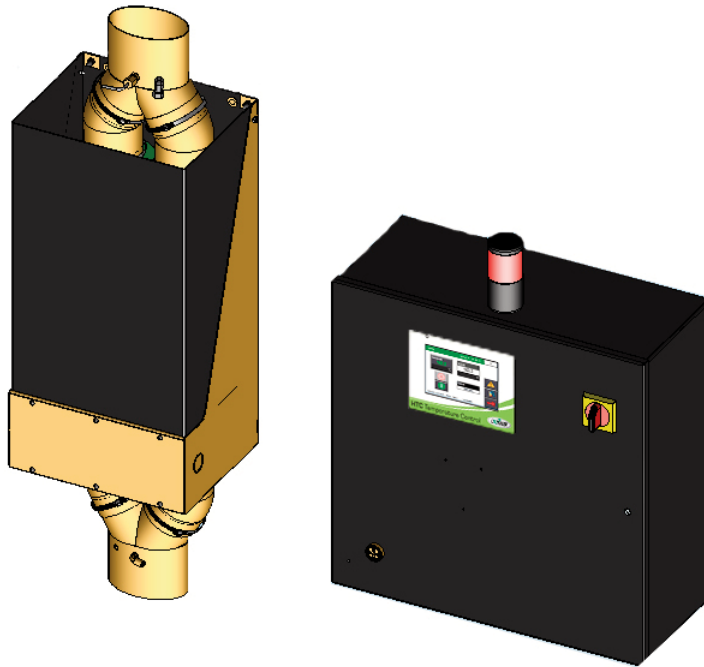


USER GUIDE
UGD031-0919

Hopper Temperature Controller

Process Air Heater, 30 to 270 kW.

For use with Conair Carousel Plus Series D Dryers and HADs.



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: UGD031-0919

Serial Number(s):

Model Number(s):

DISCLAIMER: Conair nor its employees shall be liable for errors contained in this User Guide or for incidental, consequential damages in connection with the furnishing, performance or use of this information. Conair makes no warranty of any kind with regard to this information, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose.

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Purpose of the User Guide

This User Guide describes the Conair Hopper Temperature Controller (HTC) process air heater 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 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 circle marks items in a list.
- ◆◊ Indicates a tip. A tip is used to provide you with a suggestion that will help you with the maintenance and the operation of this equipment.
- ✎ Indicates a note. A note is used to provide additional information about the steps you are following throughout the manual.

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: Improper installation, operation, or servicing may result in equipment damage or personal injury.

This equipment should be installed, adjusted, and serviced by a qualified technician who is familiar with the construction, operation and potential hazards of this type of machine.

All wiring, disconnects and fuses should be installed by a qualified electrical technician in accordance with electrical codes in your region. Always maintain a safe ground. Do not operate the equipment at power levels other than what is specified on the machine serial tag and data plate.



WARNING: Voltage hazard

This equipment is powered by three-phase alternating current, as specified on the machine serial tag and data plate.

A properly-sized conductive ground wire from the incoming power supply must be connected to the chassis ground terminal inside the electrical enclosure (control center). Improper grounding can result in severe personal injury and erratic machine operation.

Always disconnect and lock out the incoming main power source before opening the control center or performing non-standard operating procedures, such as routine maintenance. Only qualified technician should perform troubleshooting procedures that require access to the control center while power is on.

ATTENTION:

Read this so no one gets hurt (continued)

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.



CAUTION: Hot Surfaces.


Always protect yourself from hot surfaces inside the dryer and hopper. Also, exercise caution around exterior surfaces that may become hot during use. These include the hopper door frame, the exterior of an uninsulated hopper, the return air hose and the dryer's process filter housing and moisture exhaust outlet.



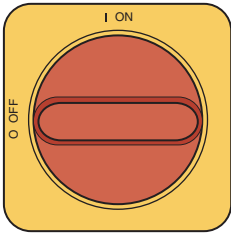
WARNING: Do not place aerosol, compressed gas or flammable materials on or near this equipment.

The hot temperatures associated with the drying process may cause aerosols or other flammable materials placed on the dryer or hopper to explode.

How to Use the Lockout Device

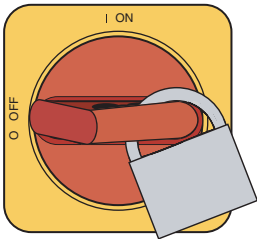
 **CAUTION:** Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energization or start-up. A lockable device has been provided to isolate this product from potentially hazardous electricity.


Lockout is the preferred method of isolating machines or equipment from energy sources. Your Conair product is equipped with a lockout device similar to the one pictured below.



To use the lockout device:

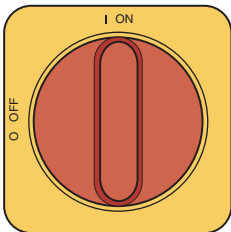
- 1 Stop or turn off the equipment.**
- 2 Isolate the equipment from the electric power.** Turn the rotary disconnect switch to the OFF, or “O” position.
- 3 Secure the device with an assigned lock or tag.** Insert a lock or tag in the holes to prevent movement.
- 4 The equipment is now locked out.**



 **WARNING:** Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed and all safety guards re-installed.

To restore power to the heater, turn the rotary disconnect back to the ON position:

- 1 Remove the lock or tag.**
- 2 Turn the rotary disconnect switch to the ON or “I” position.**



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What is the HTC Process Air Heater?

The HTC process air heater is designed to control the temperature of dry air as it enters a material hopper. This process air heater can be set to increase, or “raise”, the temperature of air that was dehumidified at a central dryer or from a blower as part of hot-air drying.

The HTC includes a control center, heater box with electric heating elements, an airflow differential pressure switch and a RTD temperature probe(s).

The differential pressure switch places the HTC in Standby mode to save energy and prevents heating element damage when air flow is not present.

Typical Applications

Carousel Plus “D Series” Dryer

The HTC process air heater is designed for use with a dehumidifying device that supplies dry air, such as a central dehumidifying dryer in which the process heaters (if present) have been disabled, or with a stand alone blower for hot-air drying.

The HTC can be used successfully in applications that require:

- Drying temperatures ranging from 150° - 350°F {65.5° - 176.7°C} (150° - 350°F {65.5° - 176.7°C} on HAD models).
- The ability to dry multiple materials requiring different drying temperature setpoints in a central drying system. (Requires separate HTCs / hoppers.)
- The ability to easily take a hopper “off-line” for cleaning without shutting down the entire central drying system.

Hot Air Dryer (HAD)

The HTC process air heater, for use with a hot-air dryer such as a Conair model HAD, connects plant air generated by a Conair blower assembly to a material drying hopper.

The HTC for HAD can be used successfully in applications that require:

- Drying temperatures ranging from 120° - 250°F {48.8° - 121.1°C}
- Non-hygroscopic materials that are in pellet or flake form (not powder).
- Open-loop drying (not recirculated).

The HTC does not have an integral blower to circulate the hot air, so it can not be used as a stand-alone material preheater. It must be combined with a Conair Carousel Plus Series “D” dryer or Hot Air Dryer (HAD).

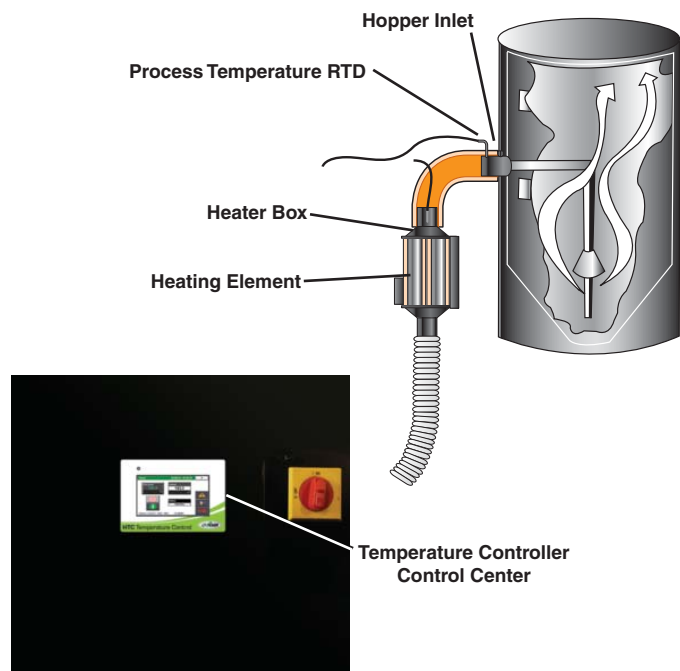
How it Works

The HTC process air heater works a lot like the thermostat and heater in your house. The RTD probe measures the temperature of the air entering the hopper. If this air is not warm enough to properly dry the material in the hopper, the RTD sends a message to the temperature controller which tells the heater to begin heating. The heating elements inside the heater enclosure heat until the RTD probe senses that the air entering the hopper is at the setpoint entered by the user.

An air flow differential pressure switch detects air flow by sensing the natural drop of pressure due to air flow through the heater. This prevents damage to the heater elements or material in the hopper due to loss of air flow.

The temperature controller alarms if the heating elements are heating too much. It also alarms if the heating elements are not heating enough.

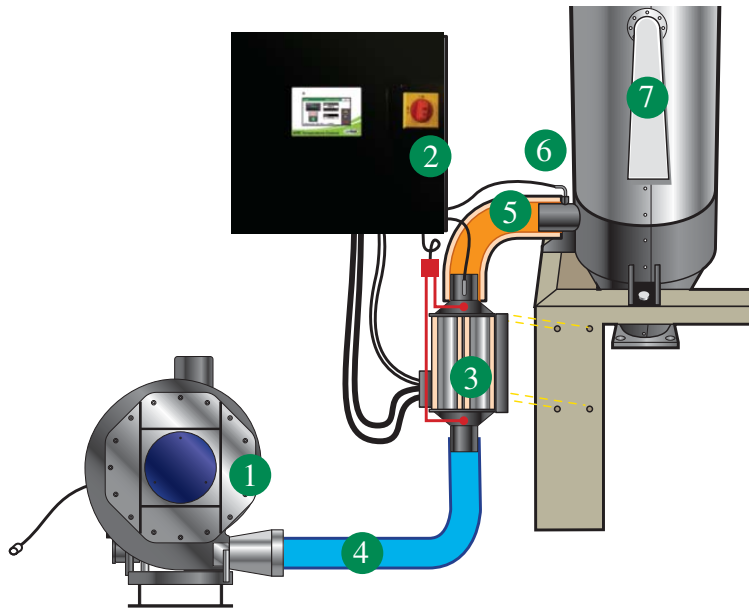
How the HTC Works



(continued)

How it Works (continued)

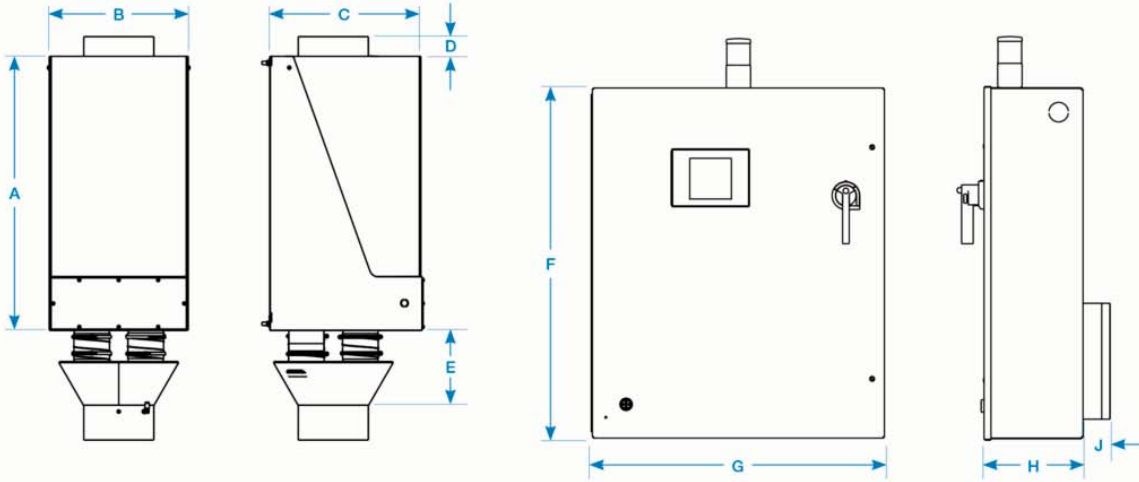
How the HAD Works



- ① Centrifugal blower assembly
- ② Control center
- ③ Electric heater assembly
- ④ Hose - 15 ft {4.6 m}
- ⑤ Insulated hose - 3 ft {0.9 m}
- ⑥ RTD process temperature
- ⑦ Outlet filter sock

Specifications: HTC Models 600 - 5000

TPDX022-0819



Model HTC	HTC-30H*	HTC-60H*	HTC-90H*	HTC-120H*	HTC-180H*	HTC-270H*
Carousel Plus dryer model	W600	W800 & W1000	W1600	W2400	W3200	W5000
Performance characteristics						
Temperature range	150° - 350° F (65.5° - 176.7° C)					
Flow rate cfm	300	400	500	800	1200	2500
Pressure drop @ flow rate						
inches WC†	3.0	1.8	2.3	4.0	3.8	6.4
(mm) WC†	(76.2)	(45.7)	(58.4)	(101.6)	(96.5)	(162.6)
Dimensions inches (cm)						
Heater box dimensions						
Inlet size (OD)	8		12			
Outlet size (OD)	8		12			
A - Height	31.4 (79.8)	27.5 (69.9)	27.0 (68.6)	31.0 (78.7)	34.0 (86.4)	36.4 (92.5)
B - Width	10.1 (25.7)	13.6 (34.5)	16.0 (40.6)		18.0 (45.7)	24.2 (61.5)
C - Depth	10.7 (27.2)	10.9 (27.7)		16.0 (40.6)	17.0 (43.2)	
D - Height of discharge nozzle (above the heater box)	1.75 (4.4)	1.5 (3.8)	2.0 (5.1)	1.0 (2.5)	2.0 (5.1)	1.0 (2.5)
E - Height of inlet nozzle (below the heater box)	10.6 (26.9)	7.1 (18.0)	8.0 (20.3)	10.0 (25.4)	13.0 (33.0)	15.4 (39.1)
Installed weight lb (kg)‡	38 (17)	37 (17)	78 (35)	93 (43)	102 (46)	131 (59)
Control center dimensions						
F - Height	24.0 (61.0)		36.0 (91.4)	48.0 (122.0)	60.0 (152.4)	
G - Width	24.0 (61.0)		30.0 (76.2)	36.0 (91.4)	42.0 (106.7)	
H - Depth			10.0 (25.4)		12.0 (30.5)	
J - Clearance for heat sink			3.0 (7.6)			
Installed weight lb (kg)	150.0 (68.0)		180.0 (81.6)	250.0 (113.0)	consult Conair	
Voltage full load amps §						
400V/3 phase/50 Hz	45	88	132	175	261	392
460 V/3 phase/60 Hz	39	76	114	152	228	341
575 V/3 phase/60 Hz	31	62	92	122	182	273

Specification Notes

* The HTC model number reflects the kilowatts of each unit. For example, HTC-60 has a 60 kilowatt heater.

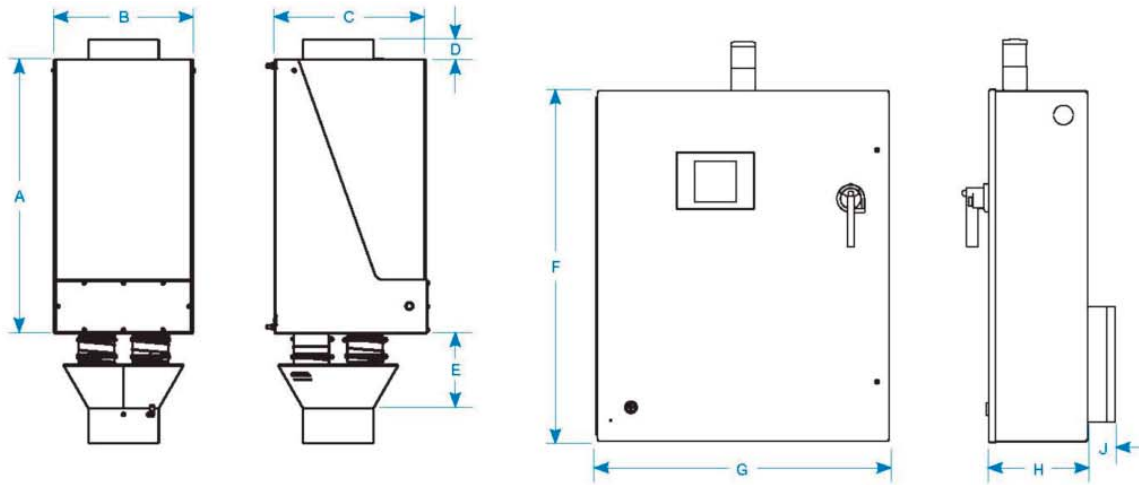
† The unit of measure WC is water column.

‡ Weights are approximate.

§ FLA data for reference purposes only. Does not include any options or accessories on equipment. For full FLA detail for power circuit design of specific machines and systems, refer to the electrical diagrams of the equipment order and the nameplate applied to the machine.

Specifications may change without notice. Consult a Conair representative for the most current information.

Specifications: HTC for Hot Air Dryers (HAD)



Model HTC	HTC-30H*		HTC-60H*		HTC-90H*	HTC-120H*	HTC-180H*	HTC-270H*
Carousel Plus dryer model	W600		W800 & W1000		W1600	W2400	W3200	W5000
Performance characteristics								
Temperature range	150° - 375° F {66° - 191° C}							
Flow rate cfm	300	400	500	800	1200	1600	2500	
Pressure drop @ flow rate								
inches WC†	3.0	1.8	2.3	4.0	3.8	5.9	6.4	
{mm} WC†	{76.2}	{45.7}	{58.4}	{101.6}	{96.5}	{149.9}	{162.6}	
Dimensions inches {cm}								
Heater box dimensions								
Inlet size (OD)	8			12				
Outlet size (OD)	8			12				
A - Height	31.4 {79.8}	27.5 {69.9}		27.0 {68.6}	31.0 {78.7}	34.0 {86.4}	36.4 {92.5}	
B - Width	10.1 {25.7}	13.6 {34.5}		16.0 {40.6}		18.0 {45.7}	24.2 {61.5}	
C - Depth	10.7 {27.2}	10.9 {27.7}			16.0 {40.6}		17.0 {43.2}	
D - Height of discharge nozzle (above the heater box)	1.75 {4.4}	1.5 {3.8}		2.0 {5.1}	1.0 {2.5}	2.0 {5.1}	1.0 {2.5}	
E - Height of inlet nozzle (below the heater box)	10.6 {26.9}	7.1 {18.0}		8.0 {20.3}	10.0 {25.4}	13.0 {33.0}	15.4 {39.1}	
Installed weight lb {kg}‡	38 {17}	37 {17}		78 {35}	93 {43}	102 {46}	131 {59}	
Control center dimensions								
F - Height	24.0 {61.0}			36.0 {91.4}	48.0 {122.0}	60.0 {152.4}		
G - Width	24.0 {61.0}			30.0 {76.2}	36.0 {91.4}	42.0 {106.7}		
H - Depth				10.0 {25.4}		12.0 {30.5}		
J - Clearance for heat sink				3.0 {7.6}				
Installed weight lb {kg}	150.0 {68.0}			180.0 {81.6}	250.0 {113.0}	consult Conair		
Voltage full load amps §								
400V/3 phase/50 Hz	45	88		132	175	261	392	
460 V/3 phase/60 Hz	39	76		114	152	228	341	
575 V/3 phase/60 Hz	31	62		92	122	182	273	

Specification Notes

* The HTC model number reflects the kilowatts of each unit. For example, HTC-60 has a 60 kilowatt heater.

† The unit of measure WC is water column.

‡ Weights are approximate.

§ FLA data for reference purposes only. Does not include any options or accessories on equipment. For full FLA detail for power circuit design of specific machines and systems, refer to the electrical diagrams of the equipment order and the nameplate applied to the machine.

Specifications may change without notice. Consult a Conair representative for the most current information.

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Unpacking the Boxes

The HTC process air heater comes in two boxes. Depending on the model and options ordered, the boxes could include:

Standard Equipment:

- Heater assembly
- Control center
- One (1) insulated hose
- Two (2) hose clamps
- Two (2) RTD probes (one (1) process and one (1) process protection)
- Blower (HAD models only)

Optional Equipment:

- One (1) RTD probe (one (1) setback).

- 1 Carefully remove all components** from their shipping containers.
- 2 Remove all packing material**, protective paper, tape and plastic.
- 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** and electrical power specifications in the blanks provided on the back of the User Guide's title page. The information will be helpful if you ever need service or parts.
- 5 You are now ready to begin installation.** See *Installation section entitled, Preparing for Installation.*

Preparing for Installation


The HTC process air heater is easy to install, if you prepare the mounting area properly.


1 Make sure the mounting area provides:

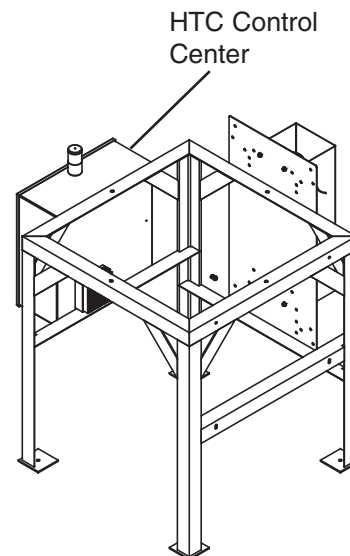
- ❑ **A grounded power source supplying the correct current for your HTC model.** All models require three-phase power. Check the HTC's serial tag for the correct amps, voltage and cycles. Field wiring should be completed by a qualified technician to the planned location for the HTC. All electrical wiring should comply with your region's electrical codes.
- ❑ **Minimum clearance for safe operation and maintenance.** The HTC control center should be mounted so that its display panel can be seen and accessed easily by the operator.
- ❑ **Process air lines installed from the dryer to the HTC location.** For easy maintenance, we recommend using flexible hose to make the final connections between the process outlet of the dryer or blower and the HTC.

Installation of the HTC Control (Models HTC 30, 60, and 90)

 **CAUTION:** You are responsible for the structural integrity of this installation.

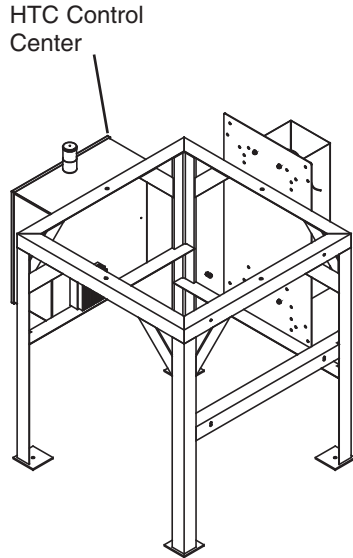
 **NOTE:** The HTC control is shipped mounted on the left side of the floor stand on models 30, 60, and 90 (*see figure to the right*).

 **NOTE:** If, by using your own provisions, you change the mounting arrangement of the control center to a wall mount unit, it must be mounted 6 inches {152.4 mm} off of the wall to provide clearance for the heat sink.



(continued)

Installation of the HTC Control (continued) (Model HTC 120)



CAUTION: You are responsible for the structural integrity of this installation.

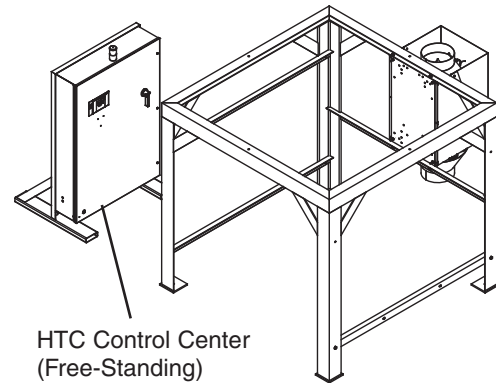
- 1 **Securely bolt the HTC control to the left side of the floor stand.** Use the supplied locking fasteners to securely mount the HTC control center to the floor stand to prevent vibration-induced loosening.

NOTE: If, by using your own provisions, you change the mounting arrangement of the control center to a wall mount unit, it must be mounted 6 inches {152.4 mm} off of the wall to provide clearance for the heat sink.

Installation of the HTC Control (continued) (Models HTC 180 and 270)

CAUTION: You are responsible for the structural integrity of this installation.

- 1 **Move the control center into its final location for operation** (see figure to the right). The control center must be positioned close enough to the hopper to allow connection of the RTD temperature probe.



The control center can be mounted to a wall, the hopper frame or a floor stand with customer provided provisions.


NOTE: If, by using your own provisions, you change the mounting arrangement of the control center to a wall mount unit, it must be mounted 6 inches {152.4 mm} off of the wall to provide clearance for the heat sink.

NOTE: If the length of the process and process protection RTD wiring is too short for your installation, contact Conair Parts Department (800.458.1960) to purchase an extension cable. From outside the United States, call 814.437.6861.

(continued)

Location and Mounting of the HTC Heater Assembly (Models HTC 30, 60 and 90)

 **CAUTION:** You are responsible for the structural integrity of this installation.


 **NOTE:** The HTC heater assembly is shipped mounted to the back of the floor stand on Models 30, 60 and 90 (*see figure to the right*).

The heater is prewired to the control box on HTC Models 30, 60, and 90.

Location and Mounting of the HTC Heater Assembly (Model HTC 120)

 **CAUTION:** You are responsible for the structural integrity of this installation.

1 Securely bolt the HTC heater assembly to the back of the floor stand (see figure to the right). Use the locking fasteners provided to securely mount the heater assembly to the floor stand to prevent vibration-induced loosening.

 **NOTE:** The heater is prewired to the control box on HTC Model 120.

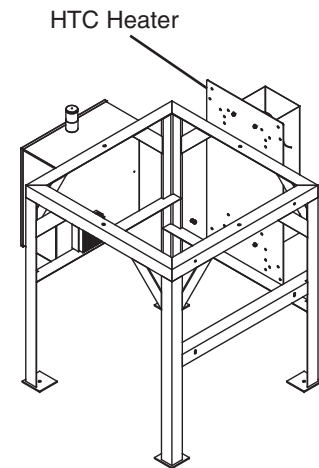
Location and Mounting of the HTC Heater Assembly (Models HTC 180 and 270)


 **CAUTION:** You are responsible for the structural integrity of this installation.


1 Securely bolt the HTC heater assembly to the back of the floor stand (see figure to the right). Use the locking fasteners provided to securely mount the heater assembly to the floor stand to prevent vibration-induced loosening.

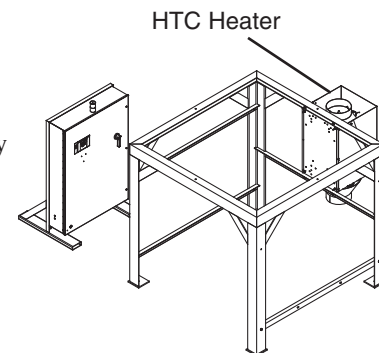
2 Refer to the wiring diagram to make the wiring connections for the heater and control box. *See Installation section entitled, Connecting the Power.* Only a qualified electrician should make the wiring connections between the control and the heater. The customer must supply the appropriately-sized wire and conduit to make connections.

IMPORTANT: Always refer to the wiring diagrams that came with your heater before making electrical connections.



 **CAUTION:** Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by qualified personnel.

 **CAUTION:** Check the disconnect with a volt meter to insure that the power is off.



Connecting the HTC Heater Assembly to the Dryer or Blower and Hopper



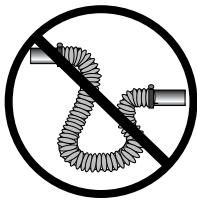
IMPORTANT: Some hopper designs allow for alternative hot air inlet locations. Check to ensure that the location of the hot air inlet of the hopper is reached with the supplied hosing from the HTC before final installation.

The inlet of the HTC heater assembly should be plumbed to the air source (usually a blower or central dehumidification dryer). This inlet hose should be at least the size of the heater inlet (lower) connection size (hoses provided). Also, the hose should be as short and straight as possible to prevent unnecessary frictional losses. This hose is un-insulated and will normally be at ambient temperature plus 50° to 90°F {10° to 32.2°C}. This hose should be properly supported so no weight will be on the heater inlet connection.



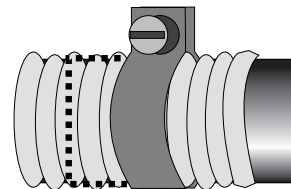
CAUTION: Hot Surfaces.

The connection between the heater assembly outlet and the hopper should be made with the supplied insulated hose. The insulation is important from an energy standpoint and for personnel protection. Be careful not to block off any heater sensor mounting locations.




NOTE: Do not allow the flexible hoses to kink or crimp.

Make sure all hoses are securely clamped to prevent wasteful leaking. The hoses should be routed neatly and supported where possible to prevent undue stress on the heater and hopper assemblies. Also, the bends should be made with gradual radiuses. Sharp turns will cause undue pressure drops.

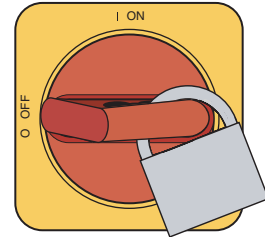


Connect the filter sock, optional dust collector, cyclone or dryer return air connection to the hopper discharge. Verify the connections are secure and do not leak.


Installing the Isolation Valves

 **NOTE:** Isolation valves should be installed only when multiple hoppers are connected to a single dryer or blower.

- 1 Turn the disconnect dial on the control center door to the Off or “O” position** to lock out the main power. *See Introduction section entitled, How to Use the Lockout Device.*
- 2 Install one isolation valve in the return air line.** Secure the hoses on the valve with hose clamps.
- 3 Install the other isolation valve in the delivery air line.** Secure the hoses on the valve with hose clamps.



Connecting the Power (Models HTC 30, 60, 90 and 120)

 **IMPORTANT:** Always refer to the wiring diagrams that came with your heater before making electrical connections.

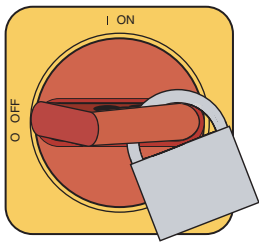
The electrical connection for the HTC models 30, 60, 90 and 120 only consists of bringing power into the control center. The incoming power should match the rated nameplate power required on the serial tag on the control center. *See Description section entitled, Specifications: HTC for HAD Dryers and HTC Model 600 -5000.* This power should be clean and have a voltage variation of no more than +/- 5% of the nameplate voltage. Unless the actual voltage is equal to the nameplate voltage, the actual kW output of the HTC will vary slightly. The output varies with the square of the voltage difference.



CAUTION: Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by a qualified technician.



CAUTION: Check the disconnect with a volt meter to ensure that the power is off.





- 1 Disconnect and lock out the main power sources before making electrical connections.** Electrical connections should be made only by a qualified technician.
- 2 Turn the disconnect dial on the control center door to the Off or “O” position.** Turn the captive screw and swing the control center door open.
- 3 Insert the main power cable** through a knockout in the side of the control center. Secure the power cable with an appropriate strain relief or use conduit. Verify that the incoming power is securely attached to the control center and there is no strain on the incoming power.
- 4 Connect the power wires** to the three terminals at the top of the power disconnect holder.
- 5 Connect the ground wire** to the ground lug.

