

**INSPIRED INNOVATION**

**Despatch**  
INDUSTRIES

# UltraFlex™ Drying & Firing Furnace OWNER'S MANUAL

C-229  
VERSION 3  
12/2010



## SERVICE AND TECHNICAL SUPPORT

service parts: 1-800-473-7373  
international service/main: 1-952-469-8230  
service fax: 1-952-469-8193  
service@despatch.com

## GLOBAL HEADQUARTERS

phone: 1-952-469-5424  
toll free usa: 1-888-337-7282  
fax: 1-952-469-4513  
sales@despatch.com  
service@despatch.com

8860 207th Street West  
Minneapolis, MN 55044 USA

**Despatch**  
INDUSTRIES

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# 1. About This Manual

## 1.1. Important User Information


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In no event will Despatch Industries be liable for technical or editorial omissions made herein, nor for direct, indirect, special, incidental, or consequential damages resulting from the use or defect of this manual.

	<b><i>Values displayed on screens are examples only. Though those values may be typical, contact Despatch Industries for the final value.</i></b>
---	---

	<b><i>Actual screens may vary from those published in this manual.</i></b>
---	--

The information in this document is not intended to cover all possible conditions and situations that might occur. The end user must exercise caution and common sense when installing or maintaining Despatch Industries products. If any questions or problems arise, call Despatch Industries at 1-888-DESPATCH or 1-952-469-5424.

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## 1.2. **Manufacturer**

The UltraFlex Drying and Firing Furnace is manufactured by:



**Despatch Industries**  
8860 207th Street  
Lakeville, MN 55044  
1-952-469-5424 • 1-888-DESPATCH  
www.despatch.com

Refer to the UltraFlex Drying and Firing Furnace name plate for a list of machine specifications and technical support contact information.

## 1.3. **Organization of this Manual**

The Owner's manual contains the most comprehensive set of information for the UltraFlex™ Firing and Drying Furnace.

## 1.4. **Conventions Used in this Manual**

	This icon signifies important information.
	This icon signifies information that describes an unsafe condition that may result in death, serious injury, or damage to the equipment.
<b>Danger!</b>	A condition that may result in death, serious injury or damage to equipment.
<b>Warning!</b>	A condition that may result in serious injury or damage to equipment.
<b>Caution!</b>	A condition that may result in damage to equipment or product.
<b>LOG OUT</b>	Bold, 10pt Arial typeface indicates a specific key or button on screen to click.

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## 1.5. **Acronym Identifier**

<b>Acronym:</b>	<b>Refers to:</b>
CDA	Clean, Dry Air
GUI	Graphical User Interface
HMI	Human-Machine Interface
IR	Infrared
Lpm	Liters per minute
MFC	Mass Flow Controller
PLC	Programmable Logic Controller
SSR	Solid State Relay
SCR	Silicon-Controlled Rectifier or Semiconductor-Controlled Rectifier
VFD	Variable Frequency Drive
VOC	Volatile Organic Compound

## 2. Safety

### 2.1. Safety Information

Do not work on the UltraFlex Drying and Firing Furnace without reading and understanding this section which contains important information and warnings. Ignoring these warnings can result in death, serious injury or damage to the machine and product.

#### 2.1.1. Lockout

Machine lockout places the UltraFlex Drying and Firing Furnace into a zero energy state and prevents accidental machine start up. Always follow the Lockout Procedure described in this Section before cleaning, maintaining or repairing the UltraFlex Drying and Firing Furnace. An accidental start-up, while working on the UltraFlex Drying and Firing Furnace, can result in serious injury or death.

##### 2.1.1.1. Lockout Requirements

1. Every power source that can energize any element of the UltraFlex Drying and Firing Furnace must be shut off at the closest possible power source. This includes air, water and electricity.
2. After energy sources are locked out, test to ensure circuits are de-energized.

##### 2.1.1.2. Lockout Procedure

Personnel authorized to lockout equipment must have the necessary locks to perform the lockout.

1. Physically disconnect all electrical power to the machine or lockout the appropriate breaker or disconnects.
2. Close all valves for air or water sources and bleed off any pressure.
3. Test for power by attempting a start with the machine controls.



### ***Danger!***

***Electrical panels contain high voltage. Disconnect and lock out the power supply before working inside any electrical panels. Failure to lock out the power supply can result in death or injury.***


4. Identify the Lockout Condition with a tag on the electrical disconnect and pneumatic shut off valve.
5. When work is complete, remove all tags and restore the machine to its working state.

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### 2.1.2. Doors and Covers

Doors and covers on the UltraFlex Drying and Firing Furnace protect against the hazards behind them. Operation without these safety devices in place creates hazards that the doors and covers are intended to render safe for personnel. Inspect the UltraFlex Drying and Firing Furnace periodically to make sure the doors and covers are in place.

	<p><b>Danger!</b></p> <p><i>Electrical panels contain high voltage. Disconnect and lock out the power supply before working inside any electrical panels. Failure to lock out the power supply can result in death or injury.</i></p>
---	---


All doors on this machine have fasteners that latch to the frame and require a tool to open. Panels and doors that require a tool to open are part of the safety system of the UltraFlex Drying and Firing Furnace. Do not open any doors while the machine is running.

## 2.2. Maintenance

Only qualified and trained personnel should perform maintenance or repair.

## 2.3. Electrical Power

Only qualified and trained personnel should perform electrical maintenance or electrical repair.

	<p><b>Danger!</b></p> <p><i>Contact with energized electrical sources may result in serious injury or death.</i></p>
---	--


- Before performing maintenance, disconnect all electrical power from the machine. Use a padlock and lockout all disconnects feeding power to the machine.
- Never clean, lubricate or repair the furnace when in operation.

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- Unauthorized alterations or modifications to UltraFlex Drying and Firing Furnace are strictly forbidden. Never modify any electrical circuits. Unauthorized modifications can impair the function and safety of the UltraFlex Drying and Firing Furnace.

	<p><b>Danger!</b></p> <p><i>Systems equipped with an uninterruptible power supply (UPS) may require that the UPS be powered OFF manually to disconnect all electrical power.</i></p>
---	--

## 2.4. Fire

Keep the UltraFlex Drying and Firing Furnace clean and free of scrap materials, oil or solvents to prevent the possibility of fire. In the event of fire, use a fire extinguisher as follows.

1. De-energize the machine immediately by pushing an Emergency Stop push button
2. Turn off the remote main disconnect (customer supplied disconnect).
3. Extinguish the fire.

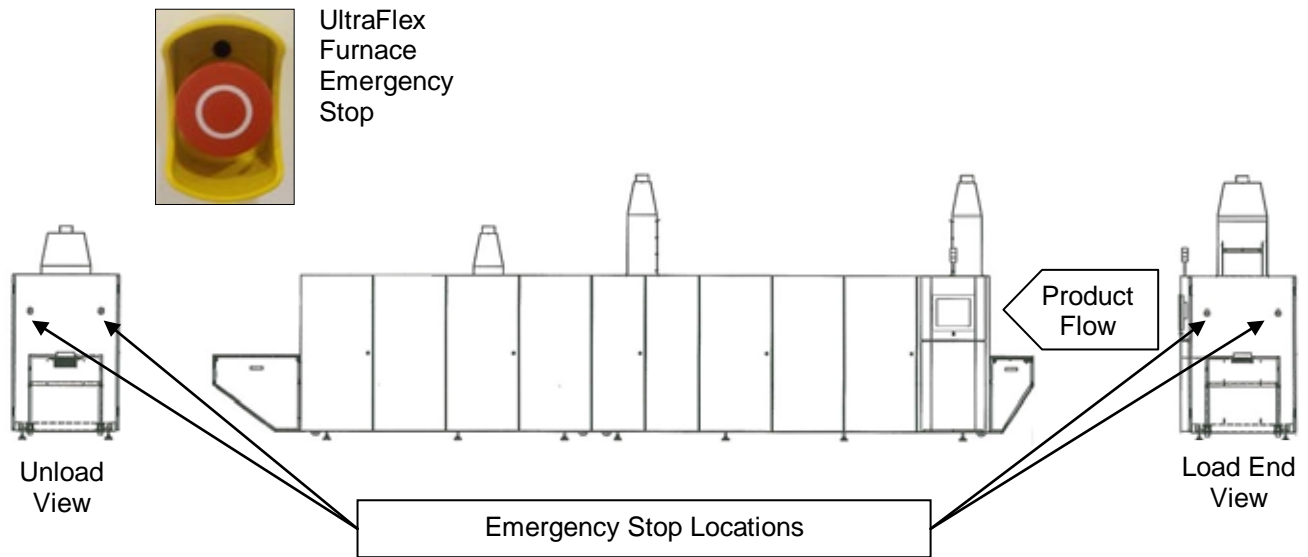
	<p><b>Danger!</b></p> <p><i>Always disconnect all power before extinguishing a fire. Attempting to extinguish a fire in a machine connected to electrical power can result in serious injury or death!</i></p>
---	--

## 2.5. Equipment Lockout Requirements

To prevent injury or equipment damage during inspection or repair, the UltraFlex Drying and Firing Furnace must be locked out.

### 2.5.1. Emergency Stop

When a risk of personal injury or damage to the UltraFlex Drying and Firing Furnace exists, push an Emergency Stop operator. This shuts off all electrical power to the machine. Figure 1 shows location of Emergency Stop operators.



**Figure 1. UltraFlex Furnace Emergency Stop Locations.**

### 3. Theory of Operation

The Despatch UltraFlex furnace is a second generation in-line (conveyorized) furnace (following the Despatch CF/CDF series). It is designed for use in photovoltaic manufacturing lines for the express purpose of drying and firing metalized paste to silicon substrates. The furnace process immediately follows the last screen printing step (typical manufacturing process steps shown in Figure 2).

