

Thoreson-McCosh Inc

PROTEK DRYER CONTROLS

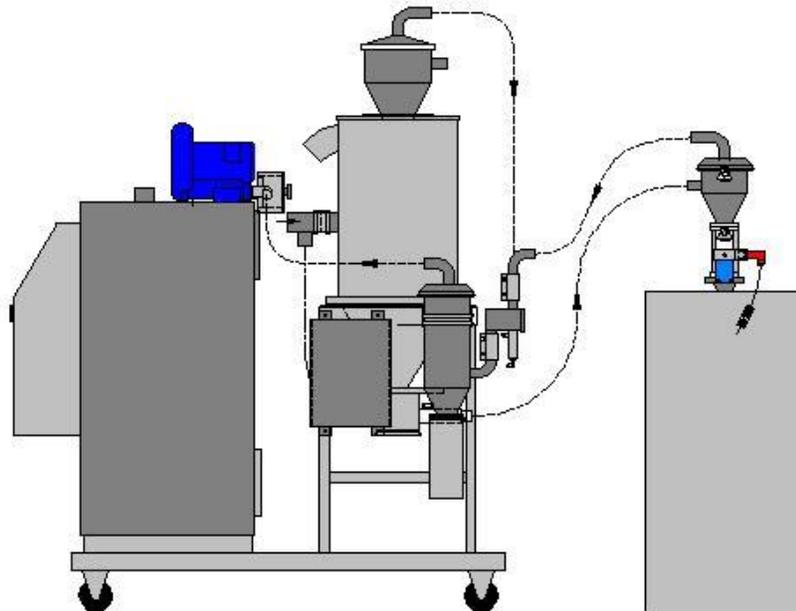
PROTEK CONTROLS

MAIN	ON MODE	CHART
PROCESS	ALARM	REGEN
PROCESS TEMP 200	DEWPOINT -40	REGEN TEMP 550
PROCESS SETPT 200		REGEN EXH 225
RETURN AIR 138		
CYCLE TIME REMAINING 120:00		REGEN TIME REMAINING 70:00

1885 Thunderbird Street
Troy, Michigan 48084

**THORESON
McCOSH** INC

248.362.0960
www.thoresonmccosh.com



INSTRUCTION MANUAL IB201501

Thoreson-McCosh Inc.
1885 Thunderbird Street, Troy, Mi. 48084
Phone 248.362.0960 FAX 248.362.5270
www.thoresonmccosh.com
sales@thoresonmccosh.com

Thoreson-McCosh Inc

FORWARD

Installation, Operation and Maintenance manual for your
Thoreson-McCosh Inc. equipment.

Please complete the information below. When calling the Thoreson-McCosh Inc. Service department, this information will be needed.

Model Name _____

Serial Number _____

Wiring Diagram _____

Insert _____

Program _____

Layout _____

Additional information can be found at:

Thoreson-McCosh Inc.

1885 Thunderbird Street

Troy, MI. 48084

Phone: 248.362.0960

FAX: 248.362.5270

www.thoresonmccosh.com
sales@thoresonmccosh.com

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MSDS: Information is available upon request. Contact Thoreson-McCosh Inc. or download the information from our website. www.thoresonmccosh.com

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**** SECTION 1 ****

THORESON-MCCOSH INC. PRODUCT WARRANTY

Thoreson-McCosh warrants each product of its manufacture to be free from defects in material and workmanship for a period of 30 months (2-1\2) year from the date of delivery to the original purchaser. Thoreson-McCosh's obligation under this warranty is limited to repairing or replacing any part returned to the Thoreson-McCosh factory with transportation charges prepaid, and which, on examination by Thoreson-McCosh, shall disclose to Thoreson-McCosh's satisfaction to have been defective.

The purchaser must notify Thoreson-McCosh of such defects and promptly deliver the defective part(s) in accordance with Thoreson-McCosh's shipping instructions, delivery prepaid. Parts will be replaced F.O.B. Thoreson-McCosh factory, by Thoreson-McCosh, and will be invoiced to the purchaser with "credit on return of defective part", if the part is returned within fifteen (15) days after shipment of replacement part. Thoreson-McCosh is not liable for installation or cost to install the replacement part or removal of the defective part.

Thoreson-McCosh is not responsible for any failure of its product due to improper use, installation, or operation. Thoreson-McCosh shall not assume any expense or liability for repairs made to any Thoreson-McCosh unit or equipment outside Thoreson-McCosh's own factory unless specifically agreed to in writing by Thoreson-McCosh.

Equipment and accessories furnished by us, but manufactured by others, are guaranteed to the extent of the original manufacturer's guarantee to Thoreson-McCosh, if that guarantee exceeds one (1) year.

It is expressly understood that Thoreson-McCosh is not responsible for damage and/or injury caused to buildings, contents, products, or persons by reason of installation or use of any of our products. Thoreson-McCosh shall not be liable for loss, damage or expenses arising directly or indirectly from, or being consequential or incidental to, the use of its products or from any other cause.

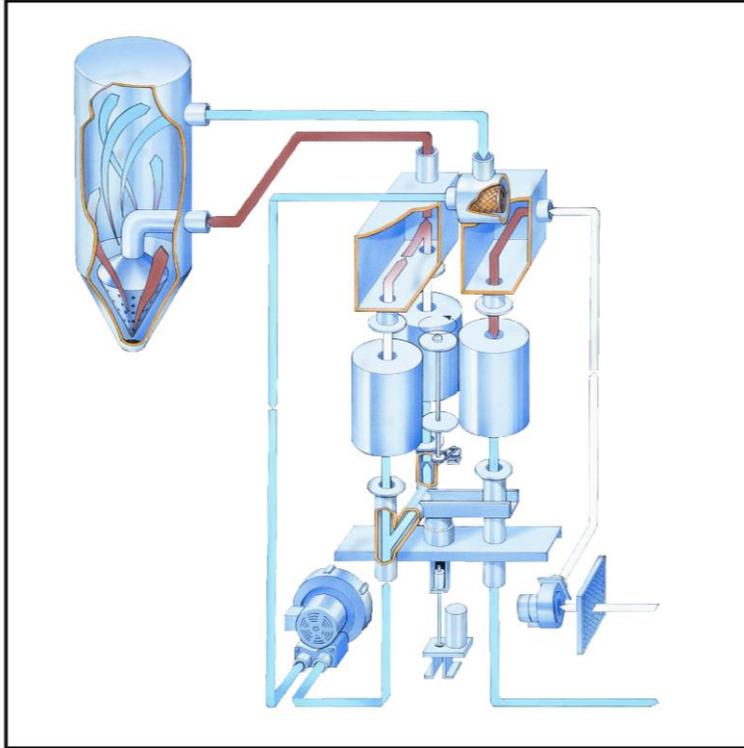
The above warranty supersedes, and is in lieu of all other warranties expressed or implied; and no person, agent, representative or dealer is authorized to give any warranties on behalf of Thoreson-McCosh, not to assume for Thoreson-McCosh any other liability in connection with Thoreson-McCosh products.

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** SECTION 2 **

TD DRYER METHOD OF OPERATION

The Thoreson-McCosh Inc., **Thermal Dynamic** or **TD** dryer, is a 3 Desiccant bed, closed looped drying system. The dryer has 2 separate air flow circuits. Each circuit has its own filter, blower and heater. The three bed positions are Process, Regen & Cool down.



TD-DRYER AIR FLOW SCHEMATIC

The **PROCESS** air flow circuit blower, moves air through the dry desiccant bed that is in the process position, removing moisture from the air down to below a -40° dew point. The air then passes through the process heater box, then to the hopper. This heats the dry air to a precise temperature, to maximize the drying effect on the resin material in the hopper. The heated dry air then percolates through the resin material in the hopper, absorbing moisture in the resin. The wet air then returns to the dryer, to repeat the sequence. A process cycle timer will force the beds to rotate to the next position, so the bed in the Process position, can move to the Regeneration or **REGEN** position.

The **REGEN** air flow circuit blower, moves filtered air through the Regen heater box, that heats the air up to 550° F. The hot air then passes through the bed, heating the desiccant beads. This causes the desiccant beads to release moisture instead of absorbing moisture. The water laden air exits the dryer carrying all the moisture with it.

The process cycle timer will force the beds to rotate to the next position, so the hot bed can cool down.

The **COOL DOWN** air flow circuit has an orifice that allows a small amount of the process air to flow through the desiccant bed to help cool the bed down, and adds the heat to the process air to conserve energy. When the process cycle timer times out, the beds will rotate again to repeat the cycle.