Connecting the Power

(Models HTC 180 and 270)


The electrical connection consists of bringing power into the control center and wiring the heater power from the control center to the heater assembly. The incoming power should match the rated nameplate power required on the serial tag on the control center. *See Description section entitled, Specifications: HTC for HAD Dryers and HTC Model 600 -5000.* This power should be clean and have a voltage variation of no more than +/- 5% of the nameplate voltage. Unless the actual voltage is equal to the nameplate voltage, the actual kW output of the HTC will vary slightly. The output varies with the square of the voltage difference.

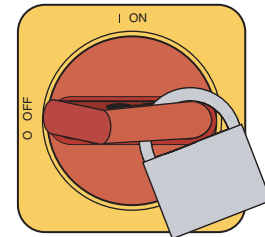
 **IMPORTANT:** Always refer to the wiring diagrams that came with your heater before making electrical connections.

 **CAUTION:** Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by a qualified technician.

 **CAUTION:** Check the disconnect with a volt meter to ensure that the power is off.

- 1 Disconnect and lock out the main power sources before making electrical connections.** Electrical connections should be made only by a qualified technician.
- 2 Turn the disconnect dial on the control center door to the Off or “O” position.** Turn the captive screw and swing the control center door open.
- 3 Insert the main power cable** through a knockout in the side of the control center. Secure the power cable with an appropriate strain relief or use conduit. Verify that the incoming power is securely attached to the control center and there is no strain on the incoming power.
- 4 Connect the power wires** to the three terminals at the top of the power disconnect holder.
- 5 Connect the ground wire** to the ground lug.

 **NOTE:** The connection between the heater and control center should be made with properly-sized conductors and protected with appropriate conduit (customer supplied). The routing should be neat and away from potential mechanical damage. The terminations should be landed on the terminals in the control center and heater junction area. These terminations should be regularly checked to prevent loosening and shorting to ground. (continued)



Connecting the Power (Models HTC 180 and 270) (continued)



IMPORTANT: Always refer to the wiring diagrams that came with your heater before making electrical connections.

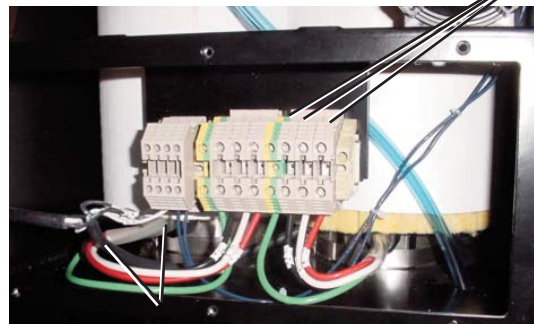
- 6** Insert the customer-supplied heater power wire through a knockout in the side or bottom of the control center. Secure the wire with an appropriate strain relief, if conduit is not used.
- 7** Connect the heater power wires to the control center's terminal block and heater ground wire to the ground lug, as shown.



Power Wires
(Gray - Customer
Supplied)

Ground Wires
(Green - Customer
Supplied)

- 8** Insert the other end of heater power wire through the knockout in the side of the heater assembly. Secure the wire with an appropriate strain relief, if conduit is not used.
- 9** Connect the heater power wires to the top terminals of the heater assembly's terminal block and heater ground wires to the ground lug, as shown.



Insert the Power
Wires Here

Ground Wires
(Green/Yellow)

Connecting the Power to the HAD Blower

The electrical connection for the HAD's blower only consists of bringing power into the blower's electrical enclosure. The incoming power should match the rated nameplate power required on the serial tag of the blower. This power should be clean and have a voltage variation of no more than +/- 5% of the nameplate voltage.



CAUTION: Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by a qualified technician.



CAUTION: Check the disconnect with a volt meter to ensure that the power is off.

- 1 Disconnect and lock out the main power sources before making electrical connections.** Electrical connections should be made only by a qualified technician.
- 2 Remove the blower's enclosure cover by unscrewing the retaining bolt located on the bottom of the enclosure,** with an appropriately-sized screwdriver.



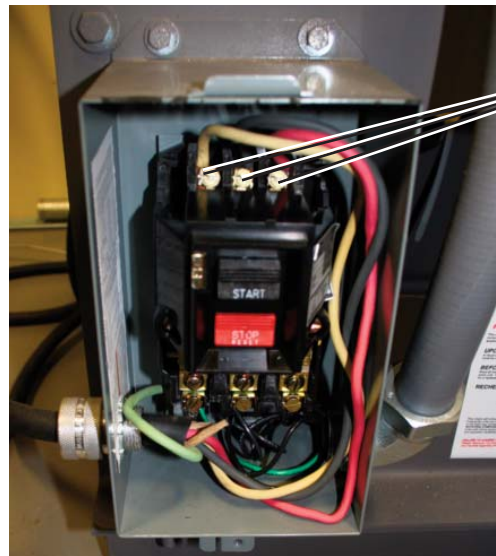
Retaining Bolt (1)

- 3 Insert the main power cable** through a knockout on the left-side of the blower's electrical enclosure. Secure the power cable with an appropriate strain relief or use conduit. Verify that the incoming power is securely attached to the enclosure and there is no strain on the incoming power.

(continued)

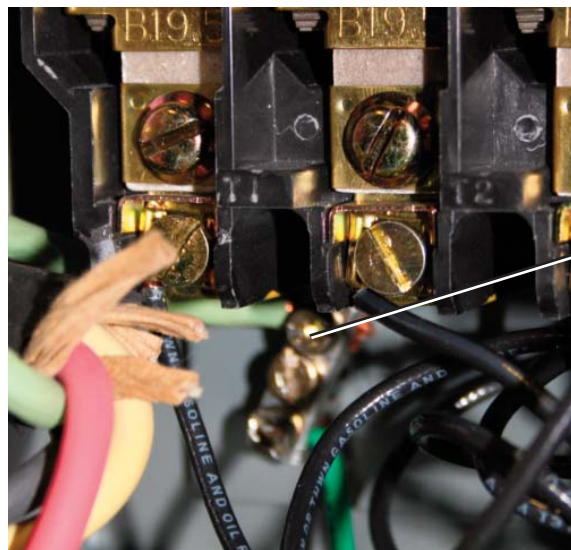
Connecting the Power to the HAD Blower

- 4** Connect the blower's power wires to the top terminals of the blower's terminal block, secure with an appropriately sized screwdriver.




Insert the Power Wires Here


- 5** Connect the ground wire to the ground lug. The ground lug is located on the bottom of the electrical enclosure and mounted to the back panel.

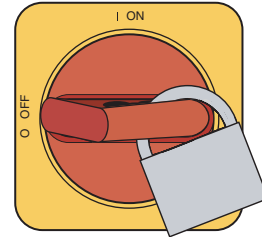


Ground Lug


Connecting the Control Wires (Models HTC 180 and 270)

 **IMPORTANT:** Always refer to the proper wiring diagram supplied with your equipment before making electrical connections.

 **CAUTION:** Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by a qualified technician.



- 1 Disconnect and lock out the main power sources before making electrical connections.** Electrical connections should be made only by a qualified technician.
- 2 Refer to the wiring diagram that came with your control.**
- 3 Insert the customer-supplied control wires encased in conduit through a knockout in the side or bottom of the HTC control center.**
- 4 Connect the high temperature and pressure switch wires to the control center's terminal block.**
- 5 Insert the other end of the control wires through the knockout on the side of the HTC heater assembly terminal box.**
- 6 Connect the high temperature and pressure switch wires to the heater assembly terminal block.**

 **NOTE:** The connection between the heater and control center should be made with properly sized conductors and properly protected with appropriate conduit (customer supplied). The routing should be neat and away from potential mechanical damage. The terminations should be landed on the terminals in the control center and heater junction area. These terminations should be regularly checked to prevent loosening and shorting to ground.

RTD Probe Placement for Efficiency and Accuracy

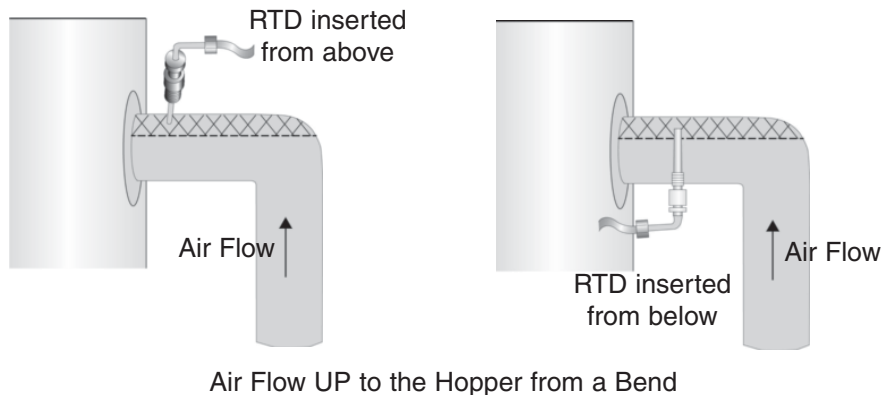


IMPORTANT: Always refer to the wiring diagrams that came with your heater before making electrical connections.

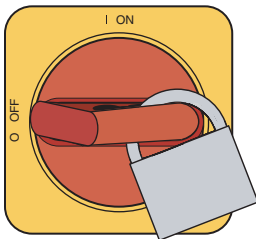
The tip of the RTD is the only part of the RTD that senses the temperature. To insure the efficiency and accuracy of the RTD temperature reading, the location of the RTD tip is critical. The tip **MUST** be located in the area of the maximum heated air flow which usually includes 1/3 of the air flow area. This maximum heated air flow area is affected by how the heated air is entering the pipe/vessel in which the RTD tip is mounted.

For example:

- If the pipe carrying the air from the dryer is coming UP to the hopper inlet from a bend, the maximum heated airflow will be in the top 1/3 of the hopper inlet. So the RTD probe should be inserted so that the tip is located in that top 1/3 of the inlet pipe, sensing the hottest air.



CAUTION: Always disconnect and lock out the main power sources before making electrical connections. Electrical connections should be made only by a qualified technician.



- 1 Turn the disconnect dial on the control center door to the Off or “O” position** to lock out the main power. *See Introduction section entitled, How to Use the Lockout Device.*

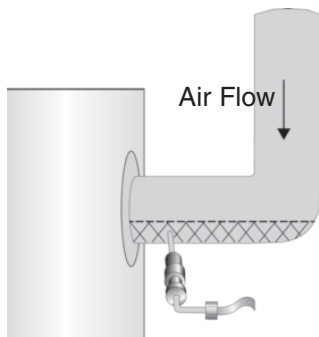



NOTE: The RTD probe should **NOT** touch the inlet tube walls.

(continued)

RTD Probe Placement for Efficiency and Accuracy (continued)

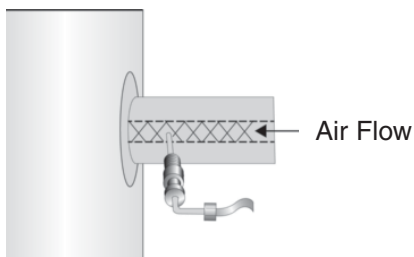
- If the pipe carrying the air from the dryer is coming **DOWN** to the hopper inlet from a bend, the maximum heated airflow will be in the bottom 1/3 of the hopper inlet. So the RTD probe should be inserted so that the tip is located in that bottom 1/3 of the inlet pipe, sensing the hottest air.



 **NOTE:** The RTD probe should **NOT** touch the inlet tube walls.

Air Flow **DOWN** to the Hopper from a Bend

- If the pipe carrying the air from the dryer is coming **DIRECTLY INTO THE CENTER** of the hopper inlet from a straight pipe, the maximum heated airflow will be in the center 1/3 of the hopper inlet. So the RTD probe should be inserted so that the tip is located in the center of the inlet pipe, sensing the hottest air



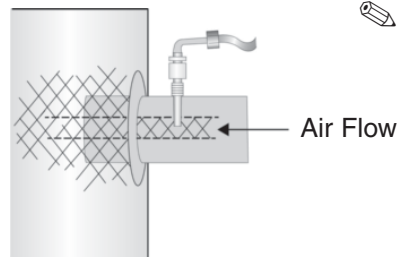
Air Flow **CENTERED** into the Hopper from a Straight Pipe

(continued)

RTD Probe Placement for Efficiency and Accuracy (continued)


- If the pipe carrying the air from the dryer is coming **DIRECTLY INTO THE CENTER** of the hopper inlet from a straight pipe, **BUT THERE IS AN AIR FLOW OBSTRUCTION IN THE HOPPER** (pipe extending too far into the hopper, internal hopper components, build up of heavy material, etc.), the maximum heated airflow will be in the center of the hopper inlet but may extend back into the entire inlet area. So the RTD probe should be inserted so that the tip is located in the center of the inlet pipe but farther from the hopper to neutralize the heat build-up but still sensing the hottest air flow from the dryer.

 **NOTE:** If the length of the set-back RTD wiring is too short for your installation, contact Conair Parts Department (800.458.1960) to purchase an extension cable, if not already supplied. From outside the United States, call 814.437.6861.



 **NOTE:** The RTD probe should **NOT** touch the outlet tube walls.

Air Flow **CENTERED** but **OBSTRUCTED** into the Hopper from a Straight Pipe

 **NOTE:** Having the RTD tip in the center of a pipe or vessel can actually create a problem, because sometimes the center of the pipe or vessel is up to 10% different than where the concentrated heat airflow is located. So if a dryer is set to 350 degrees, and the tip is in the center of the inlet tube but not in the area of the maximum heated air flow, the dryer is actually overshooting and sending 385 degree air in, but the RTD is sensing 350 degrees at the center.

(continued)

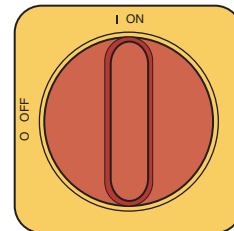
Testing the Installation


You have completed the HTC installation. Now it's time to make sure everything works.

- 1 Make sure there is no material in the hopper.** If there is a loader or vacuum receiver mounted on the hopper, disconnect the material inlet hose at its source.
- 2 Perform the following safety checks:**
 - Make sure all components are securely mounted
 - Make sure all hoses are connected to the proper locations and secured with hose clamps
 - Make sure all sensors are properly installed and secured
 - Make sure all wiring is secure and away from potential mechanical damage
- 3 Perform a resistance test.** Check the resistance leg-to-leg and leg-to-ground to ensure that each heater and blower are wired correctly. The three legs should have equal resistance +/- 5%. The resistance to ground should be 20 megohms or higher.
- 4 Turn on the main power to the HTC.** Make sure the disconnect dial is in the ON or "I" position. This powers up the control and the display will illuminate.

For Hot Air Dryer (HAD) Models Only

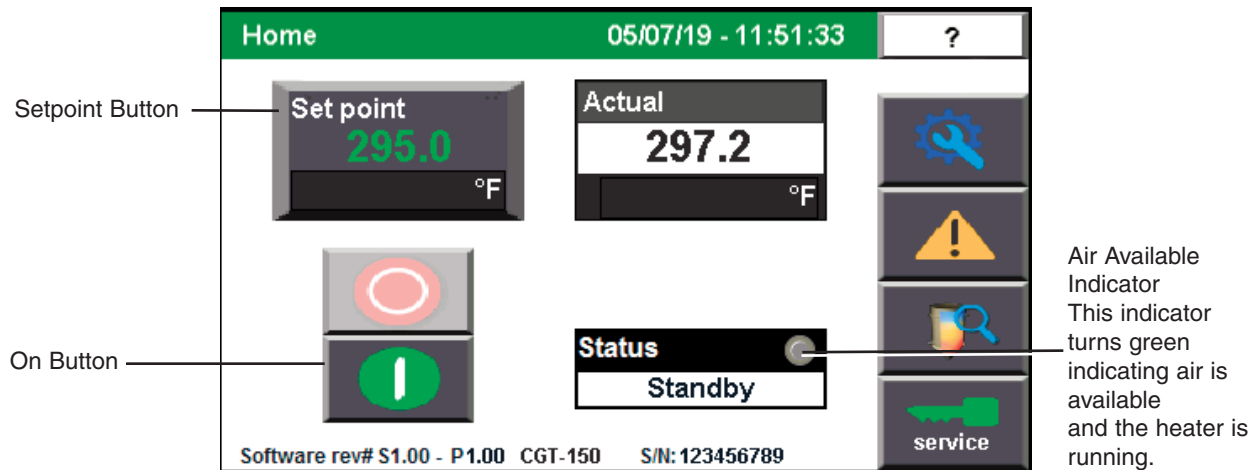
- 1 Bump (rapidly start and stop) the blower motor and verify the motor is turning in the correct rotation** according to the labels on the motor. If the rotation is incorrect, shut off and lock out power and switch any two of the three power legs on the line side of the disconnect provided with the blower.
- 2 Check the discharge damper setting.** The handle on the outlet of the blower is connected to the discharge damper. This is required to be set to the proper position to determine the proper airflow for the heater/hopper. Adjust the discharge damper until the blower pressure is 20 to 30 in. W.C.
 - Make sure the air filter is clean and has a minimum of 6 in. {15.2 cm} clearance without any flow obstructions
 - Make sure the hopper outlet is free from obstructions that would cause back pressure in the drying hopper



 **NOTE:** See the blower specifications sheet in the appendix for design supply pressure.

Testing the Installation (continued)

- 3 Set the setpoint to the desired hopper inlet temperature.** Press the Setpoint temp to set the temperature. Press the “On” button. The temperature should stabilize around the setpoint and not significantly overshoot the set temperature.



- 4 The Status is “Standby” not turned on and “Waiting” - turned on but no air available.**
- 5 The heater’s temperature climbs towards the setpoint,** if everything is functioning properly.

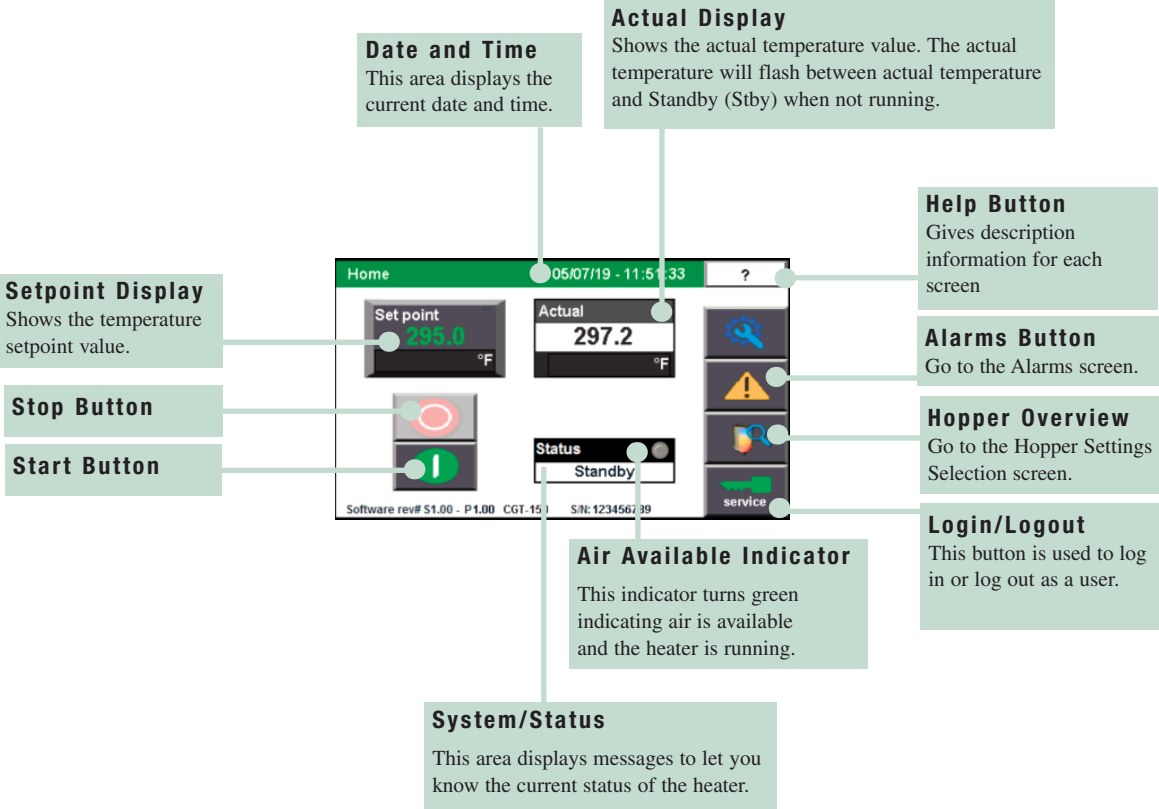
For Carousel Plus Dryers Only

- 1 Verify the dryer’s blower is running in the correct direction and the dryer is ready for operation,** by referencing the dryer manual.
- 2 Start the dryer.**
- 3 Adjust the setpoint to the desired hopper inlet temperature.** Press the Setpoint temp to set the temperature. Press the Start button. The temperature should stabilize around the setpoint and not significantly overshoot the set temperature.
- 4 The heater’s LED flashes and the temperature climbs towards the setpoint,** if everything is functioning properly.

Operation


The HTC process air heater control	4-2
How to navigate the control screens.	4-3
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HTC DC control alarms	4-20
Initial operation (HAD only)	4-21
Initial operation (Carousel Plus Dryer HTC) .	4-22
Normal operation to start heating.	4-23
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Initial HTC autostart.	4-25
Operational HTC autostart.	4-26

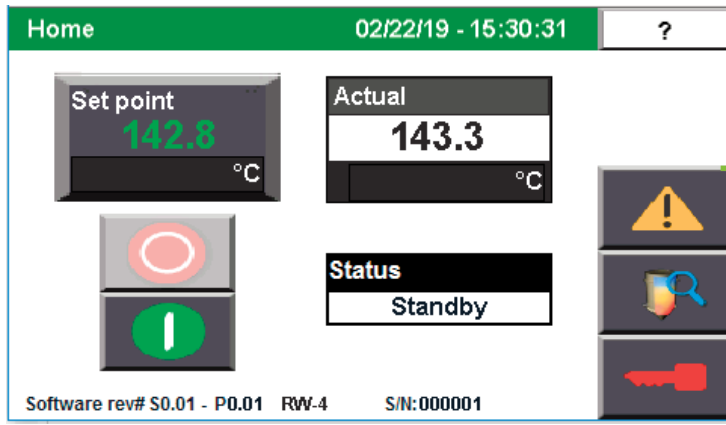
The HTC Process Air Heater Control



How to Navigate the Control Screens

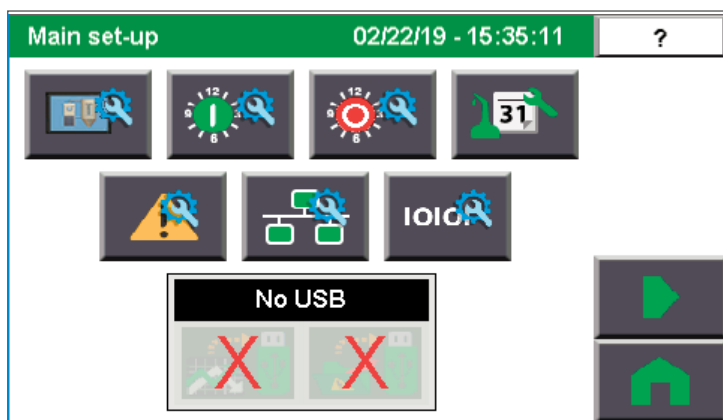
Navigate through the control screens by touching any navigation "buttons".

 **NOTE:** Depending on options ordered, software revision level, and user login levels, your screen may appear different than what is shown in this manual.



Navigation Buttons
Touching the navigation buttons will take the user to the control screen selected.

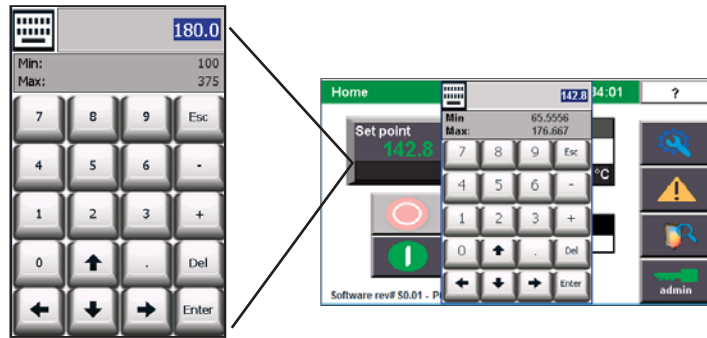
All beveled grey buttons on the control screen are selectable and will direct you to another screen. At any point, pressing the Home button will return you to the home screen.



How to Navigate the Control Screens

(continued)

The user name, password and other information can be entered using the pop-up keyboard window that appears when an appropriate field is touched.



Set points can be entered within fields with raised beveled edges with green values. Values shown within flat rectangles are “actual” values and can not be changed.

Actual Values
(Non-Changeable)

PARAMETER	ACTUAL	SET POINT
Delivery air temperature	290.7 °F	291.0 °F
Delivery air heater % on time	0.0 %	N/A
Hopper outlet temperature	251.0 °F	150.0 °F

Manual setback control

Set point	150.0 °F	Manual
Setback to	250.0 °F	
Reset at	230.0 °F	

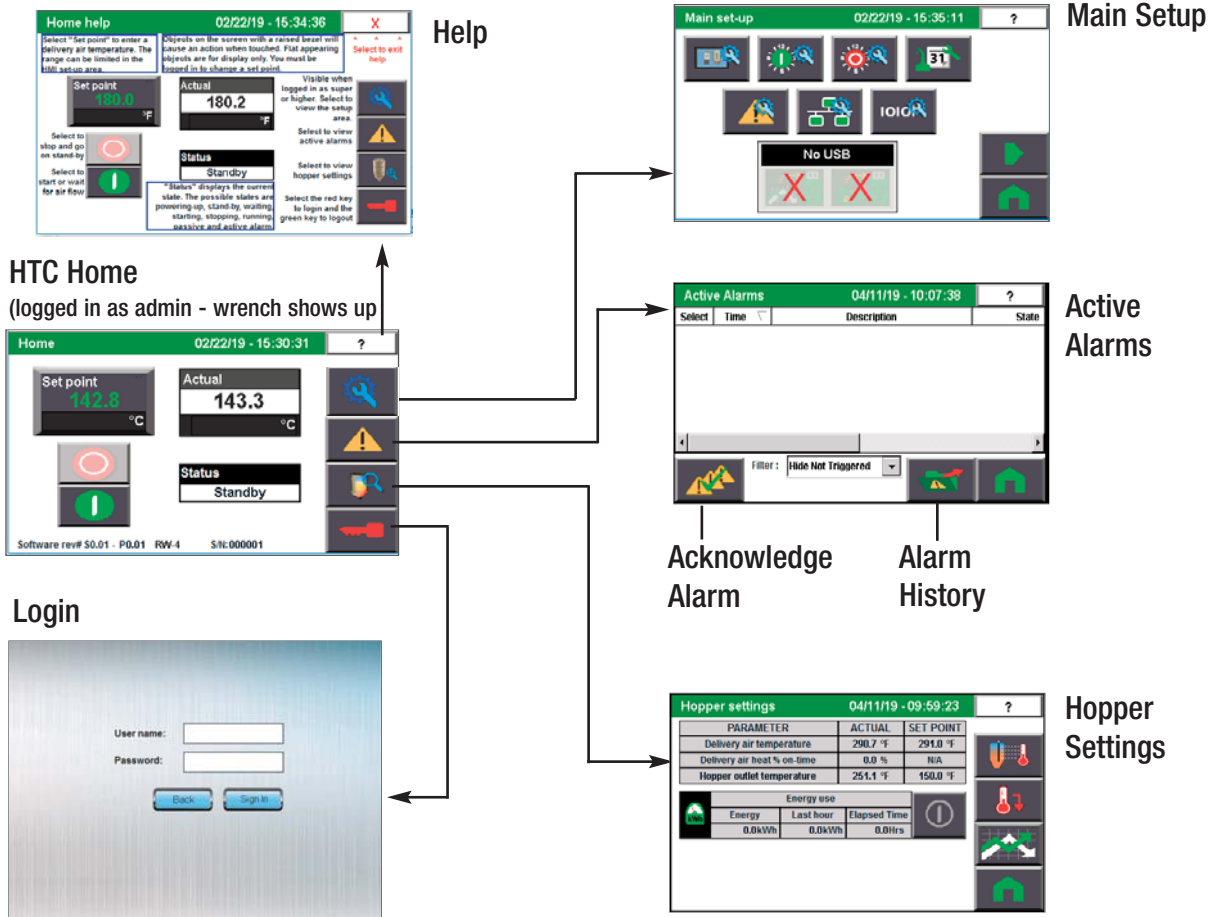
Set point Field
(User Changeable)

Control Function Flow Charts

The following flow charts provide a quick summary of the control functions. For an explanation of each control function, *see Operation section entitled, Control Function Descriptions.*

Control Function Flow Charts

From the Home screen



Control Function Flow Charts (continued)

HTC Home

Hopper Settings

PARAMETER	ACTUAL	SET POINT
Delivery air temperature	290.7 °F	291.0 °F
Delivery air heat % on-time	0.0 %	N/A
Hopper outlet temperature	251.1 °F	150.0 °F

PARAMETER	ACTUAL
HO Hopper outlet temperature	140.7 °C
T6 Drying mon. T6 temperature	118.5 °C
T5 Drying mon. T5 temperature	127.6 °C
T4 Drying mon. T4 temperature	151.4 °C
T3 Drying mon. T3 temperature	151.7 °C
T2 Drying mon. T2 temperature	151.8 °C
T1 Drying mon. T1 temperature	146.1 °C
DA Delivery air temperature	143.2 °C

Material residence time: 0.00 hr

Drying Monitor

Set back

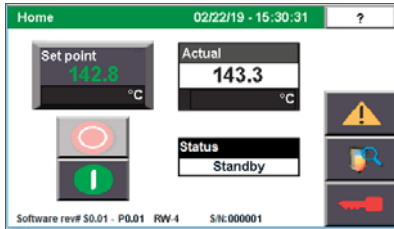
PARAMETER	ACTUAL	SET POINT
Delivery air temperature	290.7 °F	291.0 °F
Delivery air heater % on time	0.0 %	N/A
Hopper outlet temperature	251.0 °F	150.0 °F

Manual setback control	
Set point	150.0 °F
Setback to	250.0 °F
Reset at	220.0 °F

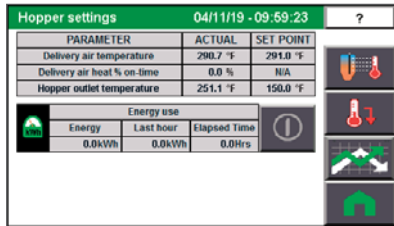
(continued)

Control Function Flow Charts (continued)