The UltraFlex furnace is available as a firing furnace alone (Model FF) or with an integral dryer (Model DFF). The function of the dryer portion of the machine is to liberate Volatile Organic Compounds (VOCs) from the screen printed substrate to prevent firing anomalies. Infrared radiation and resistant heaters provide the heat source for the drying process. The UltraFlex dryer incorporates a self-contained oxidation system that incinerates VOCs at the point of evacuation or exhaust. VOCs are exhausted near the entrance and exit of the dryer directly into individual Thermal Oxidizers. Each Thermal Oxidizer is independently monitored and controlled to ensure temperature and flow are maintained within proper limits to achieve VOC destruction.

The function of the furnace is to sinter the screen-printed and dried paste to the silicon substrate as the final manufacturing step in producing a solar cell. The furnace uses infrared radiation as a heat source and a combination radiant/convective chiller to remove heat from the product and belt prior to exiting the machine.

From beginning to end the drying/firing process entails drying, binder (polymer) burn-out, sintering and cool-down. Production speeds are approximately 457.2- 698.5 cm per minute (180-275 inches per minute).

Both the dryer and furnace use an industrial programmable logic controller (PLC) and Microsoft Windows touch screen PC (human-machine interface, or HMI) as the primary control platform and human/machine interface respectively. All software is proprietary to Despatch Industries.

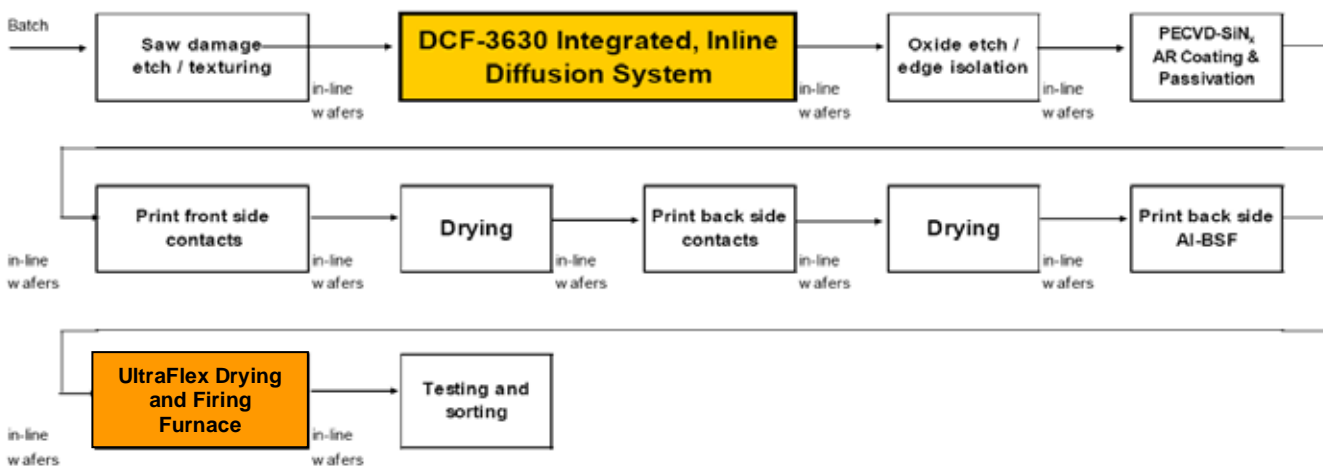


Figure 2. UltraFlex Infrared Firing and Drying Furnace in Manufacturing Line.

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### 3.1. UltraFlex Drying and Firing Furnace Machine States

The UltraFlex Drying and Firing Furnace operates using a series of seven modes. The tool dries and diffuses wafers using the Production Mode (Figure 3).

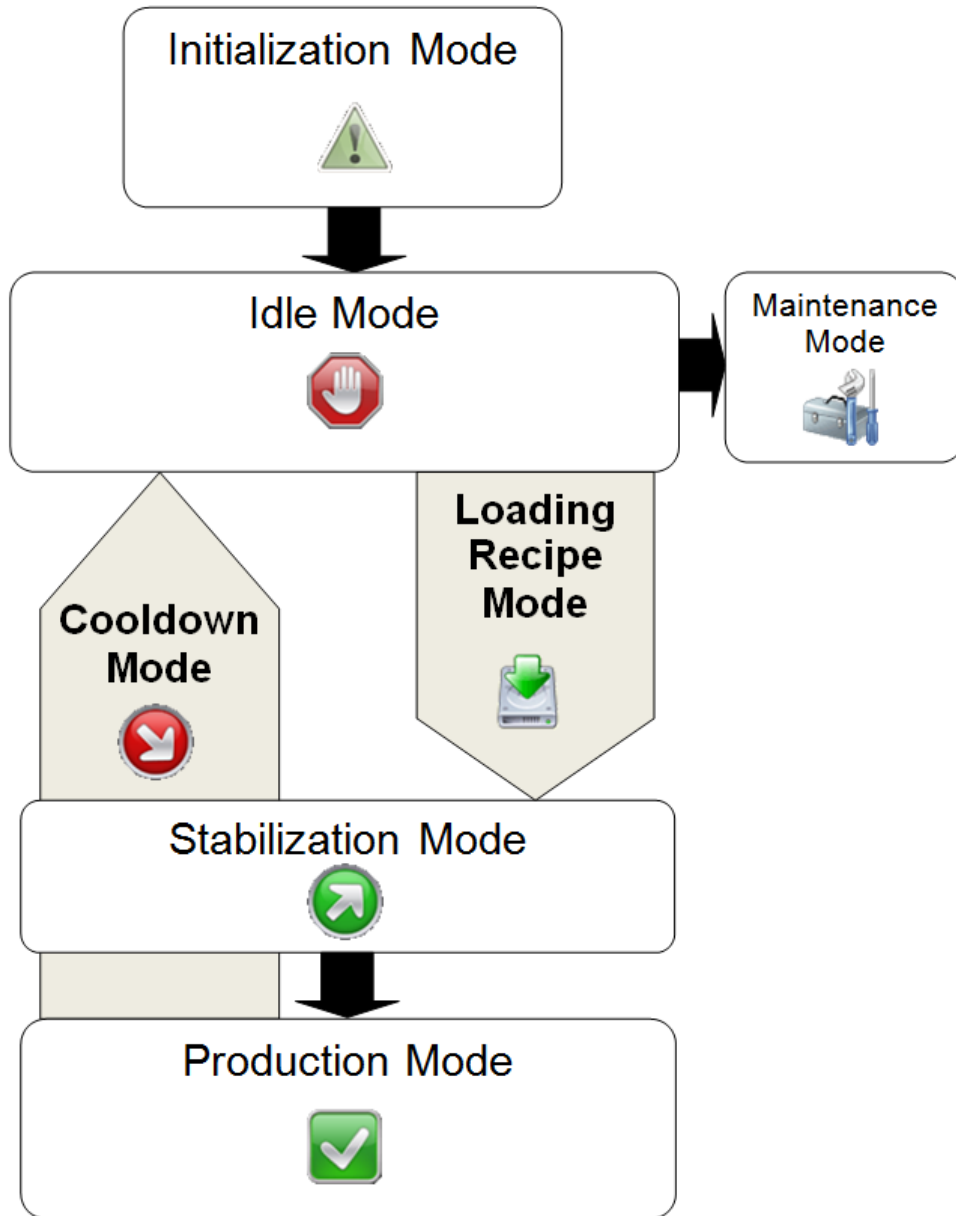


Figure 3. UltraFlex Furnace Machine States.

### 3.1.1. Power Off

Tool is OFF. Power the tool ON at the main breaker.

### 3.1.2. Initialization Mode



Initial entry state when starting the program. During Initialization, the system performs startup sequences such as:

- Diagnostic routines check for hardware errors
- System checks for local/remote I/O status. If necessary, error messages display and program remains in Initialization Mode.
- The Human Machine Interface (HMI) and the Programmable Logic Controller (PLC) are both powered up into the “Run” state. Recipe values are matched and the last running recipe is loaded. Note that a default recipe is defined at the first start up
- After successful diagnostic routines and checks, the system sets displays and outputs to default conditions and enters the Idle Mode

### 3.1.3. Idle Mode



The Idle Mode allows for recipe creation, editing and selection, without need to run the entire system. Idle Mode includes these conditions:

- The tool is idle.
- If alarm conditions exist (for instance waiting because of E-stop, high temperature limit or power low), those conditions must be acknowledged before starting the tool. In fact, exception conditions may cause the system to switch to the Stabilization or Cooldown states. A separate HMI “E-STOP Reset” sets a relay output that resets the safety circuit.
- All alarms are enabled

### 3.1.4. Loading Recipe Mode



The Loading Recipe Mode simply begins the loading process for the selected recipe. After loading a recipe, the user can start Production Mode.

### 3.1.5. **Stabilization Mode**



In Stabilization Mode the system monitors the process values until they are within a defined window and then proceeds to the Production Ready state when the system is stable.

### 3.1.6. **Production Mode**



Production Mode is the machine state used for production and maintains process values status with respect to recipe-specified target set points and deviation limits.

- Deviation exceptions and physical input exception conditions may cause the system to automatically switch to the Stabilization or Cooldown states.
- If the user selects to stop the process using the HMI console, the system enters the Cooldown state.

### 3.1.7. **Cooldown Mode**



In the Cooldown state, dryer and furnace heating is disabled while other systems (including cooling water, airflow, and oxidizer) hold the threshold temperature.