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**** SECTION 3 ****

QUICK START

After uncrating your Thoreson-McCosh Inc. equipment, the unit should be inspected for damage that may have happened during transportation. If any damage is found, it should be reported to the carrier as soon as possible. Most dryers are held to the pallet with Z brackets. You must remove the side panels to remove these Z brackets. On larger dryers, there are wood supports inside the dryer to support the desiccant beds during transport. These must be removed before power or air is connected to the dryer. The dryer can be lifted off the pallet with a hi-low or Lift. Insure that the unit does not tip off the hi-low or lift

The dryer and material drying hopper can be placed on any reasonable flat surface and should be as close to each other as possible to prevent thermal and air flow losses. If the material is going to be dried at temperatures above 220°, then an after-cooler unit should be purchased and installed. If the material drying temperature is below 150°, then a pre-cooler should have been ordered with the unit. Both of these coolers will need a water supply of 3 to 4 GPM with a maximum of 100 PSI should be used.

Units requiring compressed air, will need a minimum of 65 PSI and a maximum of 120 PSI. The 3 phase power lines from the customers disconnect, should be connected to L1, L2 and L3. Check the serial tag for power information to select the proper wire and protection device. The unit must have proper grounding.

The hopper is coated with oil and will need to be cleaned before filling with material. Some hoppers are large enough to be transported in separate pieces, and will need some assembly. After cleaning the barrel, cone and diffuser, install the diffuser with the plate and bolts included. When connecting the hoses to the hopper, an insulated hose is recommended for the process air, and non-insulated hose or air tight metal duct work is preferred for the return, air.

When starting the dryer for the first time, the blower direction needs to be checked. Smaller units, (TD-12 thru TD-360), will give an alarm of “**Process Blower Direction Flt**”, if the process blower is going the wrong way. Switching any 2 incoming power wires, will change the direction of the blower.

Larger dryers, (TD-480 thru TD-2000), the direction of the blower will need to be verified visually, by removing a side panel and looking at the cooling impeller on the back of the blower motor. Switching any 2 incoming power wires, will change the direction of the blower. Since some units have two, 3 phase blowers, never change the motor power wires, only the incoming power wires.

NOTE: RUNNING THE BLOWER IN REVERSE WILL DAMAGE THE DRYER!

Next, fill the hopper with material. When the material has covered the diffuser, the dryer can be turned on. Give the first batch of material sufficient residence time to dry. Usually this is 3 to 4 hours. Check with the manufacturer of the material resin for suggested residence time and temperature.

After starting the dryer, you will notice a visual alarm stack light. The green light will be on when the dryer is running. The green light will flash during the heater shut down period before a shift. The red light will be on when there is a alarm present. If the “Alarm light with buzzer” was purchased, the will also be a audible alarm sound when there is a alarm present.

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**** SECTION 4 ****

HMI INSTRUCTIONS

The Human Machine Interface or HMI, is a touch screen that enables the user to turn the unit Off and ON, and to monitor and modify the various set points associated with the unit.

SECTION 4.1: DISPLAYING THE PROGRAM # & CYCLE TIMES

When the dryer is first powered up, the START-UP screen will display for a few seconds. The screen will display the Program # and the Dryer Process & Regen Cycle times. After a short delay, it will display the Main Screen.

PROTEK DRYING SYSTEM

PG201419



PROCESS CYCLE TIME 120 MINUTES

REGEN CYCLE TIME 70 MINUTES

START-UP SCREEN

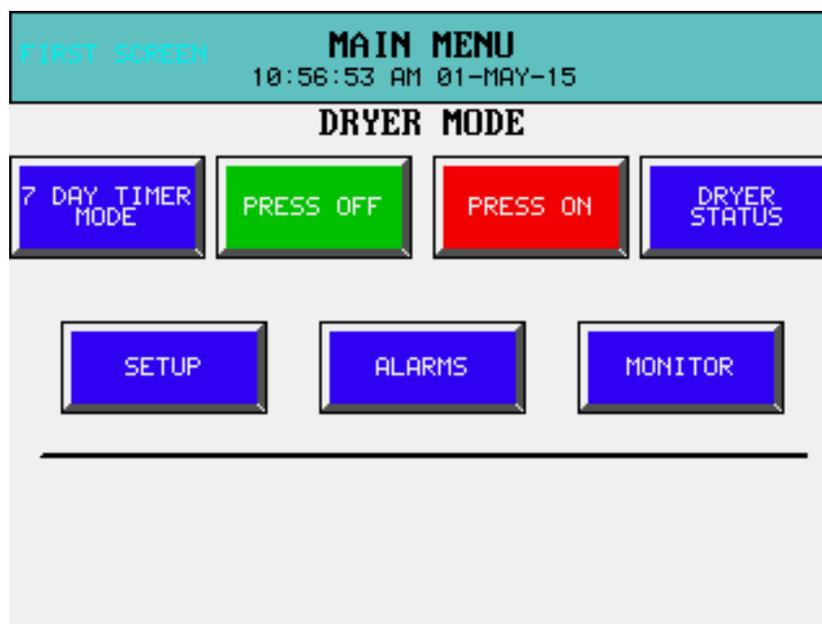
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SECTION 4.2: MAIN MENU SCREEN

The Main Menu Screen consists of 2 sections. *Dryer Mode* and *Loader Mode* or *Pre-Heaters*.

DRYER MODE SELECT:

- FIRST SCREEN:** Press this button to return the first screen to see Program number.
7 DAY TIMER: Press this button to display the Auto Mode screen. This screen enables the 7-DAY and allows the user to modify the 7 DAY set points.
OFF: Press this button to turn the dryer OFF.
ON: Press this button to turn the dryer ON and displays the On Mode screen.
DRYER STATUS: Press this button to display the Dryer Status screen. This screen has buttons that display the status of the dryer. Many displays are interactive to edit set points.
DRYER SETUP: Press this button to display the Dryer Setup screen and to edit all set points of the dryer.
ALARMS: Displays the Dryer Alarm screen.
MONITOR: Displays the Dryer Graphical screen, which is a flow chart of the dryer with interactive displays of the status of the dryer.



MAIN MENU SCREEN

DRYER OPTIONS:

There are two Major Options that could be sold with this unit.

- LOADER:** Two station loading system.
PRE-HEATER: Multi hopper drying system.

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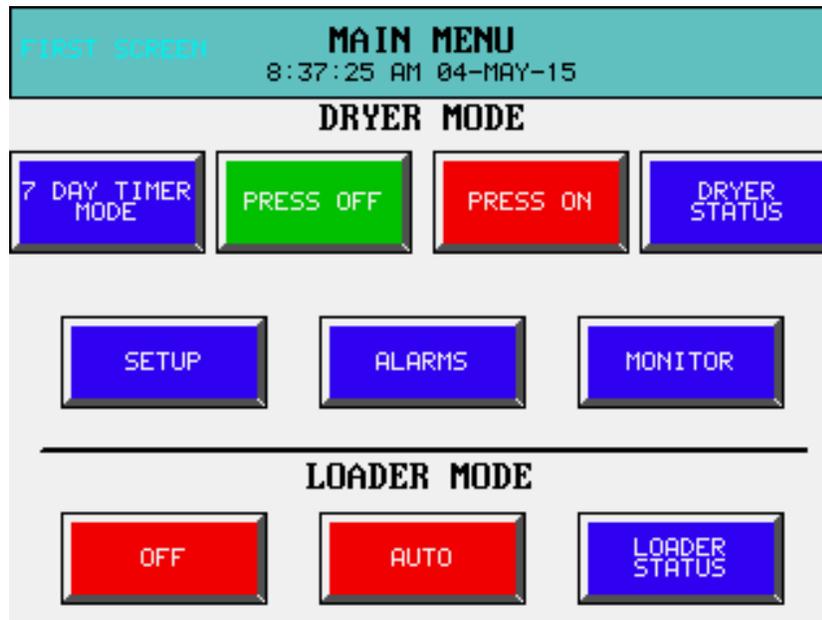
LOADER MODE:

The loader can consist of up to two receivers. One of which can be ratio.

OFF: Press this button to turn the loading system Off.

AUTO: Press this button to turn the loading system On

LOADER STATUS: Press this button to display the Loader Status screen.



MAIN MENU SCREEN LOADER

The Loader controls will be covered later in this manual.

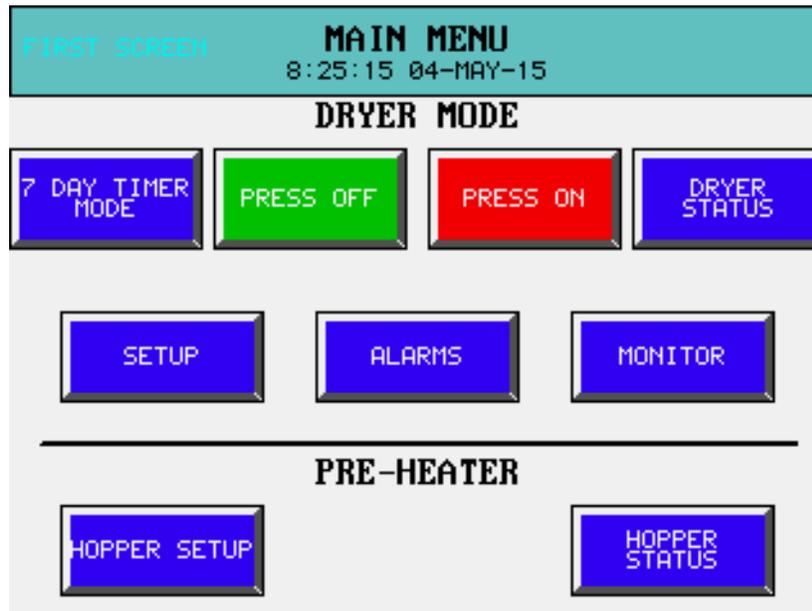
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PRE-HEATER MODE:

The Pre-Heater option can control multiple hoppers, with or without Delta-T.