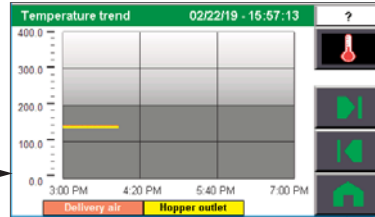
HTC Home



Hopper Settings



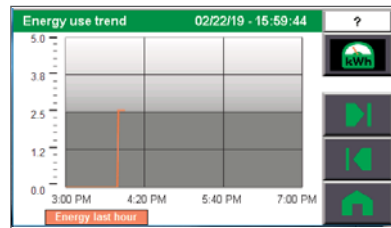
Temperature



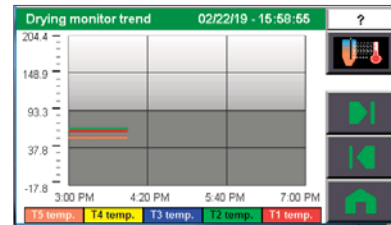
Heat On-time % Trend



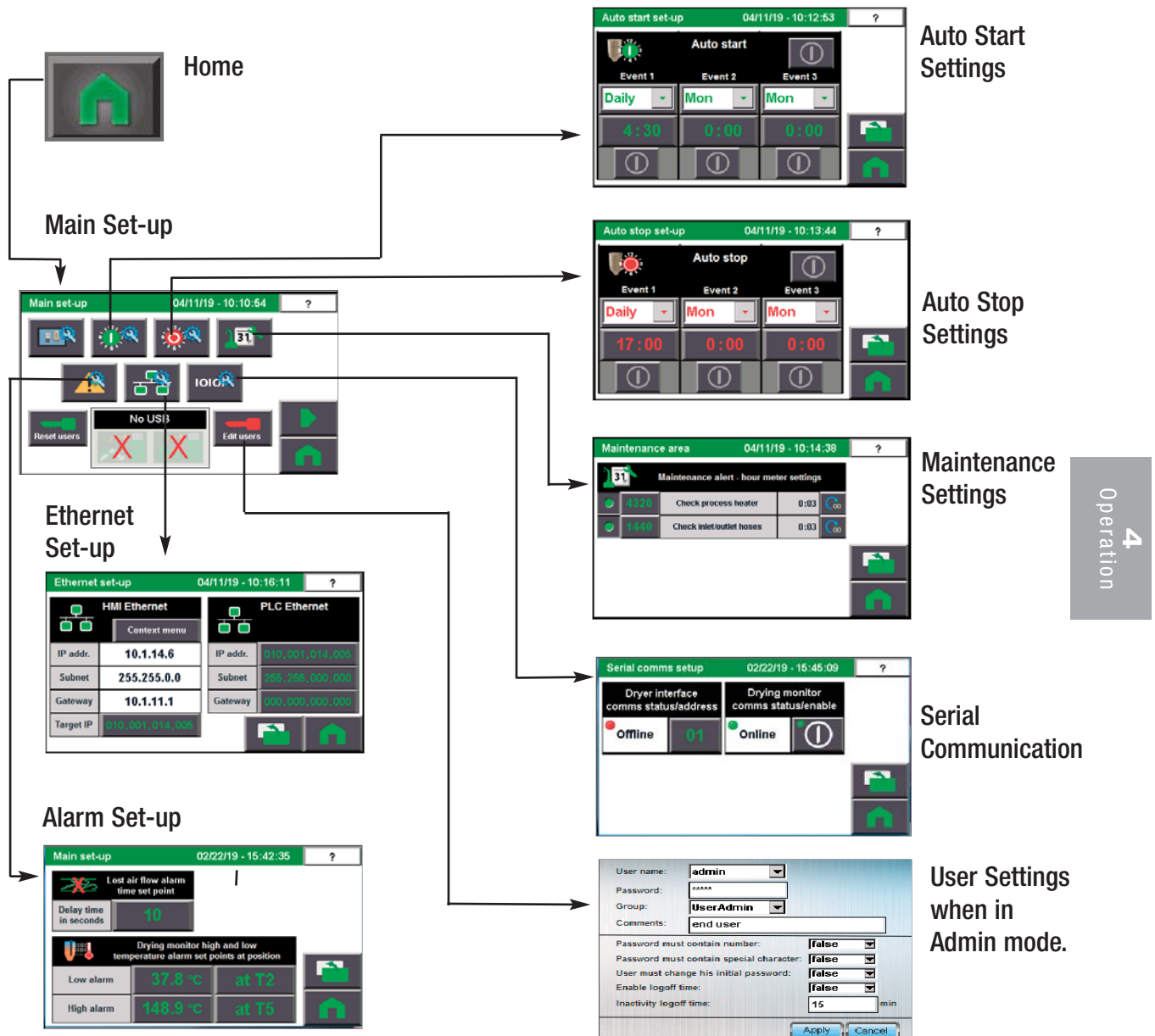
Energy Use



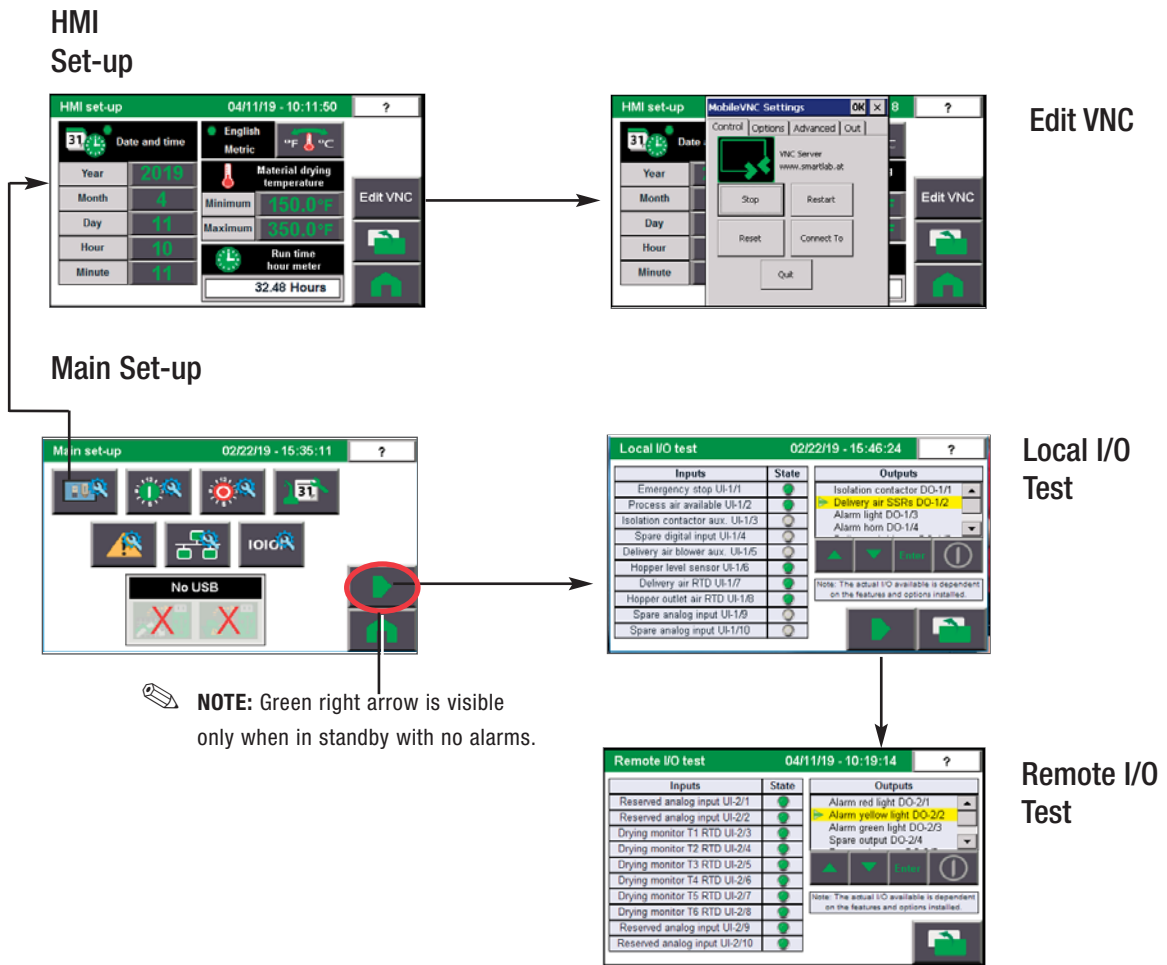
Drying Monitor (when installed)



Control Function Flow Charts (continued)

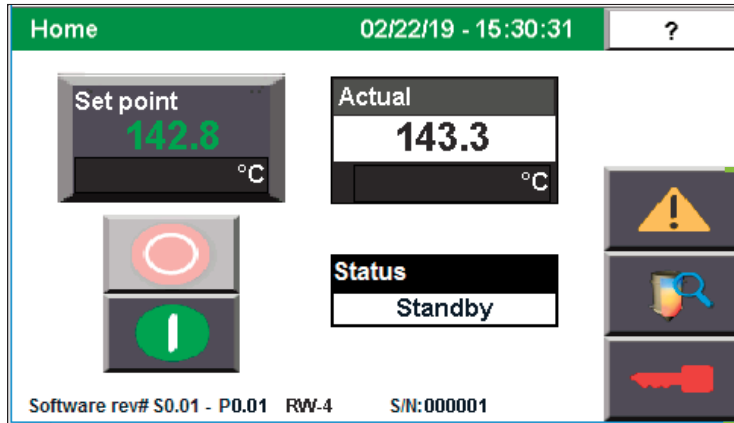


Control Function Flow Charts (continued)



Control Function Descriptions

Home Screen



Navigation Buttons
Touching the navigation buttons will take the user to the control screen selected.

The Home screen provides the user with the current live information concerning the processes within the dehumidifying heater including:

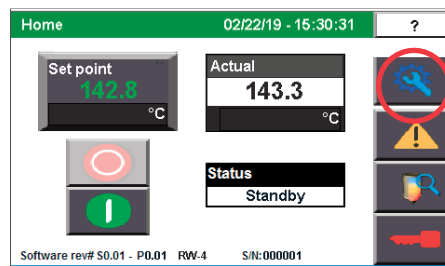
- Setpoint
- Actual Temperature
- Dryer Status

It tells the user the current status of the heater blower (powering up, standby, waiting, starting or stopping, passive and shutdown alarms).

If the user is logged-in at the proper security level, changes can be made to:

- Setpoint - (Active material exit temperature) The setpoint is limited by the delivery air min/max located on the HMI set-up screen.

When logged in as “super or higher” the wrench button appears and when selected will give you access to the Setup Screen.

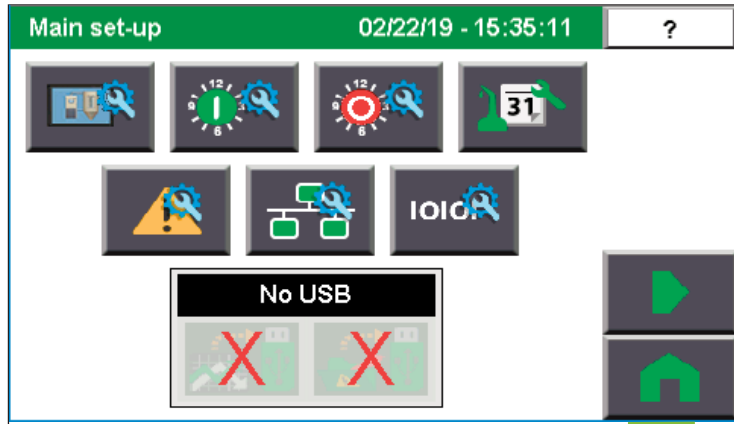


This screen also allows the user to start or stop the dryer. The user can also view the other system parameters, view alarms, view hopper settings, or log in by pressing the applicable buttons on the right of the screen.

NOTE: Live data is displayed as text inside a box. Set point boxes have beveled edge borders and green text. Set points can be changed, if the user has logged in at the proper security level, by pressing the set point boxes. This will launch a pop-up keypad window that can be used to change the set point. *See Operation section entitled, How to Navigate Control Screens.* After the new set point value has been entered, press the "Enter" key to lock in the new set point.

Control Function Descriptions

Main Set-up Screen



Access the Main Setup screen by pressing the Wrench button on the Home screen. The Main Setup screen provides the user with access to function screens including:

- HMI Setup to set time, limits or units
- Auto start and stop setup
- Maintenance Setup to enable /disable maintenance alerts
- Serial Comm Setup to monitor and enable/disable installed serial communications
- Ethernet Setup to monitor and change Ethernet communication settings
- Alarm Setup to access the alarm setup area

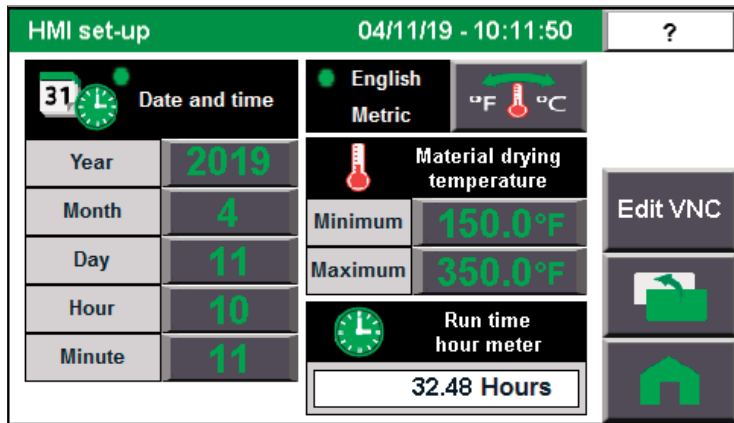
When visible in “Standby” selecting the green arrow button will give you access to the I/O test screen

The Edit User button allows you to set up security when signed in as “Admin”.

Inserting a USB flash drive into the HMI, enables saving the trend and alarm history. The files are saved in CSV format.

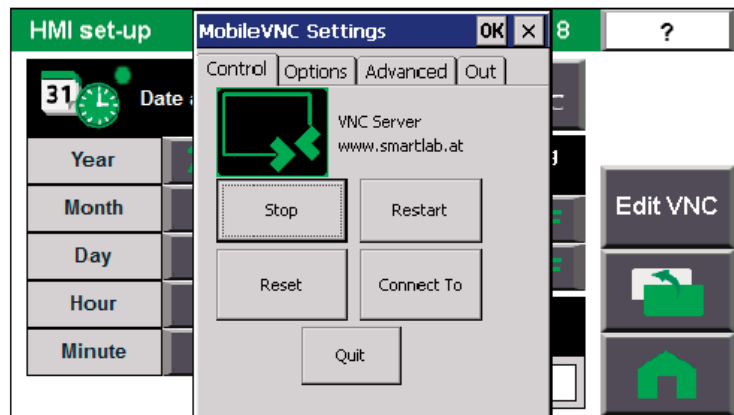
Control Function Descriptions

HMI Set-up Screen



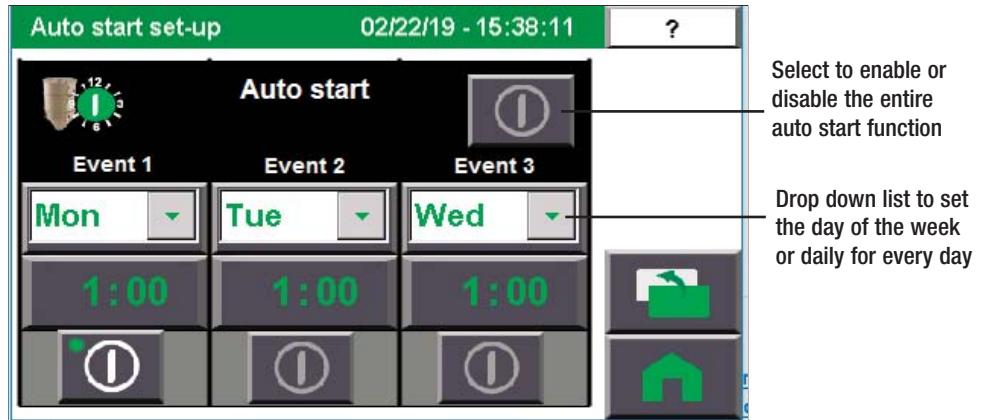
The HMI Set-up screen lets you set the Date and Time, Units of Measure, Run Time, and Material drying temperature.

- 1 Press the Edit VNC button to access a pop up window to set the VNC Server.
Requires “Admin” log-in.



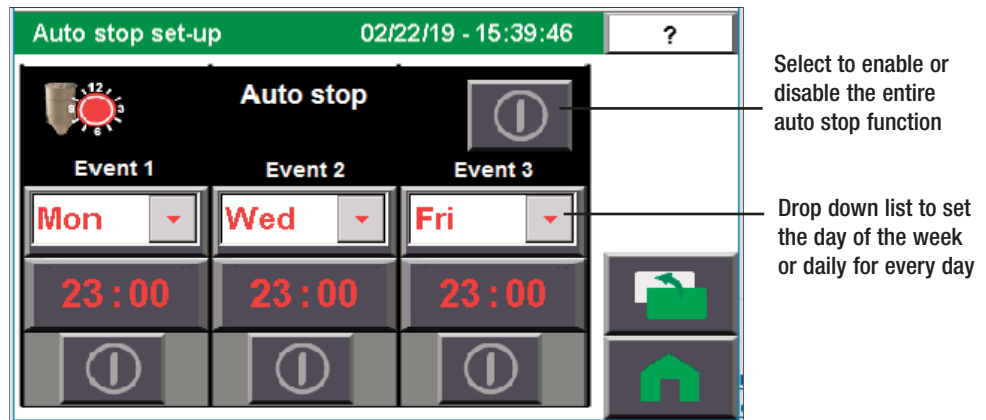
Control Function Descriptions

Auto Start Set-up Screen



The Auto Start function will automatically start the heat source on a predetermined day and time. Up to three different start events can be individually setup and enabled/disabled.

Auto Stop Set-up Screen



The Auto Stop function will automatically stop the heat source on a predetermined day and time. Up to three different stop events can be individually setup and enabled/disabled.

(continued)

Control Function Descriptions

Maintenance Area Set-up Screen

Select push button to enable or disable each alert. Indicator is green when enabled and grey when disabled

Alert Name	Set Point	Duration	Status
Check process heater	4320	0:03	Enabled (Green)
Check inlet/outlet hoses	1440	0:03	Enabled (Green)

Maintenance alerts will sound a passive alarm when the accumulated hours reach the set point. Acknowledging the alert automatically resets the accumulated time.

Serial Communication Set-up Screen

The indicator light for each device turns red when the communications are offline or have errors. The light turns green when online without errors.

Device	Status	Address/Setting
Dryer interface	Online	01
Drying monitor	Online	Power Button

The Serial Comms Setup screen provides a way to monitor and controls all the installed devices. The serial protocol is Modbus RTU. All devices must be set to 38.4K Baud, 8-Data bits, 1-Stop bit and Parity -None.

Control Function Descriptions

Ethernet Set-up Screen

The screenshot shows the 'Ethernet set-up' screen with a green header bar containing the title, date/time '04/11/19 - 10:16:11', and a question mark icon. The screen is divided into two main sections: 'HMI Ethernet' and 'PLC Ethernet'. The 'HMI Ethernet' section has a 'Context menu' button and a table with the following values: IP addr. 10.1.14.6, Subnet 255.255.0.0, Gateway 10.1.11.1, and Target IP 010,001,014,005. The 'PLC Ethernet' section has a 'Send changes' button and a table with: IP addr. 010,001,014,005, Subnet 255,255,000,000, and Gateway 000,000,000,000. At the bottom right are two home icons. Three callout boxes provide instructions: Step 3 points to the 'Context menu' button; Step 2 points to the 'Target IP' field; Step 1 points to the 'Send changes' button.

Step 3
Press this button, then on the menu select "show system settings". Under network set the new HMI IP address.

Step 2
Set the target IP to the new PLC IP address.

Step 1
Visible when settings are different. Verify new PLC settings before sending.

Changing the Ethernet settings requires the admin login. Only qualified personnel should attempt changes. Always record your new settings before making any changes. Select the individual octets to change the values. Always set the PLC first! Warning, communications will be lost after step #1. It will return after step #3 is completed.

Alarm Set-up Screen

The screenshot shows the 'Alarm set-up' screen with a green header bar containing the title, date/time '04/11/19 - 10:15:23', and a question mark icon. The screen is divided into three sections. The top-left section is 'Lost air flow alarm time set point' with a 'Delay time in seconds' field set to '10'. The top-right section is 'Hopper low level alarm' with a 'Low level set point' field set to '0 %'. The bottom section is 'Drying monitor high and low temperature alarm set points at position' with 'Low alarm' set to '70.0 °F at T2' and 'High alarm' set to '300.0 °F at T5'. At the bottom right are two home icons. Three callout boxes provide instructions: one points to the 'Delay time' field; one points to the 'Hopper low level alarm' section; and one points to the 'Drying monitor' section.

Select to enter the amount of time that the system waits while running before shutting down on a loss of air flow. Range 5-15 seconds.

Only visible when drying monitor is installed.

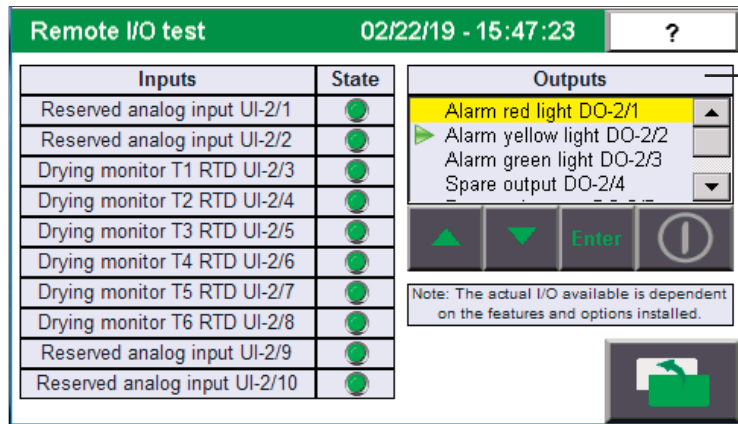
Only visible when continuous level is installed.

The Alarm Set-up Screen enables you to set low and high temperature alarms at the same or different points in the drying hopper.

- 1 Press the "at T" button to change the location in the drying hopper each time it is released with T2 the lowest and T5 the highest position in the hopper. The alarms are passive.

Control Function Descriptions

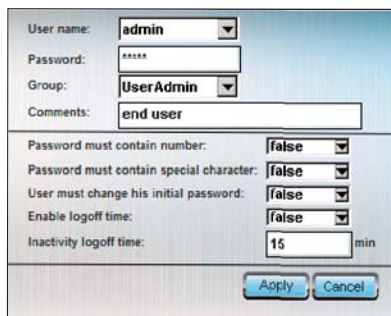
I/O Test Screen



- 1 To turn on an output, use the up/down arrow buttons to move the green position indicator to the desired output.
- 2 Press the enter button to select the output. The selected output is highlighted yellow.
- 3 Once selected, press and hold the on/off button to energize the output.
- 4 Release the on/off button and the output turns back off.

The I/O Test Screen displays a list of the controls digital and analog inputs. The status indicators are green when a digital input is on or when an analog input is ok. The indicator is gray when a digital input is off or when an analog input is out of range, not connected or short circuited.

Edit User Screen



Basic user level information:

User	Real name	Password	Change password
oper	Oper	oper	No
maint	Maint	maint	Yes
admin	Admin	admin	Yes
super	Super	super	Yes

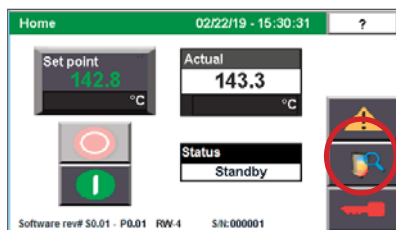
The Edit User Screen allows you set up security measures.

The green key at the bottom of the home page will display the logged in user name. Pressing the Login button again will log the user out of the system. Also, inactivity for 10 minutes will log you out of the control. The control will return to security level guest. If inactivity logoff time is set to 0-min, the user never times out.

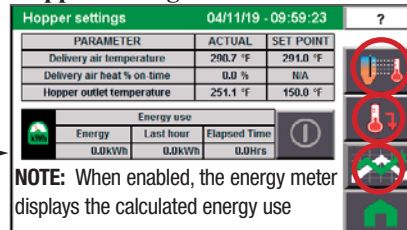
NOTE: Proper login may be required to view certain screens or make changes to various settings. Conair recommends that the administrator logs in first and changes the admin password.

NOTE: Depending on which options your dryer has been configured with, and whether or not you have the Drying Monitor enabled, your screens and icons may be different from what is shown here. For example, if your HTC system is Drying Monitor equipped, your hoppers will display as Drying Monitor hoppers (as shown in these graphics).

Control Function Descriptions (continued)



Hopper Settings Screen



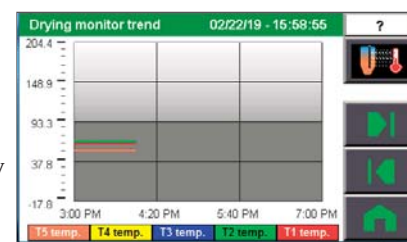
To access the Hopper Set-up screen:

NOTE: In addition to starting and stopping the heater, the Start and Stop buttons indicate whether the heater can currently be started or stopped. A faded or not vibrant button indicates that the heater is not ready/able to complete that function. For example, a faded Stop button indicates the heater is not ready to stop.

1 From the Home screen Press the Hopper Settings button. The Hopper Settings screen provides the user with the list of hopper parameters and energy usage.

2 From the Hopper Settings screen Press the navigation buttons on the right side of the screen.

From the Hopper Settings screen the user can navigate to:

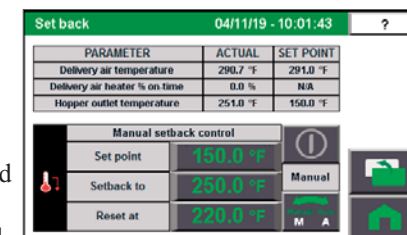


NOTE: See the Appendix of this User Guide for more information about using the Drying Monitor.

The Drying Monitor screen to see dryer parameters, set Material residence time, and see the status light turn green when the material residence time set point is reached.

The Set back screen to adjust set points manually.

The Drying Monitor Trend screen to see four hours of trend data. Up to 7 days of data are stored for viewing.



PARAMETER	ACTUAL	SET POINT
HO Hopper outlet temperature	140.7 °C	
T6 Drying mon. T6 temperature	110.5 °C	
T5 Drying mon. T5 temperature	127.0 °C	
T4 Drying mon. T4 temperature	151.4 °C	
T3 Drying mon. T3 temperature	151.7 °C	
T2 Drying mon. T2 temperature	151.8 °C	
T1 Drying mon. T1 temperature	146.1 °C	
DA Delivery air temperature	143.2 °C	

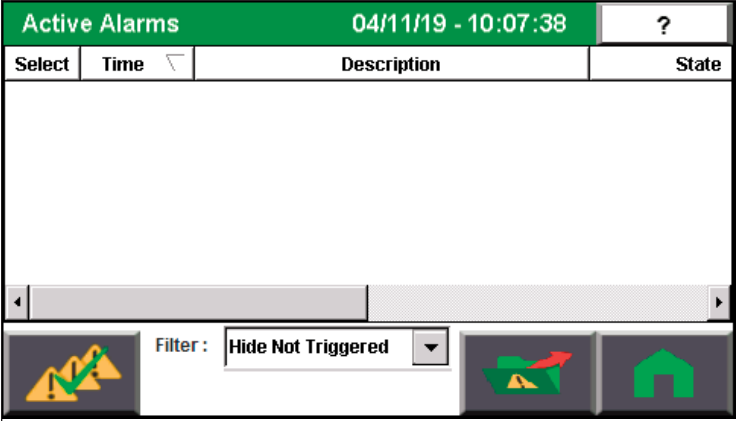
Material residence time: 0.00 hr

Available trends are:

- Temperature
- % On Time
- Drying Monitor
- Energy Use

Control Function Descriptions

Active Alarms Screen



Access the Active Alarms screen by pressing the Alarm button on the Home screen. The alarms displayed on the Active Alarm screen can be filtered between the default view “hide not triggered” or inactive alarms and “show all” alarms.



Select the Acknowledge/reset button to acknowledge an alarm.



Select the Alarm History button to view the Alarm History screen.

HTC DC Control Alarms

Passive Alarms

Passive alarms flash the alarm indicator until the alarm condition goes away, or it becomes a shut down alarm.

Shut Down Alarms

Shut down alarms flash the alarm indicator. The HTC process air heater stops immediately.

After the alarm is corrected and acknowledged. Press the start button to restart the process control.

Initial Operation (HAD Only)

- 1 Hopper material:** Fill the hopper with the material to be heated.
- 2 Blower inlet filter:** Verify that the area around the inlet filter is clean and free of debris. This will extend the time between service of the filter.
- 3 Air discharge from the hopper:** Verify that the sock filter hose connection to the dust collector connections are secure and do not leak.
- 4 Setting of damper after material:** The damper valve will need to be opened to adjust the flow back down to 20 in. W.C. on the pressure gauge. This setting is a suggested setting. If the airflow in the hopper is carrying over material out of the hopper, then the flow rate may be adjusted downward by closing the damper. If the airflow is too low then the heater will go into stand by. If the airflow is too high, the setpoint might not be achievable.



WARNING: Fire potential - The electric heating elements are exposed to the air going into the hopper. It is important that there is no debris in this air stream. Under no circumstances should the HTC be ran in a dirty air stream as material passing through the heater could ignite embers and shoot sparks into the hopper, which could catch fire.

- 5 Autotuning:** When the unit is fully assembled and ready for operation, it should be tuned to the actual system that it is connected to with material in the hopper. *See Operation section entitled, Autotuning.*
- 6 Hopper residence time:** The material throughput rate must be determined by the size of the hopper, the drying time required and the extent of drying desired for the product.

Initial Operation (For Carousel Plus Dryer HTC)

1 Hopper material: Fill the hopper with the material to be heated.

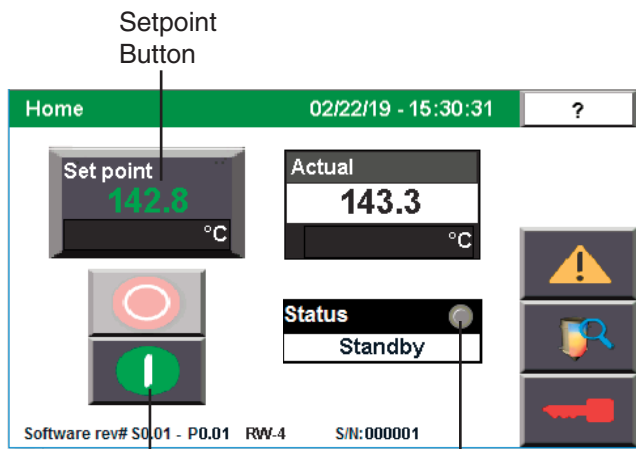
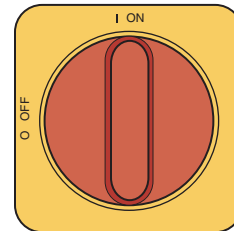


WARNING: Fire potential - The electric heating elements are exposed to the air going into the hopper. It is important that there is no debris in this air stream. Under no circumstances should the HTC be ran in a dirty air stream as material passing through the heater could ignite embers and shoot sparks into the hopper, which could catch fire.

2 Hopper residence time: The material throughput rate must be determined by the size of the hopper, the drying time required and the extent of drying desired for the product.

Normal Operation to Start Heating

- 1 Determine what the HTC's setpoint must be for your process and material.**
- 2 Check to ensure there is material in the hopper.**
- 3 Start the dryer or process blower to begin air flow.** Set the proper flow on the blower if equipped.
- 4 Turn on the main power to the HTC.** Make sure the HTC's disconnect dial is in the ON position. This powers up the control and the display lights will illuminate.
- 5 Set the drying temperature.**



Start Button

Air Available Indicator
This indicator turns green indicating air is available and the heater is running.

- 6 Press the Start button.**



Normal Operation To Stop Heating

1 Press the Stop button.



IMPORTANT: Always turn off the HTC **BEFORE** the dryer or process blower.

The HTC turns off heat immediately. Wait for temperature to cool to below 150°F {65.5°C} before turning off the dryer or blower. If the HTC is not stopped first, an airflow loss shutdown alarm will occur.

