User Guide

DM-1 Drying Monitor

Installation

Maintenance

Operation

Troubleshooting

Instant Access
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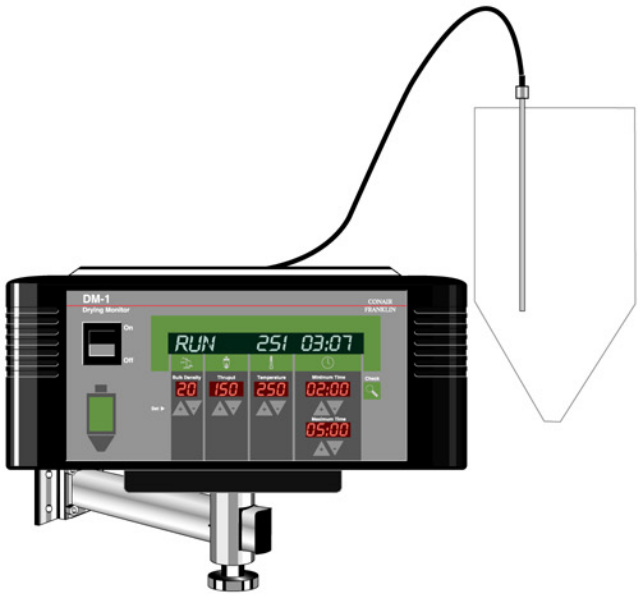

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UGD010/0696

⚠ **WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!**

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

Please record your equipment's model and serial number(s) and the date you received it in the spaces provided.

It's a good idea to record the model and serial number(s) of your equipment and the date you received it in the User Guide. Our service department uses this information, along with the manual number, to provide help for the specific equipment you installed.

Please keep this User Guide and all manuals, engineering prints and parts lists together for documentation of your equipment.

Date:
Manual Number: UGD010/0696
Serial number(s): ....
Model number(s): ....

The Conair equipment described in this publication is covered by: U.S. Patent No. 5,487,225.

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INTRODUCTION

PURPOSE OF THE USER GUIDE

This User Guide describes the DM-1 Drying Monitor and explains step-by-step how to install, operate, maintain and repair this equipment.

Before installing this product, please take a few moments to read the User Guide and review the diagrams and safety information in the instruction packet. You also should review manuals covering associated equipment in your system. This review won't take long, and it could save you valuable installation and operating time later.

HOW THE GUIDE IS ORGANIZED

Symbols have been used to help organize the User Guide and call your attention to important information regarding safe installation and operation.

⚠ Symbols within triangles warn of conditions that could be hazardous to users or could damage equipment. Read and take precautions before proceeding.

1 Numbers within shaded squares indicate tasks or steps to be performed by the user.

◆ A diamond indicates the equipment's response to an action performed by the user.

❒ An open box marks items in a checklist.

● A shaded circle marks items in a list.

YOUR RESPONSIBILITY AS A USER

You must be familiar with all safety procedures concerning installation, operation and maintenance of this equipment. Responsible safety procedures include:

- Thorough review of this User Guide, paying particular attention to hazard warnings, appendices and related diagrams.
- Thorough review of the equipment itself, with careful attention to voltage sources, intended use and warning labels.
- Thorough review of instruction manuals for associated equipment.
- Step-by-step adherence to instructions outlined in this User Guide.

⚠ ATTENTION: READ THIS SO NO ONE GETS HURT

We design equipment with the user's safety in mind. You can avoid the potential hazards identified on this machine by following the procedures outlined below and elsewhere in the User Guide.

WARNING: Hot surfaces.

Always shut down the dryer and wait for the DM-1 probe and hopper to cool before servicing. Temperatures inside a drying hopper can reach more than 400˚ F (204˚C).

WARNING: Disconnect and lock out main power before servicing.

Always disconnect and lock out the main power source to the DM-1 before servicing. Also disconnect and lock out the main power to the dryer before servicing the DM-1 probe.

DESCRIPTION

WHAT IS THE DM-1?

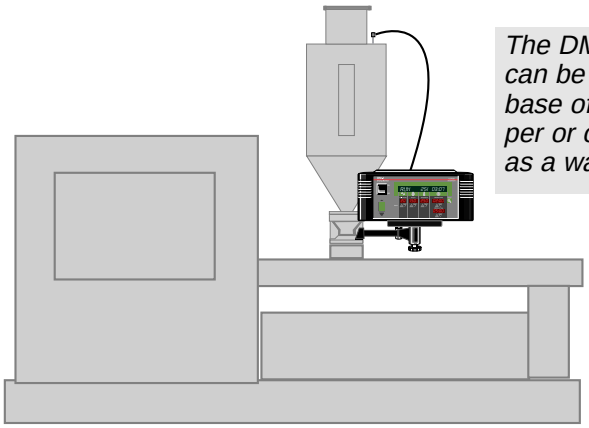
The DM-1 Drying Monitor alerts you to improper drying conditions that can lead to defects in products manufactured from hygroscopic material.

The DM-1 monitors the four key drying conditions:

- Drying temperature.
- Air flow.
- Drying time at the recommended temperature.
- Dew point (with an optional dew point monitor).

When these drying conditions are met, the DM-1 provides a green light alerting the operator to begin processing material. If one or more of the conditions are not met, the DM-1 provides an alarm and a red light alerting the operator to stop processing.

TYPICAL APPLICATIONS



The DM-1 Drying Monitor can be mounted at the base of the drying hopper or on a surface, such as a wall or shelf.

The DM-1 is ideal for applications that require strict control of the drying process to meet product quality specifications. The monitor also can output drying performance information to a printer or SPI device.

The DM-1 will alert the operator to these common drying problems:

- Improperly sized hoppers or dryers.
- Drying or loading equipment failures.
- Reduced air flow caused by dirty filters, kinked hoses or other obstructions.
- Loss of power.
- Overheated or overdried material.

How it Works

The DM-1 monitors temperatures inside the hopper with a probe containing a series of sensors. The DM-1 control uses these temperature readings, its internal time clock, and information you input about the resin, hopper size and throughput to calculate when drying conditions have been met.

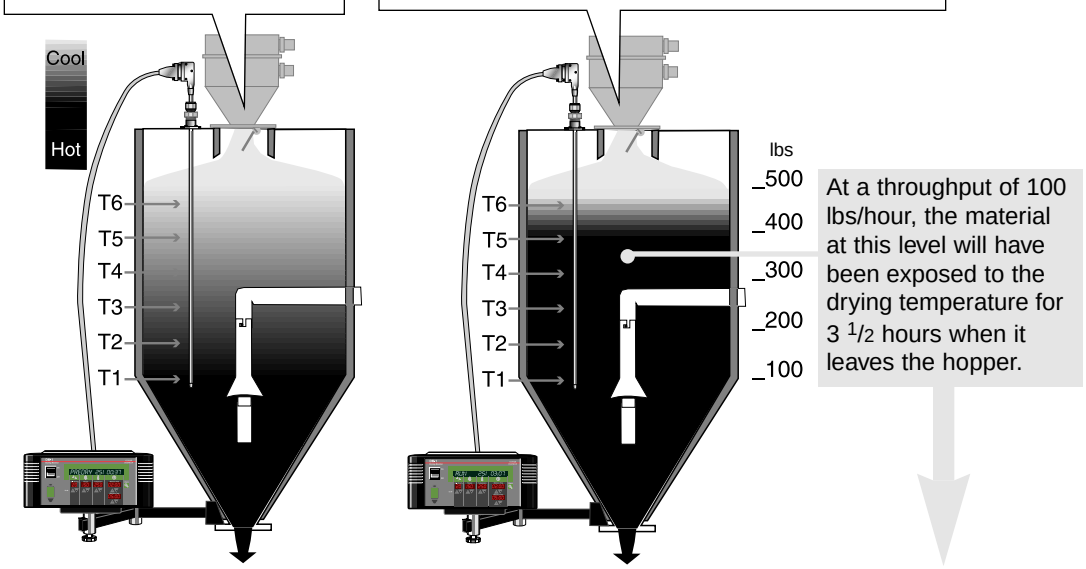
1 *PREDRY* Mode

When T1 senses the setpoint drying temperature entered by the operator, the DM-1 control begins counting the amount of time the material has dried at this temperature.

2 *RUN* Mode

The DM-1 displays a green light as soon as a sufficient amount of material has dried at the required time and temperature to satisfy your throughput.

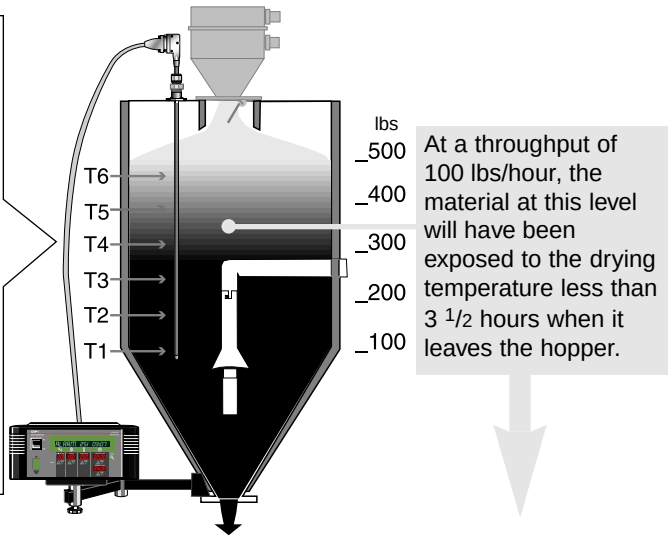
In *RUN* mode the timer displays the length of time material will be exposed to the drying temperature before leaving the hopper.



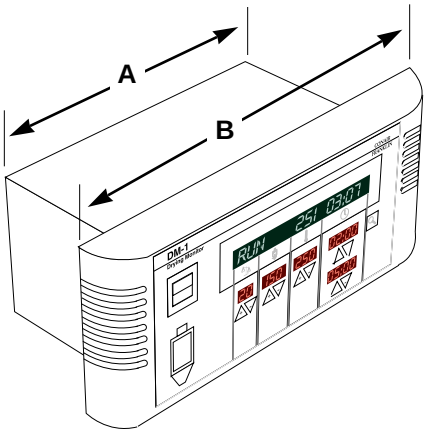
3 *ALARM* Mode

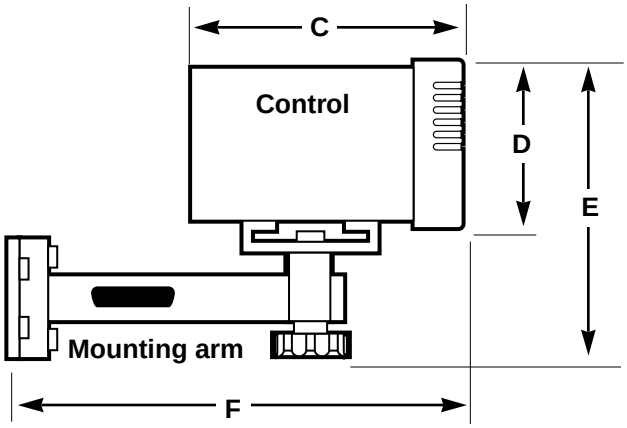
The DM-1 control displays a red alarm light whenever temperature measurements in the hopper indicate the required drying time and temperature cannot be met.