- When heat zones have cooled below the Cooldown threshold, the system shuts everything off and enters the Idle Mode.
- Using the Rapid Cool option, the system opens the chamber to approximately one inch for rapid cooling.

#### 3.1.7.1. **Quick Cooldown Mode**

In quick Cooldown mode, the chamber opens slightly for more rapid cooling. Quick Cooldown mode follows this process:

- Audible alarm sounds
- Casing lowers roughly 80 mm
- The conveyor is ON
- The tool goes to Idle Mode

### 3.1.8. Maintenance Mode



Manually select Maintenance Mode to service the tool:

- Maintenance state is open loop control mode only. 0-100% power control is available.
- User inputs are blocked to ensure safe operation of the tool.



#### **Warning!**

- **General alarms (for instance, temperature high and low) are not active in Maintenance Mode.**
- **Safety interlocks remain active in Maintenance Mode.**



**Only qualified and trained personnel should perform maintenance or repair.**



**Access to Maintenance Mode is available only when the chamber temperature is below the Cooldown threshold.**

## 3.2. Optimized Recipes and Thermal Profiling

The UltraFlex furnace optimizes heat transfer for firing so setpoints may be lower compared to other furnaces. During UltraFlex furnace fast firing and cooling profiles (those greater than 125°C/second), a wafer measured with a light gauge thermocouple spring typically under-reports true wafer temperature. Contact Despatch Global Headquarters for:

- A method to optimize the efficiency of a wafer through design of experiments
- The Despatch measurement tool that more reliably reports wafer temperature

### 3.2.1. Thermal Profiling Process

Thermal profiling consists of these general steps:

1. Determine the profile window. What needs to be accomplished with each wafer as it moves from drying to burnout to firing to cooling?

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2. Determine process speeds: Conveyor maximum and minimum speeds based on the entire line as well as the paste manufacturer's process window.
3. Determine the number of firing zones required for the profile.
4. Determine airflow rates (dryer and furnace), cooling rates and burnout temperature.



**Due to the use of Microzone™ technology, conventional high temperatures and fast belt speeds are not required.**

**While eight zones using Microzone technology are available, typical profiles make use of three to four zones.**

Additional steps may include:

- Adjusting Microzone™ technology to optimize the profile
- Adjusting the final wafer temperatures
- Testing the process using thermocouple assemblies and samples
- Reviewing cell electrical results, adjusting settings and rerunning the process

Refer to Recipe Setup and Optimization (4.3) for specific setup instructions.

### **3.3. UltraFlex Dryer**

#### **3.3.1. Overview**

To achieve the desired rheological and other compositional qualities, all photovoltaic (PV) metallization pastes contain volatile organic compounds (VOC). After printing with these pastes, the printed cells must be properly dried to avoid the release of hazardous fumes into the furnace, to avoid excessive equipment contamination and to achieve VOCs maximum cell performance.

The UltraFlex Dryer transports printed cells (wafers) through multiple integrated, independently-controlled heating chambers using a variable-speed conveyor (Figure 4). The wafers are heated to a temperature that liberates volatiles from the paste and evacuates the VOCs from the heating chamber using a closed-loop control process gas system. The VOCs are then exhausted into the integrated thermal oxidizer where they are destroyed leaving only CO<sub>2</sub> and H<sub>2</sub>O byproducts. The wafer is then transferred directly into the firing furnace for further processing.

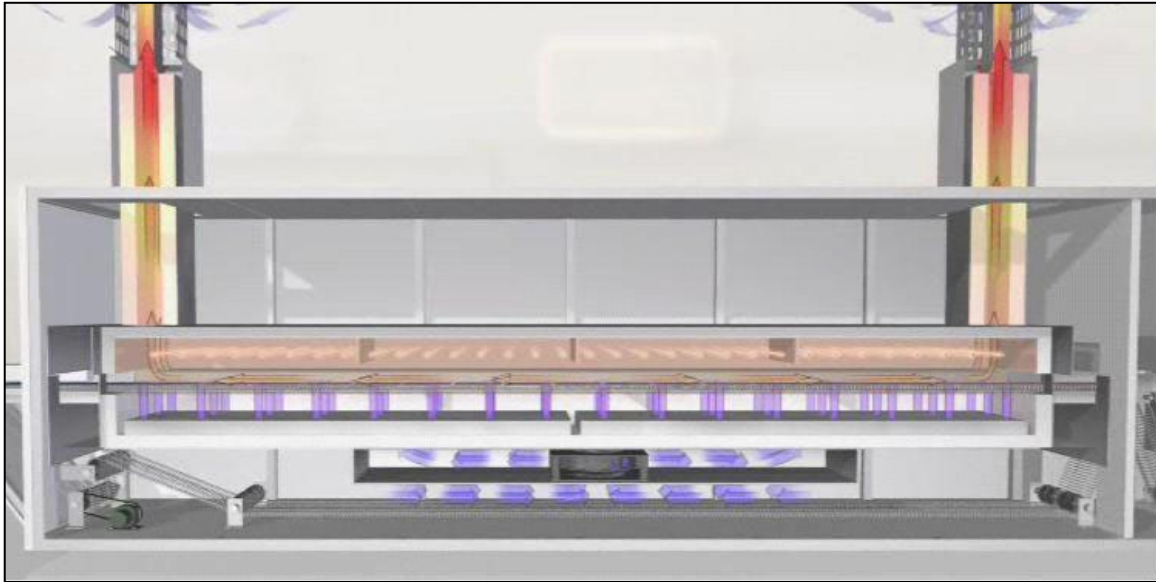


Figure 4. The UltraFlex Dryer Transports Wafers through Multiple Chambers.

### 3.3.2. Transport System

The wafer transport system consists of a mesh belt, drive motor, programmable logic controller (PLC), variable frequency drives (VFDs), encoders, wafer sensors, precision guides and an internal support system. The mesh belt is designed to contact the wafers only at the outer extremities, minimizing surface damage and allowing uniform heating without influence from belt contact. Belt speed is controlled with a closed loop system including the PLC, VFD, motor and encoder. The transport system is designed to operate from 64-635 cm/min with an accuracy of  $\pm 0.5\%$ . The conveyor is supported within the chamber by a series of quartz rods secured by glass plates within the refractory. Wafer sensor photo-eyes are secured on the entrance and exit of the chamber to ensure safe operation of the machine below the lower explosive limit of the processed VOCs.

### 3.3.3. Heating System

The heating system includes three separate yet integrated systems. The lower portion of the chamber has resistance-coil heating for preheating the process gas introduced in the chamber. The dryer upper chamber contains infrared (IR) lamps to heat the wafers to the point of solvent evacuation as they pass through the chamber. The oxidizer resistance coil heaters destroy the VOCs removed from the wafer in the process. All three heating systems are close-loop controlled via PLC, thermocouples, SSR and SCRs. The typical operation temperature of the lower chamber preheater is approximately 350 °C. IR lamp

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heaters operate in a typical range of 200-550 °C and the oxidizer operates at 760 °C. Setpoints and tolerances for all heating systems are a function of setting the recipe.

### 3.3.4. Process Gas System

Process gas is delivered using a control system made up of the PLC, mass flow controllers (MFC), proportioning valves and monitoring pressure transducers. Air is introduced into the upper and lower dryer heating chambers by the MFCs, where it is preheated and delivered to the chamber cavity. MFCs provide exhaust air flow to each dryer zone to clear the VOCs. Oxidizers evacuate contaminated process air at the ends of the chambers and destroy the VOCs, leaving only CO<sub>2</sub> and H<sub>2</sub>O byproducts.

Note:

- Two proportioning valves are factory set to achieve and maintain the required flow for oxidizer air. Two additional factory-set proportioning valves provide dryer entrance and exit air spargers (air curtains).
- Set any of the four dryer process air MFCs by using the **Recipe** screen (Set Four Dryer Process Air MFCs Using the Recipe Screen.).
- The PLC uses pressure transducers (there are several) to convert pressure to flow numbers for control, display and alarm purposes.



**Only Despatch personnel are permitted to change proportioning valves.**



Figure 5. Set Four Dryer Process Air MFCs Using the Recipe Screen.

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### 3.3.5. Oxidizer Airflow Settings



***The exhaust set-point adjusts with the Oxidizer flow set-point and does not require separate adjustment.***

The dryer is shipped with factory airflow and pressure settings which produce balanced-conditions, that is, the dryer is balanced from end to end—equal amounts of exhaust flow through each oxidizer, and the dryer runs at a very slight negative pressure compared to the room. Keep the dryer in a balanced condition by always using the factory settings.



***Consult Despatch for assistance before using non-standard oxidizer airflow settings.***

### 3.4. Wafer Throughput

The UltraFlex Drying and Firing Furnace is designed for a specific solvent load. Dilution air volume dictates the amount of flammable solvent that can be safely processed in the furnace. The dryer is equipped with an airflow safety switch to ensure the introduction of the minimum volume of dilution air. The MFC ensures the introduction of the proper volume of dilution air.

As the tool moves into Production Mode, screens prompt the user to enter information necessary for determining the proper LEL (lower explosive limit) levels. See Section 5.2 for more information.



### 3.5. VOC Thermal Oxidizer

Paste used in the metallization process can produce harmful byproducts containing volatile organic compounds (VOCs) that vaporize into the atmosphere. In the United States, the Environmental Protection Agency (EPA) requires effective abatement of VOCs.

The Despatch VOC Thermal Oxidizer was designed to eliminate over 99% of VOCs from gasses exhausted during solar cell manufacturing. Destroying the VOCs using the Oxidizer eliminates the need to collect and dispose of this waste in a separate process. The exhaust exiting from the VOC Oxidizer contains only CO<sub>2</sub> and water vapor.

