller with an analog output.

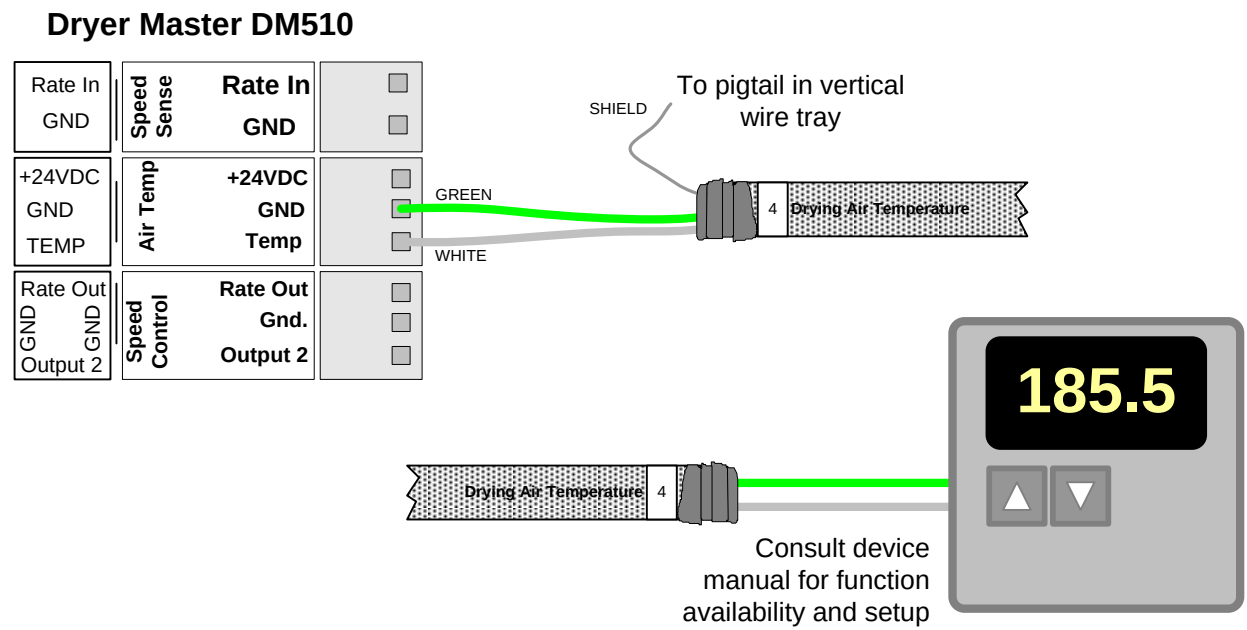


Figure 46 - APT Controller analog connection

Consult Figure 37 – I/O board Analog Input jumper configuration description for setting the input jumpers to the correct input scaling.