HOPPER SETUP: Press this button to display the Hopper Setup screen.

HOPPER STATUS: Press this button to display the Hopper Status screen.



MAIN MENU SCREEN PRE-HEATERS

The Pre-heater controls will be covered later in this manual.

SECTION 4.3: ON MODE SCREEN

The *ON MODE* Screen has 3 navigation buttons and several displays to monitor the dryer status. Many of these buttons are interactive, so the user can modify the displays set point.

NAVIGATION BUTTONS:

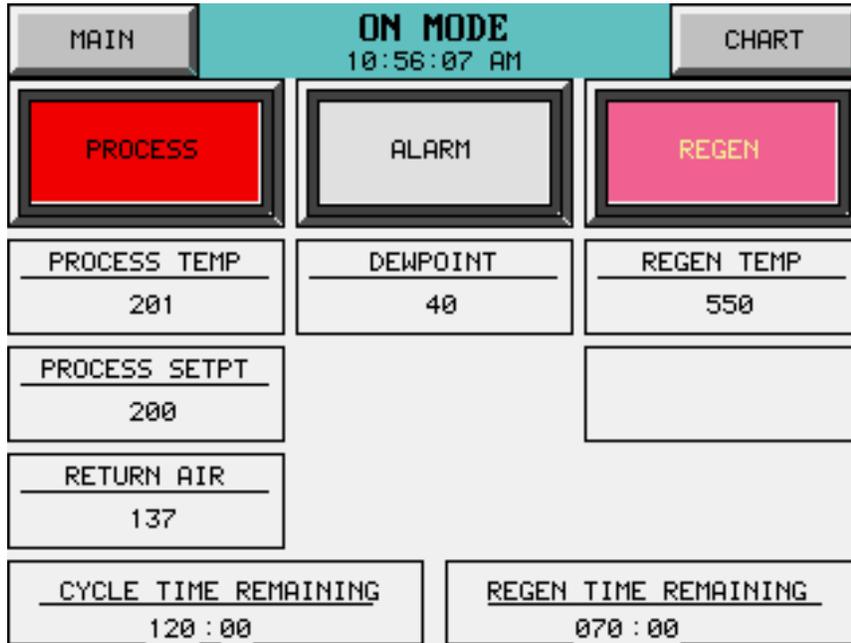
- MAIN:** Pressing this button will return to the *Main Menu* screen.
HOPPER STATUS: Pressing this button will display the Hopper Status screen.
CHART: Pressing this button will display the Chart screen, where the Dew Point and some temperatures are displayed in chart form.

DISPLAYS:

- PROCESS HEATERS:** Bank 1, Indicates if the Bank 1 Process Heaters are ON or OFF.
Bank 2, Indicates if the Bank 2 Process Heaters are ON or OFF and by pressing the button, the heater bank can enabled or disabled. If the heaters can not achieve the process set point, the extra heater bank can be enabled.
- PROCESS TEMP:** Displays the Actual air temperature coming out of the process heater box. Pressing the display will display a keypad to adjust the Process temperature set point.
- SETPT:** Displays the Process heater set point.
- ALARM:** Indicates the status of the dryer alarms. Pressing this indicator will display the Alarm screen.
- DEWPOINT:** Displays the actual Dew point of the Process air. Pressing this indicator will display the Dryer setup screen, where the Dew point set points can be adjusted.
- RETURN AIR:** Displays the actual temperature of the air returning from the Hopper(s).
- REGEN HEATERS:** Indicates if the Regen heaters are ON or OFF.
- REGEN TEMP:** Displays the actual air temperature coming out of the Regen heater box, and entering the bed in the Regeneration position.
- REGEN EXH:** Displays the actual air temperature coming out of the bottom of the bed in the Regeneration position.
- CYCLE TIME REMAINING:** Displays the Remaining Process Cycle Time.
- REGEN TIME REMAINING:** Displays the Remaining Regen Cycle Time.

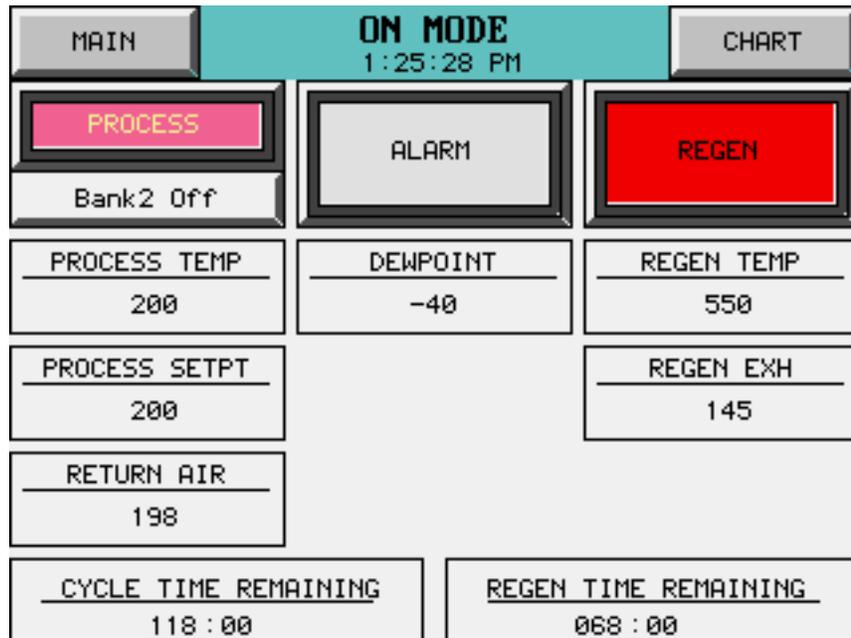
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ON MODE SCREENS



ON MODE SCREEN TD-12 THRU TD-360

The TD-480 thru TD-2000 have an extra button for the process heaters. There is usually two banks of heaters, and the operator has the choice of whether to use the second bank of heaters or not.



ON MODE SCREEN TD-480 & UP

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SECTION 4.4: DRYER SETUP SCREENS

There are 2 Setup Dryer screens. Page 1 and Page 2.

SETUP DRYER (PAGE 1):

- MAIN:** Pressing this button will return to the Main Menu screen.
- NEXT:** Pressing this button will display the Next screen.
- PROCESS TEMP:** Press this button to edit the Process Temperature set point.
- REGEN BLOWER OFF DELAY:** Press this button to edit the Regen Blower OFF delay. The Regeneration cycle is controlled by a timer and also by temperature. If the Regen Cycle timer has expired, or the bed exhaust temperature has exceeded 350°, then the Regen heaters will turn off, and the Regen blower will continue to run for the set point selected, to evacuate the heat and cool down the heaters.
- SHIFT DELAY:** Press this button to edit the Shift Delay set point. The Process Cycle is controlled by a timer and by Dew point. If the timer set point has expired, and the Dew point set point has been satisfied, (if on), then the shift delay time will shut off the process heaters and any Pre-heaters that are connected to this dryer. This will purge the heat from the heater boxes to prevent a temperature spike to the resin in the hopper and cool down the heaters.
- DEW POINT SHIFT:** Press this button to Enable or Disable the Dew point Shift function.
- DEW POINT SHIFT SET POINT:** Press this button to edit the desired Dew point temperature that the dryer will shift, after the Process cycle timer has expired, and the option is enabled.
- DEW POINT ALARM SET POINT:** Press this button to edit the desired Dew point temperature that the Dew point alarm will activate.