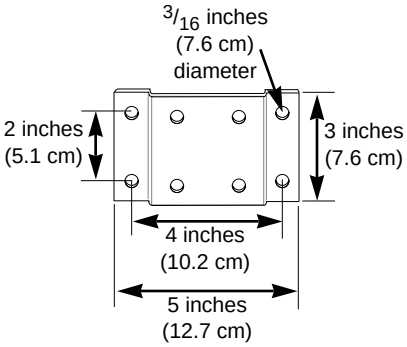
In this example, dirty filters restricted air flow. This prevents material in the upper part of the hopper from being exposed to the drying temperature for the required length of time.



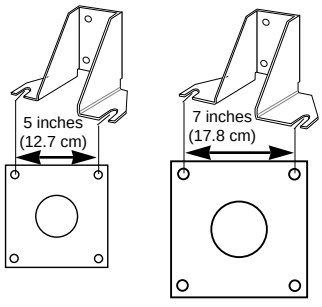
SPECIFICATIONS: DM-1 CONTROL







Wall bracket for the mounting arm



Hopper base brackets for the mounting arm
(available in two sizes to fit 5x5 inch and 7x7 inch bolt hole patterns)

Dimensions

DM-1 control	inches	cm
A	10.125	25.7
B	13.5	34.3
C	6.5	16.5
D	5.5	14
with mounting arm	**inches**	**cm**
E	9.5	24.1
F	18	45.7

Weight

	lbs	kg
Control	7.4	3.4
Control + arm	10.6	4.8

Power Requirements

110-240 VAC 50/60 hz 1.5 amp

Input / Output Ports and Cables

Device	Connector Type	Cable Lengths
Probe cable	15-pin female	20, 40, 100 ft (6.1, 12.2, 30.5 m)
*Printer cable	RS232 serial	10, 50 ft. (3, 15.2 m)
*SPI cable	RS485 serial	10 ft. (3 m)
*Alarm/Shut down adapter cable	circular	15 ft. (4.6 m)
*Alarm beacon	circular	10 ft. (3 m)
*Dew point monitor	circular	10 ft. (3 m)

* These cables or devices are available as options.

Data Output

This information can be output to a printer or SPI device.

	Units
Actual time	24-hour clock
Material drying time	24-hour clock
Material drying temperature	F˚ or C˚
Drying status	Predry/Run/Alarm

Output includes the date, hopper size, throughput, setpoint temperature and material bulk density entered by the operator.

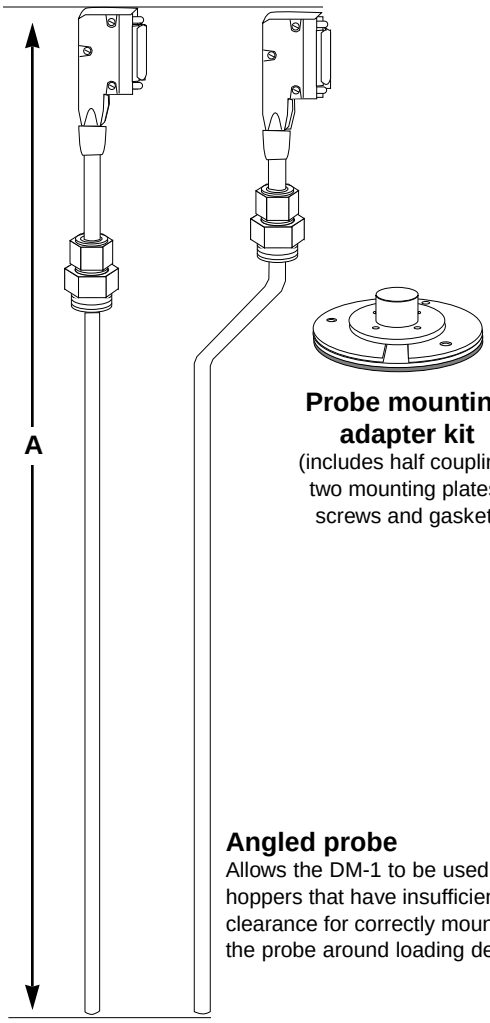
SPECIFICATIONS: DM-1 PROBE

Standard models

Model No.	Length A inches	cm
303	15	38.1
604	30	76.2
605	34	86.4
606	38	96.5
607	42	106.7
608	48	121.9
609	54	137.2
610	60	152.4
611	66	167.6
612	74	188.0
613	80	203.2
614	86	218.4
615	92	233.7
616	98	248.9
617	104	264.2
618	110	279.4
620	122	309.9
622	134	340.4
624	142	360.7
626	152	386.1
628	162	411.5
630	172	436.9
632	182	462.3
634	192	487.7
636	202	513.1
638	212	538.5
640	222	563.9
642	232	589.3
644	240	609.6
646	240	609.6

Angled models

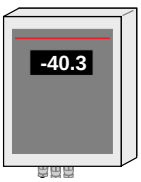
603B	23	58.4
604B	27	68.6
605B	34	86.4
606B	38	96.5
607B	45	114.3
609B	56	142.2



Probe mounting adapter kit
(includes half coupling, two mounting plates, screws and gasket)

Angled probe
Allows the DM-1 to be used on hoppers that have insufficient clearance for correctly mounting the probe around loading devices

SPECIFICATIONS: DM-1 OPTIONS



Dew Point Monitor

Dimensions (H x W x D)	4.7 x 6.3 x 3.5 inches (11.9 x 16 x 8.9 cm)
Dew point range	-85˚F to +68˚F (-65˚C to +20˚C)
Accuracy	± 5˚F (± 3˚C)
Remote Alarm Output	Two programmable alarms, rated 10A @ 240V
Power Requirements	110/240 VAC 50/60 hz

Alarm Beacon

Dimensions (H x W x D)	7.5 x 5 x 2.6 inches (19.1 x 12.7 x 6.7 cm)
Outputs	Red light during ALARM mode; Green light during RUN mode
Power Requirements	Powered by DM-1

Alarm / Shut down adapter

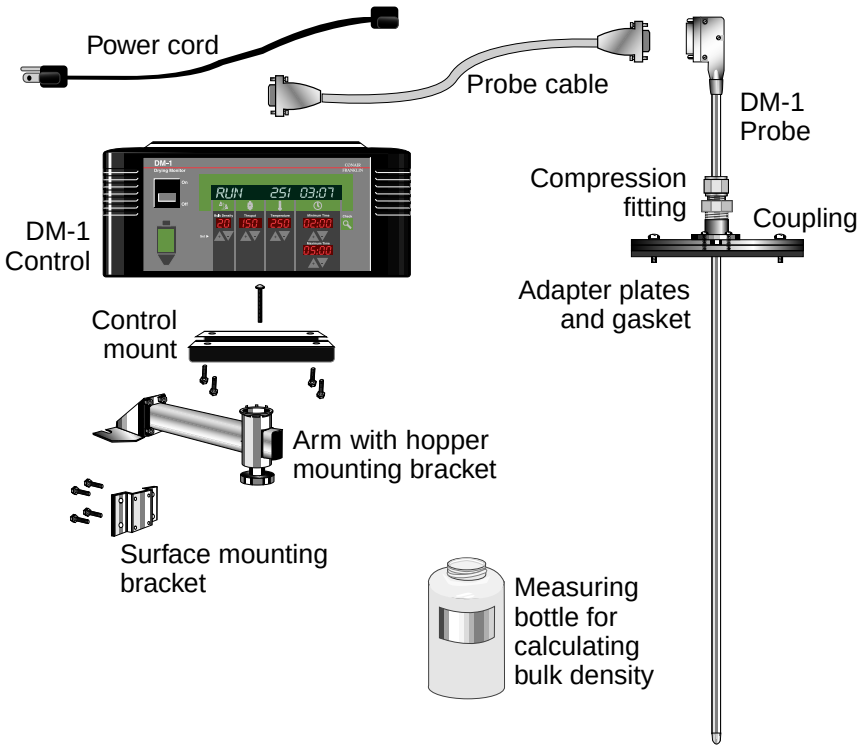
This cable and terminal strip allows the DM-1 alarm output:

- To be used with any remote alarm device.
- To automatically shut down the processing machine or dryer when the DM-1 enters ALARM mode.

INSTALLATION

UNPACKING THE BOXES

The DM-1 Drying Monitor comes in two or more boxes, depending on the options ordered. The boxes should include:



Mounting Hardware

Probe:

❒ *four $^1/_2$-inch long, 10-32 UNF screws to attach the mounting coupling to the hopper or adapter plates.*

❒ *three $^3/_4$-inch long, 10-32 UNF screws to attach the mounting adapter plates to the hopper.*

Control:

❒ *four $^1/_2$-inch long $^1/_4$-20 screws to attach the swivel bracket to the control.*

❒ *one 2 $^3/_4$ inch long $^1/_4$-20 carriage bolt to attach the swivel bracket to a surface or the mounting arm.*

❒ *four $^1/_2$-inch long $^1/_4$-20 self-locking bolts to attach the mounting arm to the hopper bracket or surface bracket.*

Optional hardware:

See the appendix for installation notes for optional equipment.

1 **Carefully remove the DM-1** control, probe and components from their shipping containers.

2 **Remove all packing material**, protective paper, tape and plastic. Do not discard installation notice tags. If you bought more than one DM-1, check each control for a tag indicating which drying hopper it was factory-configured to monitor.

3 **Carefully inspect all components** to make sure no damage occurred during shipping, and that you have all the necessary hardware.

4 **Take a moment to record serial numbers** in the blanks provided on the back of the User Guide's title page. Also record the drying hopper's model number and specifications. The information will be helpful if you ever need service or parts.

5 **You are now ready to begin installation.** Complete the preparation steps on the next page, then go to the instructions for the mounting options you selected.

PREPARING FOR INSTALLATION

The DM-1 Drying Monitor is easy to install, if you plan the location and prepare the mounting area properly.

1 Select a mounting location that provides:

❒ **Clearance for safe operation and maintenance.**
The DM-1 control should be mounted so that its display panel can be seen and touched easily by an operator. The DM-1 probe must be mounted in a location that provides easy access for installing or removing the probe through the top of the drying hopper or the hopper door. See the Specifications table for probe dimensions.

❒ **Room temperatures of not more than 158˚ F (70˚ C).**
Excessive heat can affect the DM-1 control's performance.

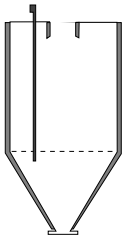
❒ **A source of single-phase, grounded electrical power.**
A grounded outlet should be installed to within 8 feet of the DM-1 control. Electrical installations should be done by qualified personnel. Check the DM-1 serial tag for the correct voltage, amps and cycles.

❒ **Minimum interference from static electricity.**
The probe cable should be routed away from material conveying lines, which can be a source of static electricity.

❒ **The correct distance from the probe to the control.**
The standard probe cable is 20 feet. Cable lengths up to 100 feet are available. You should specify at time of order.