Temperature controller to DM510 via signal converter

DM 510 Dryer Master to Omega [TXDIN70-24V](#) converter

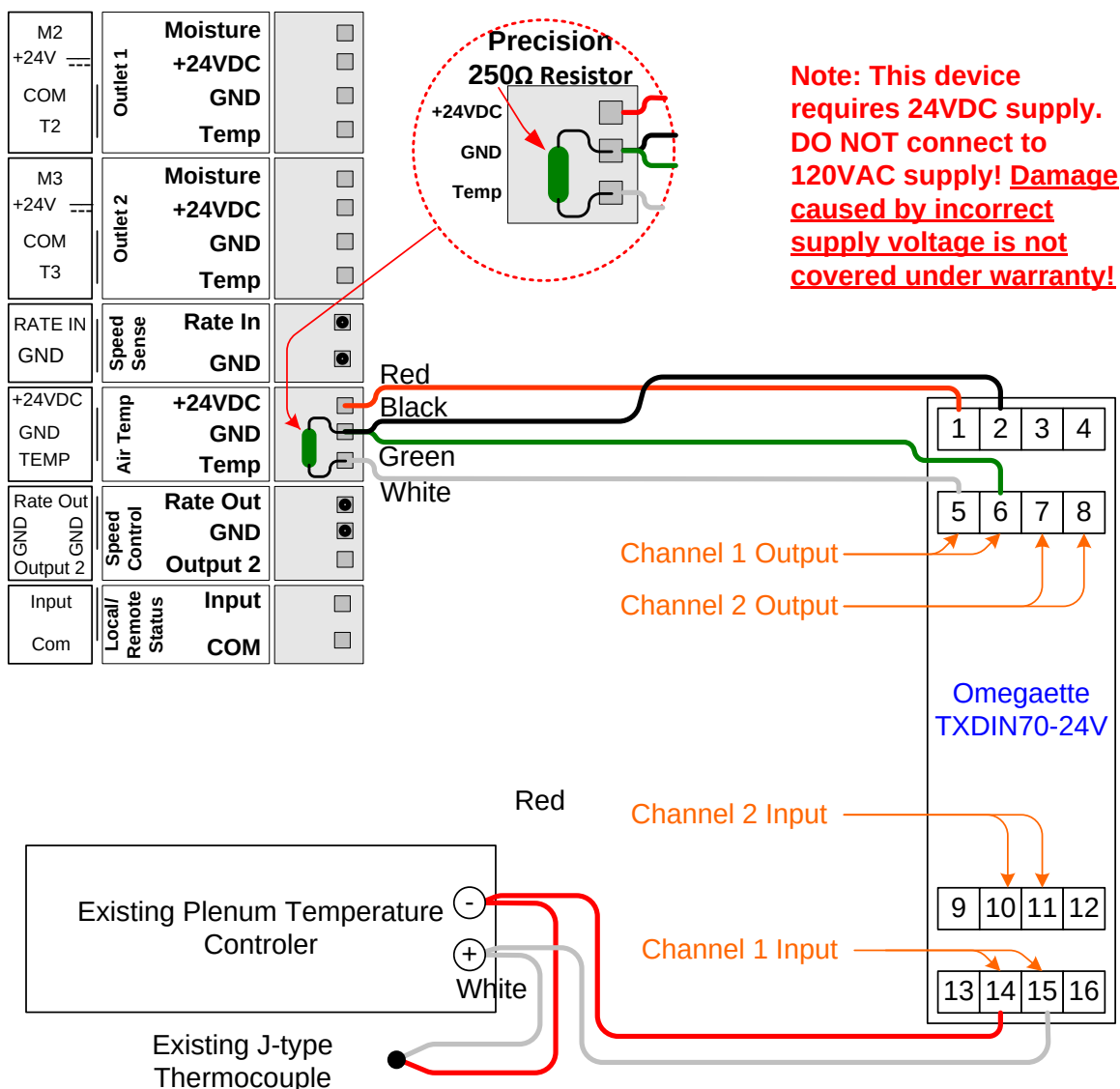


Figure 47 - DM510 to signal converter wiring

After installation the Dryer Master should now read the same temperature as the dryer panel. When drying, if there is an error greater than 2-3 degrees change the offset value on the Dryer Master so the temperature displayed matches the dryer panel reading.

Note 1: The TXDIN70-24V converter is a two-channel device. The instructions above use channel 1. Channel 2 input uses terminals 10 and 11 while the output uses terminals 7 and 8.

Note 2: If the 250Ω precision resistor is missing (two are normally supplied taped to the unit, one to use, one as a spare) you can substitute four (4) 1000Ω 5% resistors commonly available at any electronic supply house. If required twist the leads of all four resistors together to get 250Ω and install the resistors as instructed above. This may introduce a small error in the reading at the Dryer Master but should be reasonably close.