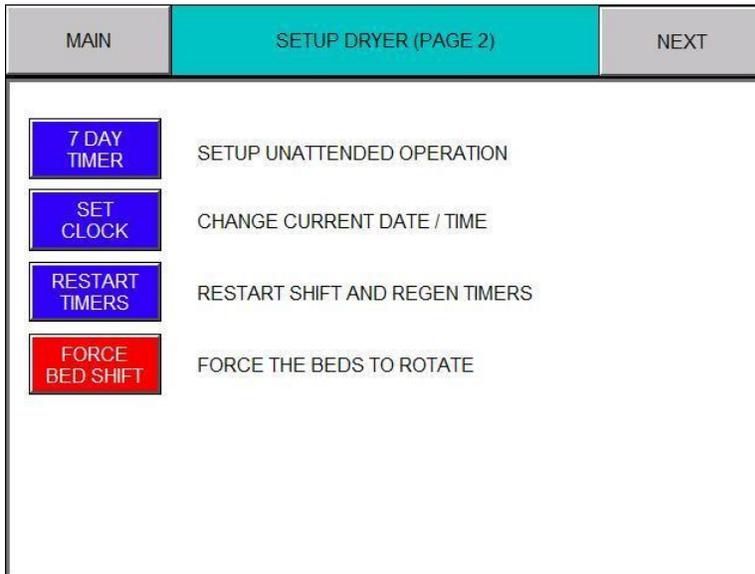
MAIN	SETUP DRYER (PAGE 1)	NEXT
250	PROCESS TEMP (DEG-F)	
10	REGEN BLOWER OFF DELAY (MINUTES)	
2	SHIFT DELAY (MINUTES)	
On	DEWPOINT SHIFT	
-35	DEWPOINT SHIFT SETPOINT	
-30	DEWPOINT ALARM SETPOINT	

SETUP DRYER SCREEN (PAGE1)

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SETUP DRYER (PAGE 2):

- 7 DAY TIMER:** The dryer can be run unattended in the 7 Day Timer Mode. Press this button to edit the times and temperatures for the unattended use of the dryer
- SET CLOCK:** Press this button to display the screen to change the current time and date.
- RESTART TIMERS:** Press and hold this button for 5 seconds to restart Cycle, Regen and Alarm timers.
- FORCE BED SHIFT:** Press this button to force a bed shift.
CAUTION: *Shifting the beds early, can cause a spike in the Process temperature.*

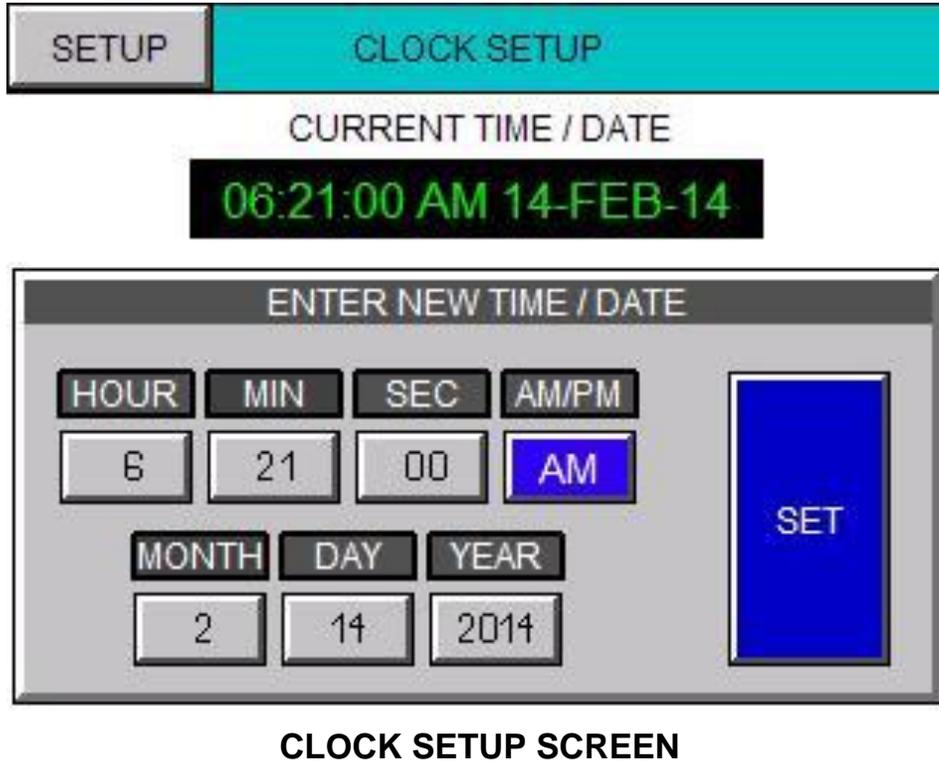


SETUP DRYER SCREEN (PAGE2)

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SECTION 4.5: SET CLOCK

Use the buttons to adjust the time and date. Then press the *SET* button to enter the new values into the PLC real time clock. Press the *SETUP* button to return to the dryer setup screen. All values displayed will be updated when the *SET* button is pushed. So make sure all values are proper before pushing the *SET* button.



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SECTION 4.6: 7 DAY TIMER

The 7 DAY TIMER SETUP screens have 2 navigation buttons.

SETUP: Press this button to return to the dryer setup screen

NEXT: Press this button to display the next day screen.

There is a separate screen for each day of the week, starting with Sunday.

ACTIVE: This enables this line of settings.

HOUR: This sets the hour to make a change in the process temperature or to turn the dryer OFF or ON.

MIN: This sets the minutes.

A/P: This sets AM or PM.

DRYER ON/OFF: This selects if the dryer is OFF or ON.

TEMP: This sets the desired temperature to change to.

SETUP	7 DAY TIMER SETUP						NEXT
01:35:00 PM 18 DEC 12							
MONDAY							
ACTIVE	HOUR	MIN	A / P	DRYER ON/OFF	TEMP		
On	2	30	AM	Off	On	85	
On	7	0	AM	Off	On	180	
On	4	0	PM	Off	On	100	
Off	12	0	AM	Off	On	100	
Off	12	0	AM	Off	On	100	

7 DAY TIMER SETUP SCREEN

The current screen shows:

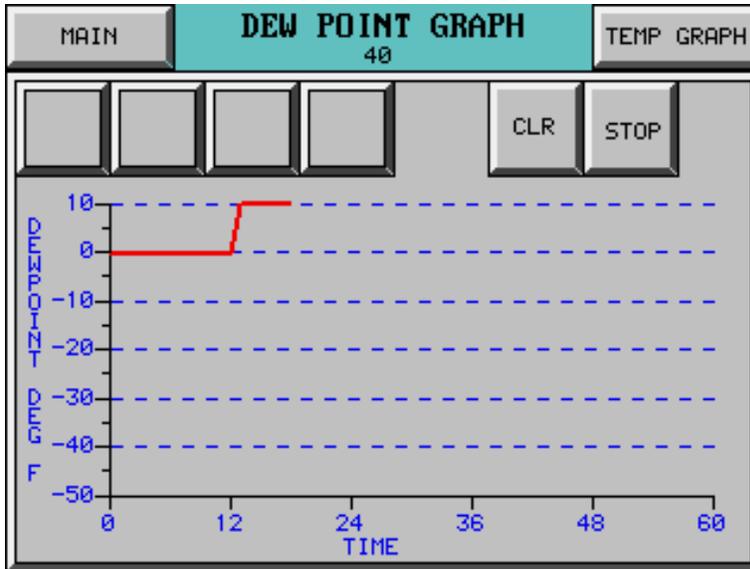
The dryer comes on at 2:30 AM and sets the process temperature to 85°.

At 7:00 AM, the process temperature changes to 180°.

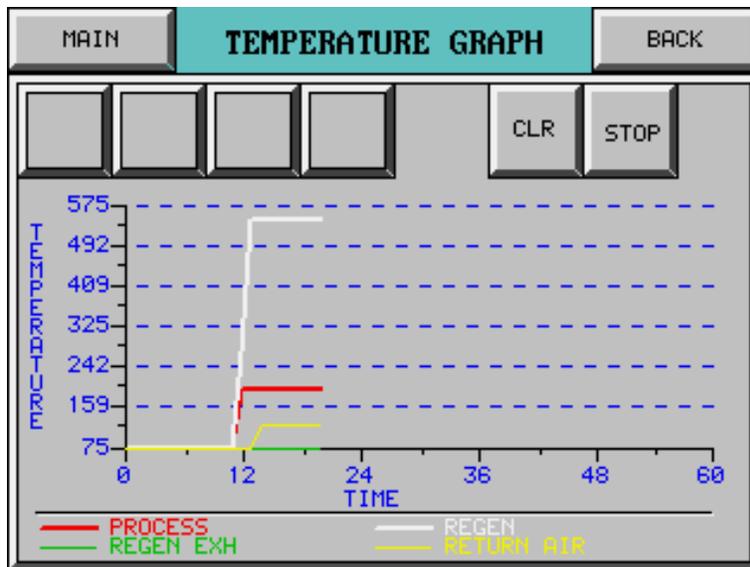
At 4:00 PM, the dryer turns OFF.

SECTION 4.7: CHART SCREEN

The CHART SCREENS display about a 8 hour period of the dew point and the actual temperature values of the dryer.



DEW POINT GRAPH



TEMPERATURE GRAPH

This graph shows:
Process heater Temperature
Regen heater Temperature
Regen Exhaust Temperature
Return Air Temperature

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SECTION 4.8: ALARM SCREEN

The ALARM (dryer faults) screen, has 3 buttons across the top.

MAIN: Press this button to return to the MAIN MENU screen.

FAULT ACK: Press this button to acknowledge the alarm. This will clear the history.

ALARM SILENCE: This button will silence the audible alarm for 5 minutes. The visual alarm will stay on.

ALARM HISTORY: Press this button to see the alarm history screen.