The Despatch VOC (Figure 6) uses elevated temperatures to cause organic compounds to combust when exposed to oxygen. Thermal destruction of most organic compounds takes place at 350 °C to 450 °C. Thermal oxidizers typically maintain a temperature of 760 °C to ensure destruction of all VOCs. The process releases heat and so contributes to maintaining the temperature of the oxidizer.

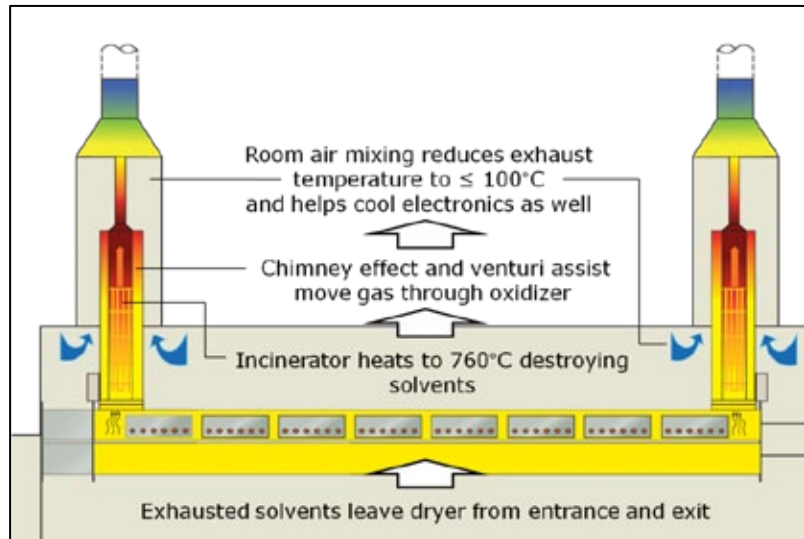



Figure 6. Despatch VOC Thermal Oxidizer Operation.

### 3.6. Chamber Lift Mechanism

The chamber lift mechanism is operated by a pneumatic cylinder and a set of lift chains which lift the chamber into place and seal the upper and lower casings. The pneumatic cylinder applies a lower pressure to lift the casing. When the casing is within roughly 50 mm, the cylinder applies a higher pressure to seal the casing. Pressure is continuously applied to the casing while the tool is in Production Mode.


	<b><i>Use of the pneumatic cylinder to close and open the chamber means no clamps are required for operation.</i></b>
---	---

Operation of the chamber lift is accomplished through the screens provided (Section 5.7).

	<b><i>Operating the Chamber Lift mechanism requires that the tool be in Maintenance Mode.</i></b>
---	---

Warnings and alerts for the chamber lift mechanism include:

- Audible and on-screen warning before opening
- Alert if the chamber opening or closing does not complete the cycle

	<b><i>If the chamber is open, neither heaters nor conveyor will run (except in Cooldown mode when casing opens 80 mm).</i></b>
---	--

## 4. Software & Hardware Setup



Always read and understand Section 2—Safety before installing, performing maintenance or adjusting the UltraFlex Drying and Firing Furnace.

### 4.1. Operation Overview

The Home Screen of the UltraFlex Drying and Firing Furnace is the system default screen, the screen that appears after boot-up (Figure 7). Navigate from the Home Screen to all other screens and modes (including Ready, Stabilization, Cooldown and Idle) used to operate the UltraFlex Drying and Firing Furnace (Figure 8).

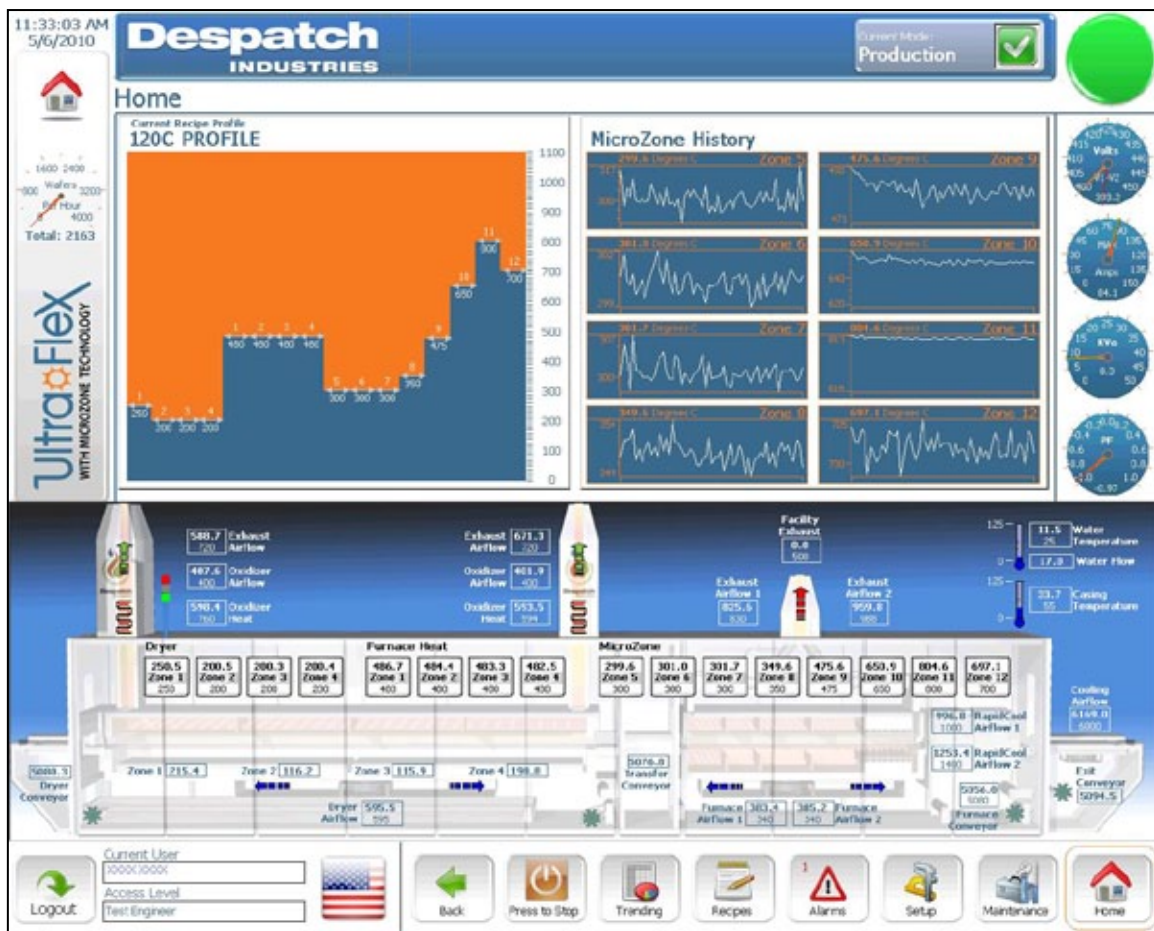


Figure 7. Typical Home Screen (UltraFlex).

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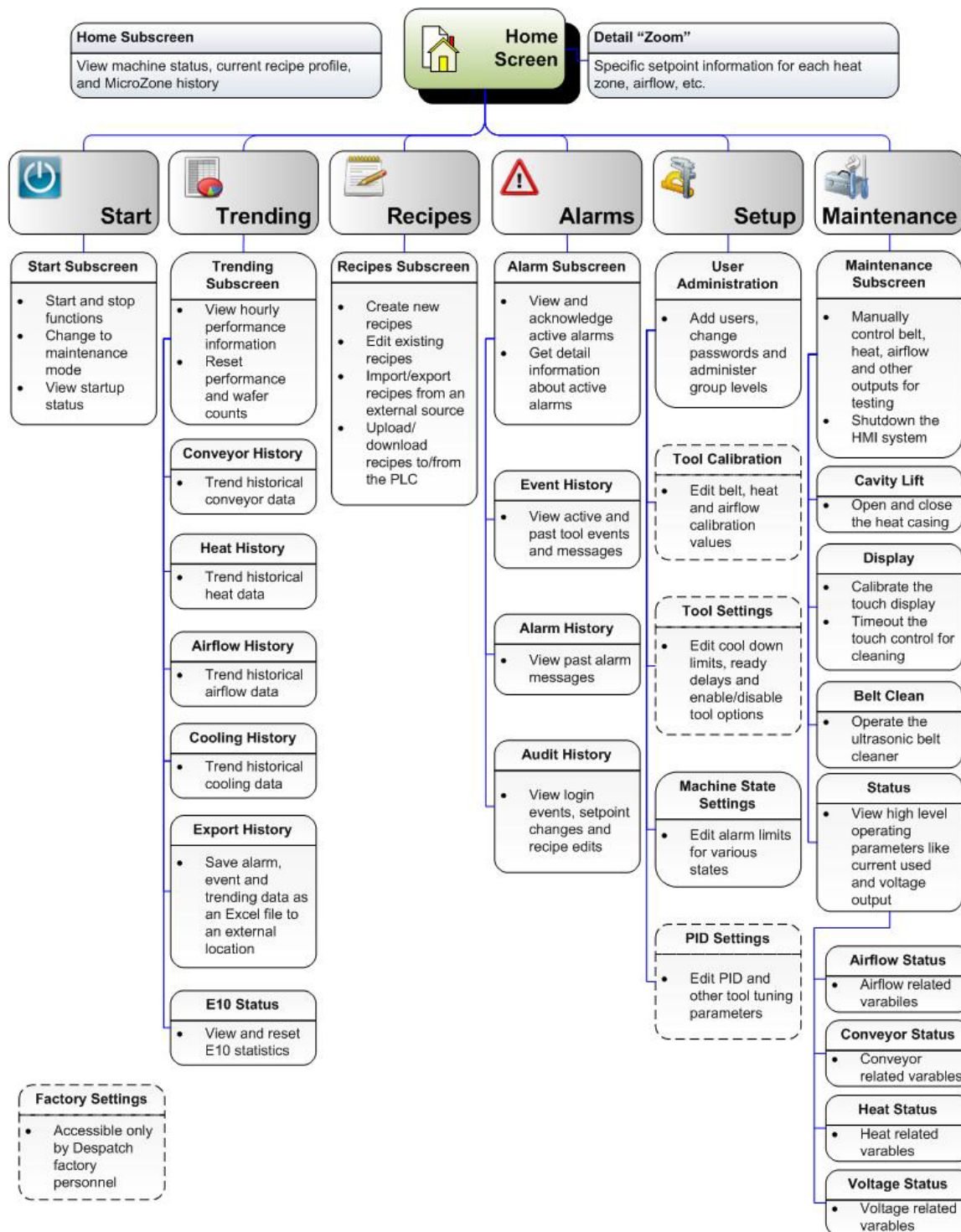


Figure 8. UltraFlex Drying and Firing Furnace Software Navigation.