Calibration Button Wiring Instructions

DM 510 Dryer Master

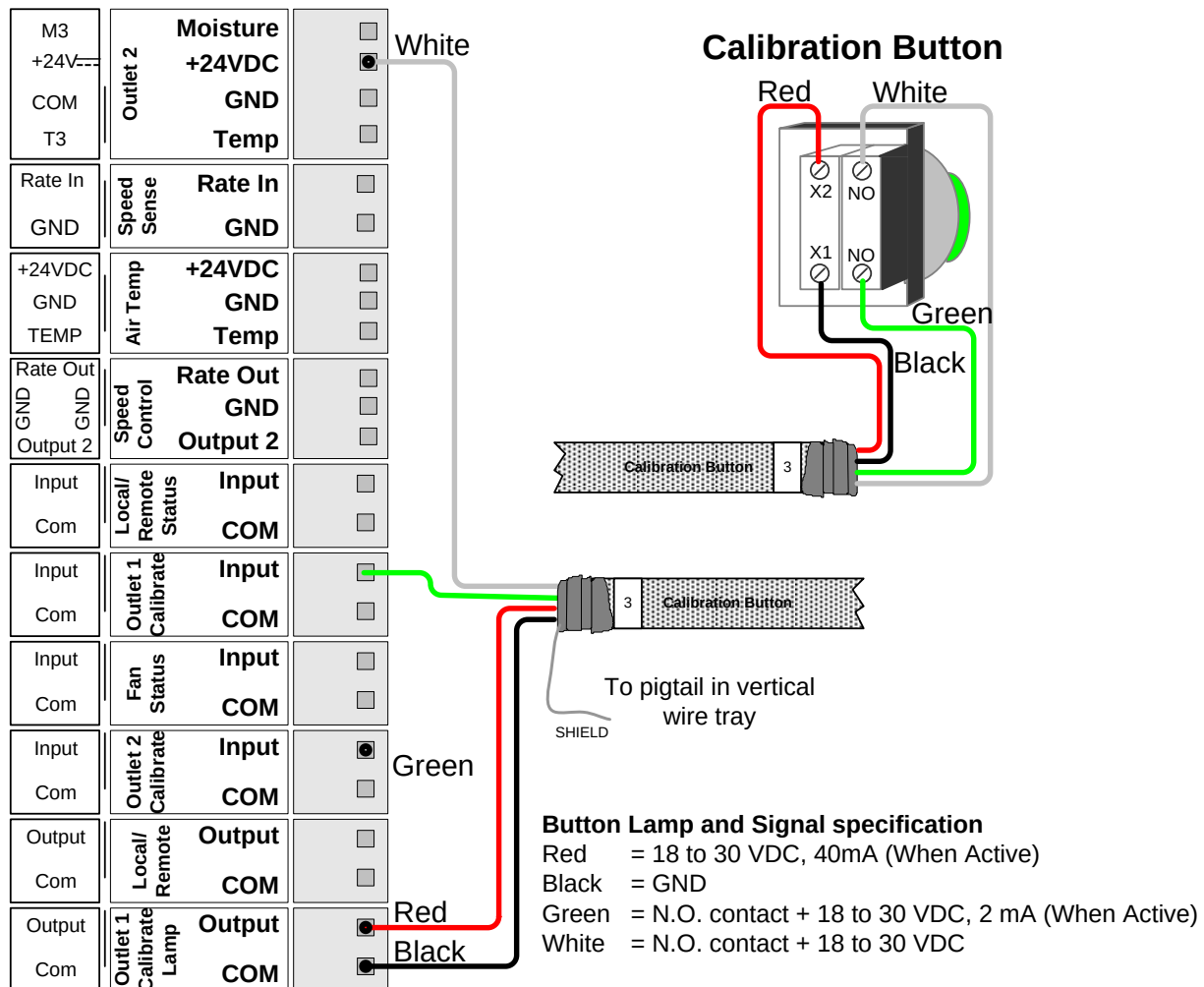


Figure 48 - Calibration Push Button

Mount the button where the operators normally take their off-line sample. The button is normally supplied pre-mounted on a plate that can be attached to the rotary feed chute. During the calibration operation, the button is pushed and it flashes. The operators should be able to see the light while they are taking the manual sample. Run one multi-cable between the button and the Dryer Master and terminate as per the above diagram.