DRYER FAULTS SCREEN

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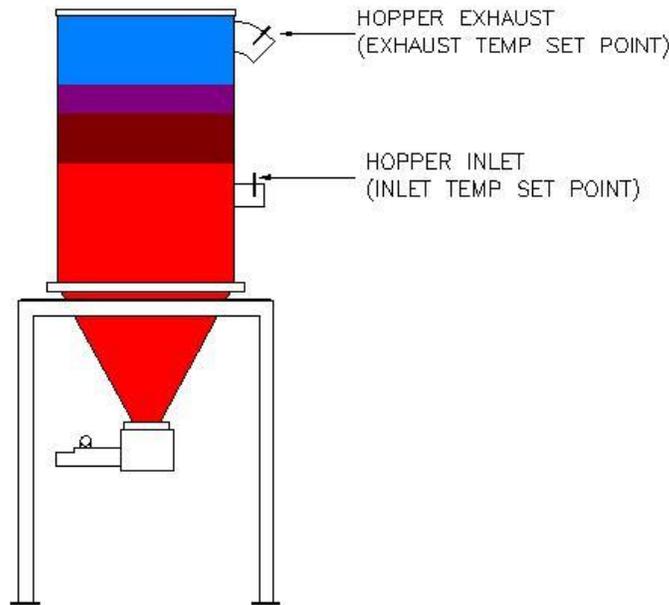
LIST OF DRYER FAULTS:

PROCESS BLOWER STARTER FAULT:	The Process blower contactor is open when the Process blower should be on. The Process blower overload relay may be tripped, or contactor is malfunctioning.
PROCESS BLOWER DIRECTION:	The Process blower is rotating backwards.
PUSH-UP MOTOR FAULT:	The push-up motor failed to pull down the beds.
BED ROTATE FAULT:	The Desiccant beds failed to rotate within 3 minutes of starting a rotate cycle.
AIR CYLINDER FAULT:	The manifolds failed to open completely in less than 30 seconds.
DEW POINT HIGH:	The actual Dew Point is higher than the set point for more than 3 minutes.
PROCESS BLOWER FILTER DIRTY:	The process filter is dirty.
PROCESS TEMP HIGH:	The Process air temperature is 30° over set point.
PROCESS TEMP LOW:	The Process air temperature is 20° below the set point.
REGEN HEATER FAULT:	The Regen air temperature has not reached 450° in the first 10 minutes of the Regen cycle. (400° for TD-12/24)
REGEN BLOWER FAULT	The Regen blower is not blowing or has reduced air flow.
_____T/C FAULT:	The _____ thermocouple is open.
MASTER HEATER CONTACTOR OPEN:	A safety thermostat is open, causing the Master Heater Contactor to open.
HOP # TEMP HIGH:	Hop1, Hop2,... Air temperature is 30° above the set point.
HOP # TEMP LOW:	Hop1, Hop2,... Air temperature is 20° below the set point.
HOP# T/C FAULT:	Hop1, Hop2,... thermocouple is open.

SECTION 4.9: DELTA-T

The Delta-T function determines the material has achieved an acceptable dry level based on the idea that when the hopper air return temperature approaches the hopper air inlet temperature, the material is dry. Obviously, due to losses of energy in a drying environment, the air inlet and outlet will never be the same, but at some point, the difference is small enough to indicate that the material can be considered dry. At this point, the process air flow heaters will turn off, and the air flow valve, (*if equipped*), will close. The process blower will continue to cycle keeping positive dry air pressure in the drying hopper. This will prevent the material from being over dried and also keep it from being saturated with moisture. This also saves energy.

The **Inlet Temperature Set point** should be set to the drying temperature recommended by the material manufacturer or supplier. The **Exhaust Temperature Set point** is determined by drying the material for the manufactures suggested residence time. (typically 3 to 4 hours). Note the **Exhaust Temperature Set point** at the end of the residence time and set the **Hopper Exhaust Set point** at this temperature. If the **Hopper Exhaust Temperature** falls below the **Differential Return Temperature Set point**, the Process heaters will come back on, and the air flow valve, (*if equipped*), will open.



DELTA-T FUNCTION

Delta-T example:

Resin Manufacture suggested drying temperature. **225°F (107°C)**

Hopper Exhaust temperature after 3 hours: **195°F (91°C)**

Low Temperature Return:

Small hopper **11-15°**

Med hopper **8-10°**

Large hopper **5-7°**

Process Set point225°F (107°C)

Hopper Exhaust Set point195°F (91°C)

Low Temp Return Set point 9° (medium hopper)

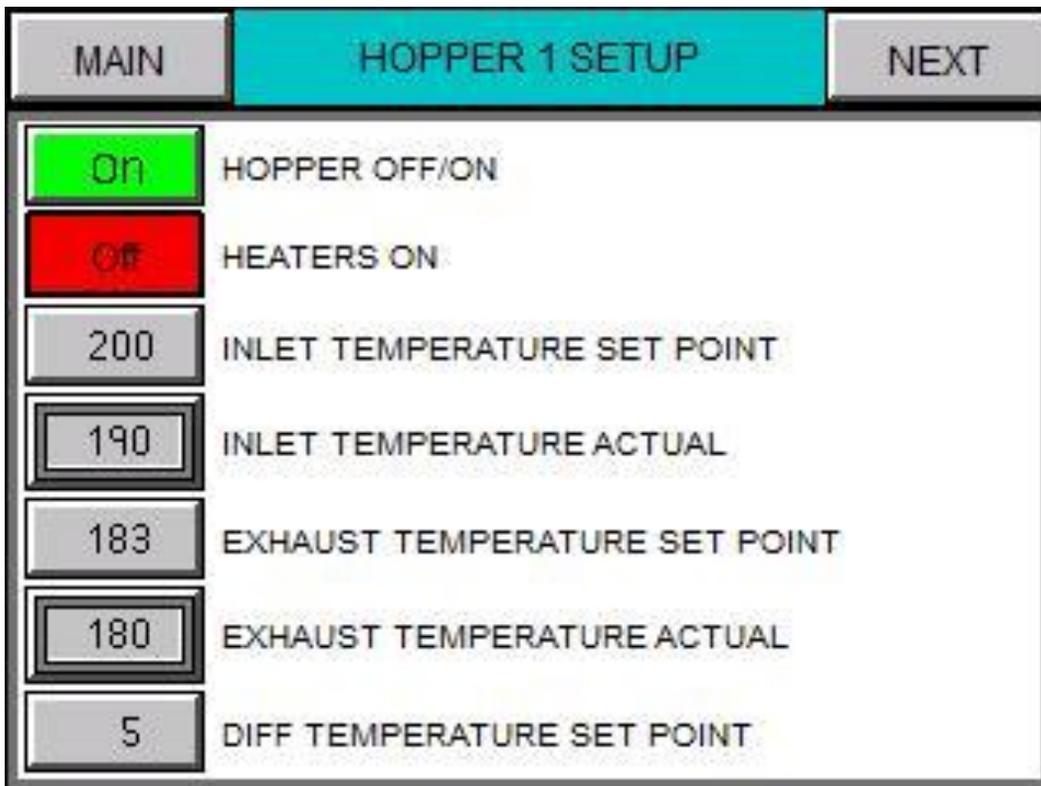
**** SECTION 5 ****

OPTIONAL PRE-HEATER CONTROL

SECTION 5.1: PRE-HEATER SETUP SCREENS

Each hopper has a setup screen that consists of 4 navigation buttons and buttons to set or monitor temperatures.

- | | |
|---------------------------------------|---|
| MAIN: | Press this button to return to the Main Menu screen. |
| NEXT: | Press this button to display the next hopper screen. |
| HOPPER OFF/ON: | Press this indicator button to turn the OFF or ON. |
| HEATERS ON: | This indicates when the heaters are on. |
| INLET TEMPERATURE SET POINT: | Press this to edit the Inlet temperature set point. |
| INLET TEMPERATURE ACTUAL: | Displays the actual Inlet air temperature. |
| EXHAUST TEMPERATURE SET POINT: | Press this to edit the Exhaust temperature set point. |
| EXHAUST TEMPERATURE ACTUAL: | Displays the actual Exhaust air temperature. |
| DIFF TEMPERATURE SET POINT: | Press this to edit the Differential Return Air set point. |



HOPPER SETUP SCREENS

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SECTION 5.2: HOPPER I/O SCREEN

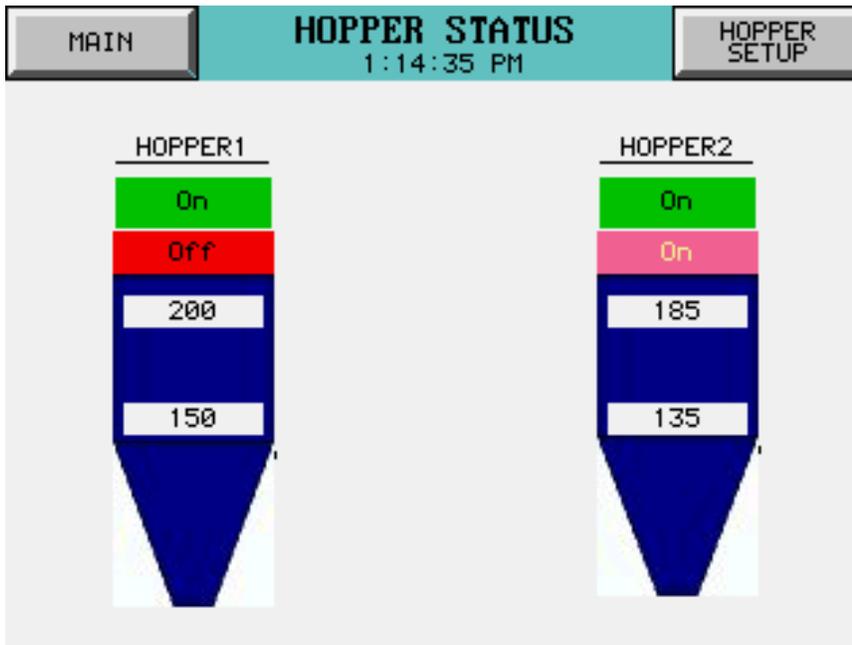
The hopper I/O screen displays information on all 9 hoppers on one screen.