2 Make sure the probe is the correct size.

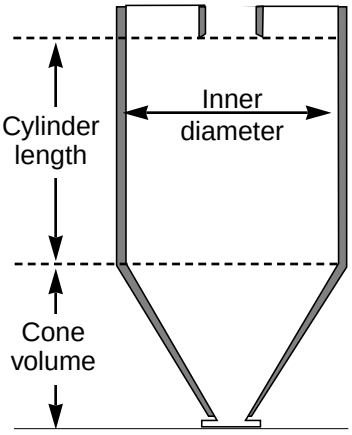
The probe should extend from just above the hopper to 2 inches (5.8 cm) below the top of the hopper cone. The probe should not touch the hopper's air diffuser or any material loading devices mounted on top of the hopper.



3 Make sure you have the following information.

❒ The hopper cone volume.
❒ The hopper inner diameter.
❒ The usable length of the hopper cylinder.
❒ The probe model number.

You will need to enter this information in the DM-1 control during the initial setup.



INSTALLING THE DM-1 PROBE

CAUTION: Hopper surfaces may be hot. Make sure the drying hopper is empty and has cooled to room temperature before installing the probe assembly. Failure to do so can lead to serious injury.

The DM-1 probe is inserted through a hole in the top of the drying hopper and secured to a threaded coupling with a compression fitting. Mounting adapter plates may be necessary.

There are three mounting methods for the probe:

- **Select Mounting Method 1** if you purchased a new Conair drying hopper equipped with a factory-installed coupling for the probe.
- **Select Mounting Method 2** if you are installing the probe and coupling in a drying hopper that has enough overhead clearance to insert the probe from the top of the hopper.
- **Select Mounting Method 3** if you are installing the probe and adapter kit on a drying hopper that does not have enough overhead clearance to insert the probe from the top.

.

MOUNTING METHOD 1

Tools for Installation:
- ❒ *3/4 inch wrench*
- ❒ *7/8 inch wrench*

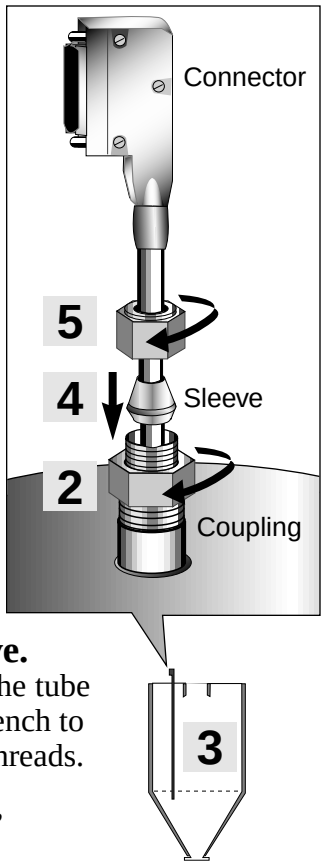
1 Insert the probe through the coupling in the top of the drying hopper.

2 Screw the fitting into the coupling. Tighten with a wrench.

3 Adjust the probe height and orientation. The bottom of the probe should reach about 2 inches (5 cm) below the top of the hopper cone. Turn the probe connector so it will face the cable you install between the control and probe.

4 Push the compression sleeve into the fitting.

5 Tighten the nut over the sleeve. The compression sleeve will crimp the tube to hold the probe in place. Use a wrench to tighten the nut so that it covers the threads.



Go to "Mounting the DM-1 Control."

MOUNTING METHOD 2

Remove the mounting adapter plates from the probe assembly. You will not need them. You will need the gasket.

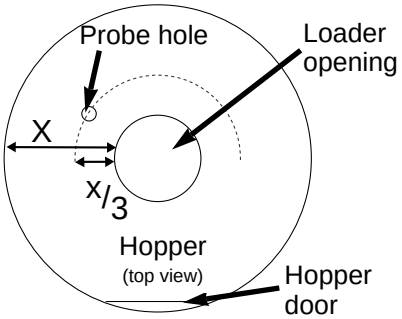
Tools for Installation:

- ❒ *drill and 10-32 tap*
- ❒ *knife*
- ❒ *flathead screwdriver*
- ❒ *3/4 inch wrench*
- ❒ *7/8 inch wrench*

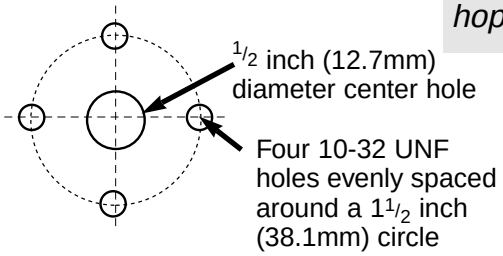
TIP: *Stretch cloth or plastic across the inside of the hopper to catch metal shavings from the hole you will drill in the top of the hopper.*

1 Drill a 1/2 inch (1.27cm) diameter hole in the top of the hopper.

Drill the hole opposite the hopper door, anywhere along a 180˚ arc. The hole should be drilled no more than 1/3 the distance from the edge of the loader opening to the inner wall of the hopper. The probe should not touch any loading device.



2 Drill and tap four 10-32 UNF holes to match the screw pattern in the coupling.

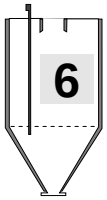


3 Secure the gasket and coupling to the hopper with the four 10-32 screws. Remove excess gasket with a knife.

4 Insert the probe through the coupling in the top of the hopper.

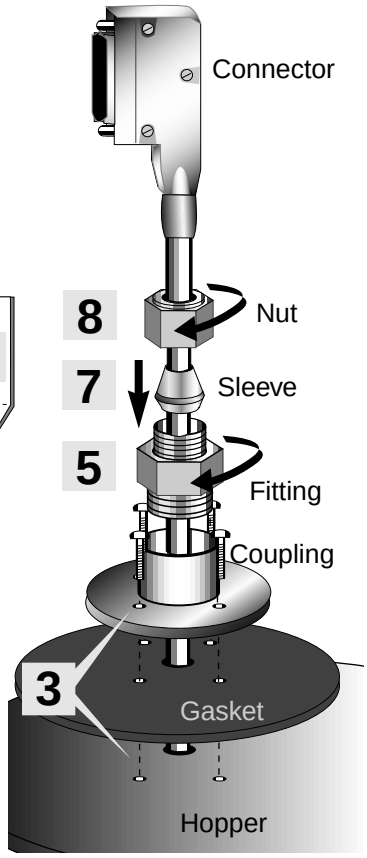
5 Screw the fitting into the coupling. Tighten with a wrench.

6 Adjust the probe height and orientation. The bottom of the probe should reach about 2 inches (5 cm) below the top of the hopper cone. Turn the probe connector so it will face the cable you install between the control and probe.



7 Push the compression sleeve into the fitting.

8 Tighten the nut over the sleeve. The compression sleeve will crimp the tube to hold the probe in place. Use a wrench to tighten the nut so that it covers the threads.



Go to "Mounting the DM-1 Control."

MOUNTING METHOD 3

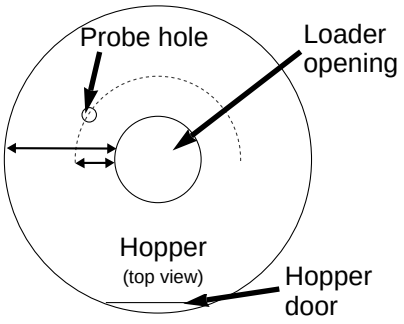
Tools for Installation:

- ❒ *drill and 10-32 tap*
- ❒ *flathead screwdriver*
- ❒ *$^3/_4$ inch wrench*
- ❒ *$^7/_8$ inch wrench*

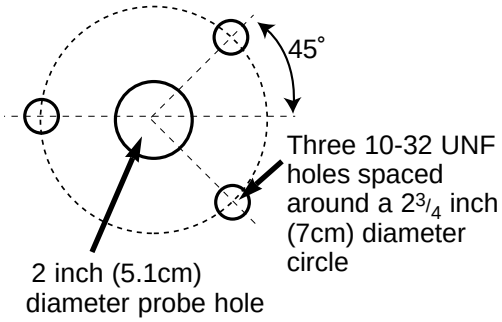
TIP: *Stretch plastic or cloth across the inside of the hopper to catch metal shavings from the hole you will drill in the top of the hopper.*

1 Drill a 2 inch (5.1cm) diameter hole in the top of the hopper.

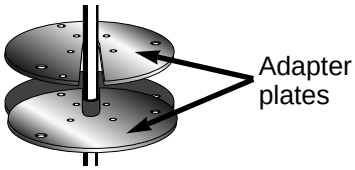
Drill the hole opposite the hopper door, anywhere along a 180˚ arc. The hole should be drilled no more than $^1/_3$ the distance from the edge of the loader opening to the inner wall of the hopper. The probe should not touch any loading device.



2 Drill and tap three 10-32 UNF holes to match the screw pattern in the adapter plates and gasket. You can use the template in the appendix, or drawing # 18169901.

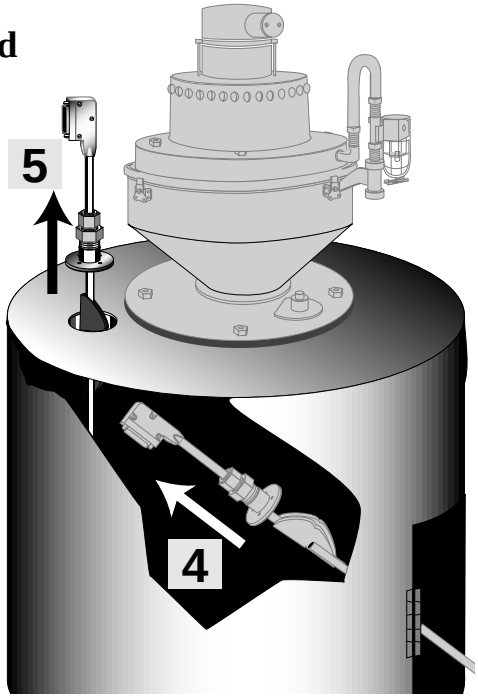


3 Remove the two adapter plates from the probe mounting assembly. Set the mounting plates aside for use in Step 7.



4 Insert the probe and mounting assembly through the door of the hopper.

5 Pull the probe and mounting assembly through the hole in the top of the hopper. Fold the gasket around the probe so that it will fit through the hole.



MOUNTING METHOD 3

6 Place the gasket over the probe hole.

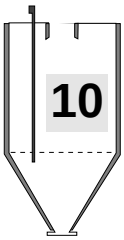
7 Place the adapter plates over the gasket and secure them to the hopper with three10-32 UNF screws. Make sure the adapter plate with the threaded holes is on the bottom.