Remote Alarm Control

DM 510 Dryer Master

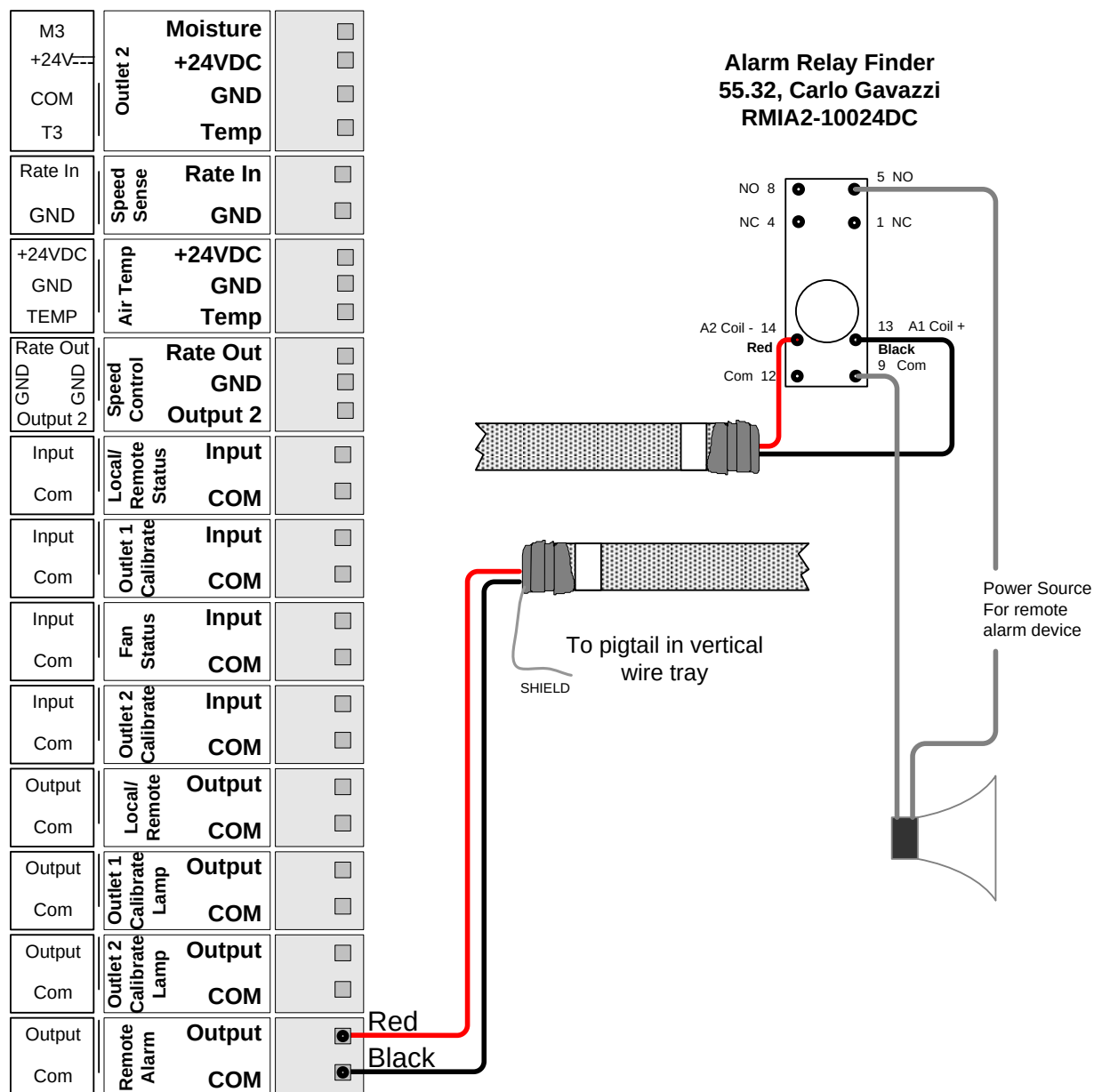


Figure 49 - Remote Alarm

DM510 Control Panel supplies a set of relay contacts to be used if an external alarm is desired. Run one multi-cable between the 24 VDC control relay and the Dryer Master and terminate as in Figure 49 - Remote Alarm. The Alarm Control Relay is activated when alarm parameters (set by the operator) are exceeded. See the DM510 Users' Guide for further details.

Appendix 1: Motor speed control wiring diagrams

Included in this section are wiring diagrams for some common motor speed controls. If your motor speed control diagram is not included here and you need guidance with the connections, contact the Dryer Master Support Center for assistance.