Press the Main button to display the Main Menu screen.

Press the Back button to return to the last screen.

MAIN	HOPPER STATUS			DRYER STATUS
HOPPER #	1	2	3	
HOPPER ON	■	■	■	
HEATERS ON	■	■	■	
HEATER OVER TEMP	□	□	□	
HEATER UNDER TEMP	□	□	□	
INLET TEMP SETPT	100	100	100	
INLET TEMP ACTUAL	100	100	100	
EXHAUST TEMP SETPT	85	85	85	
EXHAUST TEMP ACTUAL	85	85	85	
DIFF TEMP RETURN SETPT	5	5	5	

HOPPER I/O SCREEN



HOPPER STATUS SCREEN

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SECTION 5.3: OPTIONAL LOADER CONTROLS

There are two screens to setup the Stations and the Pump set points.

LOADER STATUS SCREEN:

- BACK:** Press this button to go back to the last screen.
- SETUP:** Press this button to go to the Loader setup screen.
- ENABLED:** Press this button to go toggle the Station *Off* or *ON*.
- LIMIT SWITCH:** This indicates if the hopper needs material.
- LOADING:** This indicates if the station is *Loading* or is *Idle*.
- LOAD TIME:** Press this button to adjust the station load time set point.
- DUMP TIME:** Press this button to adjust the dump time set point.
- NO LOAD ALARM:** Press this button to adjust the no load set point. Selecting zero will disable the no-load alarm for that station.
- RATIO PERCENTAGE:** Press this button to adjust the ratio or the amount of regrind you want to mix with the virgin material. Selecting zero will pull only virgin material.

	Sta #1	Sta #2
Enabled	On	On
Limit Switch	Empty	Full
Loading	Loading	Idle
Load Time	18	0
Dump Time	20	0
No Load Alarm	2	3
Ratio Percentage	40	0

LOADER STATUS SCREEN

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LOADER SETUP BLOWBACK SCREEN:

MAIN: Press this button to return to the Main Menu screen.

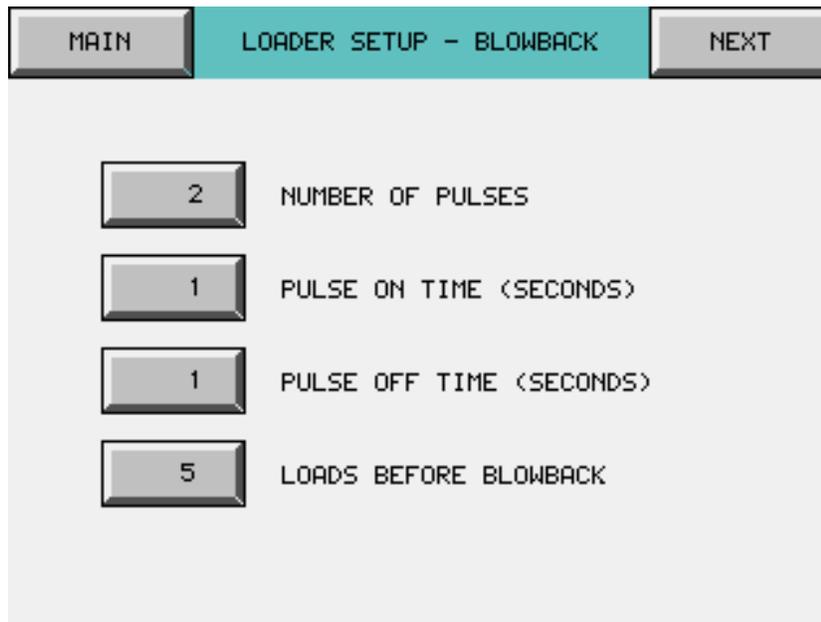
NEXT: Pressing this button will take you back to the Dryer Setup - Page1 screen.

NUMBER OF PULSES: Press this button to adjust the number of blowback pulses wanted.

PULSE ON TIME : Press this button to adjust how many seconds you want the pulse of compressed air on to clean the filter.

PULSE OFF TIME: Press this button to adjust the number of seconds needed to recharge the tank.

LOADS BEFORE BLOWBACK: Press this button to adjust how many times the system will go thru a load cycle before the blowback cycle will run again.



LOADER SETUP SCREEN

**** SECTION 6 ****

MAINTENANCE

BEFORE STARTING THE DRYER:

Visually Check The Drying System. Check that the delivery and return hoses are in good condition and are routed with a minimum of length and with no sharp bends. The hopper lid should be in place and well sealed. If a hopper loader is used, it should be mounted so that air leakage is minimized.

AFTER STARTING THE DRYER:

The drying temperature should match the recommended temperature specified by the material supplier. In general, as hot as possible without allowing thermal degradation or discoloration of the material being processed. If the hopper inlet temperature is lower than the dryer discharge, the dryer temperature set point should be increased to compensate for the temperature drop in the process air flow hose.

PRE-COOLER & WATER SAVER VALVE:

When drying a resin below 170°F (77°C), a pre-cooler will need to be installed on the dryer. A water saver valve can also be installed to control the water flow. This valve is temperature controlled and turns the water flow down when not in use.

FILTERS:

The process and regeneration filters should be checked weekly and cleaned with compressed air or replaced if necessary.

Remember to check the filter gasket and fix or replace as needed.

LUBRICATION:

The regeneration blower motor bearings may be lubricated every 6 months to extend blower life. A couple drops of S.A.E. 20 motor oil at each of the two motor bearings is recommended.

MOLECULAR SIEVE TEST:

When it is suspected that the molecular sieve needs replacement, there is a simple test that can be performed. A positive test does not ensure that the molecular sieve is in good condition. If there is a large percentage of broken pellets or dust, contamination from foreign matter, or most of the pellets are discolored, the desiccant should be replaced. New desiccant is light tan in color.

To test the desiccant's effectiveness, a sample should be regenerated in an oven at 600°F/ 316°C for about two hours. At the end of that period, place the desiccant into an air tight jar and allow it to cool down to room temperature for a minimum of 12 hours. Pour 30ml of water into a small glass. Determine and record the temperature of the water using a mercury thermometer. Into a similar dry glass, pour a quantity of desiccant that is 10% greater by volume than the water (33ml). Dry the thermometer and place it into the glass containing molecular sieve. With one quick motion, pour the water into the glass of desiccant. Observe the increase in temperature of the mixture while stirring with the thermometer and record the peak temperature. This will occur in about 20 to 30 seconds. Subtract the water temperature from peak temperature observed. If the temperature difference is 40°F/ 4°C or greater, the sieve is in satisfactory condition.

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SECTION 6.1: REMOVING THE BEDS

READ THE INSTRUCTIONS COMPLETELY BEFORE ATTEMPTING TO REMOVE THE BEDS!

FOR TD-12 THROUGH TD-360

Read instructions completely before attempting to remove the beds.

1. Remove the Fuses or turn OFF the circuit breakers for the process and regen heaters.
2. Remove side panels.
3. Power up the dryer and turn the dryer ON.
4. From the Main Menu screen, press the SETUP button.
5. Press the NEXT button to display the SETUP-DRYER (Page 2) screen.
6. Press the FORCE BED SHIFT button.
7. After the Manifold has pulled down, disconnect the power from the unit. DO NOT turn the dryer OFF with the controls. The manifold will go back up.
8. Loosen the band clamps that hold the bed tight up against the turret plates, and remove the bed from the unit. Secure the clamps so they don't catch on any thing in the unit.
9. Apply power and repeat items 6, 7 & 8 until all the beds have been removed.

Note: On some units, the bed turret assembly can be manually rotated if care is taken to rotate them slowly, and always in a left to right direction.

Inspect the center cavity at the top of the bed for any quantity of beads, which may indicate a damaged inner perforate screen.

Inspect the bottom part of the bed for the presence of any loose beads, which may indicate a damaged outer screen. If when the beds are refilled and there is evidence of bead leakage, the bed must be repaired or replaced.