8 Secure the coupling to the adapter plates with the four 10-32 UNF screws.

9 Screw the fitting into the coupling. Tighten with a wrench.

10 Adjust the probe height and orientation.

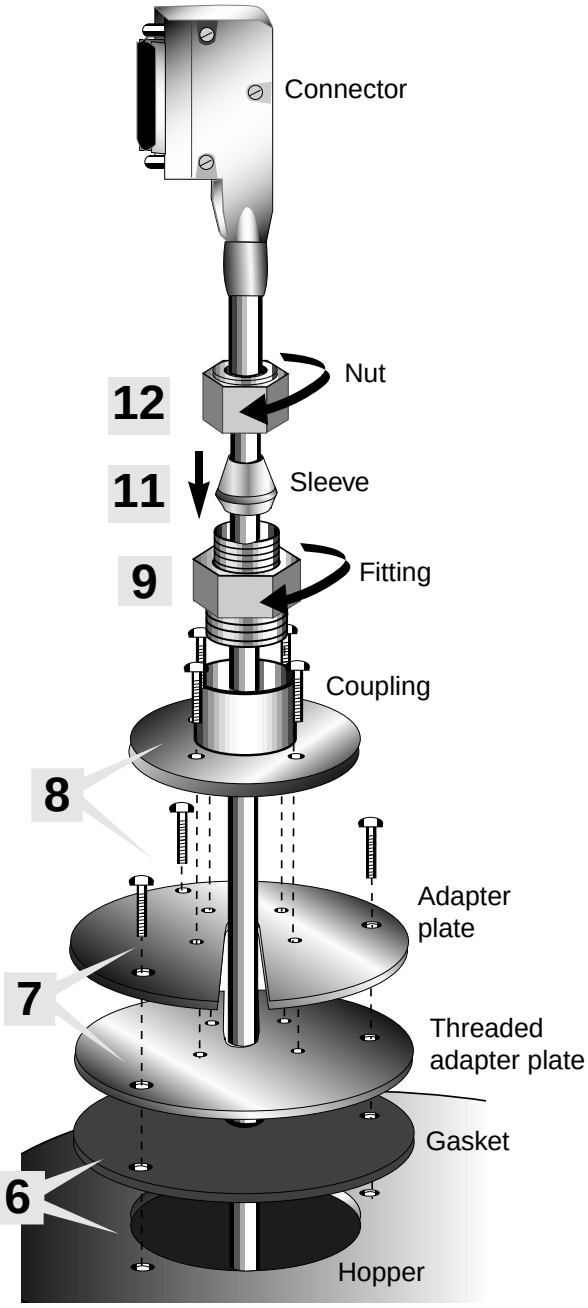
The bottom of the probe should reach about 2 inches (5 cm) below the top of the hopper cone. Turn the probe connector so it will face the cable you install between the control and probe.



11 Push the compression sleeve into the fitting.

12 Tighten the nut over the sleeve.

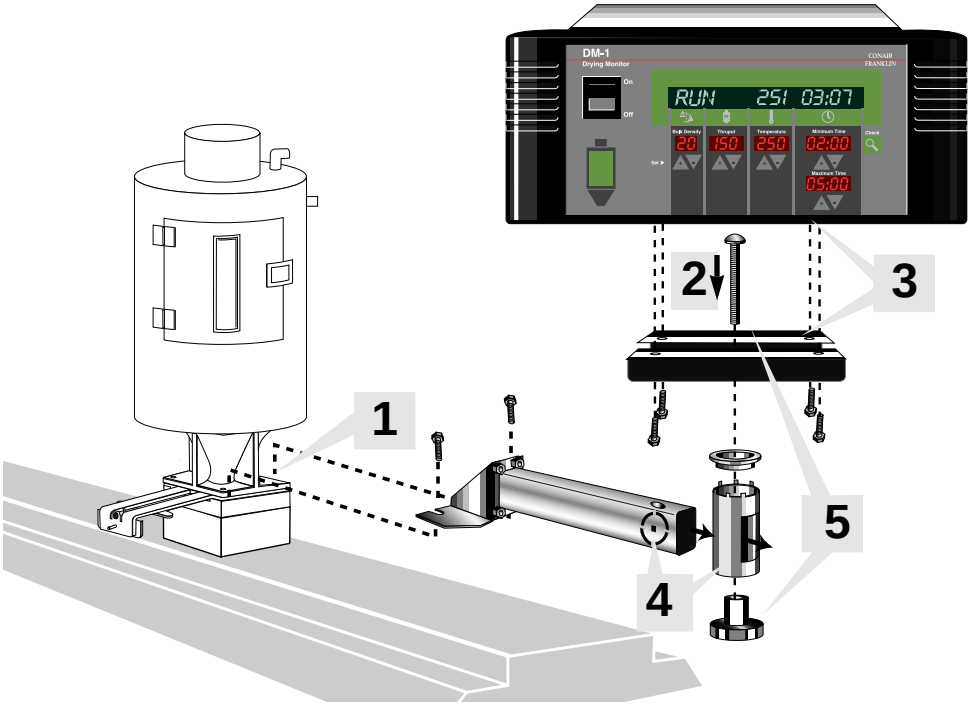
The compression sleeve will crimp the tube to hold the probe in place. Use a wrench to tighten the nut so that it covers the threads.



Go to "Mounting the DM-1 Control."

DM-1 CONTROL: HOPPER MOUNT

The DM-1 control can be mounted to the base of a drying hopper by using the hopper mounting bracket and arm.



Tools for Installation:
- ❒ *wrench*
- ❒ *flathead screwdriver*

NOTE: *Arm extensions are available as an option. See the appendix for instructions on installing and using the extensions.*

1 Bolt the hopper bracket and arm to the base of the drying hopper. Use the mounting bolts on the drying hopper. Position the arm so that the control can be seen and easily touched by an operator.

2 Insert the carriage bolt through the center of the control mount.

3 Attach the control mount to the control. Screw the four 1/2 inch long, 1/4-20 screws into the threaded holes in the base of the control.

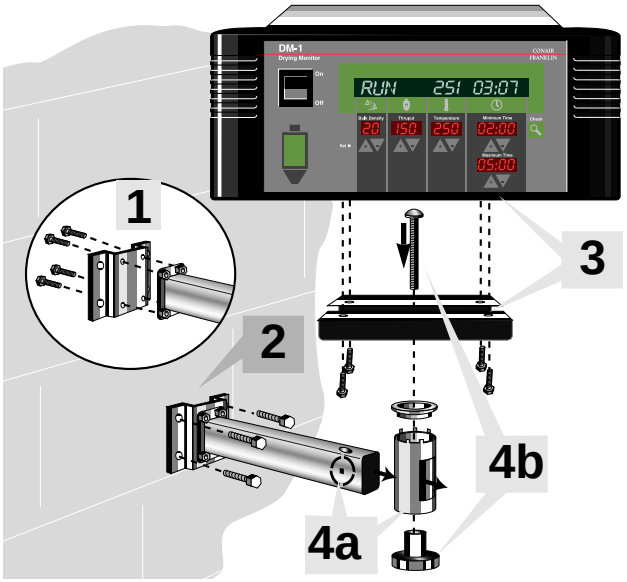
4 Slide the joint tube onto the arm.

5 Fasten the control mount to the mounting arm. Insert the carriage bolt through the arm and joint tube. Then attach the knob to the bolt.

6 Adjust the control position. Loosen the knob, turn the control to face whatever direction you want, and then tighten the knob.

DM-1 CONTROL: SURFACE MOUNT

You can mount the DM-1 control to a wall or horizontal surface using brackets, or you can bolt the control to a shelf. Place the control where it can be easily seen and touched.



Tools for Installation:
- ❒ *drill*
- ❒ *flathead screwdriver*

NOTE: *If you mount the control directly to a shelf or other surface, you need to supply a 1/4-20 carriage bolt that is at least 1/4 inch longer than the depth of the surface.*

1 **Attach the wall bracket to the mounting arm** using four of the 1/2-inch long, 1/4-20 screws.

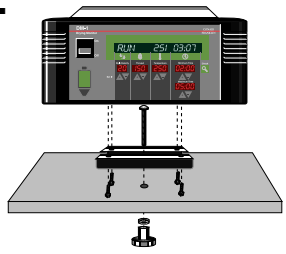
2 **Bolt the wall bracket and arm to the wall.**

3 **Attach the control mount to the control.** Insert the carriage bolt through the control mount. Screw the four 1/2-inch long, 1/4-20 screws through the mount and into the threaded holes in the base of the control.

4 **Fasten the control mount to the arm.** Slide the joint tube onto the arm. Then insert the carriage bolt through the arm and joint tube. Attach the knob to the bolt.

5 **Adjust the control position.** By loosening the knob you can turn the control to face any direction.

TO MOUNT DIRECTLY TO A SURFACE:



1 **Drill one 1/4-inch hole in the surface.**

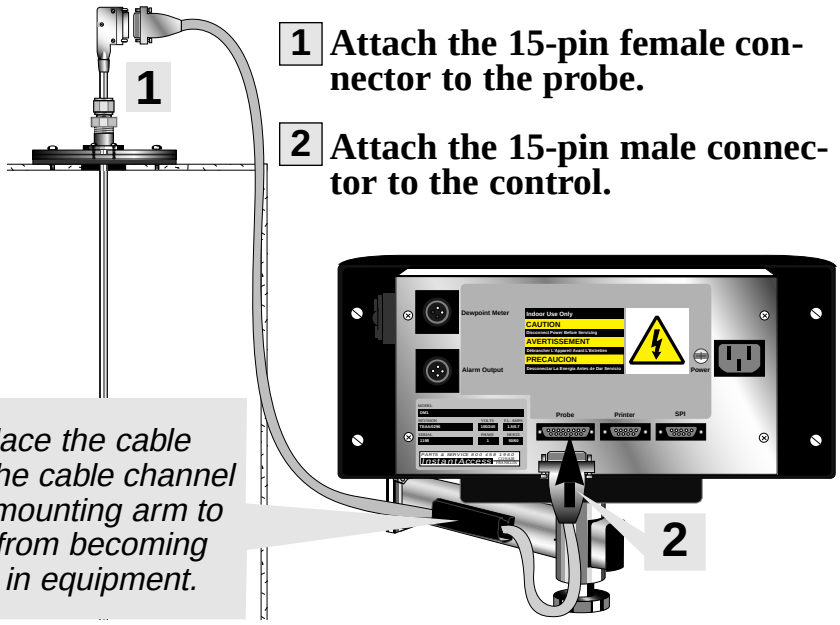
2 **Attach the control mount to the control.** Insert a 1/4-20 carriage bolt through the mount, then attach the mount to the control with the four 1/2-inch long, 1/4-20 screws.

3 **Insert the carriage bolt through the surface and secure with the knob.**

⚠ WARNING:
The surface temperature must be less than 120° F. Higher temperatures will harm the control.

Connecting The Probe to the Control

Use the cable with 15-pin connectors on each end to attach the probe to the port marked “Probe” on the back of the control.