The HTC will turn off the blower or dryer.



2 Be sure to disconnect and lockout the main power if you have stopped the




HTC to perform maintenance or repair.

CAUTION: Improper shut down can cause damage to your heater.

Initial HTC Autostart

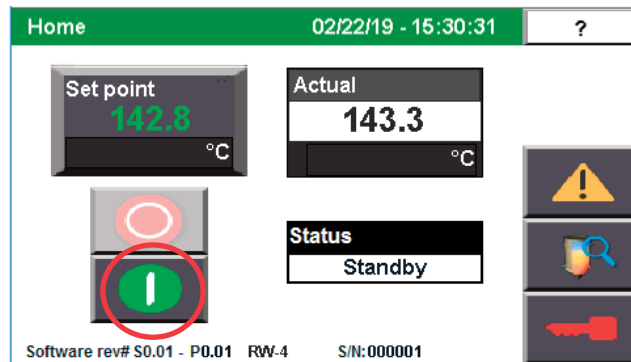
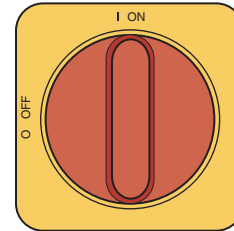
(Carousel Plus Dryers only)

The HTC can be configured to start drying automatically in conjunction with your dryer's autostart function. Correct preparation must be followed for this feature to function properly with the HTC.

 **NOTE:** Reference your particular dryer manual for steps to activate Autostart.

To configure the HTC to start automatically:

- 1 Determine what the HTC's setpoint must be for your process and material.**
- 2 Check to ensure there is material in the hopper.**
- 3 Turn on the main power to the HTC.** Make sure the HTC's disconnect dial is in the ON position. This powers up the control and the display lights will illuminate.
- 4 Set the drying temperature.**
- 6 Press the Start button.** The control will wait at this state until it detects airflow from the dryer. Once airflow is detected, the HTC's heaters will be enabled and your material will start to dry.



Operational HTC Autostart


(Carousel Plus Dryers only)

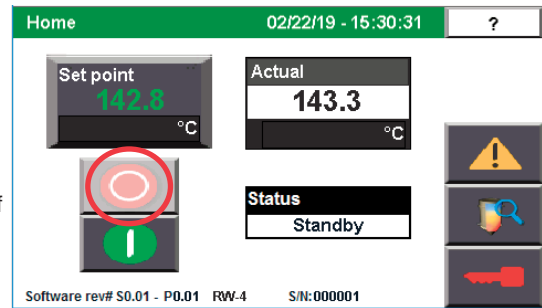
The HTC and dryer must be shut down properly in order for the HTC to automatically start again using the dryer's autostart function.

To shut down the HTC:

- 1 Press the Stop button.



 **IMPORTANT:** Always turn off the HTC **BEFORE** the dryer.



Allow the dryer to run long enough to cool the heaters to below 150°F {65.5°C}.

 **CAUTION:** Improper shut down can cause damage to your heater.

 **NOTE:** Reference your particular dryer manual for steps to activate Autostart.

Maintenance

Preventative maintenance checklist 5-2
Cleaning the HAD blower filter 5-3

Preventative Maintenance Checklist

The HTC process air heater requires little maintenance. We recommend the following maintenance schedule and tasks.

- **Whenever you change material or process**

- Change the HTC setpoint if it must be changed.**

- **Daily or weekly as needed**

- Inspect the inlet and outlet hoses.**

Tighten the hose clamps if loose. Replace the hose if worn or damaged.

- Inspect the HAD filter (if equipped).**

Clean or replace the filter as necessary. *See Maintenance section entitled, [Cleaning the HAD Blower Filter](#).*

- **Monthly or as often as needed**

- Inspect the main power wires, heater wires and conduit, and RTD probe wires for damage and wear.**

Replace any damaged or worn wire or conduit.

- Check for any damage to the control panel.**

Replace if damaged.

- Check for damage to the heater box.**

Replace if damaged.

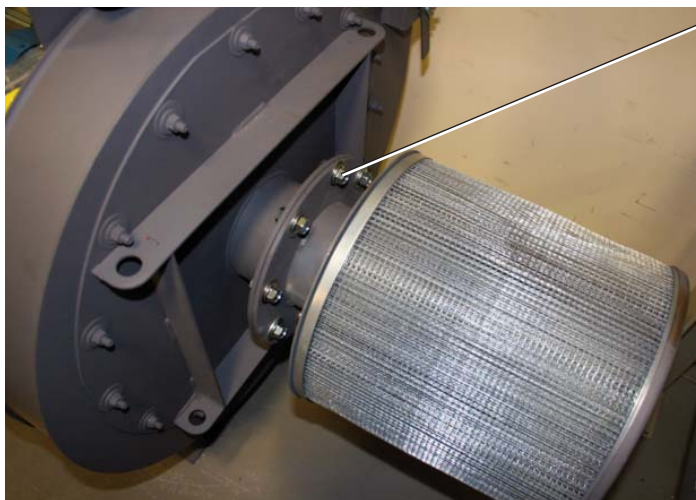
- Clean dirt from exterior surfaces with a cloth dampened with water.**

Cleaning the HAD Blower Filter

Clogged filters reduce air flow and blower efficiency. Cleaning frequency depends on how much material you process and how dusty or full of fines it is.

To clean the HAD blower filter:

- 1 Disconnect and/or lock out main power to the blower.**
- 2 Remove the eight (8) retaining bolts that secure the filter to the HAD blower body**, using appropriately-sized wrenches. Ensure to support the filter's weight before removing all retaining bolts.



Retaining bolts (8)

- 3 Inspect the filter for clogs or blinding, use a soapy solution to clean the filter.** If the filter is damaged, replace as necessary.
- 4 Re-attach the filter to the HAD blower body using supplied hardware.**
- 5 Re-apply main power.**

Replacement filters are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861



CAUTION: Wear eye protection. If you use compressed air to clean the equipment, **you must wear eye protection** and observe all OSHA and other safety regulations pertaining to the use of compressed air.

Troubleshooting

Before beginning	6-2
A few words of caution	6-3
<u>DIAGNOSTICS</u>	
How to identify the cause of a problem	6-4
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Passive alarms	6-9
<u>REPAIR</u>	
Replacing fuses	6-11
Checking heater solid state relays	6-12
Checking or replacing temperature sensors	6-13
Replacing the heating elements	6-14
Replacing the air flow differential pressure switch	6-16

Before Beginning

You can avoid most problems by following the recommended installation and maintenance procedures outlined in this User Guide. If you do have a problem, this section will help you determine what caused it and how to fix it.

Before you start disassembling the HTC process air heater be sure to:

- Diagnose causes from the control panel.**

1 Press the “Acknowledge Alarm” button to silence the alarm.



2 Address the alarm message and fix the problem.

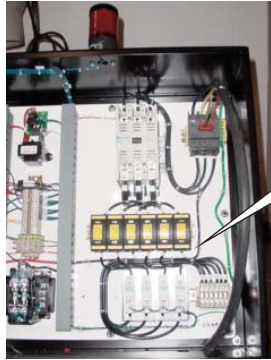
3 Press the Start button to restart normal control. If the alarm reappears the problem was not fixed.



- Diagnose causes from the control panel.**

The screen will display a description of the alarm.

Before Beginning (continued)




See warnings below. Open the control center to check fuses and heater contactors.

- ❑ **Find the wiring and equipment diagrams that were shipped with your heater.** These diagrams are the best reference for correcting a problem. The diagrams also will note any custom features, such as special wiring or alarm capabilities, not covered in this User Guide.

A Few Words of Caution

The HTC process air heater is equipped with numerous safety devices. Do not remove or disable them. Improper corrective action can lead to hazardous conditions and should never be attempted to sustain production.

 **WARNING: Only qualified service technician should examine and correct problems that require opening the HTC's control center or using electrical wires to diagnose the cause.**

 **WARNING: High voltage. Always stop the HTC process air heater, disconnect and lock out the main power source before troubleshooting or performing repairs.**

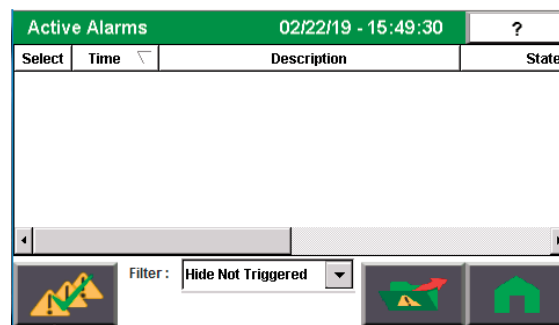
 **CAUTION: Hot surfaces. Always protect yourself from hot surfaces inside and outside of the heater.**

How to Identify the Cause of a Problem

Most heater malfunctions are indicated by an illuminated alarm light on the HTC process air heater control panel.

A problem can trigger two types of alarms:

- **Shut Down:** The heater has automatically shut down because it detected a serious problem that could damage your material or dryer.
- **Passive:** The heater continues to operate, but warns of a problem that could prevent correct heating of your material. If ignored, this problem could lead to a condition that will shut down the dryer.



Active Alarms		02/22/19 - 15:49:30	?
Select	Time	Description	State

Filter: Hide Not Triggered

Acknowledge Alarm Button

When the alarm light is displayed:

- 1 Read and select the alarm for acknowledgement.**
- 2 Correct the issue.**
- 3 Press reset all alarms button to clear the alarm.** If the condition still exists after pressing this button it triggers a new alarm in the list. *See possible Shutdown Alarms in this section.*
- 5 Press Start to restart normal control.** If the alarm reappears, the problem was not fixed.



Shut Down Alarms

The heater will shutdown automatically to prevent damage to the equipment or personnel.

List of Possible Shut Down Alarms

Shutdown alarms, Modbus 100101 - 100124

E-stop pressed - Shutdown	
Process temperature control fault- Shutdown	(loop break)
Process heater safety switch - Shutdown	
Air flow switch loss - Shutdown	
Process RTD fault- Shutdown	
PLC error detected - Shutdown	
Process blower overload- Shutdown	(Optional)
Variable speed drive fault - Shutdown	(Optional)
Startup failed at process blower - Shutdown	(Optional)
Startup failed at isolation contactor - Shutdown	(electric heat)
Startup failed at PID enable - Shutdown	(both heats)
Startup failed at interlocks - Shutdown	(gas heat)
Startup failed at purge - Shutdown	(gas heat)
Startup failed at pilot ignition - Shutdown	(gas heat)
Startup failed at main ignition - Shutdown	(gas heat)
Delivery air VFD communications fault - Shutdown	(Optional)
Combustion air VFD communications fault - Shutdown	(gas heat)
Burner control communications fault - Shutdown	(gas heat)
Burner control lockout - Shutdown	(gas heat)
Material exit temperature RTD fault - Shutdown	(ES1 dryer only)

Shut Down Alarms

The heater will shutdown automatically to prevent damage to the equipment or personnel.

Problem	Possible cause	Solution
<p>Process High Temperature – If the process temperature exceeds the process high temperature setpoint, it shuts down the dryer. Defaults are set to 385°F {196.1°C} for 20 seconds for CP HTCs, and 360°F {182.2°C} for 20 seconds for HADs.</p>	The process high temperature is not at least 10°F {5.6°C} above the setpoint.	Increase the process high temperature.
	The RTD temperature probe is not installed correctly.	Make sure the RTD temperature probe tip is in the center of the hopper inlet tube’s air flow.
<p>Process Temperature Loop Break – If the process temperature is outside of the operator entered deviation, alarm band (see Process High Temperature Deviation passive alarm) and the process temperature is not moving towards the setpoint at a rate greater than specified. It shuts down the dryer. Defaults are set at 3°F {1.7°C} over 20 seconds.</p>	The air lines are restricted or loose.	Straighten any crimps in the hoses. Tighten any loose hoses.
	Solid state relay (SSR) has failed.	Replace the solid state relay (SSR).
<p>Process Temperature Loop Break – If the process temperature is outside of the operator entered deviation, alarm band (see Process High Temperature Deviation passive alarm) and the process temperature is not moving towards the setpoint at a rate greater than specified. It shuts down the dryer. Defaults are set at 3°F {1.7°C} over 20 seconds.</p>	Output on the board has failed.	Replace the board.
	Process RTD is loose or has fallen out.	Check the process RTD and tighten if needed.
<p>Process Temperature Loop Break – If the process temperature is outside of the operator entered deviation, alarm band (see Process High Temperature Deviation passive alarm) and the process temperature is not moving towards the setpoint at a rate greater than specified. It shuts down the dryer. Defaults are set at 3°F {1.7°C} over 20 seconds.</p>	The process heater has failed.	Check the heater fuses, and resistance across each leg of the process heater.
	The air lines are restricted or loose.	Straighten any crimps in the hoses. Tighten any loose hoses.
<p>Process Temperature Loop Break – If the process temperature is outside of the operator entered deviation, alarm band (see Process High Temperature Deviation passive alarm) and the process temperature is not moving towards the setpoint at a rate greater than specified. It shuts down the dryer. Defaults are set at 3°F {1.7°C} over 20 seconds.</p>	Output on the board failed “Open”.	Replace the board.
	Drying or setback setpoint is too low.	Adjust the setpoint. Add additional cooling, either a pre-cooler or an aftercooler/intercooler, to the circuit.

Shut Down Alarms (continued)

Problem	Possible cause	Solution
Process Heater High Temperature – The snap switch in the process heater tube opens due to excessive temperature.	There is an air flow blockage or loose hoses.	Remove the blockage. Tighten any loose hoses.
	The isolation contactor failed in the closed position.	Replace the isolation contactor.
	The heater solid state relays (SSRs) failed.	Replace the failed heater solid state relays (SSRs).
	No air flow or the airflow is reversed.	Turn on the blower. Reverse the connection points of the hoses. Check the operation of the differential pressure switch.
Airflow Switch Loss – The airflow to the HTC system has been interrupted for a duration longer than 5 seconds.	The dryer for the HTC system has been turned off.	Restart the dryer.
	The blower for the HAD system has been turned off.	Restart the blower.
	Too short of an alarm delay setpoint.	Increase the duration of alarm delay, <i>see Operation section, entitled, Control Descriptions, Screen 14.</i>
RTD Integrity – If a RTD is faulty.	The connection in the electrical enclosure for the RTD is loose.	Check the RTD plug connection and tighten if needed.
	The connection of the RTD plug on the control board is loose.	Check the plug connection and tighten if needed.
	One of the RTDs has failed.	Replace the RTD.
	The RTD is enabled but wired incorrectly.	Move the wires to the proper terminals (see the wiring diagrams supplied with the unit).

Shut Down Alarms (continued)

Problem	Possible cause	Solution
EEProm Write Error.	Internal control board problem.	Replace the control board.
Process Protection High Temperature – If the process protection temperature exceeds the process protection high temperature setpoint, it shuts down the dryer. Defaults are set to 600°F {315.6°C} for 10 seconds for larger HTC's and 400°F {204.4°C} for 10 seconds for smaller HTC's.	<p>The Process RTD temperature probe is not installed correctly.</p> <p>The air lines are restricted or loose.</p>	<p>Make sure the RTD temperature probe tip is in the center of the hopper inlet tube's or heater manifold's air flow.</p> <p>Straighten any crimps in the hoses. Tighten any loose hoses.</p>
Process Protection Differential Temperature – If the process protection differential temperature exceeds the process protection differential temperature setpoint, it shuts down the dryer. Defaults are set to 325°F {162.7°C} for 180 seconds. <i>See Operation section entitled, Control Function Descriptions, Screen 23.</i>	<p>The Process RTD or Process Protection RTD temperature probe is not installed correctly.</p> <p>The air lines are restricted or loose.</p>	<p>Make sure the RTD temperature probe tip is in the heater outlet. <i>See Installation section entitled, Connecting the RTD Sensor.</i></p> <p>Straighten any crimps in the hoses. Tighten any loose hoses.</p>

Passive Alarms

The heater continues to operate, but this problem could prevent correct heating of your material. A passive alarm will go away when the alarm condition is cleared.

List of Possible Passive Alarms

Passive alarms, Modbus 100201 - 100224	
Drying monitor low temperature - Passive	(Optional)
Drying monitor high temperature - Passive	(Optional)
Dewpoint high - Passive	(Optional)
Drying hopper low level - Passive	(Optional)
Material is ready to use - Passive	(Optional)
Dew point sensor fault - Passive	(Optional)
Hopper outlet RTD fault - Passive	(Optional)
Drying monitor T1 RTD fault - Passive	(Optional)
Drying monitor T2 RTD fault - Passive	(Optional)
Drying monitor T3 RTD fault - Passive	(Optional)
Drying monitor T4 RTD fault - Passive	(Optional)
Drying monitor T5 RTD fault - Passive	(Optional)
Drying monitor T6 RTD fault - Passive	(Optional)
Remote I/O communications fault - Passive	(Optional)
TrueRate communications fault - Passive	(Optional)
Burner control initialization failed - Passive	(GasTrac only)
Continuous level sensor fault - Passive	
Delivery air flow sensor fault - Passive	(ES1 dryer only)

Passive Alarms

The heater continues to operate, but this problem could prevent correct heating of your material. A passive alarm will go away when the alarm condition is cleared.

Problem

Process Temperature

Deviation – The process temperature exceeds the deviation band as entered for the specified time. Default values are 10°F {6°C} for 5 seconds.

Possible cause

- One of the solid state relays (SSRs) has failed.
- The process RTD is loose or has fallen out.
- The air hose connections are loose.
- The heater has failed.

Solution

- Replace the failed solid state relays (SSR).
- Check the process RTD and tighten if needed.
- Tighten all air hose connections.
- Replace the failed heating element. *See Troubleshooting section, entitled, Replacing the Heating Elements.*

Replacing Fuses

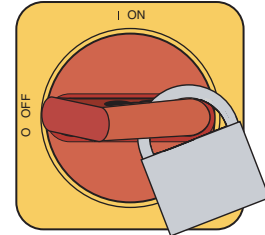
1 Disconnect and lockout the main power supply. 


2 Open the control center.



Fuse Blocks

To locate the appropriate fuse and replacement part, refer to the wiring diagrams that came with your HTC.



 **IMPORTANT:** Always refer to the wiring diagrams that came with your heater to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

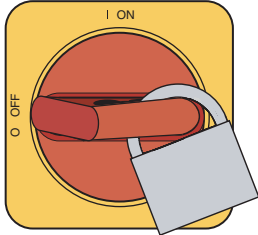
3 Check the fuse. If necessary, pull the fuse out and replace it with a fuse of the same type and rating.



Replacement fuses are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

Checking Heater Solid State Relays



1 Disconnect and lockout the main power supply. 

2 Open the control center door.

3 Locate the process solid state relays (SSRs). Refer to the wiring diagrams that came with your heater.

4 Check the resistance using an ohmmeter.



IMPORTANT: Always refer to the wiring diagrams that came with your heater to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

Replacement solid state relays (SSRs) are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

Solid state relays

Check the resistance between the terminal screws. If ohms equal zero, replace the relays.

Terminal Screws




Checking or Replacing Temperature Sensors


The HTC process air heater uses RTD sensors to monitor the process temperature in the hopper inlet, the setback temperature in the hopper outlet and the process protection temperature in the heater outlet.

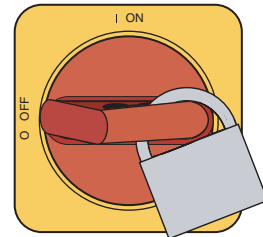


Typical location of the Process RTD at the hopper inlet.

 **IMPORTANT:** Always refer to the wiring diagrams that came with your heater to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

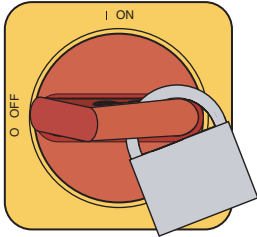
To check or replace an RTD sensors:

- 1 Disconnect and lockout the main power supply.** 
- 2 Locate the RTD sensors.**
- 3 Check the sensor positions and conditions.** Temperature readings will be incorrect if the sensors are touching the wall of an air hose or pipe or if the sensor or wiring is damaged. The tip of the sensor should be centered within the air hose's or pipe's airflow. Sensor wires should be attached to the appropriate connection points on the heater's control center.
- 4 To check with ohm meter,** measure the resistance across the RTDs. The resistance should be approximately 110 ohm at room temperature.
- 5 Replace the sensor,** if necessary.



Replacement RTDs are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the United States, call:
(814) 437 6861




IMPORTANT: Always refer to the wiring diagrams that came with your heater to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

Replacement heating elements are available from Conair.

Contact Conair Parts
 (800) 458 1960
 From outside of the
 United States, call:
 (814) 437 6861

Replacing the Heating Elements

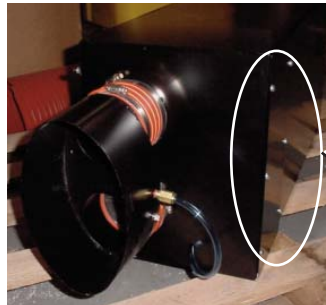
1 Disconnect and lockout the main power. 

2 Gain access to the heating elements by removing screws that secure the heating element cover to the enclosure. 

3 Remove the heating element cover by tilting the top away from the enclosure slightly, then lifting the cover up and away from the enclosure.



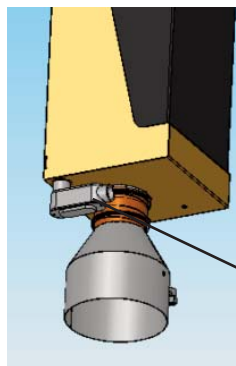
4 Determine which heater(s) is not functioning. See *Installation section entitled, Testing the Installation.*



5 Remove the screws securing the electrical cover plate to the heating element enclosure. Remove the electrical cover plate.

Screws to Remove
 - Large Heaters

6 Disconnect the heating element leads from the terminals on the terminal block, after noting connection points.



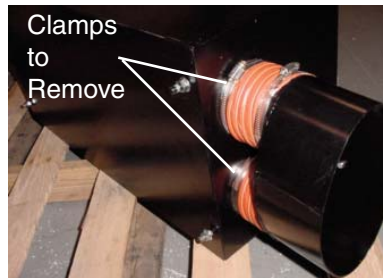
Heater
 Connection
 Junction Box

Heater
 Wires




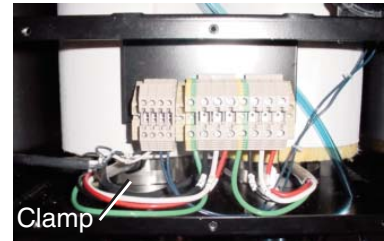
Replacing the Heating Elements (continued)

- 7** Remove the hose clamp securing the insulated hose to the outlet of the heating element. Remove the hose.
- 8** Remove the hose clamps securing the heating element to the heater inlet.
- 9** Remove the internal hose clamp.



- 10** Lift the heating element out of the enclosure.
- 11** Slide the insulation off the heater, or make a cut the entire length of the insulation sleeve to aid removal.
- 12** Check the ID mark on the side of the heating element for kW rating and voltage. The ID mark is on the outside of the tube near the end with the lead wires. Make sure the kW and voltage is the same as the replacement heating element.
- 13** Slide the original insulation over the new heater or, if the insulation was cut for removal, wrap the cut insulation sleeve around the new heater and secure it with duct tape.
- 14** Set the new heating element into the enclosure. Secure the heating element to the heater inlet with the original three (3) hose clamps.
- 15** Connect the insulated outlet hose the outlet of the heating element. Secure the hose with the original hose clamp.
- 16** Route the heating element leads to the terminal block. Connect the heating element leads to the original terminals on the terminal block. Re-install the electrical cover plate.
- 17** Re-install the heating element cover on the enclosure.
- 18** Test the system to ensure that the new heating element is functioning correctly. *See Installation section entitled, Testing the Installation, Step 3.*

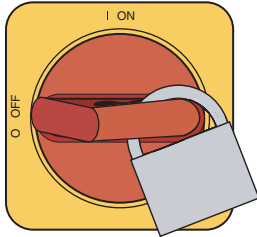
 **Note:** For larger units (above 60 kW), it may be necessary to remove the front heaters to access the rear heaters.



Replacement heating elements are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

Replacing the Air Flow Differential Pressure Switch





IMPORTANT: Always refer to the wiring diagrams that came with your heater to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

Replacement air flow differential pressure switches are available from Conair.

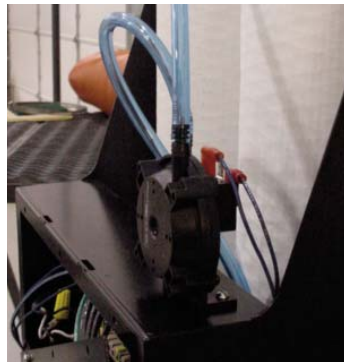
Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

NOTE: The air flow static pressure switch must be mounted with the diaphragm vertical.

If the air flow differential pressure switch fails to detect the pressure drop between the heater inlet and outlet, it should be replaced.

- 1 Stop the heater, disconnect and lockout the main power.** 
- 2 Gain access to the heating elements** by removing the screws that secure the heating element cover to the enclosure. 

- 3 Remove the heating element cover** by tilting the top away from the enclosure slightly, then lifting the cover up and away from the enclosure.



- 4 Remove the two wires connected to the pressure switch,** after noting their locations.



- 5 Disconnect the hose coming from the heater outlet from the low pressure side of the switch and the hose coming from the heater inlet from the high pressure side of the switch,** after noting their locations.

Replacing the Air Flow Differential Pressure Switch (continued)

- 6** Remove the mounting hardware securing the pressure switch to the heating element enclosure.
- 7** Align the new pressure switch with the mounting holes and secure it to the heating enclosure using the original mounting hardware.
- 8** Connect the hose coming from the heater outlet to the low pressure side of the switch and the hose coming from the heater inlet to the high pressure side of the switch.
- 9** Connect the two wires to their original location on the pressure switch.
- 10** Re-install the heating element cover on the enclosure.
- 11** Test the system to ensure that the new air flow differential switch is detecting the pressure drop between the heater inlet and outlet. *See Installation section entitled, Testing the Installation.*



Replacement air flow differential pressure switches are available from Conair.

Contact Conair Parts
(800) 458 1960
From outside of the
United States, call:
(814) 437 6861

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Department for a nominal fee. Most manuals can be downloaded free of charge from the product section of the Conair website.
www.conairgroup.com


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:



 **NOTE:** Normal operating hours are 8:00 am - 5:00 pm (EST). After hours emergency service is available at the same phone number.

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department.

Before You Call...

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

- Make sure you have all model, control type and serial numbers from the serial tag, 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.

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.



Addendum - AA

Communication Protocols for

Common Controls

Modbus Communications

DISCLAIMER: Conair nor its employees shall be liable for errors contained in this User Guide or for incidental, consequential damages in connection with the furnishing, performance or use of this information. Conair makes no warranty of any kind with regard to this information, including, but not limited to the implied warranties of merchantability and fitness for a particular purpose.

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Modbus Communications

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Installing the Modbus	
Communication Hardware	AA-2
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Description of Modbus Communications

The common controls series of products from Conair use standard Modbus communications protocol to allow the user to access the control boards for supervisory type functions. For example, you may want to display the drying temperature for all hoppers in a facility in one central location. By connecting all the dryers to a central computer, the temperatures and setpoints can be displayed in one location using a standard SCADA software program such as Wonderware or RSView.

Installing the Modbus Communication Hardware

The hardware required for Modbus communications is included with the product when it is shipped. Connectors and cabling must be supplied by the user or ordered from Conair. A converter is available if your controls do not use the standard communications you desire.

Using the Modbus Parameter List

The Modbus interface uses standard Modbus protocol to communicate with a common controls system. The data that may be retrieved is arranged in a parameter list. By using the Modbus register read and write commands, the desired data may be read from or written to the controller. The list of data that may be set or retrieved with the common controls system is arranged in Modbus registers.

Using the Modbus Parameter List (continued)



CAUTION: The list of data that may be read and written to by the user is arranged in a specific location. Writing to a location with improper data, or writing to an incorrect location outside of the specified range may cause your common controls system to become inoperative or to operate in a manner that may damage your process. Be certain that you understand each parameter and its effect before changing anything. Conair recommends that you initially attempt to read from the registers and do not attempt any writes. Once the information you are trying to read has been confirmed as accurate, you can program your new/additional data.