To replace the desiccant:

- a) Remove the bed bead plate to gain access to the desiccant.
- b) Dump the desiccant beads out and vacuum the remaining beads out.
- c) Fill the beds with new desiccant - use only 4a type 8 x 12 size (0.080" diameter) desiccant beads. Fill beds as full as possible. Rock or vibrate the beds to promote settling of the beads. Add more desiccant to fill the beds and pack tight without breaking beads.
- d) Apply high temperature sealant (G.E. silicone RTV-106n sealant is recommended) and secure bed bead plates to beds.
- e) Reverse the bed removal procedure to replace the beds. Lift the beds into the dryer with bed bead plates up and positioned outward from the shaft. Make sure that the bolts for the band clamps are not strait out from the shaft. (The bolts can catch on frame parts and stall the rotate motor)
- f) Secure the beds tight against the turret plate with the band clamps.
- g) Start the dryer and let it operate for a few bed shift cycles while inspecting for leaks at the upper and lower bed seals.
- h) Shut off dryer and install side panels.
- i) After approximately 1-2 weeks of dryer operation check the bead level and add more desiccant if needed.

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FOR TD-480 THROUGH TD-2000

READ INSTRUCTIONS COMPLETELY BEFORE ATTEMPTING TO REMOVE THE BEDS.

1. Remove the Fuses or turn OFF the circuit breakers for the process and regen heaters.
2. Remove side panels.
3. Power up the dryer and turn the dryer ON.
4. From the Main Menu screen, press the SETUP button.
5. Press the NEXT button to display the SETUP-DRYER (Page 2) screen.
6. Press the FORCE BED SHIFT button.
7. When the manifolds have pulled away from the beds, remove the rotate motor control relay from its socket. Place a 1" block inside of the upper and lower air cylinders. (2, side by side, if a single piston air cylinder). Remove the compressed air from the unit and make sure that the bed seals are far enough away from the beds to be able to slide the beds out of the turret plate. Remove power from the dryer.
8. Loosen the rotate motor bracket and remove the rotate chain. If there is not enough adjustment to remove the chain, use the master link to break the chain.
9. Using a HI-LO, place the forks on both sides of the manifold tube over the process blower. Lift the forks till just touching the beds. (DO NOT LIFT THE BED) Remove the bolts that hold the band clamps together and remove the bed by backing the HI-LO out of the unit.
10. Rotate the beds from left to right by hand so the next bed is in the same position as the first bed removed.
11. Repeat instructions 9 and 10 for the rest of the beds the bed from the unit. Secure the clamps so they don't catch on any thing in the unit.

Inspect the center cavity at the top of the bed for any quantity of beads, which may indicate a damaged inner perforate screen.

Inspect the bottom part of the bed for the presence of any loose beads, which may indicate a damaged outer screen. If when the beds are refilled and there is evidence of bead leakage, the bed must be repaired or replaced.

To replace the desiccant:

- a) Remove the bed bead plate to gain access to the desiccant.
- b) Dump the desiccant beads out and vacuum the remaining beads out.
- c) Fill the beds with new desiccant - use 4a type 8 x 12 size (0.080" diameter) desiccant beads only. Fill beds as full as possible. Rock the beds to promote settling of the beads. Add more desiccants to fill the beds and pack tight without breaking beads.
- d) Apply high temperature sealant (G.E. silicone RTV-106n sealant is recommended) and secure bed bead plates to beds.
- e) Lift the beds into the dryer with bed bead plates up and positioned outward from the shaft.
- f) Reverse the bed removal procedure to replace the beds. Make sure that the bolts for the band clamps are not strait out from the shaft. (The bolts can catch on frame parts and stall the rotate motor) and the lid clamp pads on the top of the bed don't touch the turret plate alignment bushings.
- g) Start the dryer and inspect for leaks at the upper and lower bed seals. Force a shift to check the seals on all beds in all positions.

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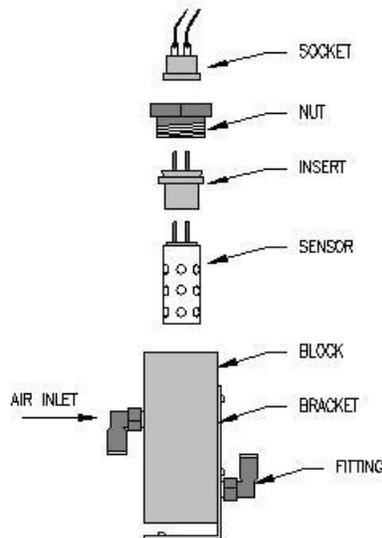
SECTION 6.2: REPLACING THE DEW POINT SENSOR

The dew point sensor should be replaced once a year or when contaminated.

Note: *Never attempt to measure the resistance of the sensor. This will damage the sensor.*

To replace the sensor:

1. Remove power from the unit.
2. Locate the sensor manifold assembly. This is a manifold (block) with wires coming from the socket to the dew point board.
3. Remove the socket.
4. Unscrew the retaining nut.
5. Remove the sensor and insert from manifold.
6. Remove the insert from the sensor. Place the insert onto the new sensor.
7. Reverse steps 1-5.



DEW POINT ASSEMBLY

SECTION 6.3: DISPOSING OF MERCURY CONTACTORS

When a mercury contactor needs to be replaced, care must be taken to properly dispose of the defective unit. Remove the contactor and place it in a plastic baggy and seal the bag. Then place the unit or units in a sealable 5 gallon steel drum. If the unit is under Thoreson-McCosh's factory warranty, ship to Thoreson-McCosh for warranty replacement credit. If the unit is no longer under warranty, please contact:

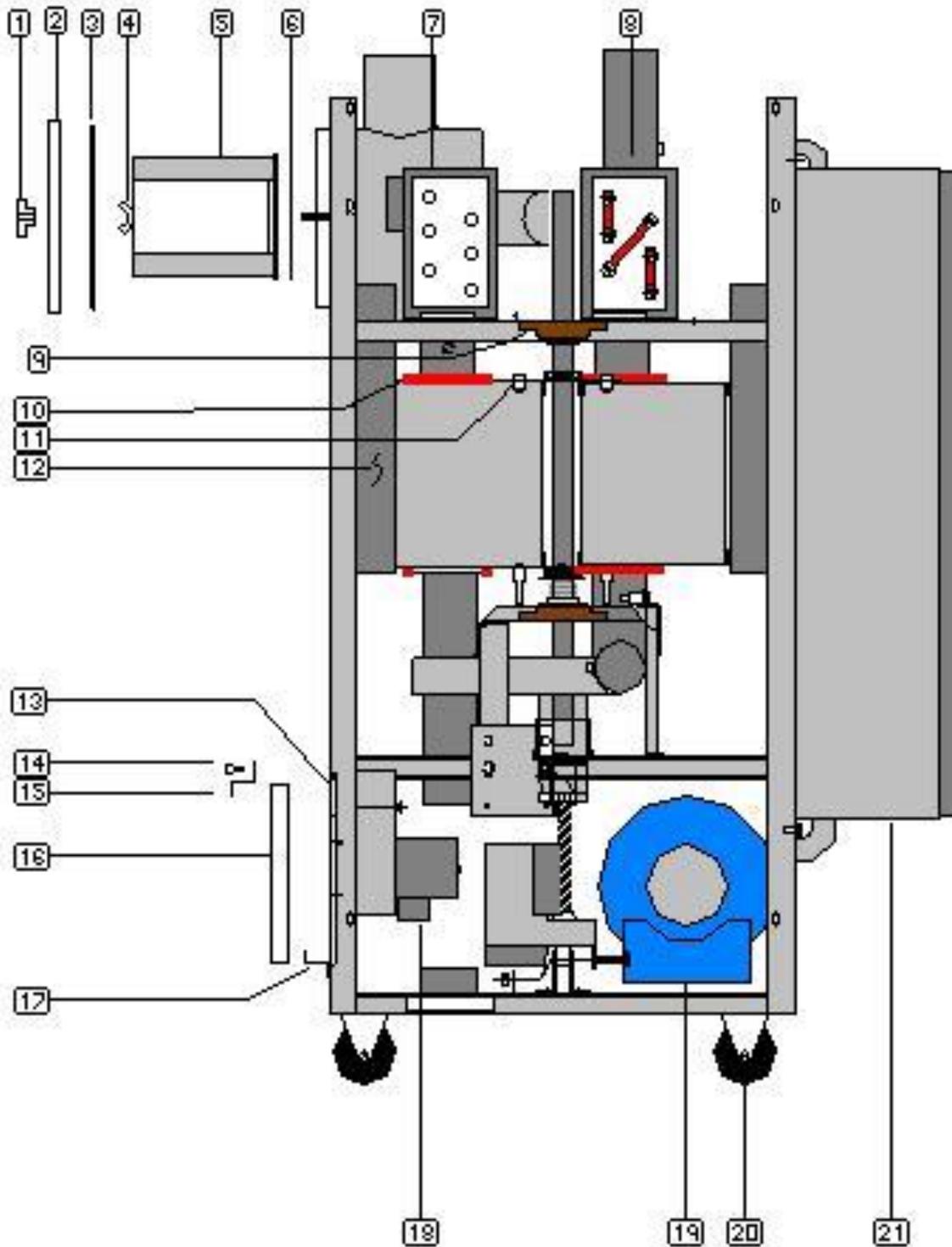
Bethlehem Apparatus
P.O. Box 890
Front St.
Hellertown, PA 18055
Ph: (215) 838-7034