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## 4.2. Managing Users

After launching the UltraFlex Drying and Firing Furnace, login to gain access to system functions.

### 4.2.1. Security Levels

Security to the various functions of the UltraFlex furnace (Table 1):

**Table 1. UltraFlex Security Levels.**

UltraFlex Furnace Function	Security Level			
	Operator	Maintenance	Process Engineer	Despatch Users
Load Recipes/Run System	X	X	X	X
Acknowledge Alarms	X	X	X	X
Change Languages	X	X	X	X
Edit Recipes		X	X	X
Maintenance Mode		X	X	X
Open Chamber		X	X	X
Enable Remote Access		X	X	X
Edit Data logging		X	X	X
Export/Import Users			X	X
Export/Import Calibrations			X	X
Exit System			X	X
Export/Import Machine Constants				X
Edit PID Values				X

### 4.2.2. Adding a User or Changing User Privileges

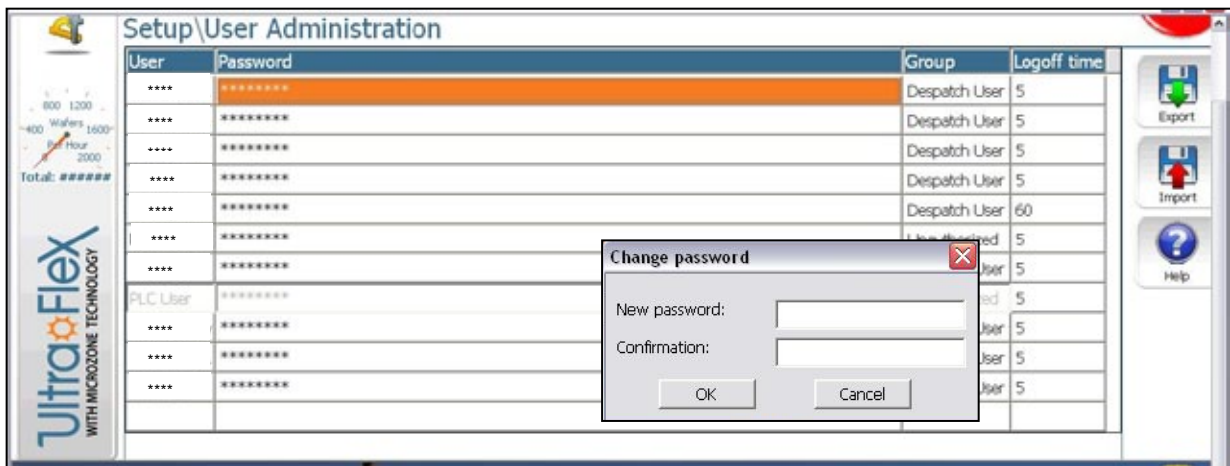
Adding a user or changing user privileges requires use of the user administration functions. Adding or changing functions includes user names, passwords, user group identification and specifying a logoff time.

**O** The UltraFlex Drying and Firing furnace keeps an audit trail which requires that every change be logged in by a user with a valid user name.

1. From the Home screen, press **Setup** (Figure 9).
2. Press **Users** in the User Administration section of the Setup screen.
  - a. Press **Help** at any time for more Information
3. Using arrow keys go to the last row on the screen.
4. Double-click (or press Enter) on that row until the blinking cursor appears



**Figure 9. Press Setup and then Users to Add or Change User Information.**



**Figure 10. Enter or Change User Information with the Setup/User Administration Screen.**

- a. Enter User name
  - b. Use the full first and last name for the User name entry.
  - c. Enter New password and Confirmation
5. Passwords must be at least four characters
    - a. Under Group, assign the group appropriate to the tasks required for the user.

- b. Enter Logoff time (maximum time the system can remain idle until it automatically logs out).

### 4.3. Recipe Setup and Optimization

Traditional recipes for solar cell production often adjust conveyor or belt speed to reach the desired profile. The UltraFlex furnace uses Microzone technology to precisely heat or cool wafers to the desired temperature. Microzone technology combines optimized radiant wavelengths with custom lamps to provide accurate profiles—independent of conveyor or belt speed. Microzone technology allows for unprecedented precision in achieving profiles without changing conveyor or belt speed and thus affecting the rest of the line.

#### 4.3.1. UltraFlex Furnace Setpoint Ranges

The setpoint ranges in Table 2 are based on typical product temperatures rather than oven temperatures. Figure 11 shows example firing zone setpoints versus actual temperatures for belt speeds of 508 cm/min and 635 cm/min. Actual zone temperatures (as measured at the wafer or wafer facsimile) will vary with belt speed and temperature disparity from adjacent zones. The same recipe will produce different measured temperatures at varying belt speeds. Measure the temperature profile following each recipe change.



Lamp zone setpoints less than 300 °C may adversely affect lamp life.

**Table 2. UltraFlex Furnace Typical Setpoint Ranges.**

UltraFlex Furnace Process Area	UltraFlex Furnace Setpoints	
	Lower Setpoint	Upper Setpoint
Dryer Zones 1-4	25°C	500°C
Furnace Zone 1	25°C	600°C
Furnace Zones 2-4	25°C	750°C
Furnace Zones 5-12	25°C	1050°C
Conveyor Speed	100 cm/min	635 cm/min
Oxidizer	25°C	780°C

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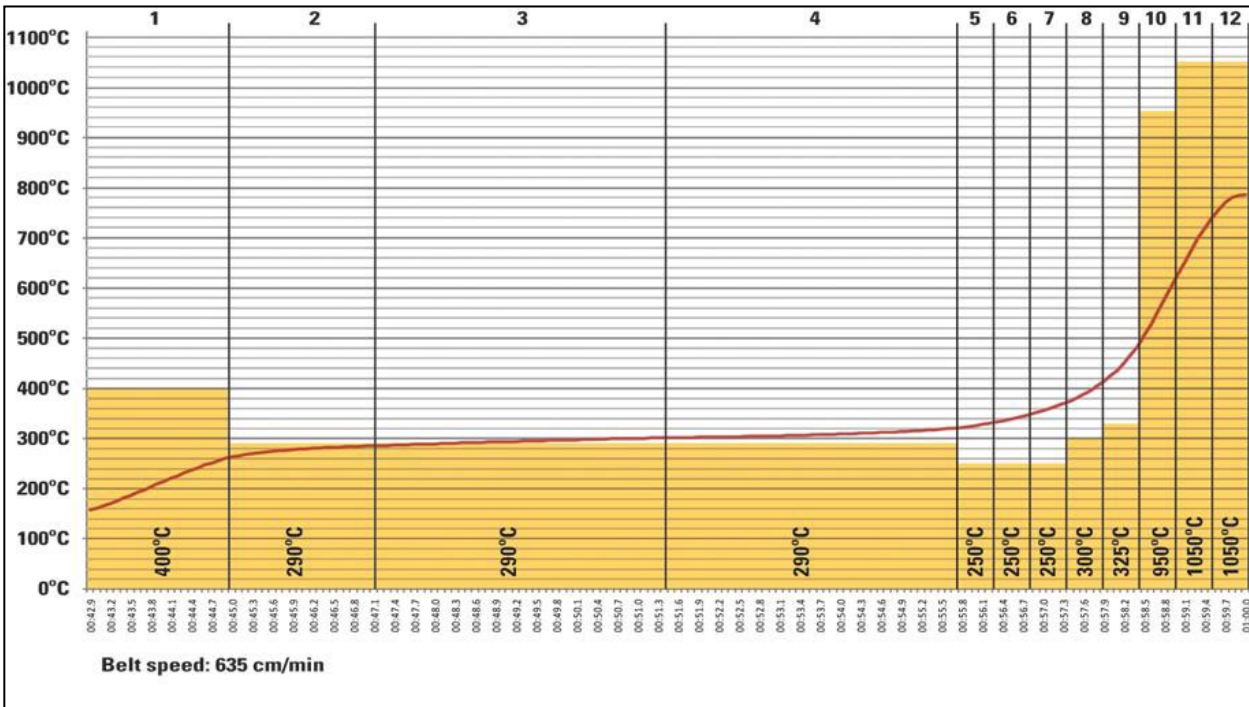
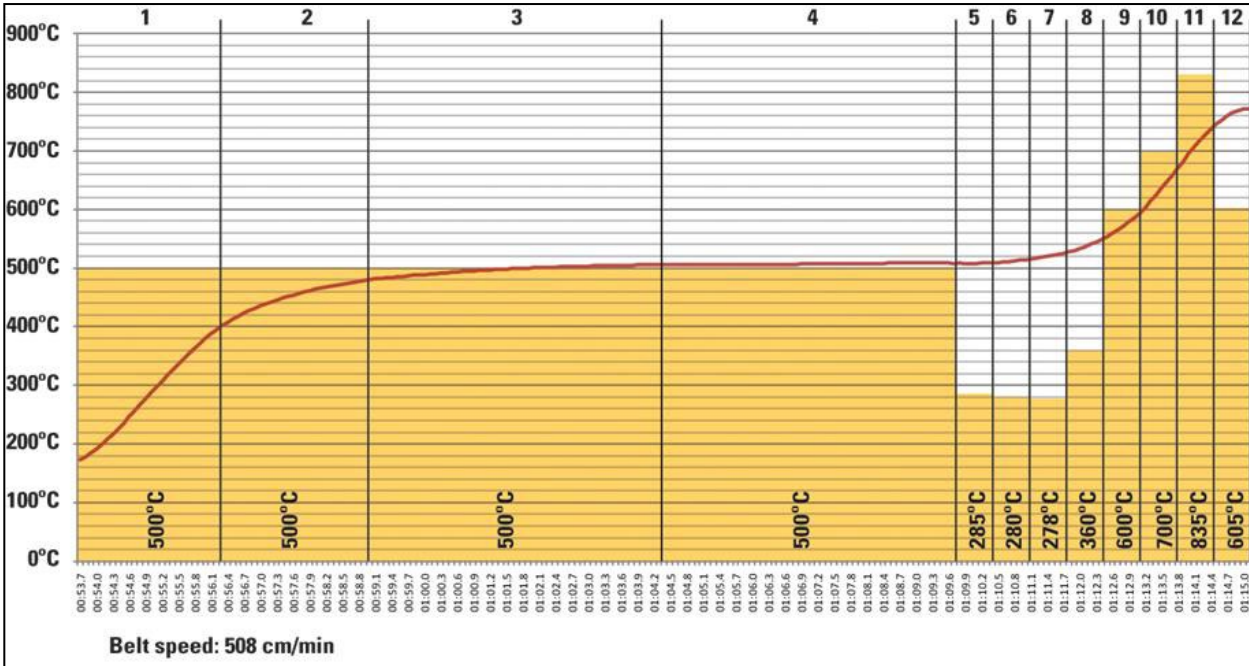