Modbus Parameter / TAG List

RHS-C CAREL remote heat source
HMI/Remote Configuration Tags 03/05/2019
CAREL mini series PLC w/CAREL pcd HMI
PLC Default IP Address 10.1.14.5
HMI Default IP Address 10.1.14.6

Data Types:

Bool
Int
UInt
Real

Access

RW = Read Write, Modbus 4X and 0X
RO = Read Only, Modbus 3X and 1X

Tag Name	Modbus 1X	Type	E/U	Access	Notes
Gx_User_Status.	1X	Bool Structure	NA	RO	Modbus 1X discrete inputs Modbus 100001 - 100036
RhsStatus	100001	Bool			Remote heat source status, True=On, False=Off
SetBkEnabled	100002	Bool			Setback control enabled when true
SetBkActv	100003	Bool			Setback control active when true
AutoStartEnabled	100004	Bool			Main auto start enabled when true
AutoStopEnabled	100005	Bool			Main auto stop enabled when true
HopperLowLevel	100006	Bool			Drying hopper low level, (True = low)
DryMonCommsActv	100007	Bool			Drying monitor expansion I/O communications (True=Active)
TrueRateCommsActv	100008	Bool			TrueRate communications active when true
VfdCommsActv	100009	Bool			Delivery air VFD communications online without errors
VfdRemoteActv	100010	Bool			Delivery air VFD keypad/remote, (True = remote active)
NetChgActv	100011	Bool			Network settings have changed (True=Yes)
BurnerCommsActv	100012	Bool			Burner control communications online without errors
HostCommsOnline	100013	Bool			Host interface communicating without errors
HostCommsError	100014	Bool			Host interface communication error
MaterialRdy	100015	Bool			Material ready to use when true
ProcAirAvail	100016	Bool			Process air available when true
UI1_1	100017	Bool			Universal input 1/2 state (True=On or Ok), Process air available
UI1_2	100018	Bool			Universal input 1/2 state (True=On or Ok), Process air available
UI1_3	100019	Bool			Universal input 1/3 state (True=On or Ok), Isolation contactor aux.
UI1_4	100020	Bool			Universal input 1/4 state (True=On or Ok), Spare digital
UI1_5	100021	Bool			Universal input 1/5 state (True=On or Ok), Delivery air blower aux.
UI1_6	100022	Bool			Universal input 1/6 state (True=On or Ok), Hopper level
UI1_7	100023	Bool			Universal input 1/7 state (True=On or Ok), Delivery air temperature
UI1_8	100024	Bool			Universal input 1/8 state (True=On or Ok), Hopper outlet air temperature
UI1_9	100025	Bool			Universal input 1/9 state (True=On or Ok), Delivery air dew point
UI1_10	100026	Bool			Universal input 1/10 state (True=On or Ok), Spare analog
UI2_1	100027	Bool			Universal input 2/1 state (True=On or Ok), Reserved 4-20mA
UI2_2	100028	Bool			Universal input 2/2 state (True=On or Ok), Reserved PT1000 RTD
UI2_3	100029	Bool			Universal input 2/3 state (True=On or Ok), Drying monitor T1 RTD
UI2_4	100030	Bool			Universal input 2/4 state (True=On or Ok), Drying monitor T2 RTD
UI2_5	100031	Bool			Universal input 2/5 state (True=On or Ok), Drying monitor T3 RTD
UI2_6	100032	Bool			Universal input 2/6 state (True=On or Ok), Drying monitor T4 RTD
UI2_7	100033	Bool			Universal input 2/7 state (True=On or Ok), Drying monitor T5 RTD
UI2_8	100034	Bool			Universal input 2/8 state (True=On or Ok), Drying monitor T6 RTD
UI2_9	100035	Bool			Universal input 2/9 state (True=On or Ok), Reserved PT1000 RTD
UI2_10	100036	Bool			Universal input 2/10 state (True=On or Ok), Reserved 4-20mA
Gb_UserAutoStartStatus[1..7]	1X	Bool Array	NA	RO	Auto start event status, Modbus 100065 - 100067
[1]	100065	Bool			Event #1 start enable status, (True = enabled)
[2]	100066	Bool			Event #2 start enable status, (True = enabled)
[3]	100067	Bool			Event #3 start enable status, (True = enabled)
Gb_UserAutoStopStatus[1..7]	1X	Bool Array	NA	RO	Auto stop event status, Modbus 100068 - 100070
[1]	100068	Bool			Event #1 stop enable status, (True = enabled)
[2]	100069	Bool			Event #2 stop enable status, (True = enabled)
[3]	100070	Bool			Event #3 stop enable status, (True = enabled)
Gx_User_BurnerStates.	1X	Bool Structure	NA	RO	Burner control states, bool structure
Initiate	100079	Bool			Burner control initiate state active when true
Standby	100080	Bool			Burner control standby state active when true
Purge	100081	Bool			Burner control purge state active when true

Modbus Parameter / TAG List (continued)

Tag Name	Modbus	Type	E/U	Access	Notes
PilotIgnition	100082	Bool			Burner control pilot-ignition state active when true
MainIgnition	100083	Bool			Burner control main-ignition state active when true
Run	100084	Bool			Burner control run state active when true
PostPurge	100085	Bool			Burner control post purge state active when true
PreIgnition	100086	Bool			Burner control pre-ignition state active when true
ValveProving	100087	Bool			Burner control valve proving state active when true
Alarm	100088	Bool			Burner control alarm state active when true, lockout also true
Hold	100089	Bool			Burner control hold state active when true, one other may also be true
Lockout	100090	Bool			Burner control lockout state active when true, alarm also true
Gb_Alarms_Shutdown[1..24]	1X	Bool Array	NA	RO	Shutdown alarms, Modbus 100101 - 100124
[1]	100101	Bool			E-stop pressed - Shutdown
[2]	100102	Bool			Process temperature control fault- Shutdown (loop break)
[3]	100103	Bool			Process heater safety switch - Shutdown
[4]	100104	Bool			Air flow switch loss - Shutdown
[5]	100105	Bool			Process RTD fault- Shutdown
[6]	100106	Bool			PLC error detected - Shutdown
[7]	100107	Bool			Process blower overload- Shutdown (Optional)
[8]	100108	Bool			Variable speed drive fault - Shutdown (Optional)
[9]	100109	Bool			Startup failed at process blower - Shutdown (Optional)
[10]	100110	Bool			Startup failed at isolation contactor - Shutdown (electric heat)
[11]	100111	Bool			Startup failed at PID enable - Shutdown (both heats)
[12]	100112	Bool			Startup failed at interlocks - Shutdown (gas heat)
[13]	100113	Bool			Startup failed at purge - Shutdown (gas heat)
[14]	100114	Bool			Startup failed at pilot ignition - Shutdown (gas heat)
[15]	100115	Bool			Startup failed at main ignition - Shutdown (gas heat)
[16]	100116	Bool			Delivery air VFD communications fault - Shutdown (Optional)
[17]	100117	Bool			Combustion air VFD communications fault - Shutdown (gas heat)
[18]	100118	Bool			Burner control communications fault - Shutdown (gas heat)
[19]	100119	Bool			Burner control lockout - Shutdown (gas heat)
[20]	100120	Bool			Material exit temperature RTD fault - Shutdown (ES1 dryer only)
[21]	100121	Bool			Spare - Shutdown
[22]	100122	Bool			Spare - Shutdown
[23]	100123	Bool			Spare - Shutdown
[24]	100124	Bool			Spare - Shutdown
Gb_Alarms_Passive[1..24]	1X	Bool Array	NA	RO	Passive alarms, Modbus 100201 - 100224
[1]	100201	Bool			Drying monitor low temperature - Passive (Optional)
[2]	100202	Bool			Drying monitor high temperature - Passive (Optional)
[3]	100203	Bool			Dewpoint high - Passive (Optional)
[4]	100204	Bool			Drying hopper low level - Passive (Optional)
[5]	100205	Bool			Material is ready to use - Passive (Optional)
[6]	100206	Bool			Dew point sensor fault - Passive (Optional)
[7]	100207	Bool			Hopper outlet RTD fault - Passive (Optional)
[8]	100208	Bool			Drying monitor T1 RTD fault - Passive (Optional)
[9]	100209	Bool			Drying monitor T2 RTD fault - Passive (Optional)
[10]	100210	Bool			Drying monitor T3 RTD fault - Passive (Optional)
[11]	100211	Bool			Drying monitor T4 RTD fault - Passive (Optional)
[12]	100212	Bool			Drying monitor T5 RTD fault - Passive (Optional)
[13]	100213	Bool			Drying monitor T6 RTD fault - Passive (Optional)
[14]	100214	Bool			Remote I/O communications fault - Passive (Optional)
[15]	100215	Bool			TrueRate communications fault - Passive (Optional)
[16]	100216	Bool			Burner control initialization failed - Passive (GasTrac only)
[17]	100217	Bool			Continuous level sensor fault - Passive
[18]	100218	Bool			Delivery air flow sensor fault - Passive (ES1 dryer only)
[19]	100219	Bool			Spare - Passive
[20]	100220	Bool			Spare - Passive
[21]	100221	Bool			Spare - Passive

Modbus Parameter / TAG List (continued)

Tag Name	Modbus	Type	E/U	Access	Notes
	[22] 100222	Bool			Spare - Passive
	[23] 100223	Bool			Spare - Passive
	[24] 100224	Bool			Spare - Passive
Gx_MaintAlert[1..16].State	1X	Bool Array	NA	RO	Maintenance alert triggers to the HMI or Remote
	[1] 100301	Bool			Check process heater
	[2] 100302	Bool			Check combustion burner
	[3] 100303	Bool			Check inlet/outlet hoses
	[4] 100304	Bool			Clean or replace blower filter
	[5] 100305	Bool			Clean or replace combustion air filter
	[6] 100306	Bool			Clean flame detector lens
	[7] 100307	Bool			Clean or replace spark igniter
	[8] 100308	Bool			Spare - Alert
	[9] 100309	Bool			Spare - Alert
	[10] 100310	Bool			Spare - Alert
	[11] 100311	Bool			Spare - Alert
	[12] 100312	Bool			Spare - Alert
	[13] 100313	Bool			Spare - Alert
	[14] 100314	Bool			Spare - Alert
	[15] 100315	Bool			Spare - Alert
	[16] 100316	Bool			Spare - Alert
	3X			RO	Modbus 3X input registers
Gx_MaintAlert[1..16].ActualHours	3X	Uint Array	Hrs	RO	Maintenance alert actual hours to the HMI or Remote
	[1] 300301	Uint			Maintenance alert 1 actual hours
	[2] 300302	Uint			Maintenance alert 2 actual hours
	[3] 300303	Uint			Maintenance alert 3 actual hours
	[4] 300304	Uint			Maintenance alert 4 actual hours
	[5] 300305	Uint			Maintenance alert 5 actual hours
	[6] 300306	Uint			Maintenance alert 6 actual hours
	[7] 300307	Uint			Maintenance alert 7 actual hours
	[8] 300308	Uint			Spare maintenance alert 8 actual hours
	[9] 300309	Uint			Spare maintenance alert 9 actual hours
	[10] 300310	Uint			Spare maintenance alert 10 actual hours
	[11] 300311	Uint			Spare maintenance alert 11 actual hours
	[12] 300312	Uint			Spare maintenance alert 12 actual hours
	[13] 300313	Uint			Spare maintenance alert 13 actual hours
	[14] 300314	Uint			Spare maintenance alert 14 actual hours
	[15] 300315	Uint			Spare maintenance alert 15 actual hours
	[16] 300316	Uint			Spare maintenance alert 16 actual hours
	300317 to 300350 Reserved				
	3X	Uint Array	Min	RO	Maintenance alert actual minutes to the HMI or Remote
Gx_MaintAlert[1..16].ActualMinutes	[1] 300351	Uint			Maintenance alert 1 actual minutes
	[2] 300352	Uint			Maintenance alert 2 actual minutes
	[3] 300353	Uint			Maintenance alert 3 actual minutes
	[4] 300354	Uint			Maintenance alert 4 actual minutes
	[5] 300355	Uint			Maintenance alert 5 actual minutes
	[6] 300356	Uint			Maintenance alert 6 actual minutes
	[7] 300357	Uint			Maintenance alert 7 actual minutes
	[8] 300358	Uint			Spare maintenance alert 8 actual minutes
	[9] 300359	Uint			Spare maintenance alert 9 actual minutes
	[10] 300360	Uint			Spare maintenance alert 10 actual minutes
	[11] 300361	Uint			Spare maintenance alert 11 actual minutes
	[12] 300362	Uint			Spare maintenance alert 12 actual minutes
	[13] 300363	Uint			Spare maintenance alert 13 actual minutes
	[14] 300364	Uint			Spare maintenance alert 14 actual minutes
	[15] 300365	Uint			Spare maintenance alert 15 actual minutes

Modbus Parameter / TAG List (continued)

Tag Name	Modbus	Type	E/U	Access	Notes	
	[16] 300366 300367 to 300400 Reserved	Uint			Spare maintenance alert 16 actual minutes	
Gn_User_RhsHtrSz_Act	300495	Dint	N/A	RO	Remote heat source electric heater size, 1 - 9 = 4kW - 270kW 1 = 4kW 2 = 10kW 3 = 15kW 4 = 30kW 5 = 60kW 6 = 90kW 7 = 120kW 8 = 180kW 9 = 270kW	
Gn_User_RhsCgtSz_Act	300497	Dint	N/A	RO	Remote heat source conair gastrac size, 1 - 5 1 = CGT150 2 = CGT250 3 = CGT350 4 = CGT500 5 = CGT700	
Gi_User_RhsPkg_Act	300499	Int	N/A	RO	Remote heat source feature package, 1-4 1 = Base 2 = Setback 3 = Drying monitor 4 = ES1 Dryer	
Gi_User_RhsType_Act	300500	Int	N/A	RO	Remote heat source type actual, 1 - 5 1 = HTC (electric) 2 = ResinWorks (electric) 3 = HAD (electric) 4 = CGT (natural gas) 5 = MRC (micro resin cart)	
Gi_User_PlcSwRev_Act	300501	Int	N/A	RO	PLC software revision, 100 = 1.00	
Gi_User_RhsState_Act	300502	Int	NA	RO	Remote heat source state actual, 0 - 9 0=Powering up 1=Standby 2=Waiting 3=Starting 4=Stopping 5=Running 6= Passive Alarm 7=Shutdown Alarm 8=Comms Loss 9=Test mode 10=Tuning	
Gu_User_BurnerSeqState	300503	Uint	NA	RO	Burner control sequence state. See table 20 of Honeywell manual	(Gas heat)
Gu_User_BurnerFaultCode	300504	Uint	NA	RO	Burner control fault code. See table 22 of Honeywell manual	(Gas heat)
Gu_User_BurnerPurgeTime	300505	Uint	NA	RO	Burner control purge time in seconds	(Gas heat)
Gr_User_DelAirTempSP_Act	300506	Real	*F-°C	RO	Delivery air temperature set point actual	
Gr_User_DelAirTemp_Act	300508	Real	*F-°C	RO	Delivery air temperature actual	
Gr_User_SetBkActvtnTempSP_Act	300510	Real	*F-°C	RO	Setback activation temperature set point actual	(Optional)
Gr_User_HprOutletTemp_Act	300512	Real	*F-°C	RO	Hopper outlet temperature actual	(Optional)
Gr_User_SetBkToTempSP_Act	300514	Real	*F-°C	RO	Setback to temperature set point actual	(Optional)
Gr_User_SetBKRstTempSP_Act	300516	Real	*F-°C	RO	Setback reset at temperature set point actual	(Optional)
Gr_User_ProcessOnTime_Act	300518	Real	%	RO	Delivery air heater on-time actual, 0-100%	

Modbus Parameter / TAG List (continued)

Tag Name	Modbus	Type	E/U	Access	Notes
Gr_User_EnergyHours_Act	300520	Real	Hrs	RO	Energy measurement total hours
Gr_User_EnergyLastHour_Act	300522	Real	kWh	RO	Energer used in the last hour
Gr_User_EnergyTotalKWHr_Act	300524	Real	kWh	RO	Total energy used
Gr_User_TotalRunHrs_Act	300526	Real	Hrs	RO	Hopper temperature control total running hours actual
Gr_User_DryingMonT1_Act	300528	Real	°F-°C	RO	Drying monitor, position T1 temperature actual (Optional)
Gr_User_DryingMonT2_Act	300530	Real	°F-°C	RO	Drying monitor, position T2 temperature actual (Optional)
Gr_User_DryingMonT3_Act	300532	Real	°F-°C	RO	Drying monitor, position T3 temperature actual (Optional)
Gr_User_DryingMonT4_Act	300534	Real	°F-°C	RO	Drying monitor, position T4 temperature actual (Optional)
Gr_User_DryingMonT5_Act	300536	Real	°F-°C	RO	Drying monitor, position T5 temperature actual (Optional)
Gr_User_DryingMonT6_Act	300538	Real	°F-°C	RO	Drying monitor, position T6 temperature actual (Optional)
Gr_User_DeIAirDewpoint_Act	300540	Real	°F-°C	RO	Delivery air dew point actual, -76 to +40F (Optional)
Gr_User_DeIAirFlow_Act	300542	Real	Hz	RO	Delivery air flow VFD %speed actual, 0-100% (Optional)
Gr_User_Throughput_Act	300544	Real	lb/hr-kg/hr	RO	Material troughput of the hopper (Optional)
Gr_User_BulkDensity_Act	300546	Real	lb/F ³ -kg/M ³	RO	Bulk density of the material in the hopper (Optional)
Gr_User_RsdncTime_Act	300548	Real	Hrs	RO	Hopper residence time actual (Optional)
Gr_User_BurnerFlameSig	300550	Real	Volts	RO	Burner control flame signal volts, 0.0-25.5 volts (Gas heat) (Optional)
Gr_User_HprLevelAct	300552	Real	%	RO	Hopper level actual, 0.0-100.0% (Optional)
Gr_User_MatExtTempAct	300554	Real	F/C	RO	Material exit temperature actual (Optional)
Gr_User_DeIAirVelAct	300556	Real	fpm	RO	Delivery air velocity actual (Optional)
0X					
Gx_User_Control	0X	Bool Structure	NA	RW	Modbus 0X coils
	Start	000001	Bool	RW	Modbus 000001 - 000032
	Stop	000002	Bool	RW	Start command True=start, resets to false
	EngUnit	000003	Bool	RW	Stop command True=stop, resets to false
	AckAlarm	000004	Bool	RW	Engineering units (False=english, True=Metric)
	EnergyMeterEn	000005	Bool	RW	Acknowledge alarm PB
	AutoStartEn	000006	Bool	RW	Energy meter enable PB
	AutoStopEn	000007	Bool	RW	Main auto start enable PB
	SetBkCtrlEn	000008	Bool	RW	Main auto stop enable PB
	SetBkMode	000009	Bool	RW	Setback temperature control enable PB
	RemCommsEn	000010	Bool	RW	Setback setpoints mode (False=Man, True=Auto)
	VfdCommsEn	000011	Bool	RW	Drying monitor, remote exp. I/O communications enable
	Spare_Bit_12	000012	Bool	RW	Delivery/Combustion air VFD communications enable
	TrueRateCommsEn	000013	Bool	RW	Place holder for the protocol
	BurnerCommsEn	000014	Bool	RW	TrueRate throughput, communications enable
	TestOutput	000015	Bool	RW	Burner control, communications enable
	TestRemOutput	000016	Bool	RW	Test mode, test PLC output PB
	SaveDelAirDflt	000017	Bool	RW	Test mode, test remote output PB
	LoadDfltDelAir	000018	Bool	RW	Save delivery air PID gains as default
	NetChgEn	000019	Bool	RW	Load the default delivery air PID gains
	Spare_Bit_20	000020	Bool	RW	Network communications change enable, true = apply
	Spare_Bit_21	000021	Bool	RW	Place holder for the protocol
	Spare_Bit_22	000022	Bool	RW	Place holder for the protocol
	Spare_Bit_23	000023	Bool	RW	Place holder for the protocol
	Spare_Bit_24	000024	Bool	RW	Place holder for the protocol
	Spare_Bit_25	000025	Bool	RW	Place holder for the protocol
	Spare_Bit_26	000026	Bool	RW	Place holder for the protocol
	Spare_Bit_27	000027	Bool	RW	Place holder for the protocol
	Spare_Bit_28	000028	Bool	RW	Place holder for the protocol
	Spare_Bit_29	000029	Bool	RW	Place holder for the protocol
	Spare_Bit_30	000030	Bool	RW	Place holder for the protocol
	Spare_Bit_31	000031	Bool	RW	Place holder for the protocol
	Spare_Bit_32	000032	Bool	RW	Place holder for the protocol
Gb_User_AutoStartEn[1..3]	0X	Bool Array	NA	RW	Three auto start events, Modbus 000065 - 000067
	[1]	000065	Bool	RW	Event #1 start enable, true=enable
	[2]	000066	Bool	RW	Event #2 start enable, true=enable
	[3]	000067	Bool	RW	Event #3 start enable, true=enable

Modbus Parameter / TAG List (continued)

Tag Name	Modbus	Type	E/U	Access	Notes
Gb_User_AutoStopEn[1..3]	0X	Bool Array	NA	RW	Three auto stop events, Modbus 000068 - 000070
	[1] 000068	Bool			Event #1 stop enable, true=enable
	[2] 000069	Bool			Event #2 stop enable, true=enable
	[3] 000070	Bool			Event #3 stop enable, true=enable
Gx_MaintAlert[1..16].Enable	0X	Bool Array	NA	RW	Enable maintenance alerts from the HMI or Remote
	[1] 000301	Bool			Maintenane alert 1 enable
	[2] 000302	Bool			Maintenane alert 2 enable
	[3] 000303	Bool			Maintenane alert 3 enable
	[4] 000304	Bool			Maintenane alert 4 enable
	[5] 000305	Bool			Maintenane alert 5 enable
	[6] 000306	Bool			Maintenane alert 6 enable
	[7] 000307	Bool			Maintenane alert 7 enable
	[8] 000308	Bool			Spare maintenane alert 8 enable
	[9] 000309	Bool			Spare maintenane alert 9 enable
	[10] 000310	Bool			Spare maintenane alert 10 enable
	[11] 000311	Bool			Spare maintenane alert 11 enable
	[12] 000312	Bool			Spare maintenane alert 12 enable
	[13] 000313	Bool			Spare maintenane alert 13 enable
	[14] 000314	Bool			Spare maintenane alert 14 enable
	[15] 000315	Bool			Spare maintenane alert 15 enable
	[16] 000316	Bool			Spare maintenane alert 16 enable
000317 to 000350 Reserved					
Gx_MaintAlert[1..16].Reset	0X	Bool Array	NA	RW	Reset maintenance alert time or count from the HMI or Remote
	[1] 000351	Bool			Maintenane alert 1 reset
	[2] 000352	Bool			Maintenane alert 2 reset
	[3] 000353	Bool			Maintenane alert 3 reset
	[4] 000354	Bool			Maintenane alert 4 reset
	[5] 000355	Bool			Maintenane alert 5 reset
	[6] 000356	Bool			Maintenane alert 6 reset
	[7] 000357	Bool			Maintenane alert 7 reset
	[8] 000358	Bool			Spare maintenane alert 8 reset
	[9] 000359	Bool			Spare maintenane alert 9 reset
	[10] 000360	Bool			Spare maintenane alert 10 reset
	[11] 000361	Bool			Spare maintenane alert 11 reset
	[12] 000362	Bool			Spare maintenane alert 12 reset
	[13] 000363	Bool			Spare maintenane alert 13 reset
	[14] 000364	Bool			Spare maintenane alert 14 reset
	[15] 000365	Bool			Spare maintenane alert 15 reset
	[16] 000366	Bool			Spare maintenane alert 16 reset
000367 to 000400 Reserved					
Gx_MaintAlert[1..16].TimeSetPoint	4X	Uint Array	Hrs	RW	Modbus 4X holding registers
	4X			RW	Maintenance alert time set points from the HMI or Remote
	[1] 400301	Uint			Maintenane alert 1 "Check process heater" time (Range 720 - 8640hrs)
	[2] 400302	Uint			Maintenane alert 2 "Check combustion burner" time (Range 720 - 8640hrs)
	[3] 400303	Uint			Maintenane alert 3 "Check inlet/outlet hoses" time (Range 168 - 4320hrs)
	[4] 400304	Uint			Maintenane alert 4 "Check or replace blower filter" time (Range 8 - 720hrs)
	[5] 400305	Uint			Maintenane alert 5 "Check or replace combustion air filter" time (Range 8 - 720hrs)
	[6] 400306	Uint			Maintenane alert 6 "Clean flame detector lens" time (Range 4320 - 12960hrs)
	[7] 400307	Uint			Maintenane alert 7 "Clean or replace spark igniter" time (Range 4320 - 12960hrs)
	[8] 400308	Uint			Spare maintenane alert 8 time (Hours)
	[9] 400309	Uint			Spare maintenane alert 9 time (Hours)
	[10] 400310	Uint			Spare maintenane alert 10 time (Hours)
	[11] 400311	Uint			Spare maintenane alert 11 time (Hours)
	[12] 400312	Uint			Spare maintenane alert 12 time (Hours)

Modbus Parameter / TAG List (continued)

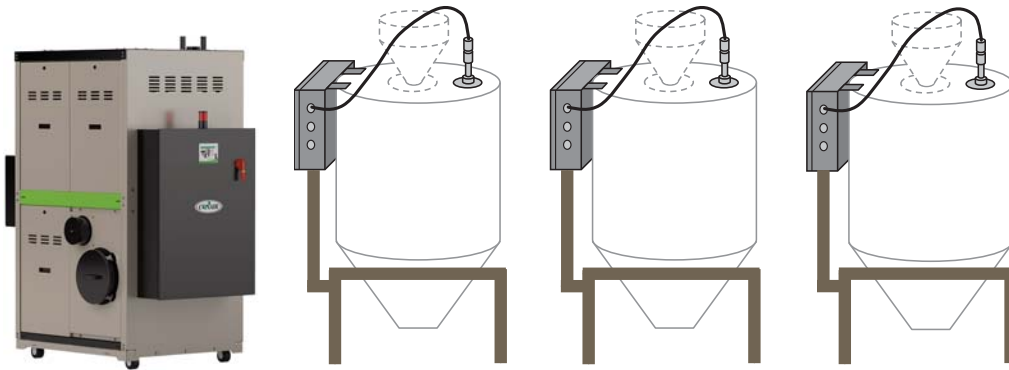
Tag Name	Modbus	Type	E/U	Access	Notes
	[13] 400313	Uint			Spare maintenane alert 13 time (Hours)
	[14] 400314	Uint			Spare maintenane alert 14 time (Hours)
	[15] 400315	Uint			Spare maintenane alert 15 time (Hours)
	[16] 400316	Uint			Spare maintenane alert 16 time (Hours)
	400317 to 400350 Reserved				
Gr_User_DeIAirTemp_SP	400530	Real	*F-°C	RW	Delivery air temperature set point, min to max
Gr_User_SetBkToTempSP	400532	Real	*F-°C	RW	Setback function, setback to temperature set point (ProcMin-ProcSp)
Gr_User_SetBkActvtnTempSP	400534	Real	*F-°C	RW	Setback function, activation hopper outlet temperature set point (ProcMin-ProcSp)
Gr_User_SetBkRstTempSP	400536	Real	*F-°C	RW	Setback function, reset at temperature set point (ProcMin-SetBkToSp)
Gr_User_DeIAirDewpoint_SP	400538	Real	*F-°C	RW	Delivery air dew point set point
Gr_User_DeIAirTempSP_Max	400540	Real	*F-°C	RW	Delivery air temperature set point max limit, min to 375F
Gr_User_DeIAirTempSP_Min	400542	Real	*F-°C	RW	Delivery air temperature set point min limit, 100F to max
Gr_User_HprLevel_SP	400544	Real	%	RW	Hopper level set point (60.0-100.0%)
Gu_User_AirLossAlarm_SP	400546	Uint	Sec	RW	Air loss alarm set point, 3-15 seconds
Gr_User_DewpointHighAlarm_SP	400547	Real	*F-°C	RW	High dew point alarm set point
Gu_User_DryingMonHlAlmPos_SP	400549	Uint	N/A	RW	Drying monitor high temperature alarm position set point, 0-3 0 = T2 1 = T3 2 = T4 3 = T5 (default)
Gr_User_DryingMonHighAlarm_SP	400550	Real	*F-°C	RW	Drying monitor high temperature alarm set point
Gu_User_DryingMonLoAlmPos_SP	400552	Uint	N/A	RW	Drying monitor low temperature alarm position set point, 0-3 0 = T2 (default) 1 = T3 2 = T4 3 = T5
Gr_User_DryingMonLowAlarm_SP	400553	Real	*F-°C	RW	Drying monitor low temperature alarm set point
Gr_User_DeIAirFlow_SP	400555	Real	%	RW	Delivery air flow set point, 60.0-100.0%
Gr_User_RsdncTime_SP	400557	Real	Hrs	RW	Material residence time, 1-10 hrs
Gr_User_HprLowLevelAlarm_SP	400559	Real	%	RW	Drying hopper low level alarm set point, 0.0-Level set point
Gx_User_AutoStart_SP[1..3]	4X	Structured Array		RW	Auto start event setpoint elements
[1].Weekday	400601	Uint	Hr	RW	Auto start event #1 weekday set point, range 1 to 8, Mon to Sun and Daily
[1].Hour	400602	Uint	Hr	RW	Auto start event #1 hour of the day, range 0-23
[1].Minute	400603	Uint	Min	RW	Auto start event #1 minute of the hour, range 0-59
[2].Weekday	400604	Uint	Hr	RW	Auto start event #2 weekday set point, range 1 to 8, Mon to Sun and Daily
[2].Hour	400605	Uint	Min	RW	Auto start event #2 hour of the day, range 0-23
[2].Minute	400606	Uint	Hr	RW	Auto start event #2 minute of the hour, range 0-59
[3].Weekday	400607	Uint	Min	RW	Auto start event #3 weekday set point, range 1 to 8, Mon to Sun and Daily
[3].Hour	400608	Uint	Hr	RW	Auto start event #3 hour of the day, range 0-23
[3].Minute	400609	Uint	Min	RW	Auto start event #3 minute of the hour, range 0-59
Gx_User_AutoStop_SP[1..3]	4X	Structured Array		RW	Auto stop event setpoint elements
[1].Weekday	400610	Uint	Hr	RW	Auto stop event #1 weekday set point, range 1 to 8, Mon to Sun and Daily
[1].Hour	400611	Uint	Min	RW	Auto stop event #1 hour of the day, range 0-23
[1].Minute	400612	Uint	Hr	RW	Auto stop event #1 minute of the hour, range 0-59
[2].Weekday	400613	Uint	Min	RW	Auto stop event #2 weekday set point, range 1 to 8, Mon to Sun and Daily
[2].Hour	400614	Uint	Hr	RW	Auto stop event #2 hour of the day, range 0-23
[2].Minute	400615	Uint	Min	RW	Auto stop event #2 minute of the hour, range 0-59
[3].Weekday	400616	Uint	Hr	RW	Auto stop vent #3 weekday set point, range 1 to 8, Mon to Sun and Daily
[3].Hour	400617	Uint	Min	RW	Auto stop event #3 hour of the day, range 0-23
[3].Minute	400618	Uint	Hr	RW	Auto stop event #3 minute of the hour, range 0-59




Appendix

Drying Monitor DM-4

For use with D Series Dryers with DC-C Control



Zero Mechanical State (ZMS)

 **CAUTION:** Before performing maintenance or repairs on this product, you should disconnect and lockout electrical power sources to prevent injury from unexpected energizing or start-up.


During maintenance, it is essential that the system be put into a state which eliminates the possibility of components making an unexpected and dangerous movement. This procedure is typically referred to as lockout. After all energy sources have been neutralized, the system is in the zero mechanical state (ZMS). This provides maximum protection against unexpected mechanical movement.

The lockout procedure must include all energy sources:

- Electrical power supply
- Compressed air supply
- Hydraulic fluids under pressure
- Potential energy from suspended parts
- Energy in springs
- Any other source that might cause unexpected mechanical movement

The following is a recommended Zero Mechanical State procedure which must be followed prior to any inspection, or maintenance of the Dryer Monitor hopper probe(s).

- 1 Turn off the loading device installed to the top of the drying hopper to assure that it does not attempt to load the hopper with material.**
- 2 Perform the proper shutdown sequence to the connected dryer or drying system and allow all hopper components (internally and externally) to adequately cool.**
- 3 Disconnect and lock out the primary electrical supply feeding the dryer.**
- 4 Drain the drying hopper, at least to a level that fully exposes the probe; typically just below the air spreader cone in the hopper, as observed through a sight glass or viewing window.**
- 5 Carefully open the drying hopper door and clarify that material level is below the probe and that the temperature of all hopper surfaces and the probe are adequately reduced to make touching and handling safe.**
- 6 Use caution working in elevated areas and use approved fall prevention measures and carefully disconnect the drying monitor probe from its junction box on the top of the hopper.**
- 7 The probe is now accessible for maintenance, replacement, adjustment or repairs.**

 **WARNING:** Before removing lockout devices and returning switches to the ON position, make sure that all personnel are clear of the machine, tools have been removed, and all safety guards reinstalled.

What is the Drying Monitor™?

The Drying Monitor is the latest generation of technology created for analyzing drying performance from a multi-zone, resistance temperature detector (RTD) probe installed in the drying hopper. Embedded into the DC-C dryer control software, the Drying Monitor is designed to provide early detection of poor drying conditions and provide alarms for correcting problems. Up to 16 hoppers can be monitored.


Drying Monitor probes are supplied for any size or brand of drying hopper and are installed through the lid of the hopper (or from the bottom of the hopper up) and extend to the base of the air diffuser. Probe signals are then continuously fed back to the control where each hopper's temperature profile can be viewed, trended and used to determine if proper drying is taking place according to required drying parameters.

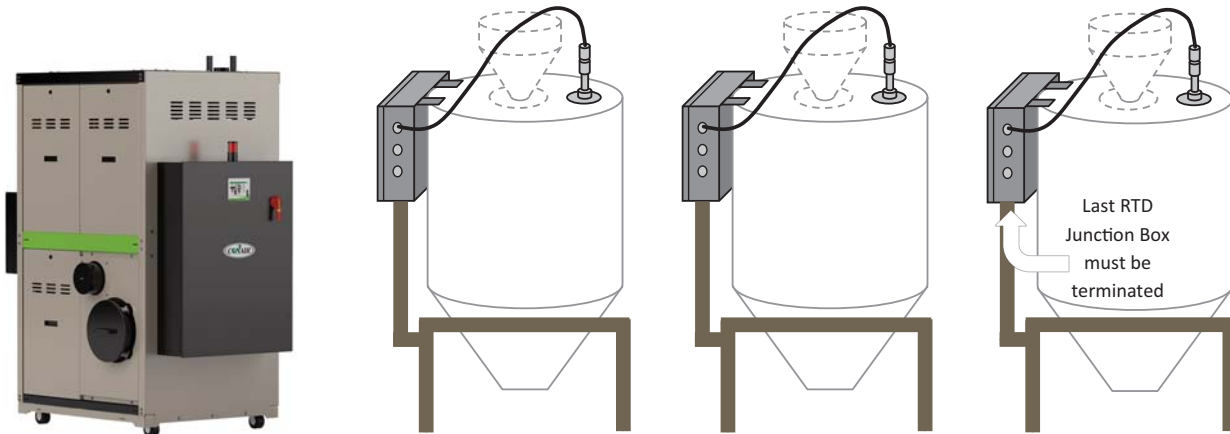
Typical Applications

The Drying Monitor is ideal for applications that require strict monitoring of the drying process to meet product quality specifications. The DM can also aid in the prevention of product rejects through early identification of potential drying problems.