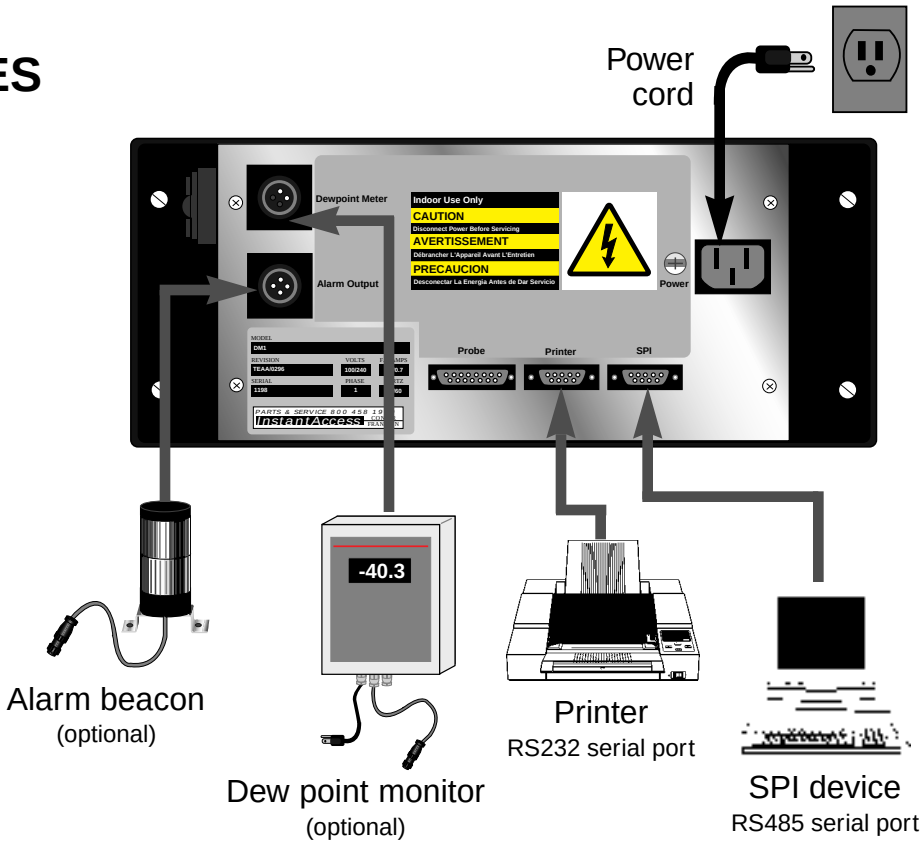
1 **Attach the 15-pin female connector to the probe.**

2 **Attach the 15-pin male connector to the control.**

TIP: *Place the cable inside the cable channel on the mounting arm to keep it from becoming tangled in equipment.*

Connecting Power and Device Cables

The power cord and cables for optional devices connect to plugs and ports on the back of the DM-1 control.

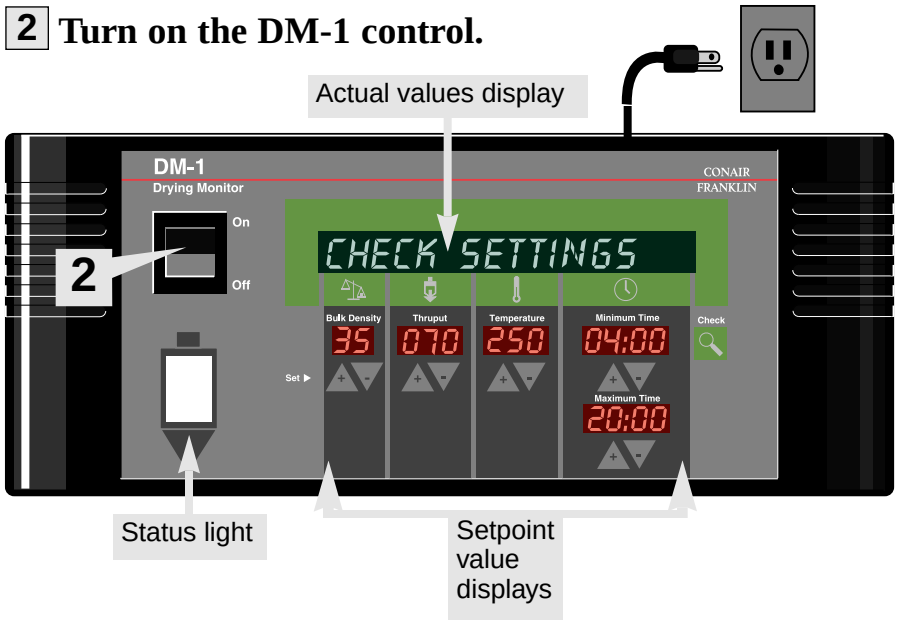


TESTING THE INSTALLATION

When you start the DM-1 Drying Monitor, the control runs a series of self tests. These tests will detect software and hardware problems, including a faulty probe connection.

1 Plug the DM-1 control into a power source.

2 Turn on the DM-1 control.



If everything is working correctly:

- ***CHECK SETTINGS*** **appears in the actual values display.**
- **The setpoint value displays blink on and off.**
  The display will blink the default numbers for 10 seconds or until the settings are changed. Once changed, the numbers indicate the settings last entered for the material's bulk density, throughput, drying temperature, minimum drying time and maximum drying time.
- **The hopper status light blinks red, then green, then off.**
- ***PREDRY*** **and time appears in the actual values display.**

3 The test is over.

If the DM-1 completed its self-test as outlined, you can begin the initial setup. If an error message appeared in the actual values display, see the Troubleshooting section.

INITIAL SETUP

Before you can start normal operation, you must provide the DM-1 control with certain information about your application and drying hopper size.

You only have to enter this information once, unless you move the DM-1 control to a different hopper and probe.

1 Turn off the DM-1 control.

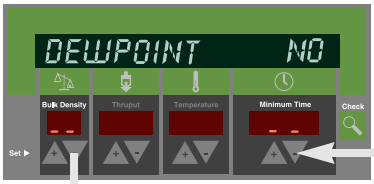
2 Press the ON switch and the Thruput ▼ button at the same time to enter *SETUP MODE*.

3 Press the Bulk Density ▼ button to move through the list of setup items.

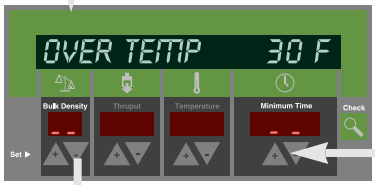
Press the Minimum Time ▲ or ▼ button to enter the following:

Press ▲ to go to the previous setup item.

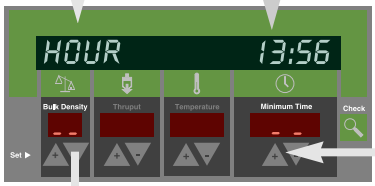
Press ▼ to go to the next setup item.



Press ▼ to select *YES*, if you have connected an optional dew point monitor. Otherwise, go to the next item in the setup list.



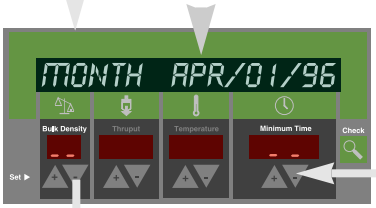
Enter the number of degrees (15-75˚) above the setpoint temperature that you want an alarm issued. Press ▼ to decrease or ▲ to increase.



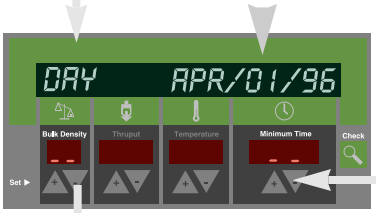
Press ▼ or ▲ to set the hour of the day. Time is displayed as a 24-hour clock:
00 to 12 = midnight to noon
13 to 23 = 1 p.m. to 11 p.m.

Go to the next page.

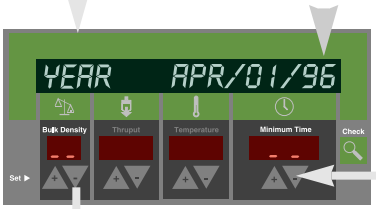
Press ▼ or ▲ to set the minutes of the hour.



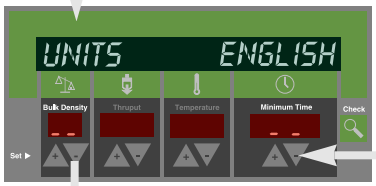
Press ▼ or ▲ to set the month of the year.



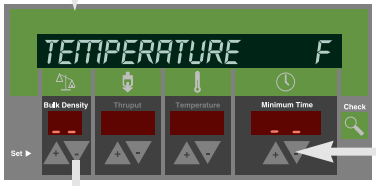
Press ▼ or ▲ to set the day of the month.



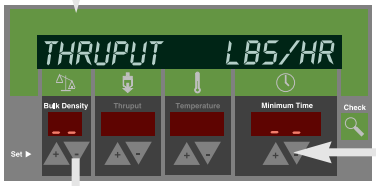
Press ▼ or ▲ to set the year.



Press ▼ to select *METRIC*, otherwise go to the next item in the list. Units will affect measures for bulk density, hopper volume and length.

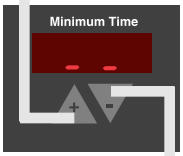


Press ▼ to select *C* for degrees Celsius, otherwise go to the next item in the list. This will affect Over Temp and setpoint temperature displays.



Press ▼ to select throughput units in kilograms/hour (*KG/HR*). Otherwise, go to the next item in the list.

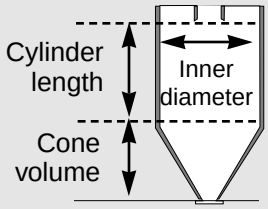
Press ▲ to increase a value.



Press ▼ to decrease a value.

Go to the next page.

INITIAL SETUP



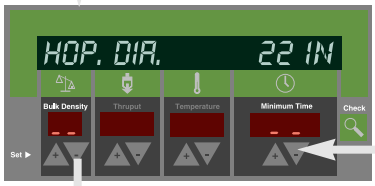
***NOTE:** You will need the information you recorded in Preparing for Installation for these setup items.*

Press ▲ to go to the previous setup item.

Press ▼ to go to the next setup item.

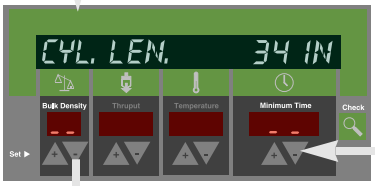
Press ▼ or ▲ to enter the volume of the hopper cone.

English = 0.1 to 100 cubic feet
Metric = 3 to 2830 liters



Press ▼ or ▲ to enter the inside diameter of the hopper.

English = 10 to 99 inches
Metric = 250 to 2514 mm

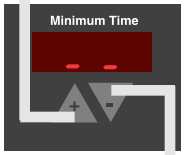


Press ▼ or ▲ to enter the usable length of the hopper cylinder.

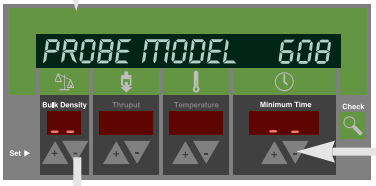
English = 1 to 999 inches
Metric = 25 to 25374 mm

This screen is informational only. It will display the hopper volume in pounds or kilograms based on the numbers you have entered.

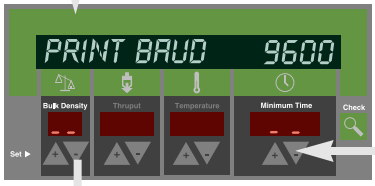
Press ▲ to increase a value.