Figure 11. Typical Firing Zone Setpoints vs. Actual Temperatures.

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### 4.3.2. Optimize Recipe Process with Example



Precise profile control is achieved using UltraFlex furnace Microzone technology rather than the traditional control of conveyor or belt speed.

While the UltraFlex furnace offers a variety of flexible optimization options, the typical UltraFlex furnace burnout-fire-cool profile includes these steps:

1. Determine process speed (conveyor minimum and maximum speed), based on:
  - a. The minimum transport speed based on the speed of the slowest element in the production line.

#### Example Transport Speed:

- While your line may be different, in this example the printer is the slowest element in the line with a speed of 1 wafer every 2.2 seconds.

$$\frac{15.6 \text{ cm}}{85\% \text{ loaded wafer}} \times \frac{1 \text{ wafer}}{2.2 \text{ seconds}} \times \frac{60 \text{ seconds}}{(1 \text{ minute})} = 500.5 \frac{\text{cm}}{\text{minute}}$$

- At 85% loading with a wafer length of 15.6 cm, the minimum transport speed in the furnace = 500.5 cm/min.

- b. Minimum and maximum process speeds based on the recommended process window supplied by the paste company.

#### Example Minimum & Maximum Process Speed:

In this example, the recommended paste process time of 24-36 seconds includes heating, burnout and firing. The heated length of the UltraFlex furnace is 183 cm.

Maximum process speed:

$$\frac{183 \text{ cm}}{18 \text{ seconds}} \times \frac{60 \text{ seconds}}{(1 \text{ minute})} = 610 \text{ cm/minute}$$

Minimum process speed:

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$$\frac{183 \text{ cm}}{24 \text{ seconds}} \times \frac{60 \text{ seconds}}{(1 \text{ minute})} = 457.5 \text{ cm/minute}$$



Example: Belt speeds faster than 500.5 cm/minute will not increase production speed.

**Example Final Process Speed:**

Using the process speed (500.5 cm/minute) may limit production. Only conveyor speeds between 610 cm/minute and 500.5 cm/minute should be considered.

- Determine the number of firing zones (Table 3)  
Microzone technology allows for an infinite amount of profile changes, independent of belt speed.

**Table 3. Guideline to Determine Number of Firing Zones.**

Heating Slopes	Number of Firing Zones Required at:		
	342.9- 381.0 cm/min (135-150 inch/min)	482.6-558.8 cm/min (190-220 inch/min)	584.2-635 cm/min (230-250 inch/min)
<b>Typical Profile</b> 100-125°C/sec	4	5	6
<b>Rapid Firing Profile</b> 125-150°C/sec	3	4	5
<b>Very Rapid Firing Profiles</b> >150°C/sec	2	3	4

**Example Number of Firing Zones:**

In this example, a typical profile (100°C-125°C/second) would require five to six firing zones.

- Set airflow in dryer and furnace. While greater volumes of air help clean the furnace, they also elevate electricity consumption and require greater exhaust flows.

**Example Airflow:**

In this example of a single lane tool, the HMI (inflow) is set to:

- Low end: 190 Lpm
- High end: 380 Lpm

4. Determine single lane or dual lane cooling rates. Rapid Cooling 1 and Rapid Cooling 2 blow air downward from above the wafer and provide top and bottom radiant cooling. The cooling rate depends on fan speeds, cooling water temperature, wafer mass and belt speed. Faster belt speeds require more cooling, because more mass needs more cooling. The rapid cooling fans 1 and 2 run between 4% and 100% when ON. Even at a 0% setting there will be a 4% minimum speed, which is required for stable fan operation. Typical cooling rates are 50° to 65°C/ second. Adjust fan speeds to obtain the desired cooling. If wafers are blown out of position or if excess vibration is observed, reduce fan speed.
5. Determine burnout temperature
  - a. In general, lower temperatures and longer burnout times are more productive. But final results are also based on the paste manufacturer recommendations.
  - b. If burnout is insufficient, increase the temperatures or reduce belt speed and use.

**Example Burnout Temperature:**

In this example, typical burnout temperatures range from more than 300°C to less than 800°C.

6. Adjust Microzone™ technology for desired peak temperature and profile. Microzone technology is typically set to higher setpoints in the center of the firing zones to optimize heat transfers—based on shared view factors with adjacent zones.
7. Adjust final wafer temperature using the exit conveyor cooling blower volume. On the Recipe screen (Figure 12):
  - a. Press **Recipe**.
  - b. Press **Exit Conveyor Cooling Airflow** and adjust blower speeds (to roughly 75%) until the wafers begin to move.
  - c. Reduce the setpoint by 1-2%.
  - d. Press **Save** to use in the currently running recipe.



Expect achievable temperature variations of 200° C from zone to zone.



Microzone technology is thermally protected from the cumulative temperature. An alarm is set if the limit temperature is exceeded.

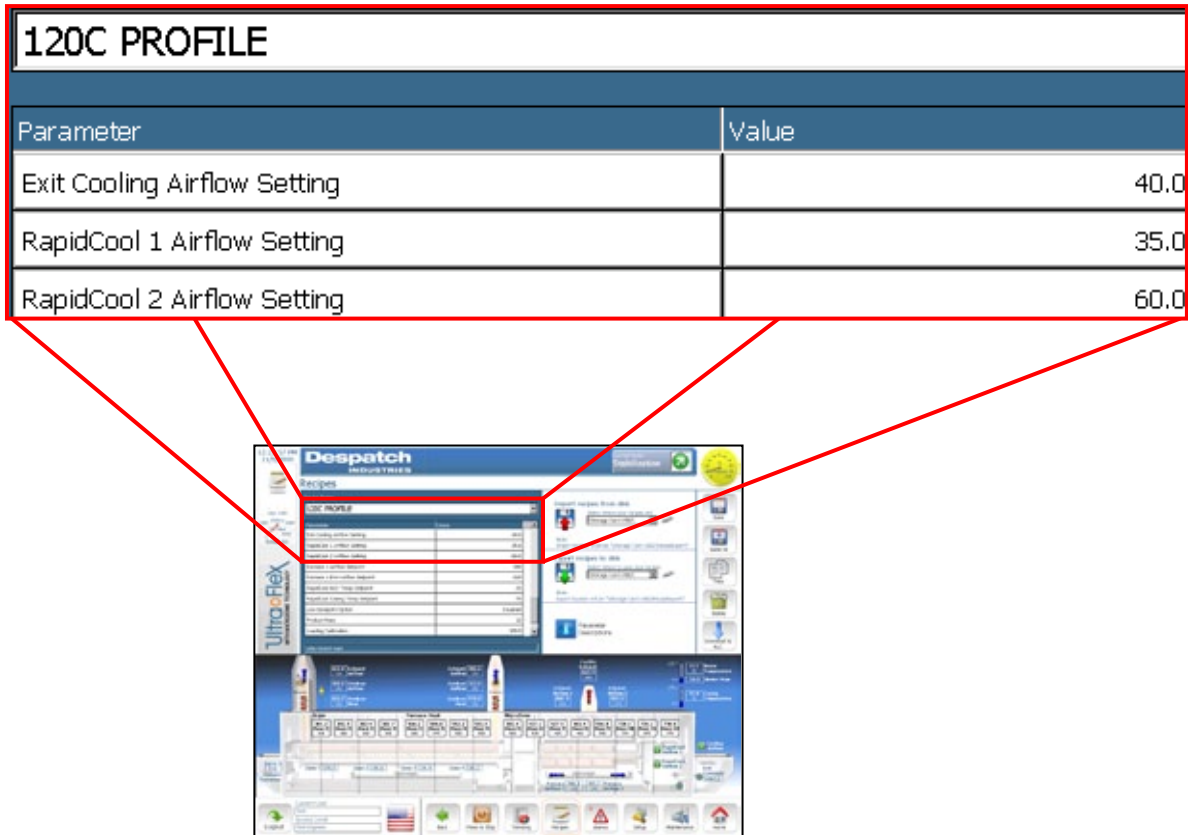


Figure 12. Adjusting Value on Detail Box.