The DM will alert the operator, through a passive alarm shown on the local hopper control monitor that one of these common drying problems may exist:

- A change in the temperature profile within the drying hopper.
- Loss of air flow through the drying hopper.
- A reduction or loss of drying time at the selected and programmed drying temperature.

 **Note:** Drying Monitor is also provided as an independent control and probe set for dryers not equipped with DC-C. This independent version is called the DM4-i. On the DM4-i version of Drying Monitor, an independent TouchView control provides the operator interface. For more information on the DM4-i version of the Drying Monitor, contact Conair.



Multi-hopper Drying Monitor

How the Drying Monitor Works

The Drying Monitor consists of stainless steel, 6-zone, temperature probes installed in drying hoppers that sense the specific temperature profile of the hoppers and compares their profiles to the requirements needed for proper drying in a specific hopper for a specific material.

Interpretation of that temperature profile by the DM leads directly to predicting under or over dried material, inadequate air flow, clogged filters, heater failure, excess throughput for that hopper size, unresponsive loading, over capacity drying and many other conditions that are likely to produce scrap and waste time, energy and material.

The DM will store all temperature readings and organize the data into logical groups for review or downloading to a spreadsheet program for analysis. The DM has memory capacity to store seven days of data for each hopper in the system.

Alarms are displayed on the local hopper control and also stored for future reference. Pressing the Alarms button will take you to the alarm list.

Drying monitor 08/28/19 - 16:48:01

PARAMETER	ACTUAL
HO Hopper outlet temperature	0.0 °F
T6 Drying mon. T6 temperature	0.0 °F
T5 Drying mon. T5 temperature	0.0 °F
T4 Drying mon. T4 temperature	0.0 °F
T3 Drying mon. T3 temperature	0.0 °F
T2 Drying mon. T2 temperature	0.0 °F
T1 Drying mon. T1 temperature	0.0 °F
DA Delivery air temperature	308.4 °F

Material residence time: 4.0 hr / 0.00 hr

Diagram labels: HO, T6, T5, T4, T3, T2, T1, DA, Status

Example of a remote heat source

Dryer settings 03/22/19 - 09:36:11

PARAMETER	ACTUAL	SET POINT
A Regeneration temperature	350.7 °F	350.0 °F
B Regen heater % on time	0.0 %	N/A
C Wheel inlet temperature	96.7 °F	N/A
D Delivery air dew point	-41.4 °F	-40.0 °F
E Hopper outlet temperature	305.3 °F	170.0 °F
F Delivery air temperature	326.5 °F	330.0 °F
G Delivery air heater % on-time	0.0 %	N/A
T6 Drying monitor T6 temp.	380.1 °F	N/A
T5 Drying monitor T5 temp.	255.9 °F	N/A
T4 Drying monitor T4 temp.	313.1 °F	N/A
T3 Drying monitor T3 temp.	271.2 °F	N/A
T2 Drying monitor T2 temp.	294.9 °F	N/A
T1 Drying monitor T1 temp.	312.2 °F	N/A

Control panels: D: Dew point control (Set point: -40.0 °F), E: Manual setback control (Set point: 170.0 °F, Setback to: 150.0 °F, Reset at: 145.0 °F)

Energy use: Last hour 0.0kWh, Elapsed time 0.0hrs

Diagram labels: E, T6, T5, T4, T3, T2, T1, Mat'l. status, D, C, B, A

Example of a stand alone standard dryer

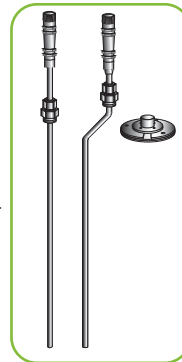
Drying Monitor System Components

The Drying Monitor system consists of:

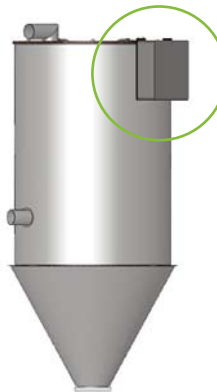
A Conair Carousel Plus dryer with DC-C control that connects to up to 16 probes via RTD junction boxes at each hopper.



Stainless steel, 6-zone, temperature probes are installed in each of the drying hoppers. These probes are sized specifically for the hoppers they will be installed into and hang from the lid of the hopper approximately halfway between the centerline and the inside wall of the hopper. Some hoppers (especially those fitted with loading equipment) often require probes with an offset to allow location in one position on the lid and another vertical position in the hopper. Conair hoppers are typically outfitted to readily receive a DM probe. Non-Conair or older Conair hoppers will require adaptation for probe installation according to instructions supplied in this manual.




RTD junction boxes link the cable from the hopper probe into the ModBus communications interface, and back to the local heat control (HTC, ResinWorks, Gastrac or standalone dryer). All remote heat controls are daisy chained back to the dryer.



Cable sets are custom ordered in lengths of 5 feet {1.5 meters}, 10 feet {3.0 meters}, 15 feet {4.6 meters}, 20 feet {6.1 meters}, 50 feet {15.2 meters}, 75 feet {22.9 meters} and 100 feet {30.5 meters} long.

To order a cable set:

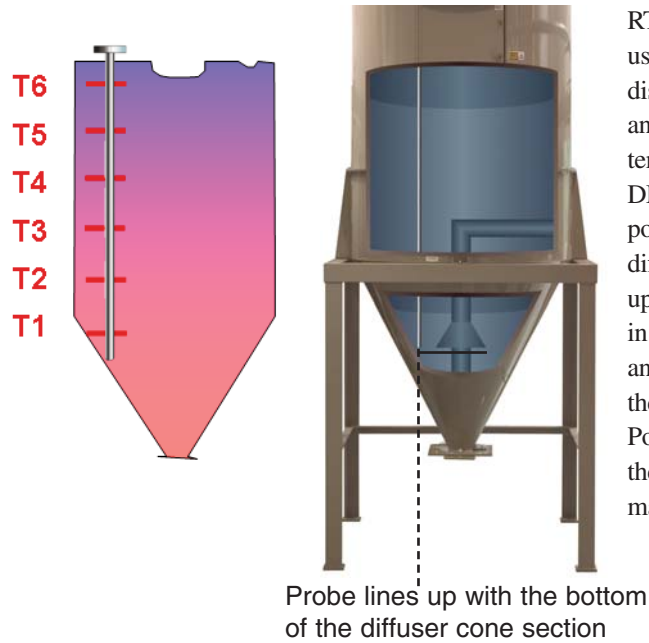
Contact Conair Parts
 1 800 458 1960
 From outside of the United States, call:
 814 437 6861

 **Note:** Cables can be shortened in the field by a qualified technician. It is better to order a cable length that is too long and shorten it in the field than to have a cable that is too short.



- 5 ft {1.5 m}- 1886780405
- 10 ft {3.0 m}- 18886780410
- 15 ft {4.6 m}- 18886780415
- 20 ft {6.1 m}- 18886780420
- 50 ft {15.2 m}- 18886780450
- 75 ft {22.9 m}- 18886780475
- 100 ft {30.5 m}- 188867804100

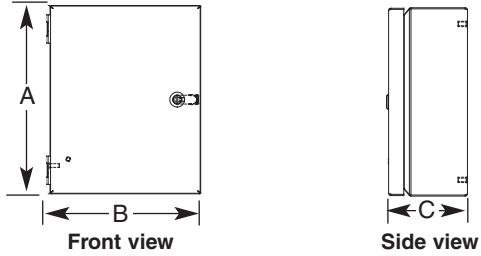
RTD Sensor Positions in the Hopper



RTD's will be referred to in this user guide and on your DM display as T1, T2, T3, T4, T5, and T6. T1 is the lower most temperature sensor within the DM temperature probe and is positioned at the bottom of the diffuser cone section. T6 is the upper most temperature sensor in the DM temperature probe and is located near the top of the hopper when installed. Position T6 is always located in the air void above the bed of material in the hopper.

Specifications

Probe junction box



MODEL	DM
Control box type	DM probe junction box
Dimensions inches {mm}	
A- Height	10.0 {254}
B- Width	8.0 {203}
C- Depth	4.0 {101}
Weight lb {kg}	
Installed	29 {13}
Shipping	36 {16}

SPECIFICATION NOTES

Specifications may change without notice. Check with a Conair representative for the most current information.

The DM is also available as a independent option, with its own TouchView control panel, to monitor up to 30 hoppers. Contact Conair for more information on the DM4-i.

Unpacking the Boxes



NOTE: You must have local hopper control (HMI) to use DM4-i as part of a central drying system.

To order a hopper mount adapter kit, part #18169902:

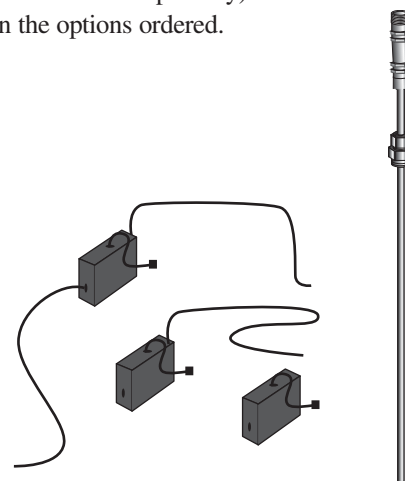
Contact Conair Parts
1 800 458 1960
From outside of the
United States, call:
814 437 6861

The DM software is included as part of your DC-C control. The necessary hardware (not included as part of the dryer - must be ordered separately) comes in two or more shipping containers, depending on the options ordered.

The DM consists of:

- One or more stainless steel probes
- An RTD junction box for each probe, including associated mounting hardware
- ModBus connecting cables and
- If ordered, installation hardware for each probe.

Packaging for the DM system can be varied depending upon what has been ordered, so carefully inventory all items.

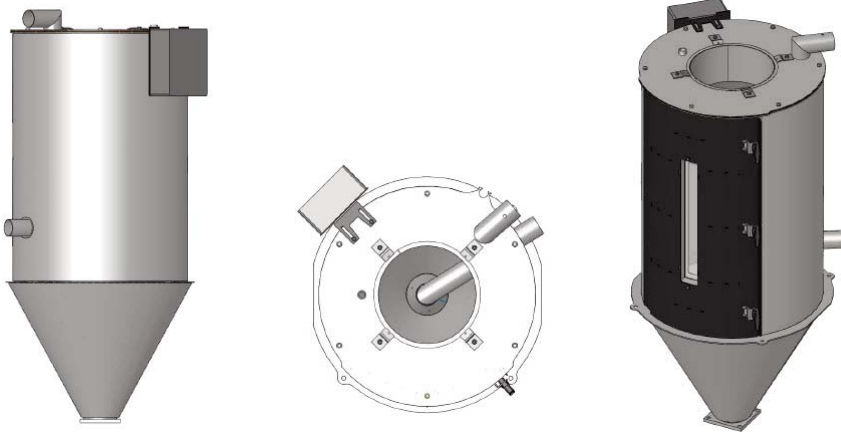


- 1 Carefully remove all components** from their shipping containers.
- 2 Remove all packing material, protective paper, tape, and plastic.** Do not discard installation notice tags.
- 3 Carefully inspect all components** to make sure no damage occurred during shipping, and that you have all the necessary hardware.
 - ❖ **TIP:** Inspect all of the equipment in the presence of the freight carrier's representative for damage during shipment. Note any damage on the delivery receipt before signing it. If damage is evident, file a claim immediately against the carrier as it is their responsibility to pay for any damage incurred during shipping. Make sure to include a detailed report of the damage along with photos. Note that RTD probes are delicate and may not operate properly if bent or otherwise damaged.
- 4 Take a moment to record serial numbers.** Also record the drying hopper's model number and specifications. This information will be helpful if you ever need service or parts.

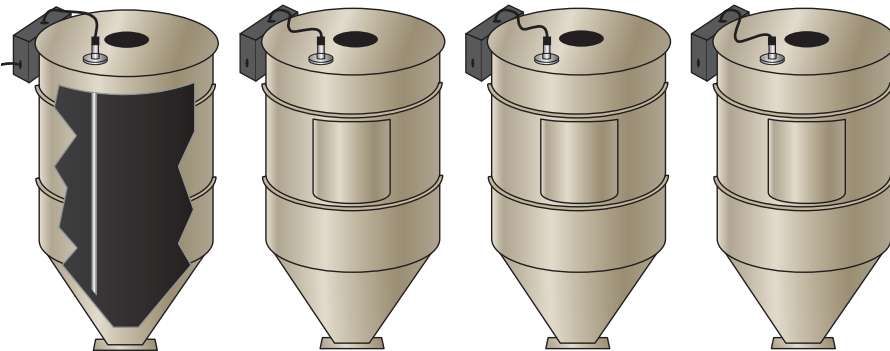
Preparing for Installation

In addition to mounting the probe into the hopper, each hopper will be equipped with an RTD Junction Box. This box provides the link from the probe to the ModBus interconnection cables that will connect each hopper to the heater control panel.

⚠ IMPORTANT: The DC-C controlled dryer, and any junction boxes should not be installed in extreme temperature locations. Ambient air temperatures below 41°F {5°C} and above 104°F {40°C} should be avoided.



The RTD Junction Box should be mounted in a safe location, at the top of the hopper as near as possible to the hopper probe and if possible, not directly above the hopper, to minimize transmitted heat from the hopper to the junction box. Stay clear of loading equipment that may require service access and be sure to mount the box so that it is not likely to be used as step or hand-hold during service procedures.



Installing the 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 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.



CAUTION: Always disconnect and lock out the main power supply before beginning the installation process.

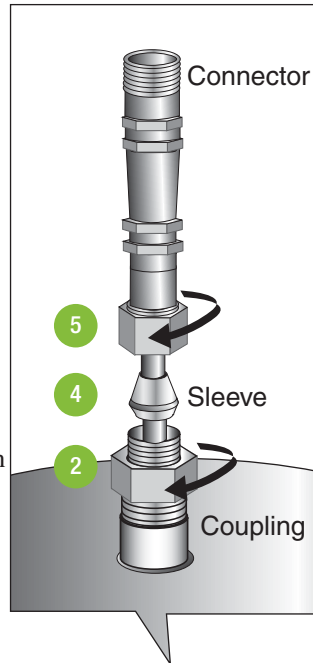
There are three mounting methods for the probe:


- **Select Mounting Method 1** if you purchased a new Conair CH series 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

(New Conair hopper with Factory Installed coupling)

- 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 Make sure the probe is the correct size.** The probe should extend from just above the top of the hopper into the hopper, with the tip approximately in-line with the bottom edge of the diffuser cone.
- 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. Be sure to position the connector in such a way as to avoid interference of the cable with the loader, etc. Use a wrench to tighten the nut so that it covers the threads.




 **CAUTION:** Always disconnect and lock out the main power supply before beginning the installation process.


 **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.

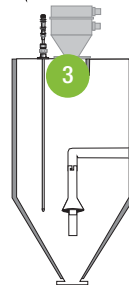
Tools for Installation:

- 7/8-in. wrench

 **NOTE:** The mounting adapter kit will only be included if the DM was ordered as a retrofit kit.



 **NOTE:** If the angled probe is used, the bend (dog leg) in the probe must be oriented so that it is angled in toward the center of the hopper.



CAUTION: Always disconnect and lock out the main power supply before beginning the installation process.

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.

IMPORTANT: 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.

NOTE: The mounting adapter kit will only be included if the DM was ordered as a retrofit kit. 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
- 7/8-in. wrench

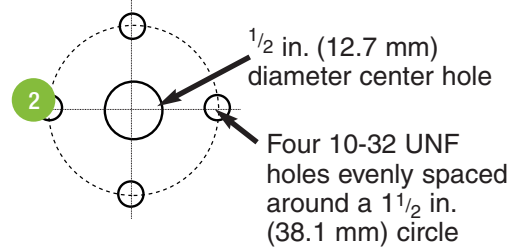
NOTE: If the angled probe is used, the bend (dog leg) in the probe must be oriented so that it is angled in toward the center of the hopper.



Mounting Method 2 (Drying hopper with enough overhead clearance to insert probe from the top of the hopper)

1 Reference the drawings at the end of this user guide and select the drawing that reflects your installation. Drill the appropriate hole in the top of the hopper.

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



3 Secure the gasket and coupling to the hopper with the four 10-32 screws. Remove any 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 Make sure the probe is the correct size. The probe should extend from just above the top of the hopper into the hopper, with the tip approximately in-line with the bottom edge of the diffuser cone.

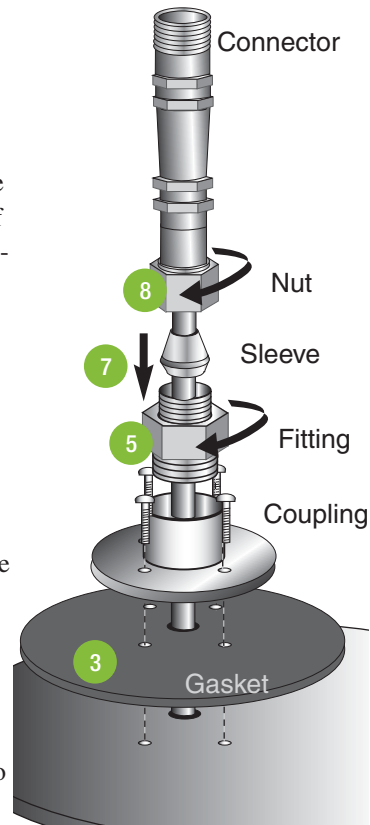


7 Push the compression sleeve into the fitting.

8 Tighten the nut over the sleeve.

The compression sleeve will crimp the tube to hold the probe in place. Be sure to position the connector in such a way as to avoid interference of the cable with the loader, etc. Use a wrench to tighten the nut so that it covers the threads.

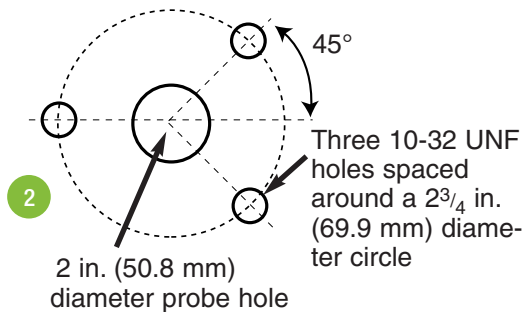
9 Thoroughly clean the inside of the hopper to remove any debris left from installation of the probe.



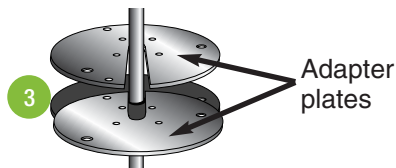
Mounting Method 3 (Not enough overhead clearance to insert the probe from the top of the hopper)

1 Reference the drawings at the end of this user guide and select the drawing that reflects your installation. Drill the appropriate hole in the top of the hopper.

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.

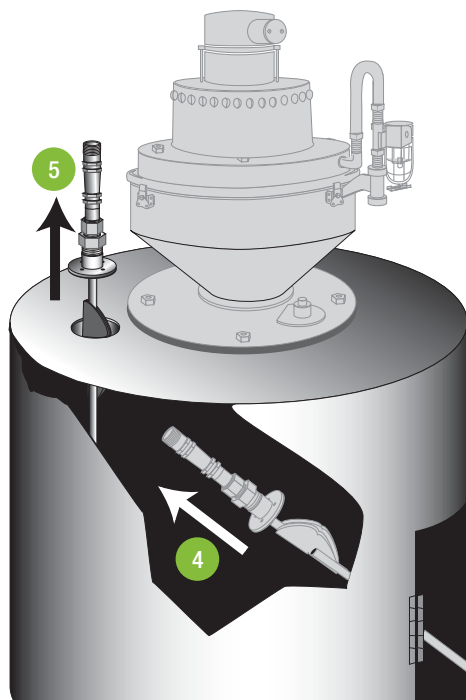


3 Remove the two adapter plates from the probe mounting assembly. Set the adapter plates aside for use in Step 7.



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.



Tools for Installation:

- Drill and 10-32 tap
- Flathead screwdriver
- 7/8-in. wrench
- 2-in. hole saw

CAUTION: Always disconnect and lock out the main power supply before beginning the installation process.

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.

IMPORTANT: 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.

NOTE: If the angled probe is used, the bend (dog leg) in the probe must be oriented so that it is angled in toward the center of the hopper.



(continued)

Mounting Method 3 (continued)

6 Place the gasket over the probe hole.

7 Place the adapter plates over the gasket and secure them to the hopper with three 10-32 UNF screws. Make sure the adapter plate with the threaded holes is on the bottom, and that the slots in the adapter plates are oriented in the opposite direction as shown. See drawing to right, #7.

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.

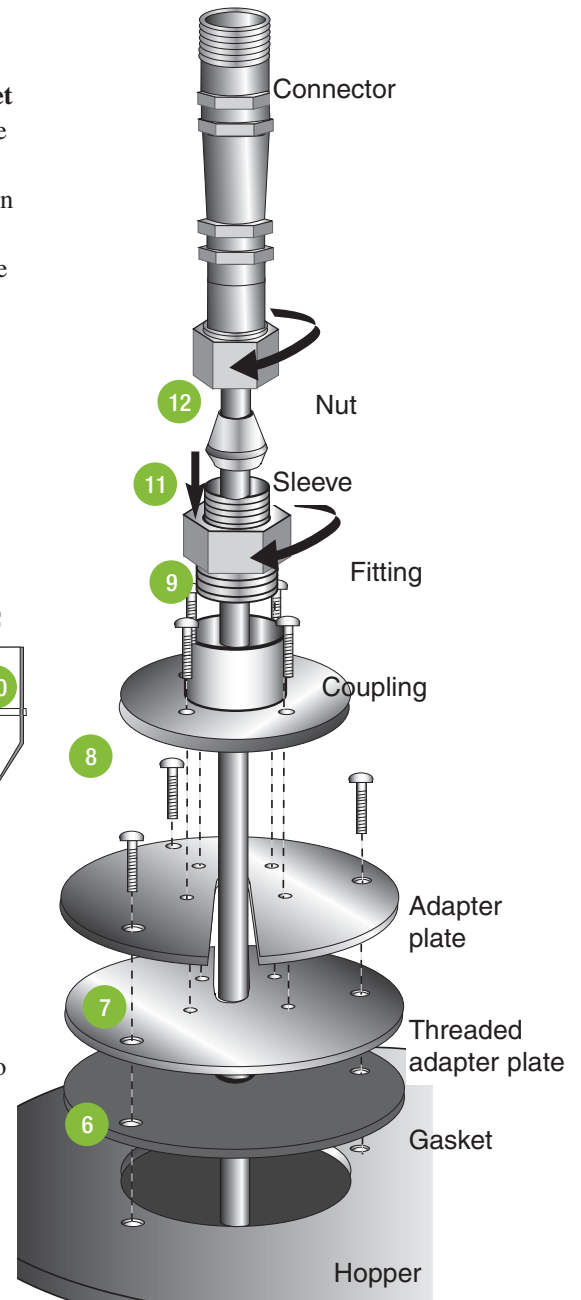
10 Make sure the probe is the correct size. The probe should extend from just above the top of the hopper into the hopper, with the tip approximately in-line with the bottom edge of the diffuser cone.



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. Be sure to position the connector in such a way as to avoid interference of the cable with the loader, etc. Use a wrench to tighten the nut so that it covers the threads.


13 Thoroughly clean the inside of the hopper to remove any debris left from installation of the probe.

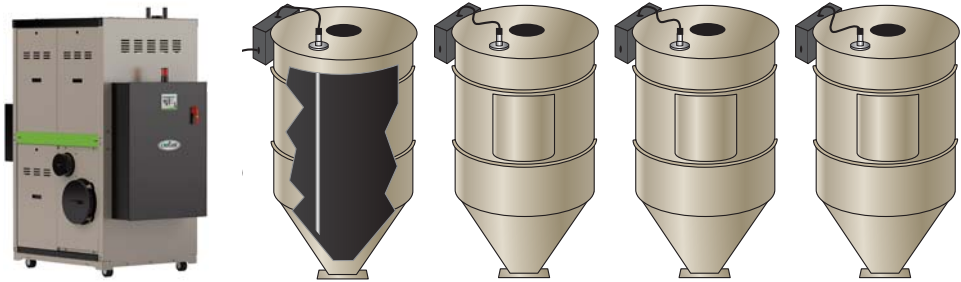



Preparing for Electrical Installation


- 1 Using the ModBus cables provided, connect the RTD box to the heat source being used (HTC, ResinWorks, Gastrac or standalone dryer) for each hopper.

Repeat this for each hopper and heat source of the ModBus. Avoid parallel runs with your factory's power cables, and material conveying lines.

 **NOTE:** RTD junction boxes connect via Modbus to the heater control and multiple heater controls are daisy chain wired Modbus connection back to the dryer control.

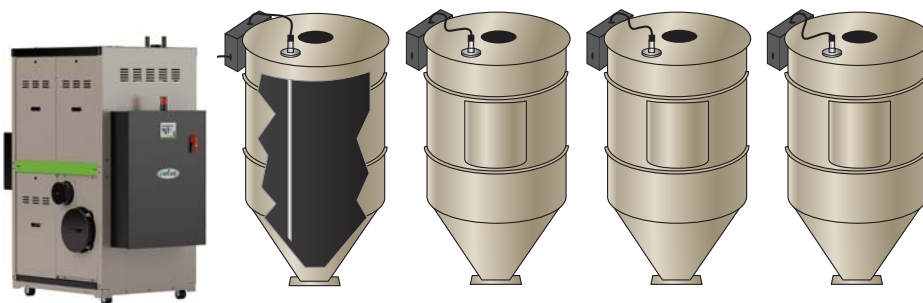


 **CAUTION:** Always disconnect and lock out the main power supply before making electrical connections. Electrical connections should be made only by qualified personnel.

 **IMPORTANT:** Always refer to the wiring diagrams that came with your dryer to locate specific electrical components. Illustrations in the User Guide are intended to be representative only.

Installing ModBus Cable Sets

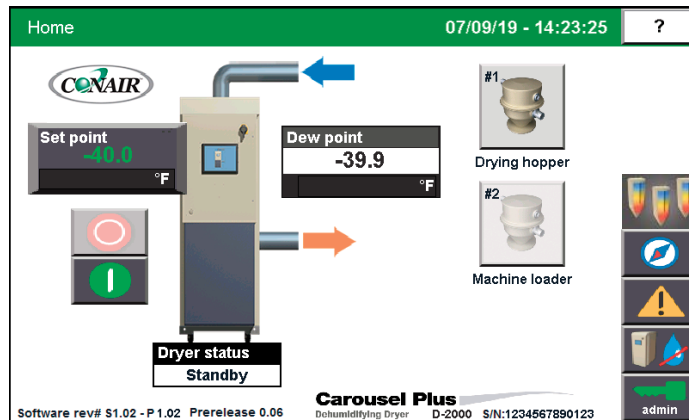
Cables are available in a wide variety of lengths and a cable assembly should be supplied with each probe/junction box set in the system. Plan your installation appropriately, determining which cable length has been selected for each hopper/junction box with consideration to neat cable routing. Cables should be routed away from heated surfaces, material conveying lines, or moving equipment and not run in parallel to three-phase power lines. Support each cable as needed to prevent strain on the connectors.



Carefully install each cable set from the remote heat source control to the hopper, firmly screwing the connectors into place on each panel.

Navigating the DC-C with Drying Monitor Enabled (ResinWorks Configuration)

The System Home screen on the dryer.



Navigation buttons for all DC-C functions are located on the right side of the screen and will appear in this location on all screens. The selection of buttons will change based on the specific screen. From the Overview page the buttons include:



A **Hopper Selector Button** for viewing of all hoppers included in the system (up to 15).



An **Alarm Log Button** for viewing of not only active alarms, but also alarms that have appeared in the past.



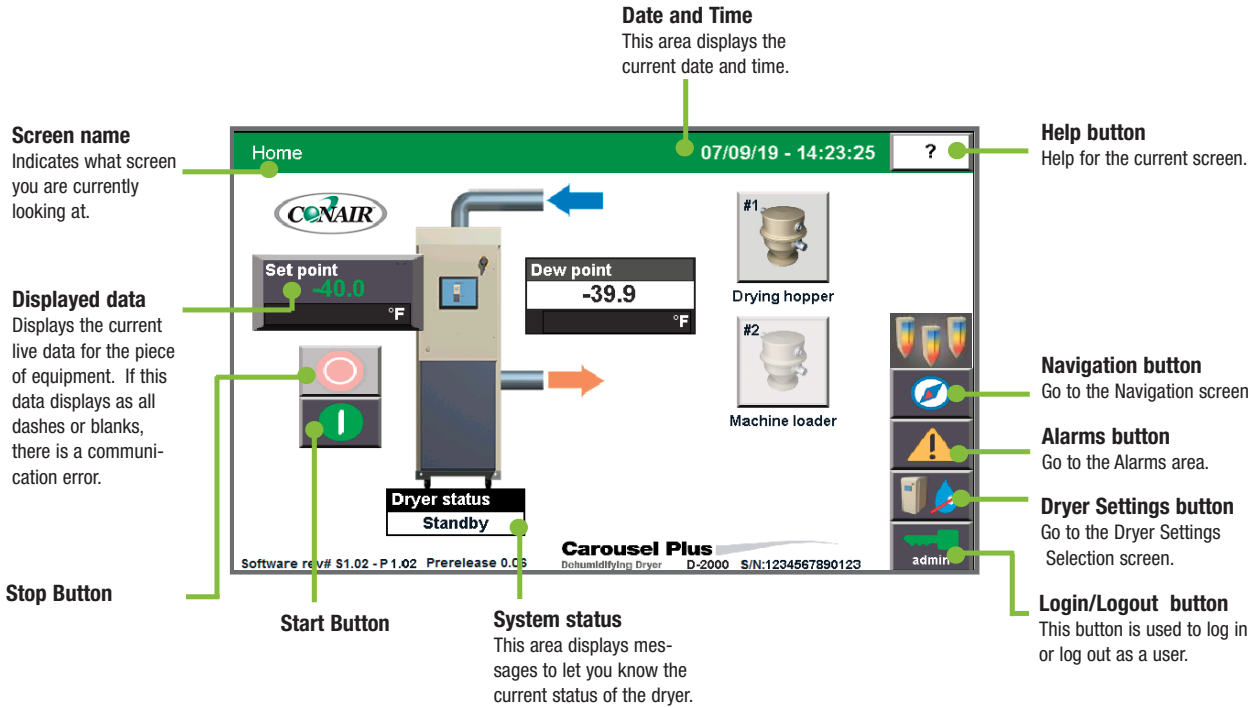
A **Trend Selection Button** for viewing hoppers to show trends for each hopper.