Sample wiring diagrams

1. Mitsubishi FR-D700
2. Generic VFD (0-10 vdc)
3. Allen Bradley PowerFlex40
4. Baldor Series H2
5. Altivar 31

DM 510 Dryer Master to Mitsubishi FR-D700 series inverter

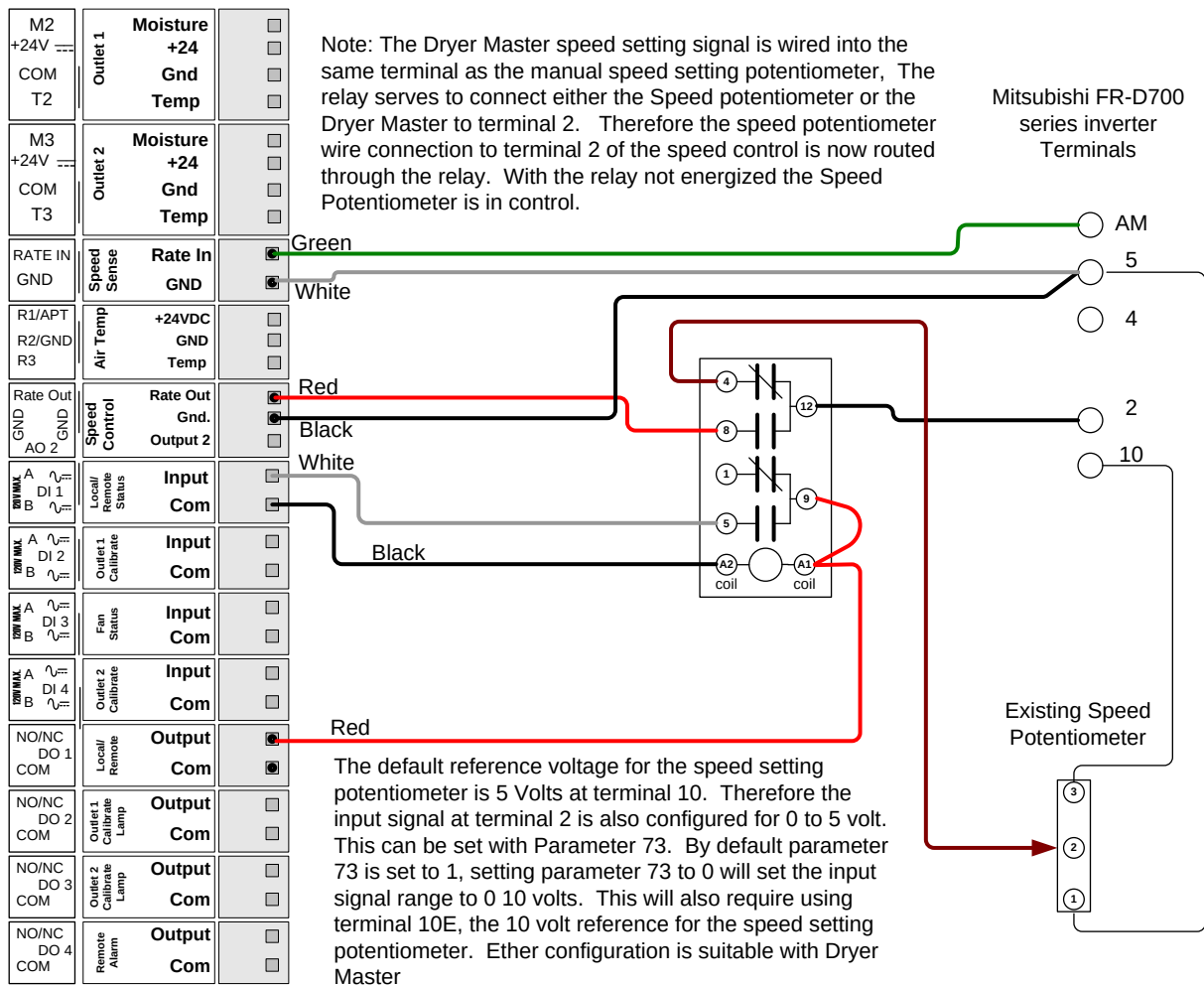


Figure 50 - DM510 to Mitsubishi FR-D700

Generic DM510 to VFD voltage input (0-10 vdc)

Note: To achieve the most flexibility and still maintain the use of a manual speed potentiometer for the just in case scenario the speed setting signal is wired into the same terminal as the manual speed setting potentiometer. The relay serves to connect either the speed potentiometer or the PLC speed signal to the input terminal. Therefore the speed potentiometer wire connection to the input terminal of the speed control is now routed through the relay. With the relay **not** energized the Speed Potentiometer is in control.