## 4.4. **Dryer/Firing Furnace Airflow Setup**

Airflow setup on the UltraFlex furnace is essential for both safety and process performance. Specific recipe process gas parameter inputs at the HMI depend on accurate airflow setup. A 45-point airflow system calibration is performed prior to shipping the UltraFlex furnace. This calibration helps ensure accurate airflow throughout the range of operation, in all circuits, and that the flow is accurately portrayed at the HMI.

Entrance and exit sparges form air curtains that help contain VOCs within the dryer, for later processing through the VOC Thermal Oxidizer (Section 3.5). Only Despatch personnel may adjust the **Dryer Entrance Sparge Airflow Setpoint** and **Dryer Exit Sparge Airflow Setpoint** to minimize VOCs escaping the dryer.

**Dryer Entrance Heat Setpoint** and **Dryer Exit Heat Setpoint** set by Despatch personnel both control a lower set of lamps to provide heat that prevents VOC condensation at dryer entrance and exit.

### 4.4.1. **Dryer Airflow Setup**

	<p><b>Warning!</b></p> <p><i>Oxidizer airflow setpoints affect the ability of the dryer to draw out VOCs. Do not tamper with oxidizer airflow setpoints without consulting Despatch.</i></p>
--	--

Process air in the dryer serves primarily as a safety feature to evacuate volatile compounds in the paste. Configuring airflow in the dryer requires inputting information about the process, including:

- Amount of paste applied
- Solvent concentration
- Throughput

Based on these inputs, the furnace identifies a safe operating range of flow to maintain concentrations below the lower explosive limit (LEL). If loading the furnace creates an unsafe level of calculated LEL, the machine alerts the operator who must either increase air flow or reduce throughput.

Four recipe inputs determine dryer airflow: MFC1 (Mass Flow Controller for Dryer Zone 1), MFC 2, MFC 3 and MFC 4. Each input value is close-loop controlled with alert and alarm bands to protect the process and furnace.

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After entering the necessary paste information in the recipe, apply the necessary airflow values. The formula for calculating LEL is:

$$Factor = \frac{(Lpm\ air) * 3.328}{\frac{wafer}{hr} * (grams\ of\ paste) / wafer * (\% solvent)}$$

Table 4 defines the Factor value the Furnace uses to determine alert and alarm levels:

**Table 4. Determine LEL Alert and Alarm Levels.**

<b>If</b>	<b>Then</b>	<b>Machine State</b>
Factor $\geq$ 4	> 25% LEL	<b>Clear</b>
2.25 < Factor < 4	25-45% LEL	<b>Alert</b>
Factor $\leq$ 2.25	> 45% LEL	<b>Alarm</b>

Example:

If processing wafers at a rate of 1200 per hour with 1.2 grams of paste and a solvent concentration of 15% you would need a minimum 259 Lpm of air as a starting point:

$$(Lpm\ air) = \frac{(Factor\ of\ 4) * \left(1200 \frac{wafers}{hour}\right) * \left(1.2 \frac{g}{wafer}\right) * 0.15}{3.328} = 259\ Lpm$$

After establishing the starting point, adjust air flow up or down to operate in the most efficient manner while maintaining a safe evacuation flow.

## 5. Operation

### 5.1. Routine Operation

Routine operation of the UltraFlex furnace involves using the Home Screen (Figure 13). All functions of the UltraFlex furnace are available from this screen (Figure 8).

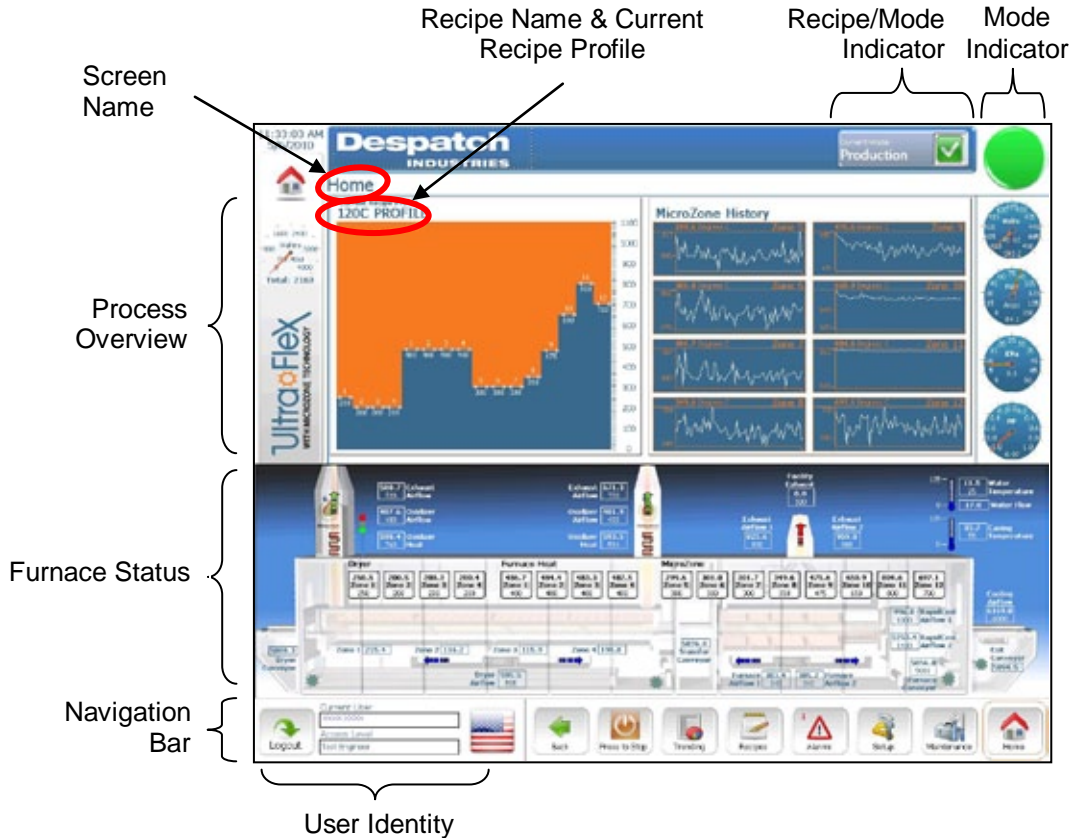


Figure 13. UltraFlex Furnace Home Screen.

○

**Graphic conventions used in the UltraFlex furnace show the current process value as the top number in the box and the current setpoint value as the bottom number.**

Belt Speed  
5072.3  
5080

Current process value

Current setpoint value

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### 5.1.1. Overview

#### 5.1.1.1. Using the UltraFlex Furnace Touch Screen Interface

The UltraFlex furnace touch screen is a highly sensitive screen that allows direct interaction with the data. Press firmly on any boxed area to change data using the on-screen keypad or keyboard (Figure 14). Note that the on-screen keypad and keyboard can be grabbed, moved to different parts of the screen and resized.