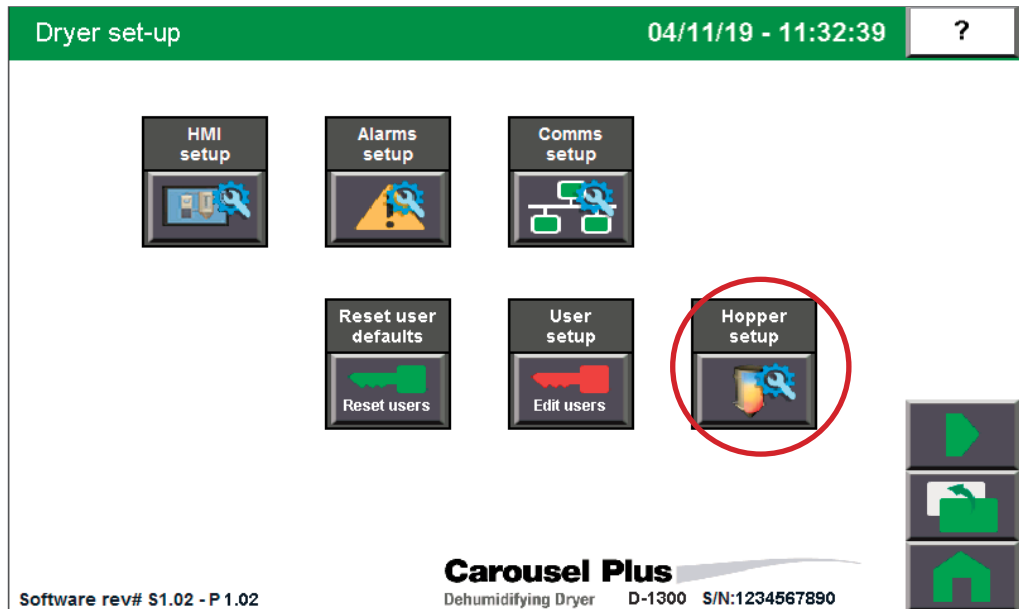
The Home Button

On pages other than the Home page, a “Home” button will appear in the lower right corner, allowing the user to return to the home screen at any time.

The Drying Monitor Screens of the DC-C (RW Configuration)



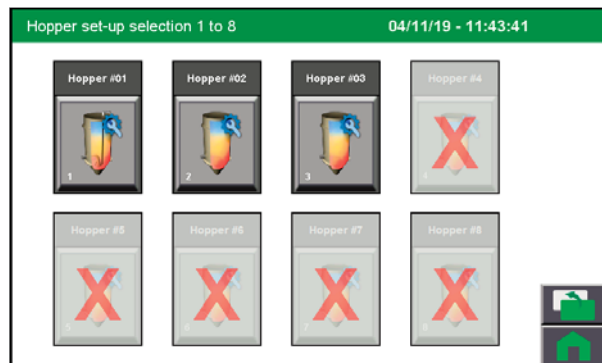
Configuring the DC-C for DM Operation



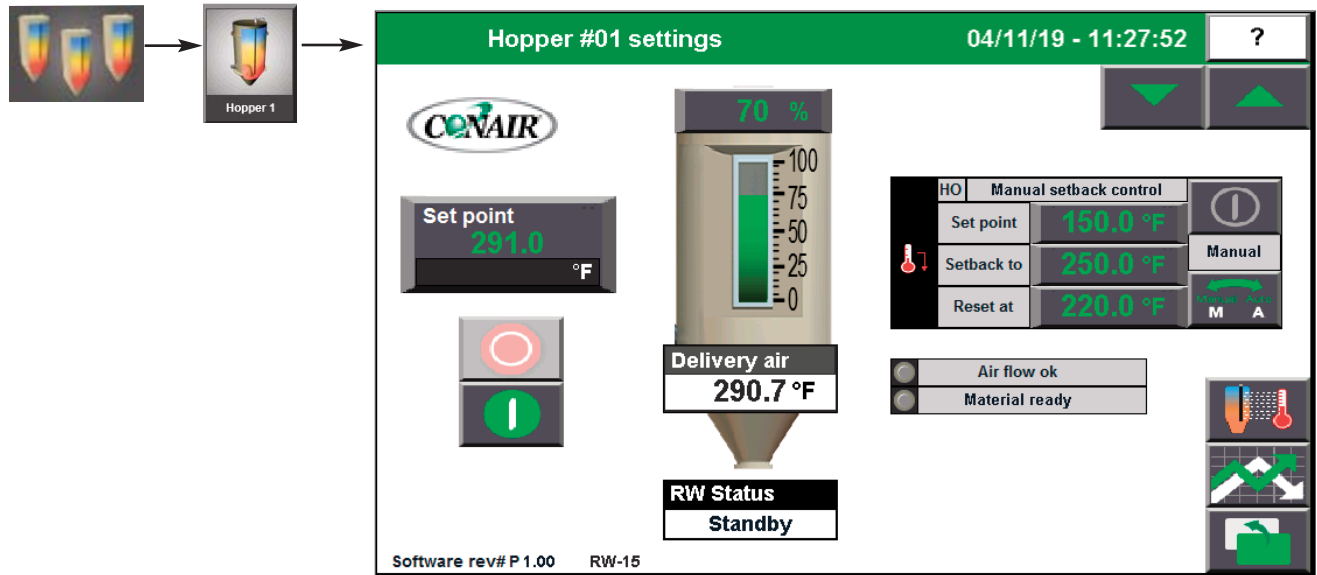
Before using the DM functionality of your DC-C dryer control, the DC-C must be set to communicate to your installed Drying Monitor hardware.

To set up the DC-C to use the DM:

- 1 Press the Dryer Setup button.** The System Settings screen will open.
- 2 Press the Hopper Setup button.** The Hopper Setup screen will open.




Navigating the DM Individual Hopper Screens



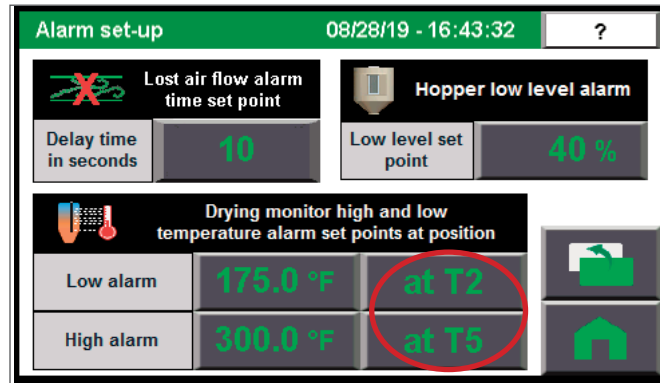
Detailed Hopper View

From the **Hopper Selection** screen, any hopper can be spotlighted by pressing its icon and a detailed view of that hopper will appear and its name will be shown in the green stripe.

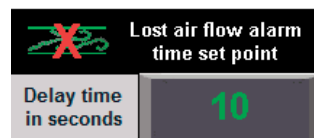
From the detailed hopper view, you will see all the information about that hopper.

 **NOTE:** Each hopper in your system will be displayed individually.

Navigating the DM Screens from the Hopper Temperature Control (GasTrac, ResinWorks, or HTC)

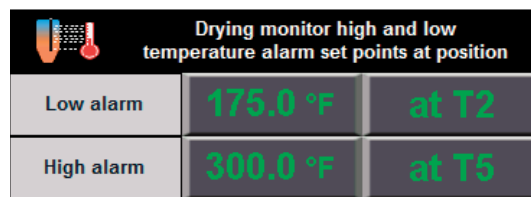


DM Settings



Alarm Time: Select to enter the amount of time in seconds that the system waits while running, before shutting down on a loss of air flow. Range 5-15 seconds.

NOTE: Only visible when drying monitor is installed.

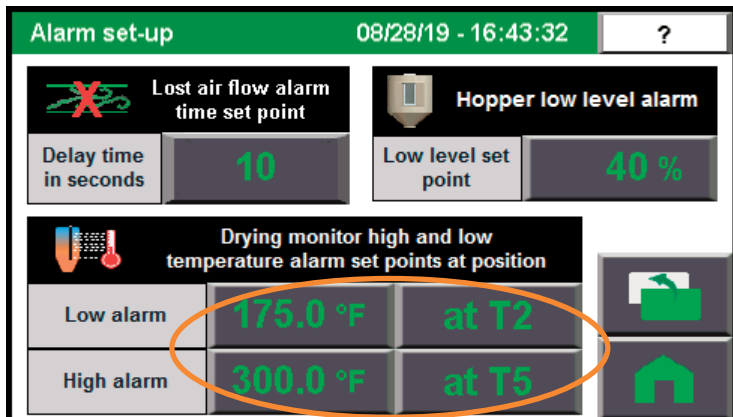


NOTE: The Alarm Location can be set to T2, T3, T4, or T5.

Alarm Setpoint and Location: Low and high temperature alarms can be set at the same or different points in the drying hopper. Selecting the “at T” pushbutton changes the location in the drying hopper each time it is released. The available positions are T2 lowest, through T5 the highest position in the hopper. The alarms are passive.

Setting Up Your DM: The Basics- Alarm Location (Simple)

The **Alarm Location** establishes the location in the drying hopper where the actual drying temperature is within a certain range of the process temperature. The user sets the point on the RTD probe to assure good drying with proper temperature delivery.



In drying, the material must be exposed to the process temperature for a set period of time (refer to your dryer manual for more information) to assure good drying. The DM’s multiple temperature sensors allow you to select the specific point where the material will see that process temperature for 4 hours, or the remainder of its travel through the hopper on its way to processing. The ‘drying zone’ is between sensor T1 (the bottom sensor, located at the hot air entry point of the hopper) and the selected “Alarm Location” sensor T4.

This critical position in the hopper, called the “Alarm Location” will monitor the temperature reading to assure that material will be within a certain range of the process temperature for the determined time, assuring good drying. Default value of the temperature range is within 10°F of the process temperature. This default value can be changed on the set-up screen in case tighter or looser tolerances are required by your application.

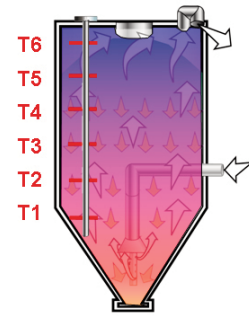
Setting Up Your DM: The Basics- Alarm Location (Advanced)

NOTE: You will need to know the bulk density of your material to calculate your drying hopper volume in cubic feet (ft³). See *Operation: Understanding Bulk Density*.

NOTE: Nuisance alarms may trigger if the selected RTD position is too close to the alarm set point. In this case, the operator would either simply select a lower RTD or adjust the alarm set point lower within the alarm band.

Why would an operator want to use the Advanced method for selecting an RTD to use as the **Alarm Location**? The advanced Alarm Location selection may be desirable for processes where the operator wants to pick an RTD at a specific material residence time level at a given throughput. To select an RTD as a monitoring position for the alarm setpoint (advanced) the operator will need to consider the following drying parameters:

- hopper capacity (ft³)
- throughput rate
- bulk density
- drying (residence) time



EXAMPLE calculation

- | | |
|---|------------------------------|
| 1. lbs per hour throughput | 100 |
| 2. drying time (residence time) | 4 hours |
| 3. material's bulk density (lbs/ft ³) | 35 lbs/ft³ |
| 4. drying hopper capacity (ft ³) | 15 lbs/ft³ |

A 15 ft³ hopper holds 525 lbs of material at 35 lbs/ft³ (35 ft³ x 15).

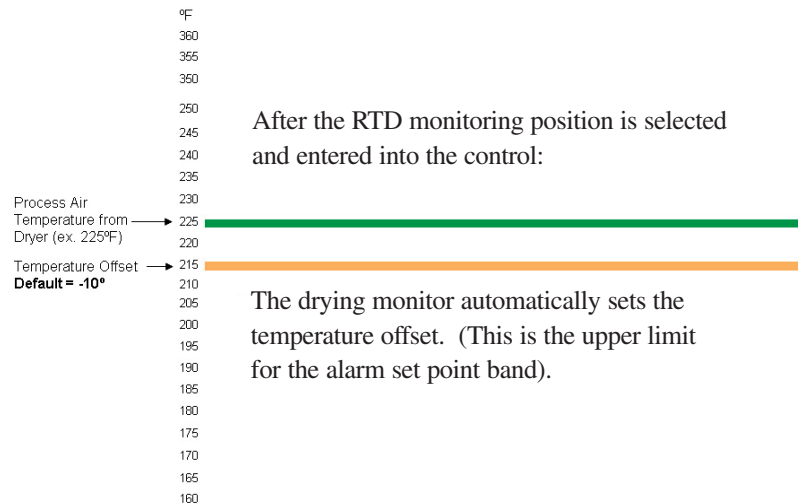
Use the chart in *Operation: Drying Hopper Volume by Model Number*.

- RTD T5 is likely at a 440 lb fill level (35 ft³ x 12.6).
- RTD T4 is at the 320 lbs level (35 ft³ x 9.15)

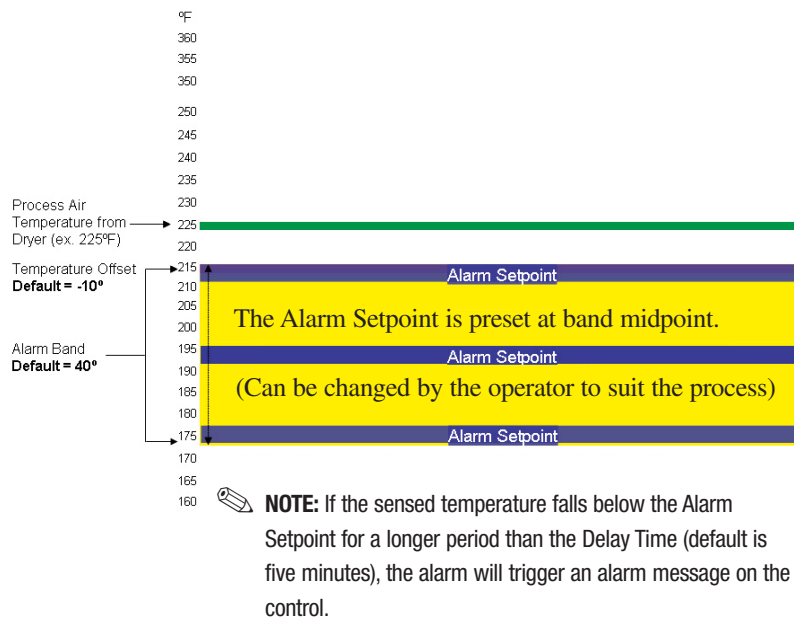
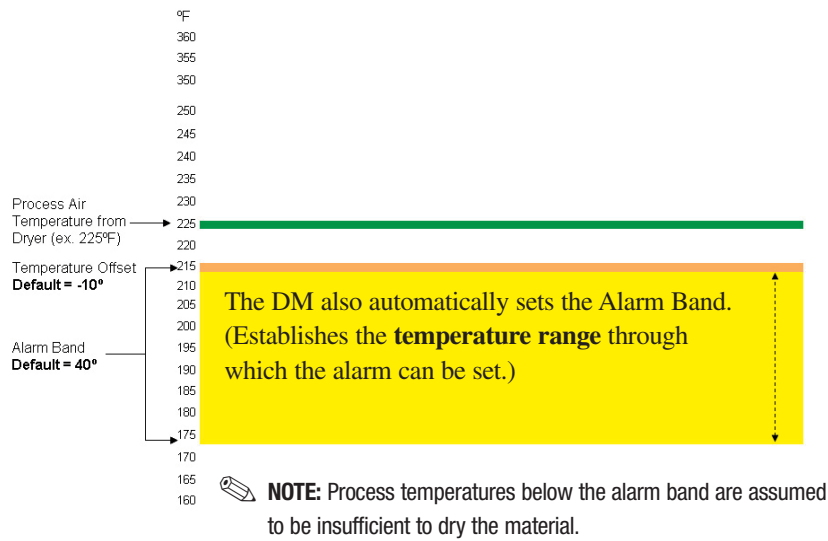
This position is at the 3/4 point of the material load.

RTD T5 is closest to the desired monitoring point of 400 lbs (100 lbs/hr x 4 hrs). Since T5 is closest to the desired monitoring point, select T5.

Check the temperature reading at T5 to confirm that the temperature is not at or below the alarm set point (default is 30 deg. below process). If necessary, adjust the alarm set point.



Setting Up Your DM: The Basics- Alarm Location (Advanced) (continued)



NOTE: From a cold start: If, after a preset time period, the temperature read at the selected alarm RTD does not reach the Alarm Setpoint, DM triggers "Temperature Not Met" alarm.

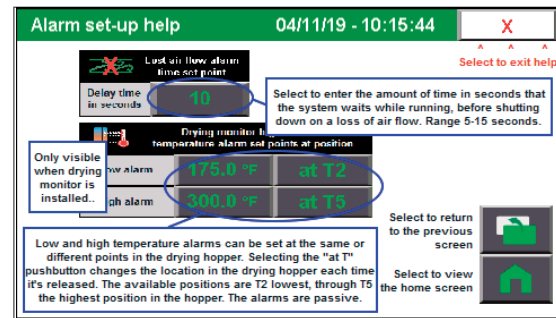
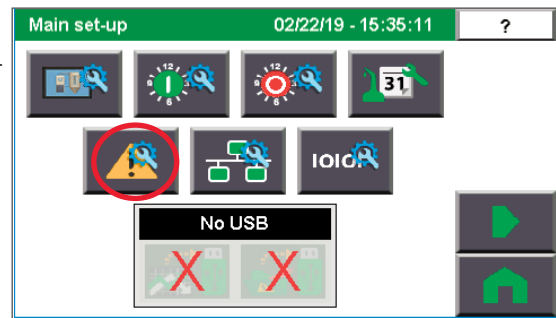
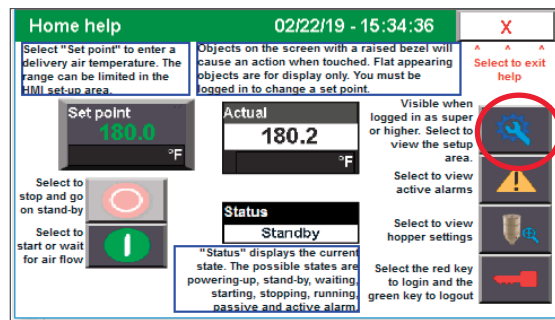
Setting Up Your DM: The Basics- Alarm Setpoint

Alarm Setpoint

The alarm setpoint is automatically established on the “Hopper Settings” screen but can be adjusted on the set-up screen. This value acts as a default level of temperature performance. If the temperature reported on the alarm location falls below this level for longer than an adjustable time range (default, 5 minutes), the DM will alarm that the material is not being properly dried. The alarm setpoint relationship with the process setpoint (referred to as “band”) as well as the time range before alarm notification can be adjusted on the Set up screen.

Remote Heat Source Procedure

- 1 Press setup button from the home screen** (logged in at appropriate level to see setup button),
- 2 Press Alarm setup button** (triangle with wrench) from setup screen .
- 3 Set settings for probe position temperatures** that you would like to activate the alarm notifications from Alarm setup screen,



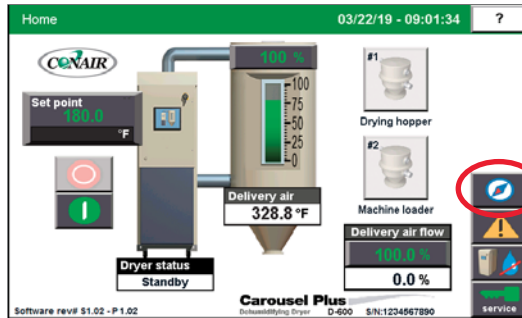
Once the process temperature and alarm location are established for the first hopper, the remaining hoppers in the system may be set up in an identical fashion.

Once hopper settings are made, only setting the Process Temp is required to align the DM functions with a particular drying application. But if necessary, further fine tuning of the process conditions can be made on the DM Set-up screen.

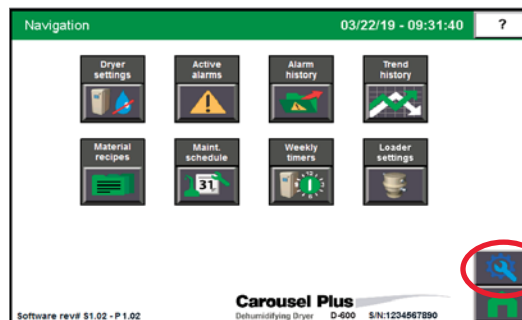
Setting Up Your DM: The Basics- Alarm Setpoint (continued)

From Stand Alone Dryer Screen Procedure

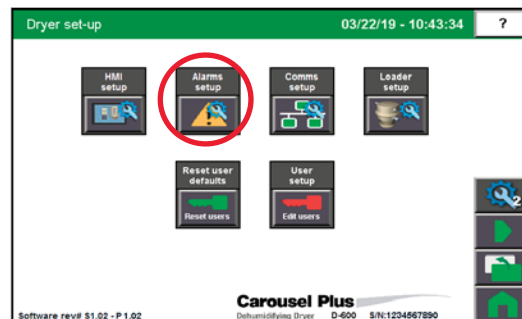
1 Press the Navigation button.



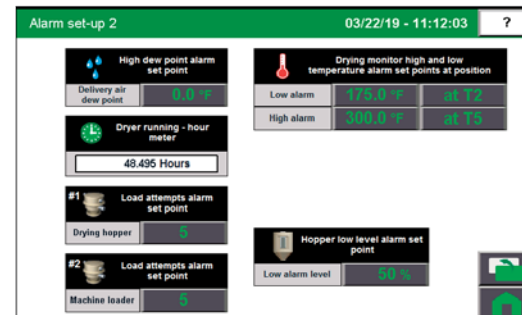
2 Press the setup button (wrench).



3 Press the alarm setup button.



4 Set Drying Monitor high and low set points and positons.



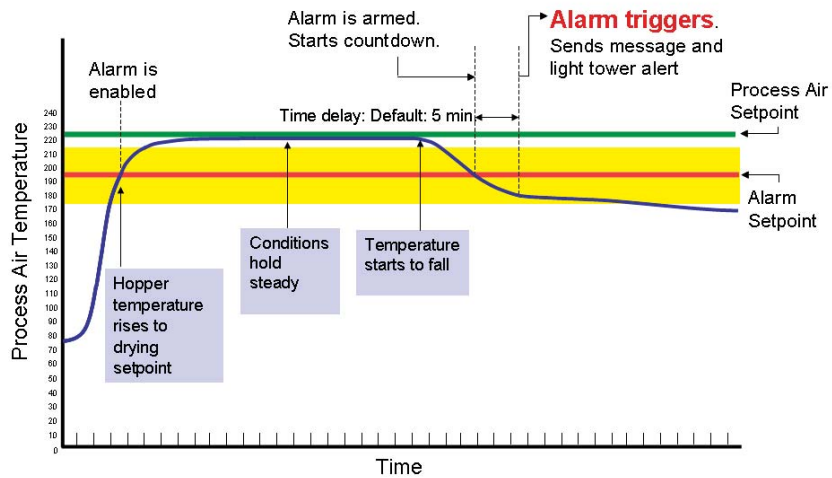
Drying Hopper Material Change

What happens when there is a drying hopper material change?

1 Change the process temperature. For example, let's say the process temperature is changed to 205°F from 225°F. If the DM is being used on a central drying with an HTC or Heater Pack, the process temperature on that hopper must be changed.

2 If material characteristics require a parameter adjustment, adjust that now. Otherwise, no further operator action is required.

This graph shows the time sequence of a DM alarm indicating low hopper air temperature, that could result in improperly dried material.



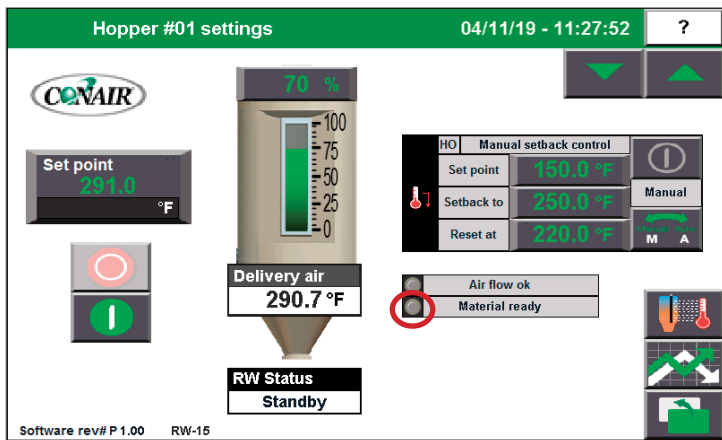
Material Ready Interlock Feature

The Drying Monitor option on your Carousel Plus dryer allows you to utilize Conair's Material Ready feature. This feature ensures that material is not conveyed to the machine until it has been dried at the proper temperature for the proper amount of time.

How does it work?

When T1, T2, or T3 locations of the Drying Monitor probe reach 95% of the setpoint for a user specified residence time, the interlock activates to allow material to convey to the molding machine or extruder. Until the material has dried for the proper amount of time at the proper temperature, the interlock will not allow material to be moved from the drying hopper. A material ready indicator is shown on the dryer control or the local hopper control (HTC, ResinWorks, or GasTrac control) indicating that material is ready.

If the temperature drops below 95% of setpoint, the residence timer stops until it returns to the setpoint range. It then continues counting up toward the desired residence time. For example - You have the residence time set at 4 hours. Your material reaches 95% of setpoint and dries for 2 hours within that range, but then drops to below 95% of setpoint for 10 minutes. After 10 minutes, your temperature returns to 95% of setpoint. The timer begins counting at 2 hours and continues until you reach the residence time of 4 hours. That 10 minutes did not count toward the residence time. But the time at temperature that was achieved was banked until the material reached the setpoint temperature again. (It did not restart the timer at 0 minutes - you got credit for time the material had already dried.)



This feature is designed to eliminate undried material making it to the molding machine, therefore eliminating the production of parts that are inferior due to moisture in the material.

Drying Hopper Volume by Model Number

Drying Hopper	Hopper Diameter	Volume (ft. ³)	RTD Position	RTD Distance from the top	Volume up to RTD position (ft. ³)
CH/RW 10-1	10	1	5	8.38	0.85
		1	4	12.88	0.65
		1	3	17.38	0.45
		1	2	21.88	0.28
		1	1	26.612	0.09
CH/RW 10-1.5	10	1.5	5	8.88	1.37
		1.5	4	16.13	1.04
		1.5	3	23.38	0.72
		1.5	2	30.63	0.46
		1.5	1	37.88	0.15
CH/RW 14-2	14	2	5	8.75221183	1.62
		2	4	13.75221183	1.18
		2	3	18.75221183	0.78
		2	2	23.75221183	0.35
		2	1	28.75221183	0.14
CH/RW 14-3	14	3	5	9.25	2.87
		3	4	17.25	2.17
		3	3	25.25	1.47
		3	2	33.25	0.80
		3	1	41.25	0.16
CH/RW 14-4	14	4	5	8.87	3.62
		4	4	19.12	2.72
		4	3	29.37	1.82
		4	2	39.62	0.95
		4	1	49.87	0.14
CH18-4	18	4	5	12.725	3.19
		4	4	18.225	2.38
		4	3	23.725	1.64
		4	2	29.225	0.84
		4	1	34.725	0.25
RW 18-5	18	5	5	10.41	4.36
		5	4	18.66	3.17
		5	3	26.91	1.97
		5	2	35.16	0.85
		5	1	43.41	0.25
CH/RW 18-6	18	6	5	10.12	5.87
		6	4	20.66	4.39
		6	3	30.91	2.92
		6	2	41.16	1.52
		6	1	51.41	0.25

(continued)

Drying Hopper Volume by Model Number

(continued)

Drying Hopper	Hopper Diameter	Volume (ft. ³)	RTD Position	RTD Distance from the top	Volume up to RTD position (ft. ³)
CH 24-8	24	8	5	13.23	7.38
		8	4	20.73	5.50
		8	3	28.23	3.56
		8	2	35.73	1.58
		8	1	43.23	0.39
RW 24-9	24	9	5	10.79	8.73
		9	4	19.54	6.48
		9	3	28.35	4.22
		9	2	37.04	2.09
		9	1	45.79	0.47
CH/RW 24-12	24	12	5	53.33	10.89
		12	4	42.58	8.14
		12	3	31.83	5.39
		12	2	21.08	2.72
		12	1	10.33	0.52
CH/RW 24-15	24	15	5	11.13	12.60
		15	4	24.63	9.14
		15	3	38.13	5.69
		15	2	51.63	2.32
		15	1	65.13	0.57
CH/RW 24-18	24	18	5	10.88	15.56
		18	4	27.38	11.35
		18	3	43.88	7.15
		18	2	60.38	2.94
		18	1	76.88	0.55
CH/RW 33-21	33	21	5	18.30	19.66
		21	4	29.80	13.96
		21	3	41.30	8.27
		21	2	52.80	2.95
		21	1	64.05	1.63
CH/RW 33-28	33	28	5	20.30	25.68
		28	4	34.80	18.52
		28	3	49.30	11.36
		28	2	63.80	4.19
		28	1	78.30	1.68
CH/RW 39-35	39	35	5	25.25	35.32
		35	4	38.75	25.98
		35	3	52.25	16.65
		35	2	65.75	7.83
		35	1	79.25	1.83

(continued)

Drying Hopper Volume by Model Number

(continued)

Drying Hopper	Hopper Diameter	Volume (ft. ³)	RTD Position	RTD Distance from the top	Volume up to RTD position (ft. ³)
CH/RW 39-42	39	42	5	25.25	42.38
		42	4	41.25	31.32
		42	3	57.25	20.26
		42	2	73.25	9.72
		42	1	89.25	1.90
CH/RW 44-58	44	58	5	27.00	59.24
		58	4	44.50	43.84
		58	3	62.00	28.45
		58	2	79.50	13.55
		58	1	97.00	2.73
CH 54-70	54	70	5	22.98	66.76
		70	4	33.48	52.85
		70	3	43.98	38.93
		70	2	54.48	25.01
		70	1	64.98	15.68
CH 54-85	54	85	5	23.98	80.12
		85	4	36.98	62.89
		85	3	49.98	45.67
		85	2	62.98	28.52
		85	1	75.98	15.17
CH 54-99	54	99	5	26.98	92.93
		99	4	42.73	73.05
		99	3	56.98	53.17
		99	2	71.98	33.40
		99	1	86.98	15.61
CH54-114	54	114	5	28.98	92.36
		114	4	47.23	69.17
		114	3	63.98	45.98
		114	2	81.48	22.78
		114	1	98.98	16.15
CH 54-129	54	129	5	29.98	116.87
		129	4	49.98	90.36
		129	3	69.98	63.85
		129	2	89.98	37.36
		129	1	109.98	16.15
CH 64-158	64	158	5	28.98	145.06
		158	4	46.98	111.55
		158	3	64.98	78.04
		158	2	82.98	44.98
		158	1	100.98	20.21

(continued)

Drying Hopper Volume by Model Number

(continued)

Drying Hopper	Hopper Diameter	Volume (ft. ³)	RTD Position	RTD Distance from the top	Volume up to RTD position (ft. ³)
CH 64-187	64	187	5	30.98	176.67
		187	4	52.23	137.11
		187	3	73.48	97.55
		187	2	94.73	58.15
		187	1	115.98	20.73
CH 64-215	64	215	5	33.98	198.55
		215	4	58.23	153.40
		215	3	82.48	108.25
		215	2	106.73	63.16
		215	1	130.98	20.73
CH 64-248	64	248	5	34.48	229.24
		248	4	62.48	177.12
		248	3	90.48	124.99
		248	2	118.48	72.86
		248	1	146.48	23.49
CH 74-245	74	245	5	30.98	180.95
		245	4	50.48	132.42
		245	3	69.98	40.15
		245	2	89.48	22.59
		245	1	108.98	5.62
CH 74-366	74	366	5	38.98	304.39
		366	4	68.48	230.97
		366	3	97.98	157.55
		366	2	127.48	29.68
		366	1	156.98	5.90
CH 74-487	74	487	5	47.98	369.86
		487	4	86.98	272.79
		487	3	125.98	175.72
		487	2	164.98	42.10
		487	1	203.98	6.78

Understanding Bulk Density

Bulk density is the weight of material in pellet form, where the material has a lot of free space between pellets. It is not a specification that material suppliers typically provide. You may need to calculate the bulk density. It is important not to confuse bulk density with material density, which is the weight of the plastic in solid form without any air gaps between pellets.