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TD DRYERS COMMON SPARE PARTS LIST

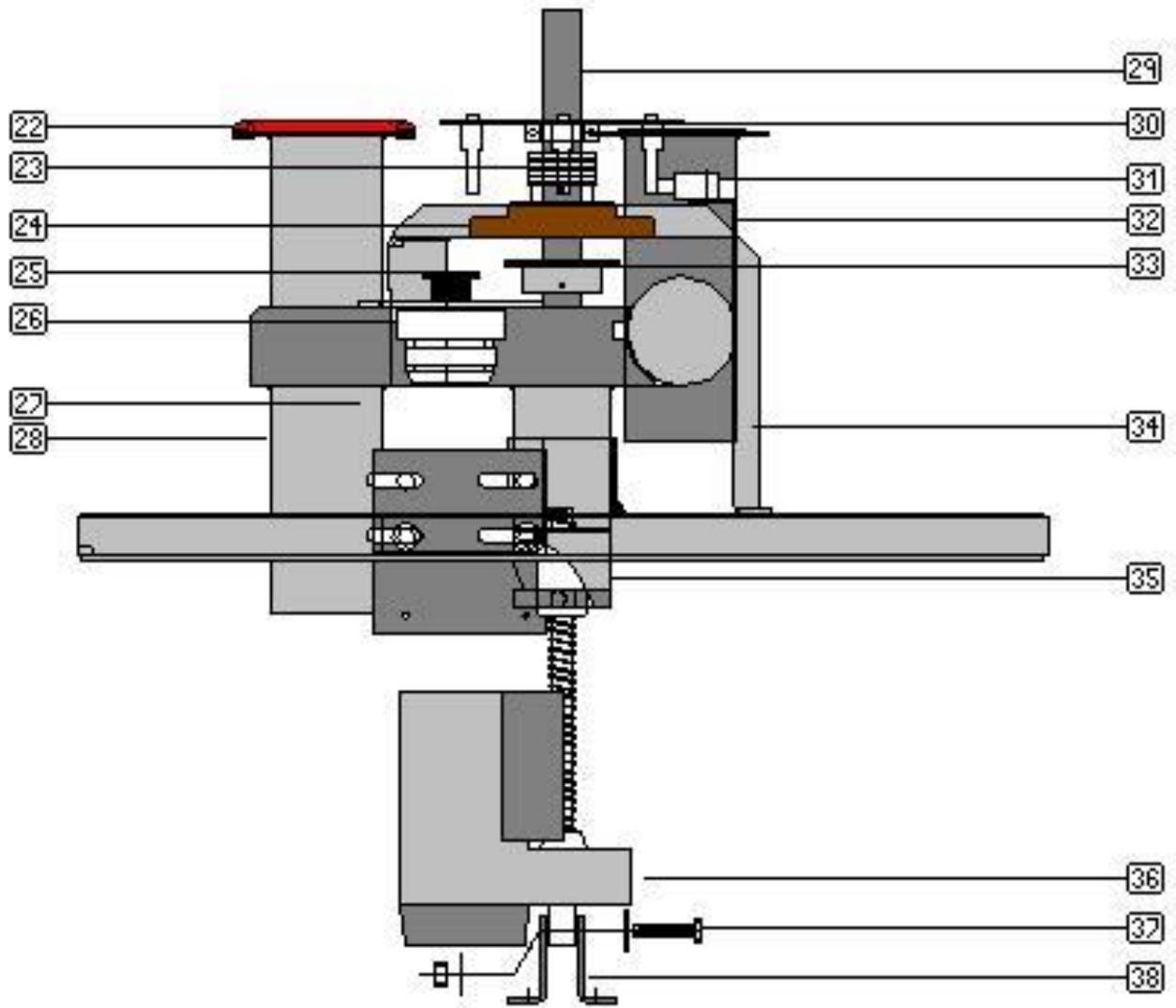
MODEL	MANIFOLD UPPER SEAL	MANIFOLD LOWER SEAL	PROCESS FILTER	REGEN FILTER	DEW POINT SENSOR	MANIFOLD SEPARATION DEVICE	BED INDEX MOTOR
TD-6	413987 (3PCS)	413987 (3PCS)	404663	404663	-----	413989	409650
TD-12	413987 (3PCS)	413987 (3PCS)	410086	404663	411335	410213	409650
TD-24	413987 (3PCS)	413987 (3PCS)	410086	404663	411335	410213	409650
TD-40	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-60	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-90	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-120	413860 (3PCS)	413861 (3PCS)	409951	404654	411335	410213	409650
TD-150	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-180	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-240	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-360	413985 (3PCS)	413986 (3PCS)	410598	404648	411335	410213	410713
TD-480	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-600	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-800	411204 (3PCS)	411204 (3PCS)	404658	409951	411335	Call Factory	410713
TD-1000	410865 (3PCS)	410865 (3PCS)	404658 (2PCS)	409951	411335	Call Factory	413663
TD-1500	410865 (3PCS)	410865 (3PCS)	404658 (2PCS)	404656	411335	Call Factory	413663
TD-2000	411792 (3PCS)	411792 (3PCS)	404658 (3PCS)	404656	411335	Call Factory	413663

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GENERAL DRYER LAYOUT TD12 THRU TD-360

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MANIFOLD LAYOUT TD-12 THRU TD-360

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40	X	---
39	X	---
38	2	PUSH-UP MOTOR BRACKETS
37	1	SHOULDER BOLT, LOCK-NUT, 2 WASHERS
36	1	PUSH-UP MOTOR
35	1	PUSH-UP MOTOR NUT
34	1	LOWER BEARING SUPPORT ASSEMBLY
33	1	SHAFT GEAR
32	1	BED INDEX LIMIT SWITCH BRACKET
31	1	BED INDEX LIMIT SWITCH
30	1	LOWER TURRET PLATE
29	1	BED SHAFT
28	1	MANIFOLD
27	1	ROTATE MOTOR BRACKET
26	1	ROTATE MOTOR
25	1	ROTATE MOTOR GEAR
24	1	LOWER BEARING
23	X	SHIMMS, AM'T VARIES TO MAINTAIN MAX 3/8" GAP
22	3	LOWER BED SEAL
21	1	ELECTRICAL CONTROL ENCLOSURE
20	4	CASTERS, 2 SWIVEL, 2 RIDGID
19	1	PROCESS BLOWER
18	1	REGEN BLOWER
17	1	LOWER REGEN FILTER BRACKET
16	1	REGEN FILTER BRACKET
15	1	UPPER REGEN FILTER BRACKET
14	1	THUMB SCREW
13	1	REGEN FILTER GASKET
12	3	DESICCANT BED
11	1	UPPER TURRET PLATE
10	3	UPPER BED SEAL
9	1	UPPER BEARING
8	1	PROCESS HEATER BOX
7	1	REGEN HEATER BOX
6	1	PROCESS FILTER GASKET
5	1	PROCESS FILTER
4	1	WING NUT WITH FLAT WASHER
3	1	PROCESS FILTER COVER GASKET
2	1	PROCESS FILTER COVER
1	1	KNOB
SYM.	AM'T	DESCRIPTION

GENERAL DRYER LAYOUT PARTS LIST TD-12 THRU TD-360

BATTERY REPLACEMENT FOR PLC1400

Using the Battery

The MicroLogix 1400 controller is equipped with a replaceable battery (catalog number 1747-BA). The Battery Low indicator on the LCD display of the controller shows the status of the replaceable battery. When the battery is low, the indicator is set (displayed as a solid rectangle). This means that either the battery wire connector is disconnected, or the battery may fail within 2 days if it is connected.

IMPORTANT

The MicroLogix 1400 controller ships with the battery wire connector connected. Ensure that the battery wire connector is inserted into the connector port if your application needs battery power. For example, when using a real-time clock (RTC).

Replacing the battery when the controller is powered down will lose all user application memory. Replace the battery when the controller is powered on. Refer to the SLC 500 Lithium Battery Installation Instructions, publication [1747-IN515](#), for more information on installation, handling, usage, storage, and disposal of the battery.

WARNING

When you connect or disconnect the battery an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that the area is nonhazardous before proceeding.

For Safety information on the handling of lithium batteries, including handling and disposal of leaking batteries, see Guidelines for Handling Lithium Batteries, publication [AG 5-4](#).

Follow these steps to connect the replaceable battery.

1. Insert the replaceable battery wire connector into the controller's battery connector.

2. Secure the battery connector wires so that it does not block the 1762 expansion bus connector as shown below.