Press ▼ to decrease a value.



Press ▼ or ▲ to enter the model number of the probe. This was entered at the factory. But if you change probe sizes, you need to enter this.



Press ▼ or ▲ to enter the baud rate of your printer (1200, 2400, 4800 or 9600). See the Appendix for printer setup information. If you don't have a printer, ignore this item.

You have finished initial setup. Go to Operation section.

OPERATION

DM-1 Control Features

Actual values display

The green window displays actual drying temperature and actual drying time; alarm messages; and the units of measure chosen during the initial setup.

NOTE: The timer counts accumulated drying time during PREDRY. During RUN, it displays actual drying time based on the setpoints and temperatures in the hopper.

Setpoint displays

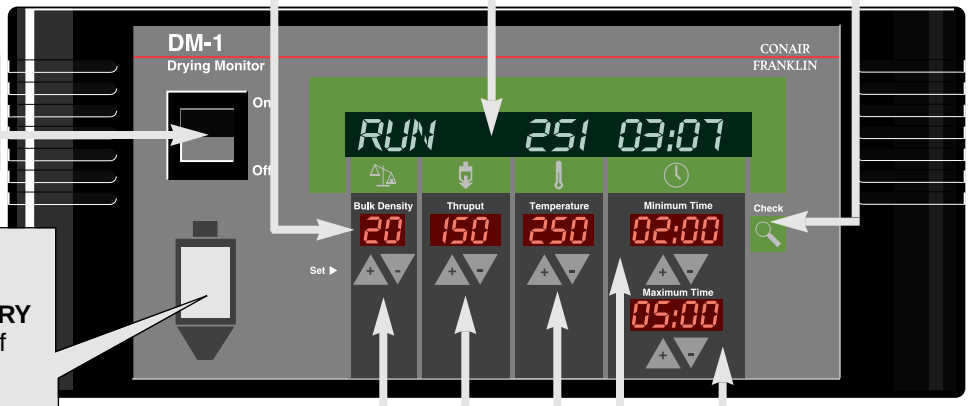
The red windows display setpoints entered for bulk density, throughput, temperature, minimum drying time and maximum drying time.

Check

Press and hold to display alarm messages and silence the audible alarm.

Power On/Off

Press to turn the DM1 on and off.



Status light

OFF = PREDRY
The light is off during predry mode.

RED = ALARM
Drying conditions have not been met. Do not process material.

GREEN = RUN
Drying conditions have been met. Material is ready to process.

Bulk Density

Press and hold ▲ or ▼ to enter the weight of the material in pounds per cubic foot or kilograms per cubic meter.

Material Throughput

Press and hold ▲ or ▼ to enter the number of pounds or kilograms of material you intend to process in one hour.

Drying Temperature

Press and hold ▲ or ▼ to enter the temperature the resin manufacturer recommends for drying the material. Temperature may be entered in degrees F or C.

Maximum drying time

Alerts the operator to conditions in the hopper that will cause the recommended drying time to be exceeded.

Press and hold ▲ or ▼ to enter the maximum amount of time the material can be dried at the setpoint temperature before it begins to degrade. The setting must be at least 150% of the minimum time setpoint

NOTE: If over drying is not a concern, enter 30 hours.

Minimum drying time

Prevents under drying material. Press and hold ▲ or ▼ to enter the amount of time the resin manufacturer recommends for drying the material at the setpoint temperature.

THE THREE OPERATING MODES

The DM-1 follows the drying process through three operating modes: *PREDRY, RUN* and *ALARM.* The hopper status light and actual values display shows which one is active.

PREDRY:
Status light OFF

- The DM-1 begins monitoring temperature in the hopper.
- When the lowest sensor in the probe senses the setpoint temperature, the DM-1 timer starts. The actual time at the drying temperature is displayed.

RUN:
Status light green

1 Start processing material.

- The DM-1 calculates that sufficient material has dried at the setpoint temperature to satisfy your throughput.
- The control displays the length of time the material will be dried at the setpoint temperature before leaving the hopper.

The DM-1 will return to *PREDRY* mode if:

- Power has been interrupted for more than 24 hours.
- All probe sensors detect temperatures below 120˚F (48˚C).
- The operator clears the timer field by simultaneously pressing Minimum Time ▼ and Maximum Time ▼ buttons.

ALARM:
Status light red

- The DM-1 has issued an alarm. Drying conditions have not been met, or there may be a problem with the DM-1 probe.

1 Press  **to see what caused the alarm.**

2 Go to the Troubleshooting section.

⚠ WARNING:
You should stop processing immediately and examine the DM-1 probe if the control displays a Probe Error. A loose probe could damage your processing machine.

PREPARING FOR OPERATION

The DM-1 will need the following information to calculate when the drying conditions have been met.

❒ **The bulk density of the material.**
If you don't know the bulk density, you can calculate it using the bottle provided.

❒ **The throughput of your processing machine.**
Calculate how many pounds or kilograms of material you process each hour.

❒ **The drying temperature for the material.**
Look for the recommended drying temperature on the resin container or in the resin manufacturer's specifications.

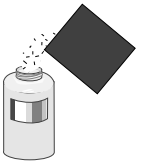
❒ **The minimum drying time for the material.**
Look for the recommended drying time on the resin container or in the resin manufacturer's specifications.

❒ **The maximum drying time for the material.**
Consult the resin manufacturer's specifications. You want to know the maximum amount of time the material can be dried at the setpoint temperature before it begins to discolor or degrade. If over drying is not a concern, you can can set maximum time on the DM-1 control to 30 hours.

How to calculate bulk density

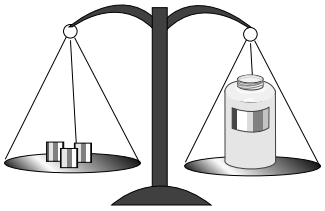
1 **Fill the bottle with material.**

2 **Level off the top with a straight edge.** Do **not** shake or pack the material into the bottle.



3 **Weigh the bottle full of material.**

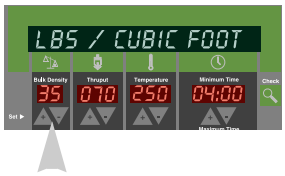
4 **Refer to the bulk density chart on the bottle.**
Weights are in pounds.



STARTING THE DM-1

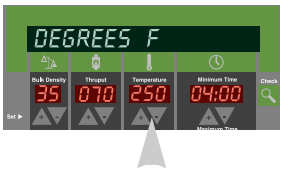
1 Turn on power to the DM-1.
If you were in Setup Mode, you need to turn off the DM-1 and then turn it back on.
- ◆ The monitor performs a self test, blinking the actual and setpoint displays.
- ◆ Status light blinks red, then green, then off.
- ◆ *PREDRY* and time appear in the actual display.

2 Press ▼ or ▲ to enter the material's bulk density.
- ◆ Actual display will indicate lbs/cubic foot or kg/cubic meter.

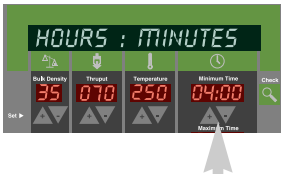


3 Press ▼ or ▲ to enter the throughput.
- ◆ Actual display will indicate lbs/hr or kg/hr.

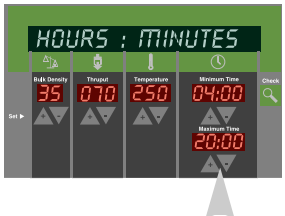
4 Press ▼ or ▲ to enter the drying temperature.
- ◆ Actual display will indicate Degrees F or Degrees C.



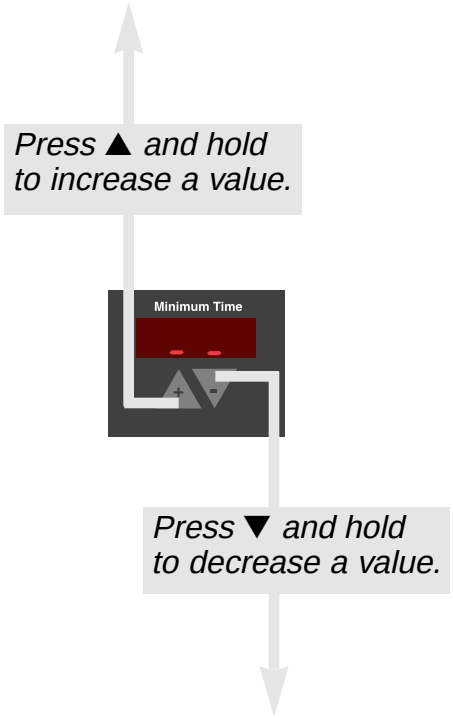
5 Press ▼ or ▲ to enter the minimum drying time.
- ◆ Actual display will indicate Hours / Minutes.



6 Press ▼ or ▲ to enter the maximum drying time.
- ◆ Actual display will indicate Hours / Minutes.



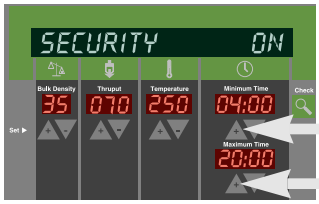
7 Start your dryer.

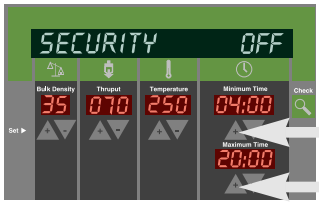


USING THE SECURITY FEATURE

The DM-1 has a security feature that prevents accidental or unauthorized changes to the bulk density, throughput, temperature and time settings. Only the CHECK button functions when security is on.

The security feature can be enabled or disabled at anytime during DM-1 operation.





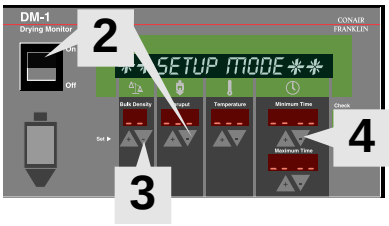
1. **Press the Minimum Time ▲ and Maximum Time ▲ at the same time to turn security ON.**
2. **Repeat Step 1 to turn security OFF.**

RETURNING TO SETUP MODE

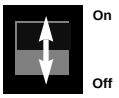
If you need to change setup information, such as switching from English or metric units of measure:

1. **Turn off the DM-1 control.**

2. **Press the ON switch and the Thruput ▼ button at the same time**.
3. **Press the Bulk Density ▼ button** to move through the list of setup items.



4. **Press the Minimum Time ▲ or ▼ button** to enter the information.
5. **Press OFF and then ON to return to operating mode** after you've finished changing setup information.



See the Installation section for initial setup instructions.

STOPPING THE DM-1

1. **Turn OFF power to the DM-1 control.**

NOTE: *If power is off for more than 5 minutes and less than 24 hours, the DM-1 will alarm on restart. Press the CHECK button to turn off the audible alarm. When the CHECK button is released the POWER OFF message will be removed.*

MAINTENANCE

DM-1 MAINTENANCE CHECKLIST

The DM-1 Drying Monitor requires little maintenance. We recommend the following maintenance schedule and tasks.