How to calculate the bulk density-

- 1 You will need a container or bucket that you know the volume of to calculate the bulk density of your material.**
- 2 Weigh the empty container and record the weight.**
- 3 Fill the container with your material, level it off at the top with a straight edge.**
- 4 Weigh the container with material in it.** Record this weight.
- 5 Subtract the weight of the empty container from the weight of the container with the material present.** The result will be the weight of the material for the volume of the container.
- 6 Convert the number you calculated in step 4, to lbs. per cubic foot. (lbs/ft³)**
For example, if your container had a volume of 0.5 ft³ and the material weight was 20 lbs., divide 20 lbs by 0.5 ft³. The result: The bulk density of the material is 40 lbs/ft³.

Interpreting Drying Monitor Trend Curves

IMPORTANT: The descriptions and curve examples shown in this user guide are for general reference only and may not relate to the characteristics of your specific drying process. These guidelines are intended to make the user aware of common temperature patterns of common drying applications to allow correct identification of proper or improper drying through observation of the temperature patterns within the drying hopper as displayed by the DM.

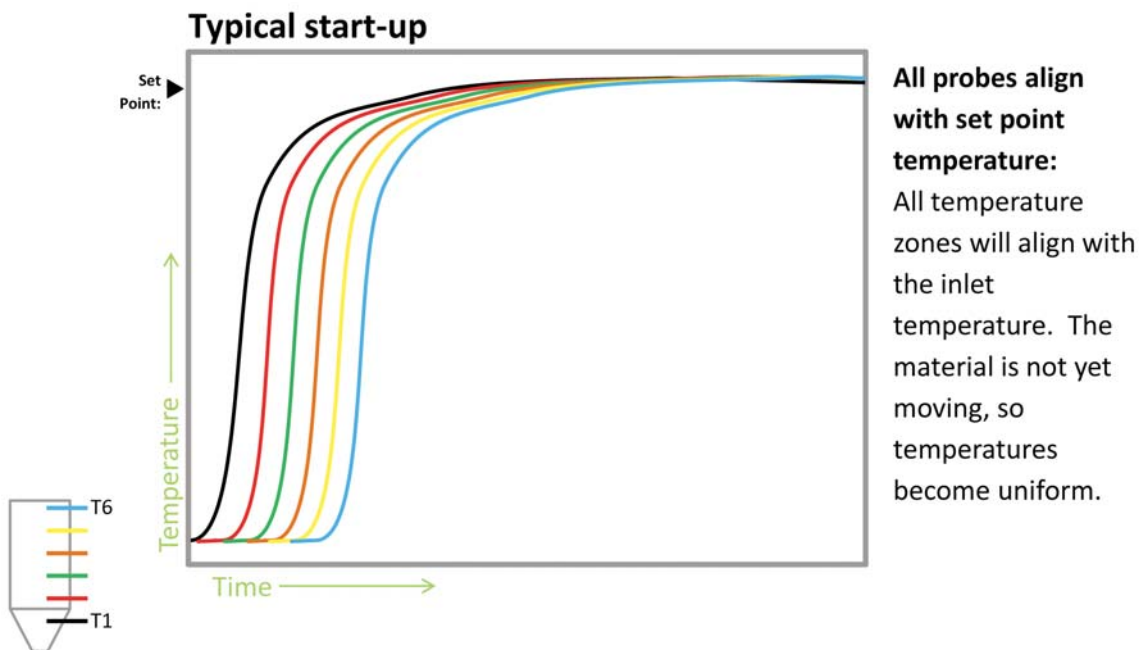
Any of these variables can effect how your drying system's particular trending curves and data will be displayed:

- hopper size and length/diameter relationship
- drying system and heat/air delivery capability
- bulk density of material being dried
- drying temperature
- condition of the drying equipment's heaters, filters and blowers and heat/air delivery system
- proper installation, condition and connection of the DM hopper probe
- type and regularity of the automated loading system being employed
- level of the material in the hopper
- temperature of incoming, new material
- specific location of probe sensors, once installed

NOTE: Conair recommends that users familiarize themselves with these guidelines to develop an understanding of typical drying parameters and then apply those principles to monitor their own particular drying system.

Interpreting DM Trend Curves- Typical Startup

Upon start-up with a full hopper of material, temperatures read by all DM probes will rise towards the drying set point temperature, starting with T1. If processing does not start (no material taken away from the hopper) eventually all the probes (with the possible exception of T6 if it is above the material level) will come very close to the process temperature.



Interpreting Drying Monitor Trend Curves- Normal Operation

NOTE: If the alarm location sensor never reaches the drying temperature setpoint, there is a problem with the drying system and it should be examined for proper operation. Refer to the user guide for your dryer.

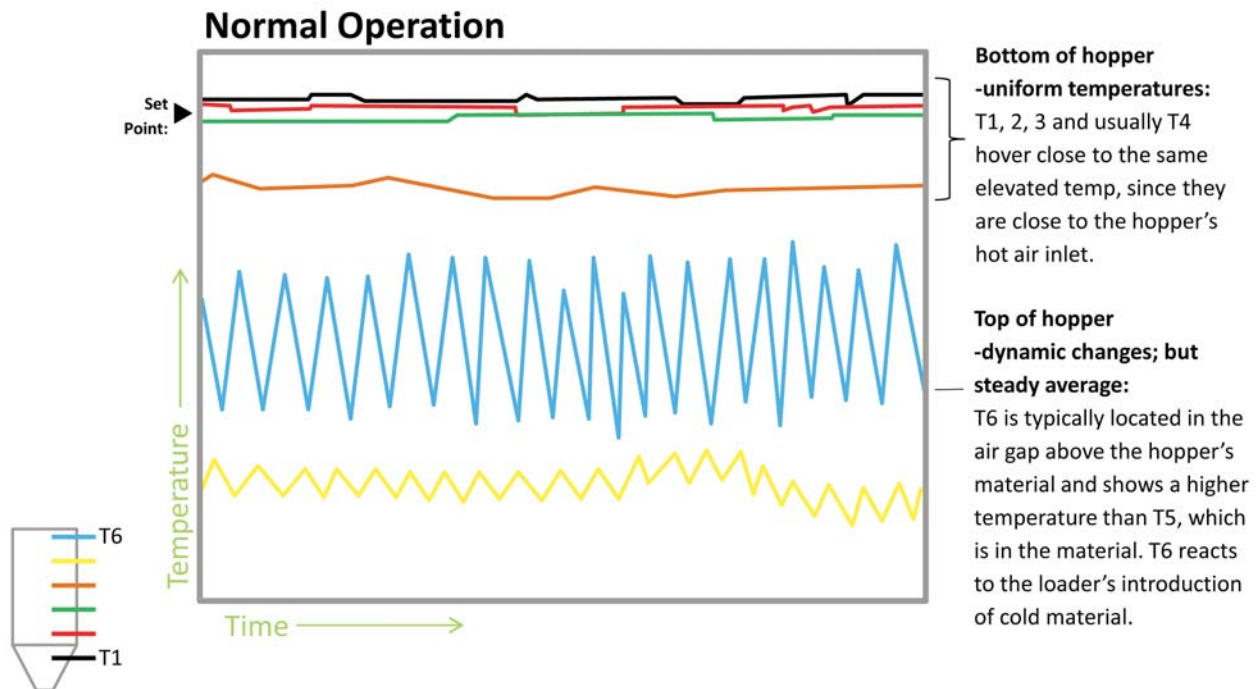
NOTE: If equipped with material ready introduce drying temp must be at 95°F at setpoint for use selected residence time.

The DM can be used to determine when successful drying is underway and processing of material can begin, using the following guidelines:

- See *Operation: Setting Up Your DM: The Basics-Alarm Location* for establishing the “alarm location” sensor for your drying system (this is typically T3 or T4).
- The alarm location sensor can be used to determine when the hopper’s material has been sufficiently exposed to proper drying temperature for the proper length of time (residence time) and processing of the material in the hopper can begin.
- Processing can begin when the alarm location sensor (typically T3 or T4) has stabilized at the drying temperature setpoint for approximately 50% of the required residence time.

Example: If the material drying temperature is 250°F and the required residence time is 4 hours, once the alarm location sensor has displayed 250°F for 2 hours (50% of 4 hours), processing can begin.

In normal operation, T1 will read closest to the process air temperature.



(continued)

Interpreting Drying Monitor Trend Curves- Normal Operation (continued)

In normal operation with material flowing through to the process, readings from T1, T2 and T3 will typically be very close to the process air temperature. T4 and T5 (and T6 if it is located in material) will display temperatures descending in value from the process temperature.

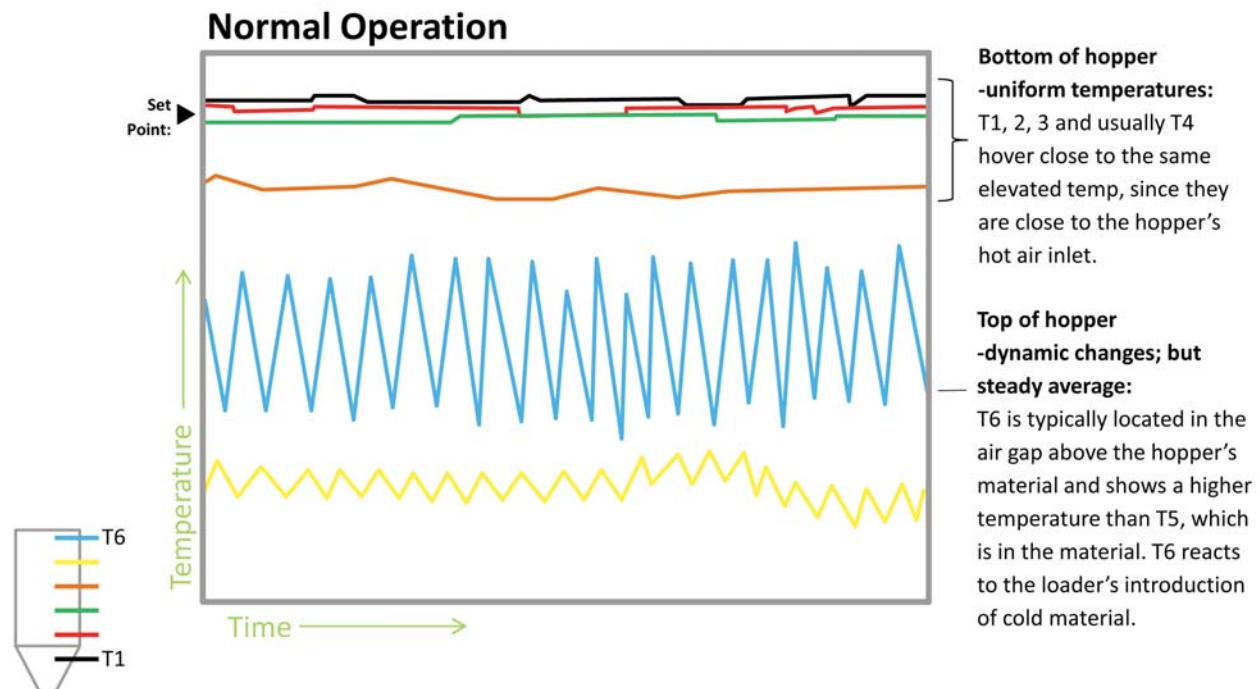
In normal operation with material flowing through to the process, if T6 is located in the air space at the top of the hopper (where there is no material), it will display a higher temperature than T5, which is typically located within the material. This is because a sensor in the open air is not in contact with heat-consuming resin. This is especially true at higher (275+°F) drying temperatures.

The hopper design, and how the material comes to rest in the hopper (the “angle of repose”) and the loading system being used typically dictate the size of the “no-material” area at the top of the hopper depending upon:

- where the demand switch for loading more material is located
- how far into the hopper the discharge of the loader/receiver extends

The DM can show a reaction to successful automated material loading as a drop in the T5 temperature (from the loading of new, cold material), alternating with a rise of T5 (as the new material absorbs drying heat). This reaction can be seen as a saw-tooth up/down temperature pattern.

NOTE: Hoppers being used at less than full capacity (hoppers using demand sensors on their viewing windows for loading, small drying jobs, hoppers that are larger than necessary for the drying task, etc) are likely to have more than one sensor exposed to air and not material, and this should be taken into consideration when analyzing DM data. This consideration is also important when selecting the “alarm location” sensor. *(See Operation: Setting Up Your DM: The Basics-Alarm Location.)*



Interpreting Drying Monitor Trend Curves- Material Flow problems

If material flow through the drying hopper is slowed down (a decrease in material throughput), the difference in temperature readings between T1 and T5 will steadily decrease. T4 and T5 will gradually align towards the T1 temperature since the slower moving material will absorb more of the drying heat.

If material flow is stopped (no material is leaving the hopper) and prior to any energy saving functions in the dryer being engaged, the temperature readings from T4, T5 and T6 will begin to increase and align with the process temperature. The stopped material now has time to more fully absorb drying heat.


If material flow increases (an increase in throughput), the difference in temperature readings between T1 through T5 will steadily increase. The faster moving material now spends less time being heated so the difference in temperatures read at the bottom of the hopper compared to the top, will display a greater spread.

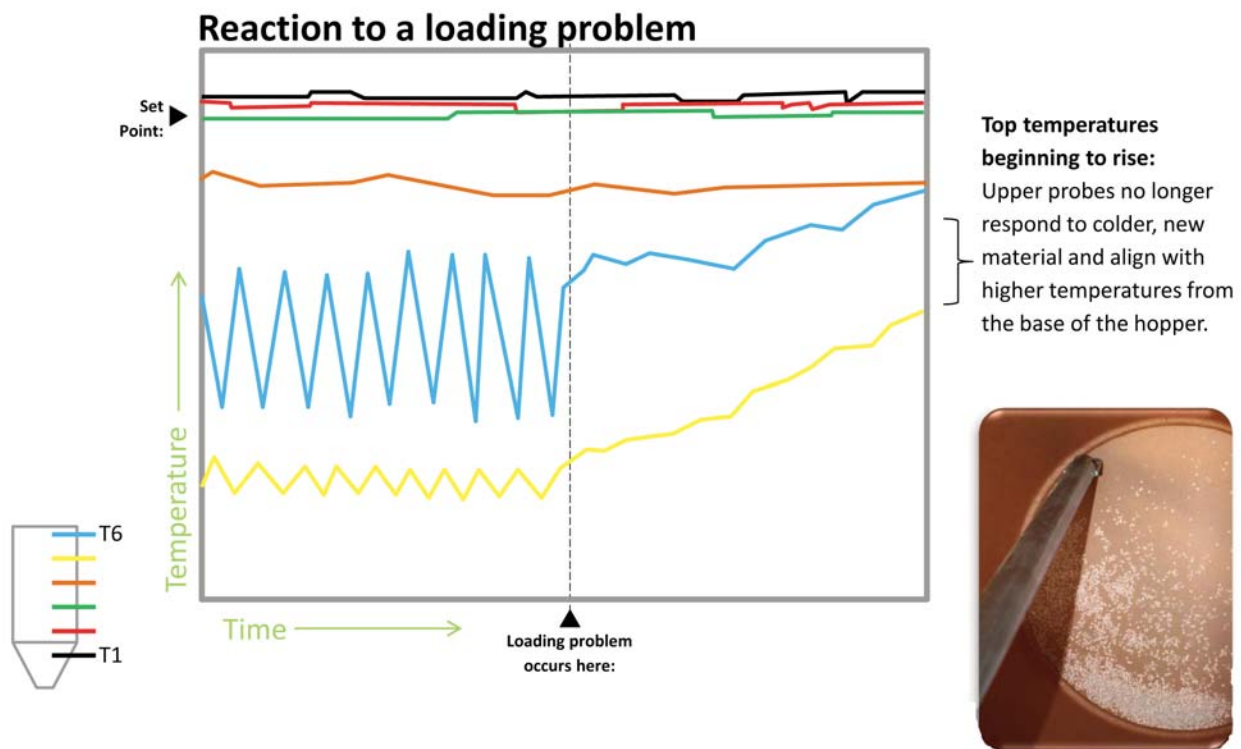


NOTE: An increase in the difference between T1 through T5 (as described above) can also be the result of an increase in the quantity of reground material being dried in the hopper. Increasing the quantity of regrind decreases the bulk density of the material being dried and increases the flow of material.

Interpreting Drying Monitor Trend Curves- Loading problems

If the loading function stops (no new material being supplied to the hopper) while normal operation is underway, T5 and T6 will increase in temperature as the heat-consuming material level in the hopper decreases. T4 will eventually follow, especially if it also becomes exposed to air and not material.


 **NOTE:** Successful drying is in jeopardy if the material supply to the hopper is interrupted. Even if the problem is corrected and the hopper is refilled, the incoming material will not be exposed to the proper length of residence time for successful drying.

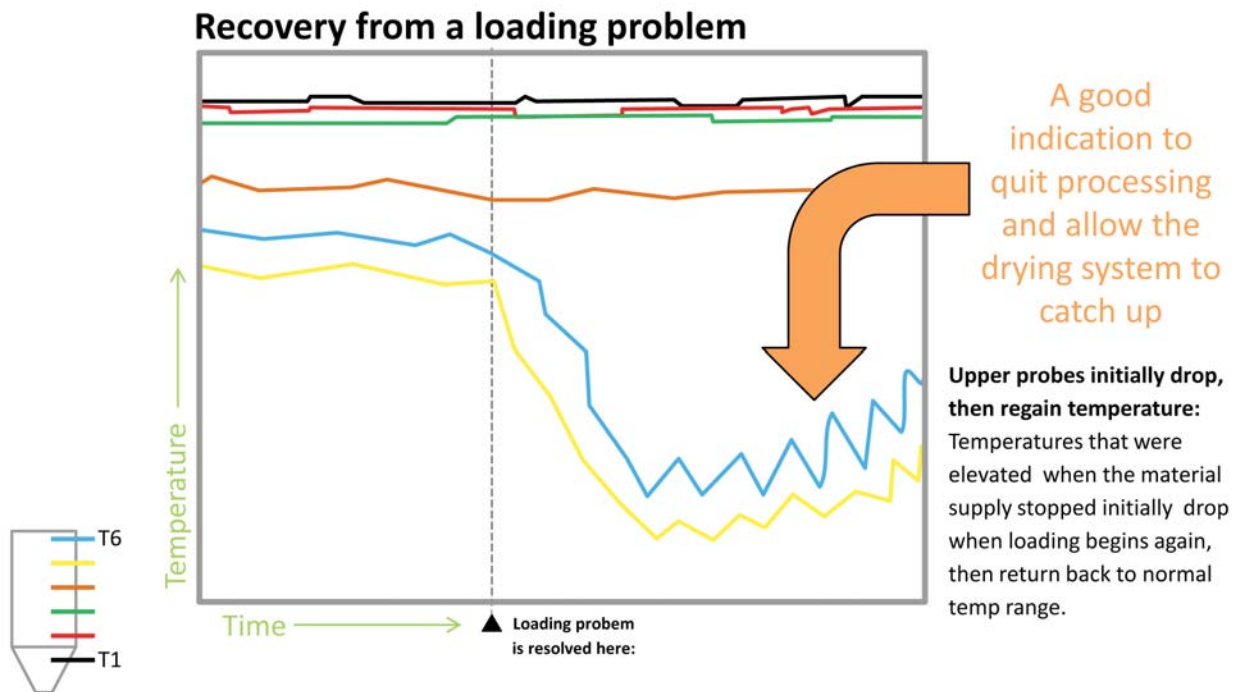


(continued)

Interpreting Drying Monitor Trend Curves- Loading problems (continued)

When automatic loading is restored, (new material is once again supplied to the hopper), T3 through T5 will initially drop in temperature from exposure to the new, colder material coming into the hopper, and then begin to rise and realign into a normal temperature profile for the hopper.

 **NOTE:** The drop in temperature displayed by T3 through T5 is a reaction to a quantity of cold material being introduced into the hopper following a lapse of automatic loading. This drop can be compared to a 'cold front' of material moving down through the hopper that has not been exposed to drying in the hopper for a long enough residence time. Temporary halting of the process should be considered to allow the drying system to catch up and deliver proper residence time to this new material, to prevent production of insufficiently dried product. If the process is not stopped, this 'cold front' will eventually be seen to a lesser degree, on T2, then T1.




Interpreting Drying Monitor Trend Curves- Problems with Heat Supply

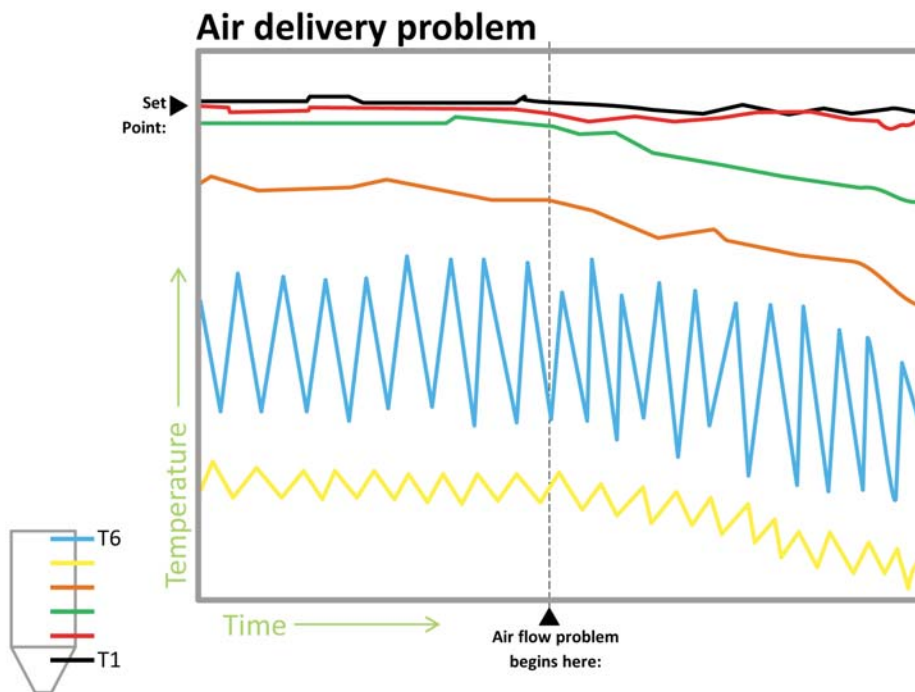
Problems with the heat supply (reduced temperature) to the drying hopper initially show up as a reduction in T1 and T2 temperature readings. Frequently, this reduction does not display immediately due to the residual heat of the material. The remaining probes will also sequentially decrease in temperature as the problem continues.



Interpreting Drying Monitor Trend Curves- Air Supply Problems

Problems with the air supply to the drying hopper (I.E: clogged filters or blocked drying air supply line) initially show up as a reduction in the T5, T4, and eventually T3 temperature readings since the air flow is no longer strong enough to carry the drying heat up through the hopper. The remaining probes will also decrease in temperature as the problem continues, even though T1 and T2 continue to display levels close to the process temperature. This can be a very gradual reaction to filters gradually becoming clogged.

 **NOTE:** A decrease of T3 (as described above) can also be the result of an increase in throughput or an increase in the quantity of reground material being dried in the hopper. Increasing the quantity of reground decreases the bulk density of the material being dried.

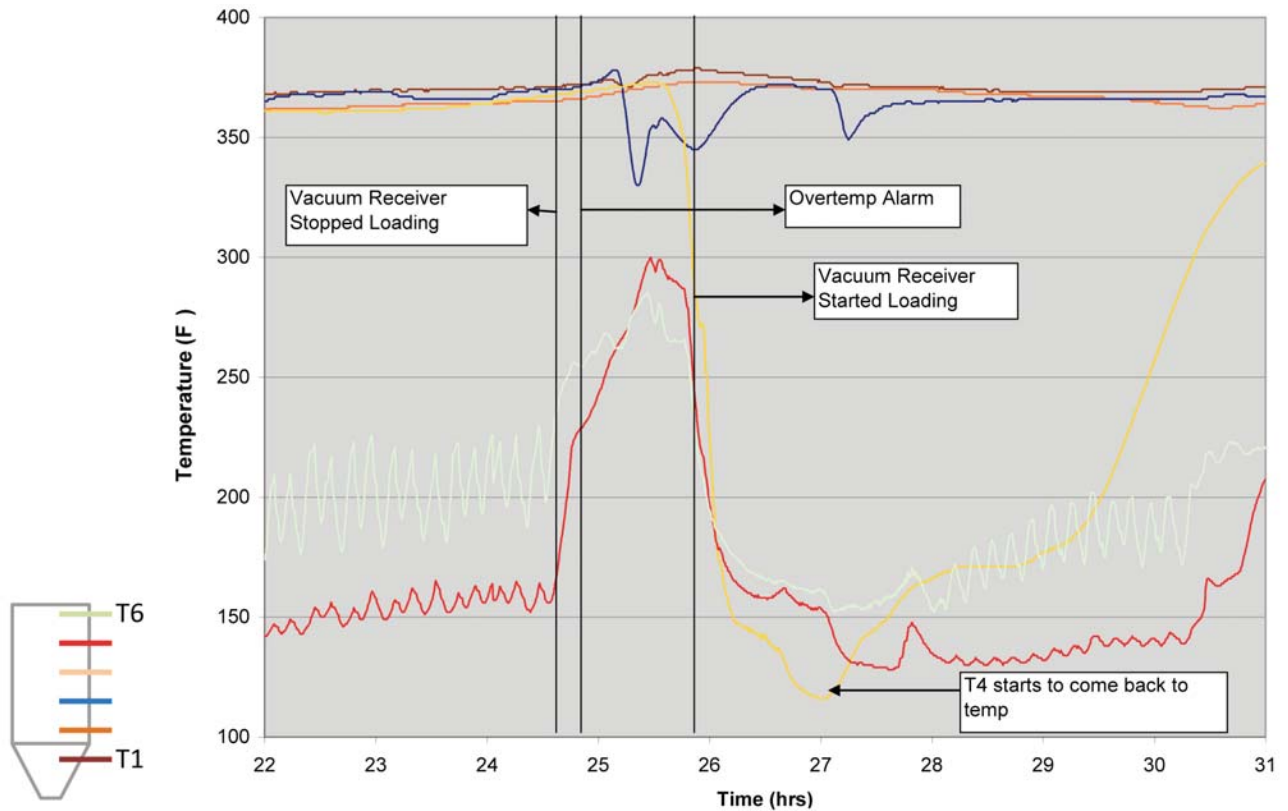


Mid temperatures react to reduced air flow.

T4 and T5 begin to drop since air flow is not strong enough to drive heat to them. T3 will eventually follow. But T1 and T2 often stay strong since they are still receiving the proper heat, in spite of reduced air flow.

Interpreting Drying Monitor Trend Curves- Actual DM Trend Analysis

Below is an actual trend analysis used by a PET bottle processor to find the cause of overnight process variations.



Preventative maintenance schedule

No specific maintenance schedule is required for the Drying Monitor since there are no moving parts. All components of the system are electrical in nature, but like any component in a factory, can be prone to unforeseen breakage.

In the event of breakage, replace the component(s). Do not attempt repair.

- **When material is changed.** Since a key component of the DM is the temperature probe(s) and they are exposed to your material and elevated temperatures, they should be checked whenever their host drying hopper is drained, cleaned, etc. No specific preventative maintenance is required beyond wiping down and examining for damage whenever the hopper is empty, cool and available for inspection. In the event of visible damage or non-operation, replace the probe. Do not attempt repair.

In addition, the coupling assembly that holds the probe in place should be closely examined from the top of the hopper and inside the hopper to be sure it is intact and has not been damaged or become loose as a result of use in the hopper.

- **Monthly, or as often as needed**

- Check that the cables and junction boxes associated with the DM.**
Make sure all cables are intact, undamaged, out of harm's way, etc.
- Correct the mounting integrity of junction boxes as required and re-route the ModBus cables to avoid high amperage electrical lines and/or moving, hot or sharp objects.**

What the Drying Monitor Can Tell You

The DM monitors the temperature profile of the material in the hopper using six Resistance Temperature Device (RTD) sensors. These RTD sensors are located at evenly spaced positions in the drying hopper. Monitoring the six sensors creates an accurate profile of the hopper's temperature gradient. This simple gradient measuring system informs the user that major characteristics of good drying are present (or not).

Heat: Each probe precisely measures the heat being created by the dryers heating system and more importantly, the changes that heat goes through as it is combined with the flow of material through the hopper. Heated air is going up in the hopper and is constantly facing a refreshed supply of material while that material is flowing down and into the process, which creates a predictable heat profile for good drying inside the hopper. The DM keeps precise track of that profile and alerts you if something is not as it should be for good drying.

Air flow: Air is the medium that carries heat to the drying hopper and carries moisture away from the material. By keeping track of different heat zones in the drying hopper, the DM is also passively keeping track of the air flow through the hopper.

Time: The DM interprets the temperature findings from the drying hopper and knows how long material needs to be kept at the correct temperature for good drying. Once again, by measuring each of the six zones the DM can tell you if you are getting good drying performance or if something is not correct for success.

Understanding Alarms

The DM monitors each hopper and will give you an alarm if the temperature falls below your established alarm setpoint. See *Operation: Setting Up Your DM: The Basics- Alarm Setpoint* for more information about setting the alarm setpoint.

The DM uses the DC-C's alarm system to alert the user to an alarm condition. Refer to the User Guide that came with your dryer for more information on understanding alarms.

The information in the alarm notification box on your DC-C screen tells you which hopper has triggered the alarm, and at what time the alarm delay was met. For example, after being at temperature, Hopper 1 fell below the alarm setpoint for a period of time longer than the alarm delay. The DM triggered an alarm so that you can determine the problem and avoid downtime due to material not being properly dried.

Drying Monitor Problems

Symptom

Hopper data does not display

Hopper alarm message appears on touch screen.

Possible cause

Connection to RTD(s) in hopper(s) is incorrect or disconnected.

The last hopper in the ModBus string is not terminated.

Loose or damaged connectors in the ModBus cables.

Damaged connectors on the hopper probe.

Defective temp sensor(s) within the probe.

A low temperature condition has been sensed by the drying monitor in the hopper listed in the alarm message

Solution

- Check integrity of cable connections from drying monitor panel to RTD junction boxes to RTD.
- See section **Terminating the final RTD Junction Box** for properly terminating the last hopper
- Check all connections and replace cable set(s) that are damaged
- Replace the hopper probe.
- Replace the hopper probe.
- Press trend button on Drying Monitor, and select the alarm hopper to view the specific time the temperature dropped, to pinpoint possible problem.
- Review settings in the hopper setup screen to assure the drying monitor settings are correct for the current drying task.
- Check drying system for insufficient air flow caused by blower malfunction or damaged or plugged air connection to hopper from dryer.
- Check if drying system material throughput has elevated due to process change or sharing of material with another process, beyond the capabilities of the drying system.