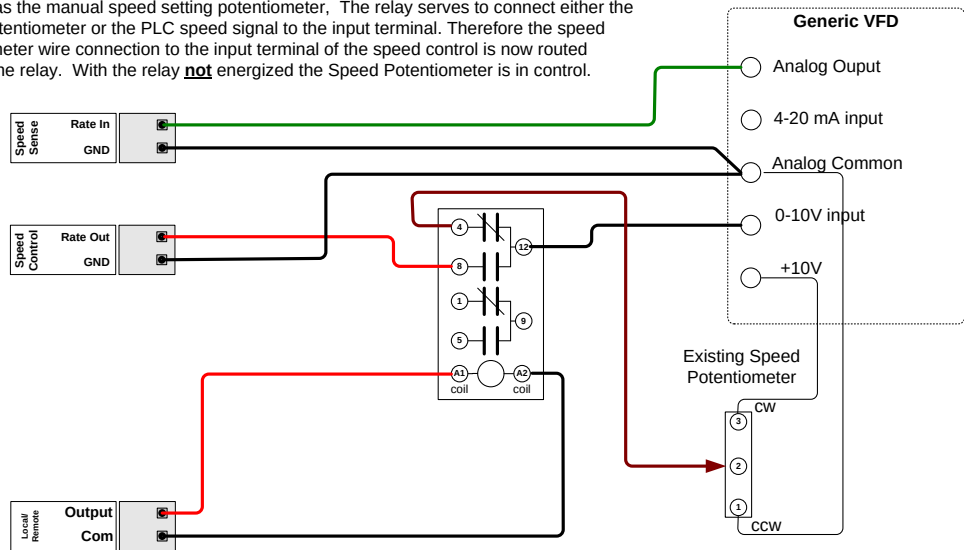
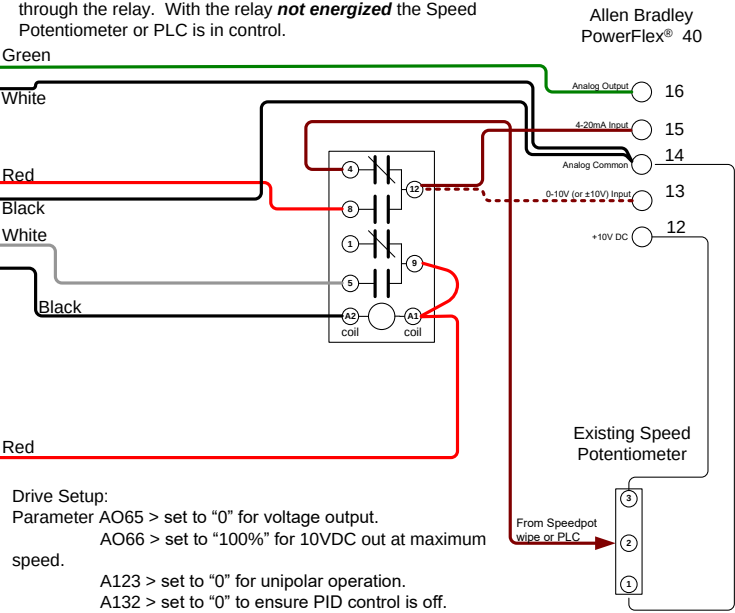


Figure 51 - DM510 to Generic VFD (0-10 vdc)

DM 510 Dryer Master to Allen Bradley PowerFlex® 40 series inverter

M2	+24V	Moisture	
COM		+24	
T2		Gnd	
		Temp	
M3	+24V	Moisture	
COM		+24	
T3		Gnd	
		Temp	
RATE IN		Rate In	
GND		GND	
R1/APT		Air Temp	
R2/GND		+24VDC	
R3		GND	
		Temp	
Rate Out		Rate Out	
GND		Gnd.	
AO 2		Output 2	
SW MA	A	Input	
SW MA	B	Com	
SW MA	A	Local Remote Status	
SW MA	B	Input	
SW MA	B	Com	
SW MA	A	Fan Status	
SW MA	B	Input	
SW MA	B	Com	
NO/NC	DO 1	Output	
COM		Com	
NO/NC	DO 2	Output	
COM		Com	
NO/NC	DO 3	Output	
COM		Com	
NO/NC	DO 4	Output	
COM		Com	

Note: The Dryer Master speed setting signal is wired into the same terminal as the manual speed setting potentiometer. The relay serves to connect either the Dryer Master or the Speed potentiometer to terminal 13. If the input is form a PLC this will be terminal 15. Therefore the speed potentiometer or PLC wire connection to terminal 13 or 15 of the speed control is now routed through the relay. With the relay **not energized** the Speed Potentiometer or PLC is in control.



Drive Setup:
Parameter AO65 > set to "0" for voltage output.
AO66 > set to "100%" for 10VDC out at maximum speed.
A123 > set to "0" for unipolar operation.
A132 > set to "0" to ensure PID control is off.

Figure 52 - DM510 to Allen Bradley PowerFlex40