● Whenever you change hoppers

❒ **Verify or change the initial setup information entered in the DM-1 control.**
Setup entries for the probe model, cone volume, hopper diameter and usable hopper cylinder length must be correct for the hopper and probe you plan to use. See the Installation section for details on initial setup information.

❒ **Verify or change setpoint entries on the control.**
Verify that the bulk density, throughput, temperature and time settings are correct for the application and material in this hopper.

● Whenever you change materials

❒ **Change the setpoint entries on the control.**
Verify that the bulk density, throughput, temperature and time settings are correct for the new material.

❒ **Inspect the probe and mounting assembly.**
If the probe is damaged, replace it. If vibration has loosened the probe mounting hardware, tighten it.

● Monthly, or as often as needed

❒ **Inspect cables and cords for damage or wear.**
Replace any cable or power cord that is worn.

❒ **Inspect cable connections.**
Check for damage or loose connections. Tighten connections or replace damaged connectors.

TROUBLESHOOTING

BEFORE BEGINNING

You can avoid most problems by following the recommended installation and maintenance procedures outlined in this User Guide and your drying equipment manuals.

If you do have a problem, this section will help you determine what caused it. You'll also find repair information, if the problem was caused by the DM-1 control or probe.

Before you begin troubleshooting:

❑ **Find the wiring and assembly diagrams you received with your DM-1.** These diagrams will note any custom features, such as special wiring or alarm capabilities, not covered in this User Guide.

❑ **Find the instruction manuals and diagrams that were shipped with your dryer and hopper.** The DM-1 alarm messages will help you diagnose problems in your drying system, but you'll need the instructions associated with your particular dryer and hopper to make any repairs.

A FEW WORDS OF CAUTION

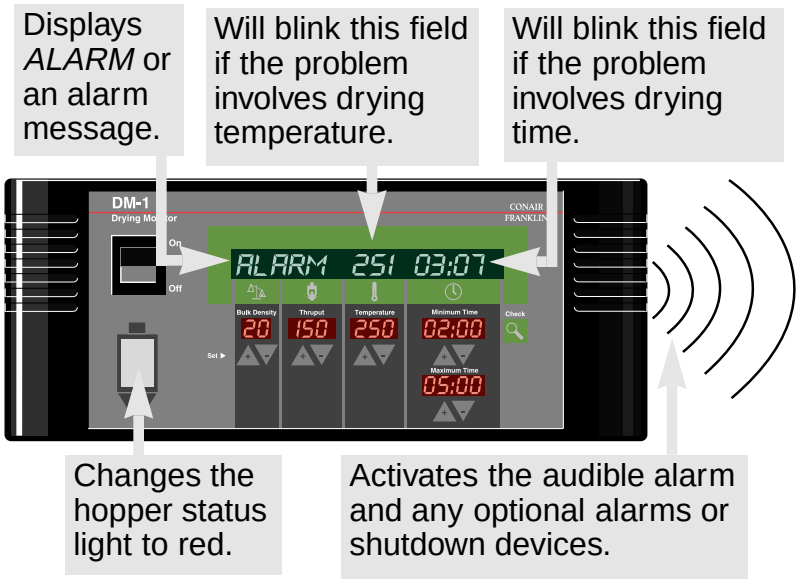
CAUTION: Disconnect and lockout power before servicing.
Always turn off the dryer, disconnect and lock out the main power source before repairing problems with the DM-1 probe or the drying system.

CAUTION: Protect yourself from hot surfaces inside and outside the hopper and dryer.
Always allow the hopper to cool before repairing or replacing the DM-1 probe.

WARNING: Only qualified service personnel should examine and correct problems that require opening electrical enclosures or using electrical wires to diagnose the cause.

WHEN AN ALARM OCCURS

When there is a problem, the DM-1:



1 Press CHECK to silence the audible alarm and display the alarm message.

> ***NOTE:*** POWER OFF, FATAL ERROR, MEMORY ERROR and PROBE ERROR *will display whenever that problem occurs. You need to press the* CHECK *button to acknowledge and clear these messages.*

2 Press and hold CHECK if more than one alarm condition exists.

Multiple alarms

The display will show the number of alarms. As you hold the CHECK button, each alarm message will appear in the display in the order in which the problem occurred.

WARNING: A broken probe could damage your machine.
If you see a ***PROBE ERROR*** message, immediately shut down your processing machine. Check for loose or damaged cable connections and wiring between the probe and control. If no problems are found, check the probe for damage.

DRYING SYSTEM ALARMS

Drying system alarms indicate a problem with your dryer, hopper or the hoses connecting the two.

Press CHECK  to silence the audible alarm and display the alarm message.

Alarm	Possible cause	Solution
OVER TEMP. TOP One or both upper sensors in the DM-1 probe sensed temperatures exceeding the safety margin you set for the drying temperature.	**Is the hose delivering hot air to the hopper connected to the wrong inlet?**	Verify that the dryer's delivery air hose is connected to the inlet near the bottom of the hopper. The hose returning moist air to the dryer should be connected to the outlet near the top of the hopper.
	Are the dryer's blowers running backwards?	Verify that the blowers are turning in the same direction as the arrow stamped on their housings. If rotation is reversed, consult your dryer manual for repair information.
	Were setpoint temperatures correctly entered in the DM-1 control?	Verify the setpoint temperature and Over Temp. setup information. Correct, if necessary.
OVER TEMP. BOTTOM Any of the four lower sensors in the DM-1 probe sensed temperatures exceeding the safety margin you set for the drying temperature.	**Has your dryer malfunctioned?**	Check your dryer. Malfunctions in the dryer's heaters, temperature controller, temperature sensors or electrical system could cause excessively hot air to be delivered to the hopper. Consult your dryer manual for troubleshooting and repair information.
	Were setpoint temperatures correctly entered in the DM-1 control?	Verify the setpoint temperature and Over Temp. setup information. Correct, if necessary.

DRYING SYSTEM ALARMS

Drying system alarms indicate a problem with your dryer, hopper, or hoses connecting the two.

Press CHECK to silence the audible alarm and display the alarm message.

Alarm	Possible cause	Solution
TEMP. LOW The bottom sensor in the DM-1 probe determined that the temperature has fallen below the drying temperature setpoint.	**Is the dryer unable to supply enough air at the setpoint temperature?**	Check filters and hoses for conditions that would reduce air flow to the hopper. ❒ Straighten crimps in hoses. ❒ Connect any loose hoses. ❒ Replace damaged hoses. ❒ Clean or replace dirty filters.
	Has the dryer malfunctioned?	Check your dryer. Malfunctions in the dryer's blowers, heaters, temperature controller, temperature sensors or electrical system could prevent delivery of hot air to the hopper. Consult your dryer manual for troubleshooting and repair information.
	Was the setpoint temperature entered correctly in the dryer and DM-1 control?	Verify the drying temperature setpoint. Correct, if necessary.
POWER OFF 02:45 The DM-1 detected a loss of power for more than 5 minutes but less than 24 hours. The display indicates the length of time without power.	**Was the DM-1 disconnected from it's power source?**	Press the CHECK button to acknowledge the message. The DM-1 will resume operation.
	Did the DM-1 and the dryer lose power?	Press the CHECK button to acknowledge the message. If the DM-1 resumes in ALARM mode, hold the CHECK button to display any additional alarms. If the DM-1 resumes in RUN mode, you can continue operating. But if you want to return to *PREDRY,* press the Minimum and Maximum Time ▼ buttons to clear the time.

DRYING SYSTEM ALARMS

Drying system alarms indicate a problem with your dryer, hopper or the hoses connecting the two.

Press CHECK  to silence the audible alarm and display the alarm message.

Alarm	Possible cause	Solution
LOW DRYING TIME Temperatures inside the hopper indicate the material needs more drying time at the setpoint temperature to satisfy the minimum time and throughput requirements you entered in the DM-1.	**Is the dryer unable to supply enough air at the setpoint temperature?**	Check filters and hoses for conditions that would reduce air flow to the hopper. ❒ Straighten crimps in hoses. ❒ Connect any loose hoses. ❒ Replace damaged hoses. ❒ Clean or replace dirty filters.
	Is your loading system keeping enough material in the hopper to satisfy throughput?	Verify that the material supply system is working correctly. Consult your conveying system manuals for troubleshooting and repair information.
	Did someone remove dried material from this hopper to prime another machine?	Continue drying the material until the DM-1 changes from ALARM mode to RUN mode, indicating that drying conditions have been met.
	Were the setpoints entered correctly in the DM-1?	Verify the minimum time, drying temperature and throughput setpoints. Correct, if necessary.
	Is the throughput too high for the size of the dryer?	Use a larger dryer for this application or reduce the required throughput.
	Are you loading excessively cold material into the hopper?	Material stored outside in extremely cold temperatures can overload a dryer's capacity. You may need to predry this material or use a larger capacity dryer to satisfy the drying temperature and time requirements.

DRYING SYSTEM ALARMS

Drying system alarms indicate a problem with your dryer, hopper or hoses connecting the two.

Press CHECK to silence the audible alarm and display the alarm message.

Alarm	Possible cause	Solution
HIGH DRYING TIME Drying time at the setpoint temperature has exceeded your maximum time setting. Material may discolor or degrade from over drying.	**Were the setpoints entered correctly in the DM-1?**	Verify the maximum time and throughput setpoints. Correct, if necessary.
	Did you reduce your throughput?	Make sure the setpoint you entered in the DM-1 control matches the actual throughput.
	Are you running a low throughput with a large hopper?	Throughput may be too low for this size hopper. Use a smaller hopper for this application, or increase throughput.
HOPPER TOO SMALL The DM-1 has determined that the hopper is not large enough to satisfy time, temperature and throughput setpoints.	**Are you running a high throughput with a small hopper?**	Throughput may be too high for this size hopper. Use a larger hopper for this application, or reduce throughput.
	Were the setpoints entered correctly in the DM-1?	Verify the minimum time, bulk density and throughput setpoints. Correct, if necessary.
	Did you enter the correct information about hopper size while setting up the DM-1?	Return to SETUP MODE and verify the cone volume, hopper diameter and cylinder length for this hopper.
DEWPOINT Dew point is unsatisfactory. ***NOTE:*** *This alarm will appear only if the DM-1 is connected to an optional dew point monitor.*	**Are there any leaks in the process or regeneration air circuits?** **Is the desiccant saturated or contaminated?** **Did the dryer malfunction?**	Consult your dryer and dew point monitor manuals for troubleshooting and repair information on any problems relating to unsatisfactory dew points.

DM-1 System Alarms

DM-1 system alarms indicate a problem with the DM-1 control or probe.

Press CHECK to silence the audible alarm and acknowledge the alarm message.

Alarm	Possible cause	Solution
PROBE ERROR The DM-1 has detected a broken probe or multiple sensor failure.	**Is the probe cable or connector loose or damaged?**	Verify that the probe cable is securely fastened to the probe connector and to the probe port on the back of the DM-1 control. Replaced damaged connectors or a damaged probe cable.
WARNING: Immediately shut down your processing machine and check the probe when you see this message. A broken probe could damage your machine.	**Has the probe come loose from its mounting in the top of the hopper?**	Shut down your processing machine and verify that the probe is securely fastened to its mount in the top of the hopper. If the probe is broken, remove all pieces from the hopper and replace the probe.
	Has more than one sensor failed in the probe?	If the probe, connectors and cable are secure and undamaged, there has been a multiple sensor failure. Replace the DM-1 probe.
SENSOR FAILED The DM-1 has detected a sensor failure in the probe.	**One sensor in the probe has failed.**	Install a replacement probe as soon as possible. The DM-1 control will continue to operate with one failed sensor.
FATAL ERROR The DM-1 has detected a hardware failure in the control. No audible alarm is sounded because it may not be possible.	**The DM-1 control's internal hardware has failed.**	Contact the Conair service department for a replacement control. The DM-1 will not operate in this condition.

DM-1 System Alarms

DM-1 system alarms indicate a problem with the DM-1 control or probe.

Press CHECK to silence the audible alarm and display the alarm message.

Alarm	Possible cause	Solution
MEMORY ERROR The DM-1 has detected a problem with its internal memory.	**Did static electricity or a power surge temporarily disrupt the control's internal memory?**	Turn off power to the DM-1 and then turn it back on. If this does not solve the problem, reset the setpoints and turn the control's power off and on again.
	Did an internal memory chip fail?	If resetting setpoints and turning the power off and on does not work, call the Conair service department. The control may have a bad memory chip.

We're Here to Help

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

How to Contact Customer Service

To contact Customer Service personnel, call:

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

Before You Call ...

If you do have a problem, please complete the following checklist before calling Conair:

- ❒ Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- ❒ Make sure power is supplied to the equipment.
- ❒ Make sure that all connectors and wires within and between control systems and related components have been installed correctly.
- ❒ Check the troubleshooting guide of this manual for a solution.
- ❒ Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- ❒ Check that the equipment has been operated as described in this manual.
- ❒ Check accompanying schematic drawings for information on special considerations.

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

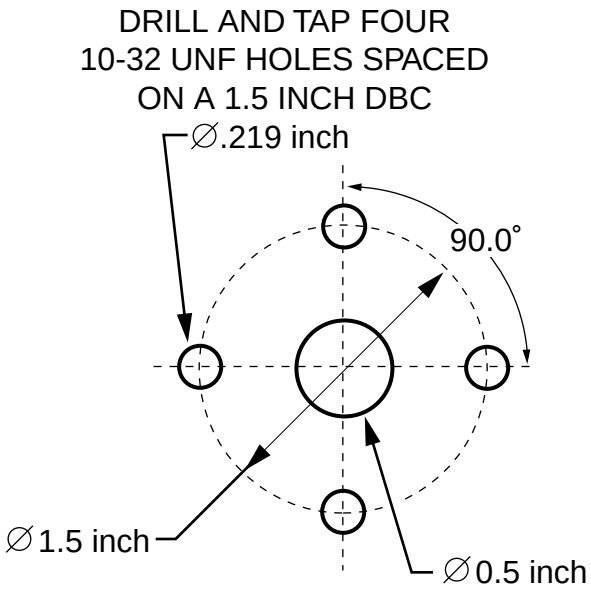
Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

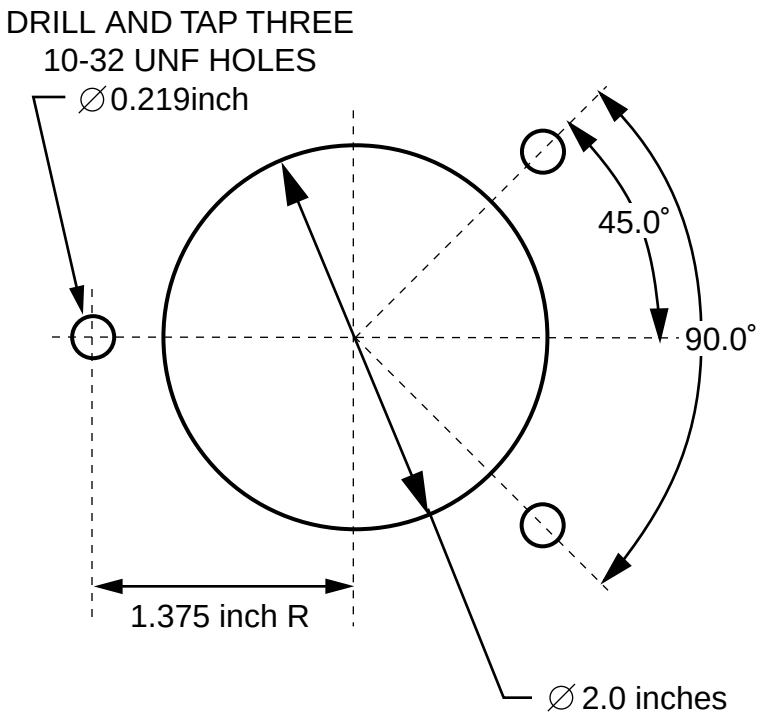
TEMPLATE FOR DM-1 PROBE MOUNTING METHOD 2

This drawing may be used as a template for drilling holes in the top of the hopper to mount the DM-1 probe using the coupling portion of the mounting adapter kit.



TEMPLATE FOR DM-1 PROBE MOUNTING METHOD 3

This drawing may be used as a template for drilling holes in the top of the hopper to mount the DM-1 probe using the coupling and mounting adapter plates contained in the kit.

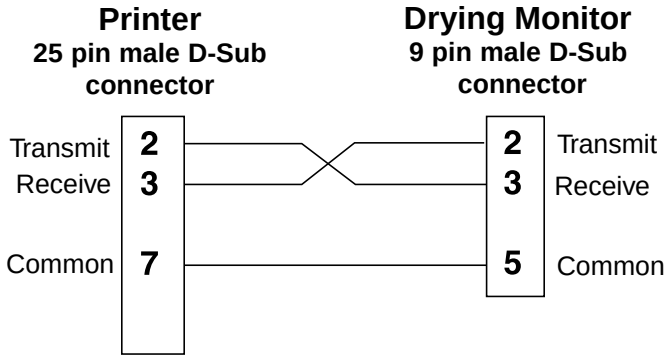


DRYING MONITOR PRINTER SPECIFICATIONS

The DM-1 Drying Monitor can be connected to an Epson LX300 or compatible printer that has:

- A RS-232 serial port
- Supports continuous feed paper
- Prints a minimum of 80 characters per line
- Supports 1200 to 9600 baud communications

The printer cable configuration is:



SETTING UP THE PRINTER FOR COMMUNICATION

You need to configure your printer to communicate with the Drying Monitor. Use the instructions that came with your printer to set these parameters

1 Set the printer's baud rate.
The setting should be 9600, 4800, 2400 or 1200 for the DM-1; 1200 for the DM-1A.

2 Set communications parameters to:
Data bits = 8
Start bit = 1
Stop bit = 1
Parity = None (No)

3 Set DTR (Data Terminal Ready) to OFF.
On printers with a choice of High/Low, set to Low.

4 Set XON/XOFF flow control to OFF.

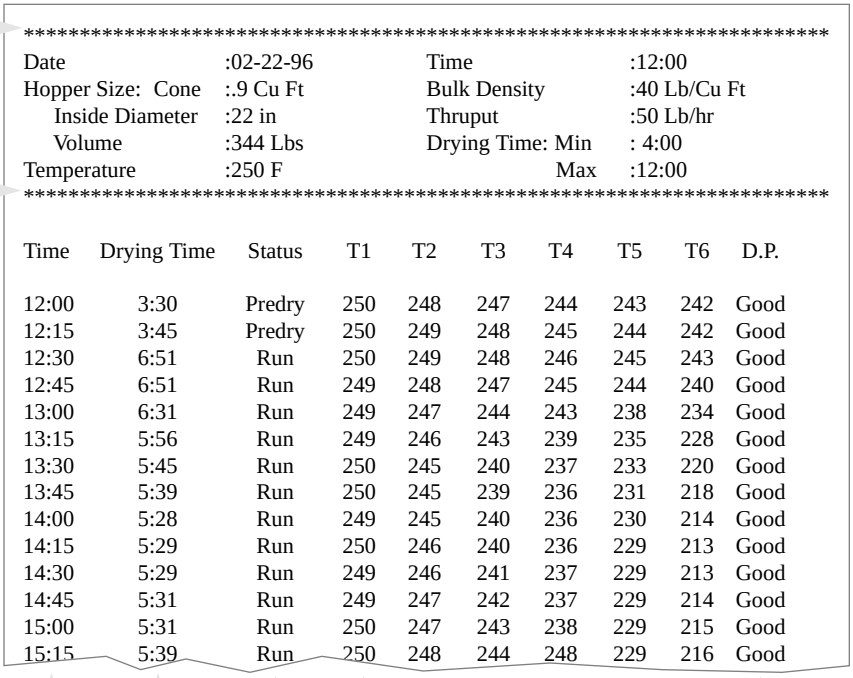
5 Set ETX/ACK (End Transmission/Acknowledge) to OFF.
Disable or turn OFF any other communications handshaking parameters your printer may use.

Make sure the baud rate you set in the printer agrees with the baud rate entered in the drying monitor during initial setup. If you have not set up the drying monitor, go to *Initial Setup* in the Installation section of the monitor's User Guide.

SAMPLE PRINTOUT

Setpoints entered by the operator are printed between lines of asterisks at the top of each page. This data also will be printed when:

- The DM-1 is turned on.
- Power is restored after an interruption
- Any control button, except CHECK, is pressed.



Date	:02-22-96	Time	:12:00
Hopper Size: Cone	:.9 Cu Ft	Bulk Density	:40 Lb/Cu Ft
Inside Diameter	:22 in	Thruput	:50 Lb/hr
Volume	:344 Lbs	Drying Time: Min	: 4:00
Temperature	:250 F	Max	:12:00

Time	Drying Time	Status	T1	T2	T3	T4	T5	T6	D.P.
12:00	3:30	Predry	250	248	247	244	243	242	Good
12:15	3:45	Predry	250	249	248	245	244	242	Good
12:30	6:51	Run	250	249	248	246	245	243	Good
12:45	6:51	Run	249	248	247	245	244	240	Good
13:00	6:31	Run	249	247	244	243	238	234	Good
13:15	5:56	Run	249	246	243	239	235	228	Good
13:30	5:45	Run	250	245	240	237	233	220	Good
13:45	5:39	Run	250	245	239	236	231	218	Good
14:00	5:28	Run	249	245	240	236	230	214	Good
14:15	5:29	Run	250	246	240	236	229	213	Good
14:30	5:29	Run	249	246	241	237	229	213	Good
14:45	5:31	Run	249	247	242	237	229	214	Good
15:00	5:31	Run	250	247	243	238	229	215	Good
15:15	5:39	Run	250	248	244	248	229	216	Good

Time data was recorded in hours and minutes.

Current drying time calculated for material in the hopper.

Operating status. *PREDRY, RUN* or *ALARM.*

Actual temperatures recorded by sensors inside the hopper. T1 is at the lowest location in the probe; T6 is at the highest location in the probe.

Prints GOOD or BAD if an optional dew point monitor is connected to the DM-1 control. GOOD indicates dew point is at or below the setpoint temperature entered by the operator.