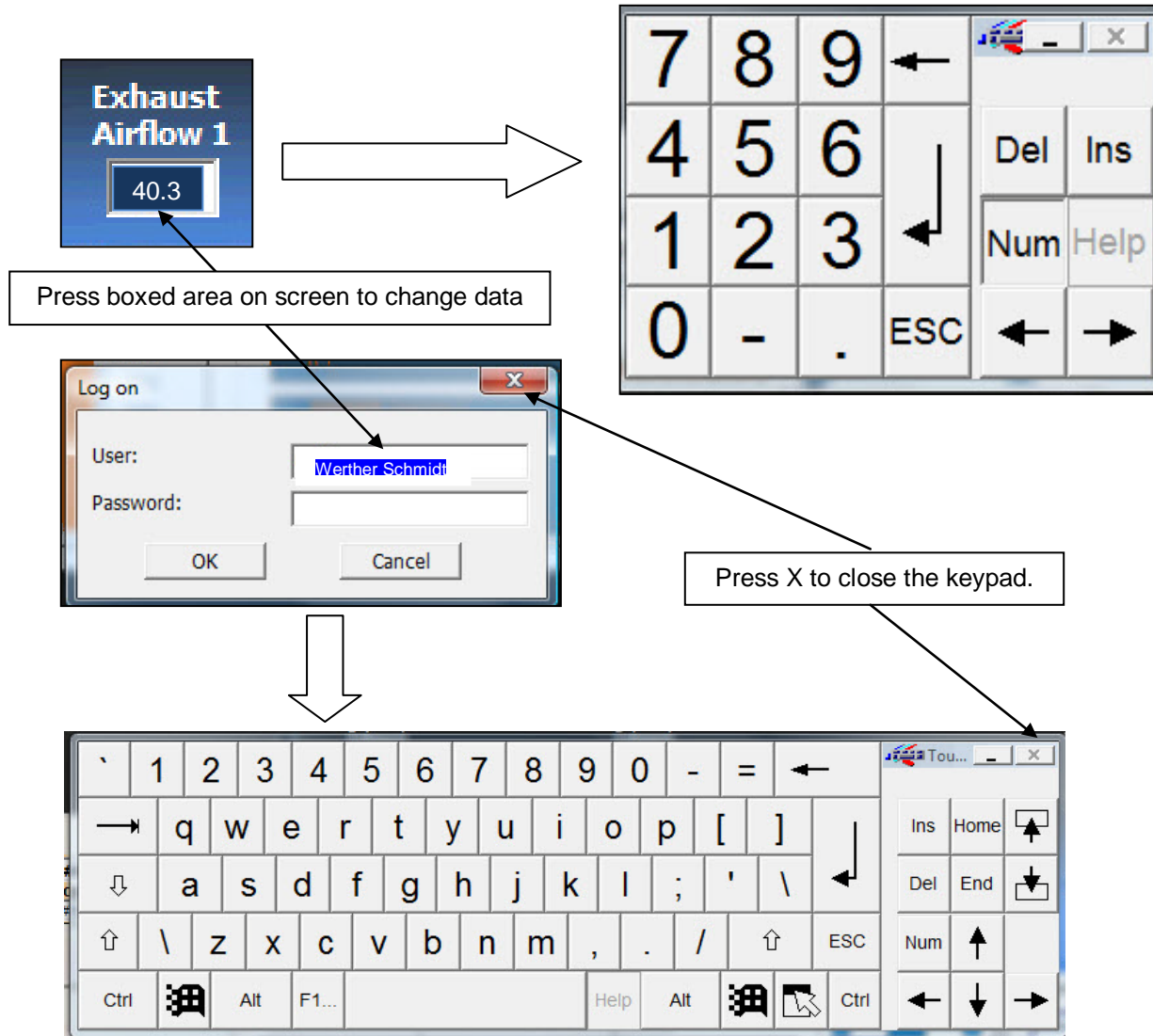


Figure 14. Use On-Screen Keypad or Keyboard to Enter Data.



### 5.1.1.2. Using On-Screen Controls

Adjust upper and lower limit on screens to focus on specific readings or trending information (Figure 15). Any box on the screen indicates a place where a user can input information.

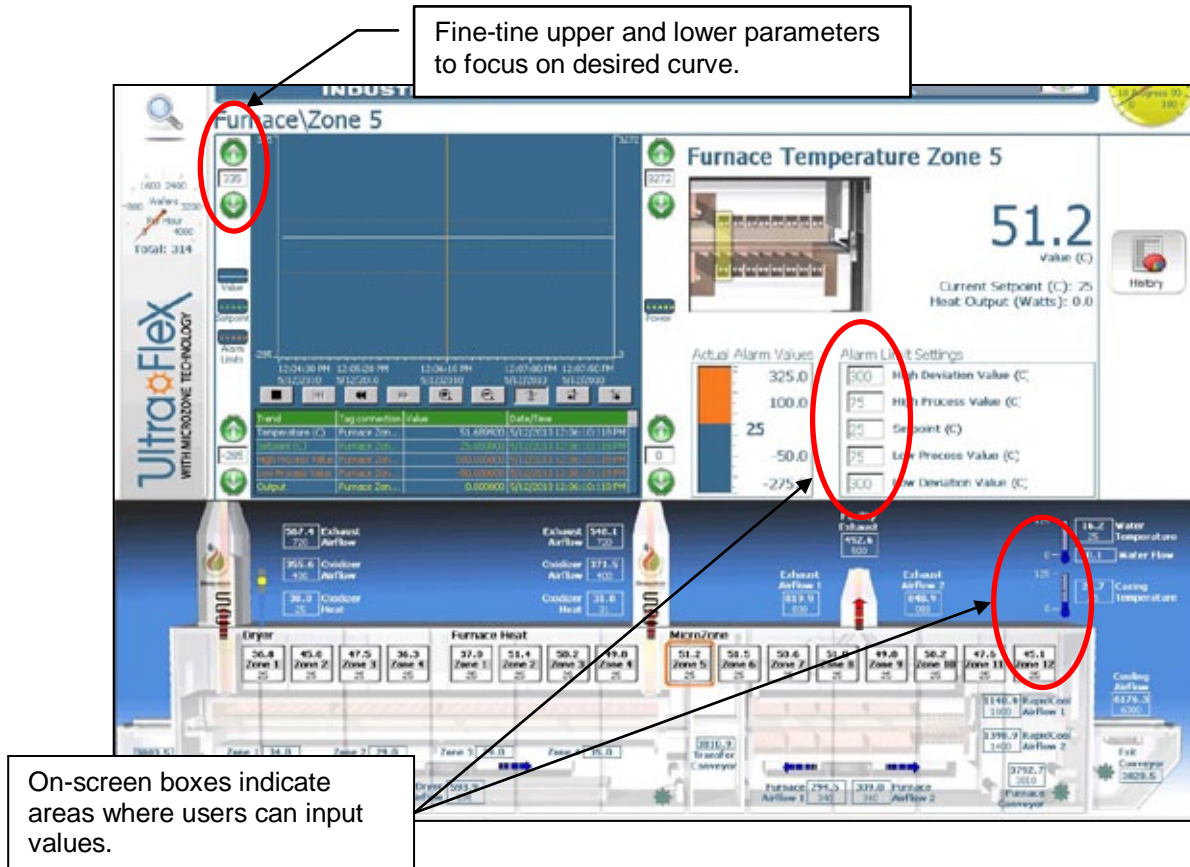


Figure 15. Using On-Screen Controls.

### 5.1.1.3. Process Overview

The top third of the Home Screen provides at-a-glance status of the current recipe including the current profile, profiles of each of the eight zones using Microzone technology and current electrical use (Figure 16).

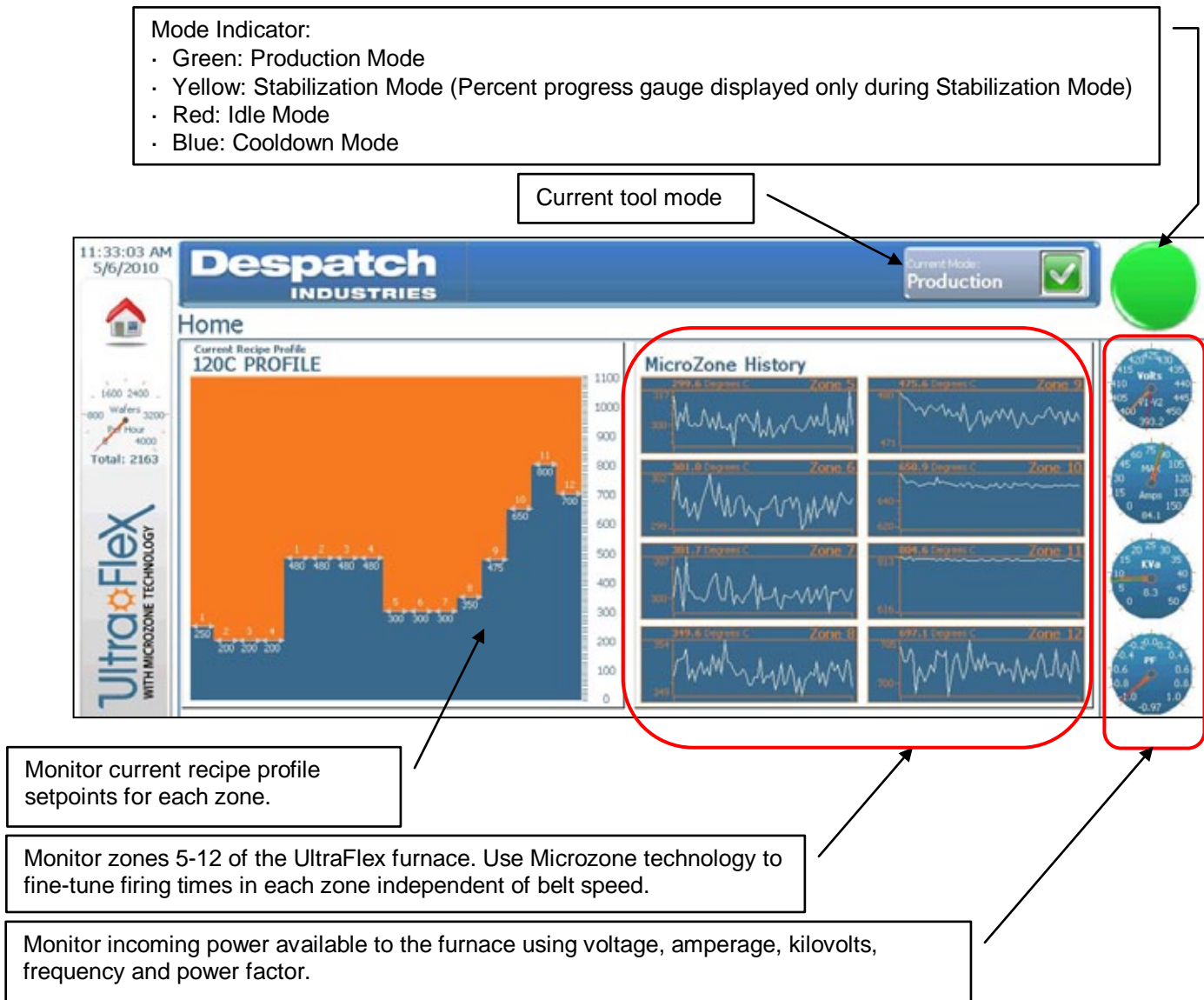


Figure 16. UltraFlex Furnace Home Screen—Process Overview.

#### 5.1.1.4. Furnace Status

The middle portion of the Home Screen presents a schematic perspective of the UltraFlex furnace showing actual and current setpoint values for each of the zones, belt speeds, exhaust values and other critical values (Figure 17). Touch any boxed area for a specific detail screen to replace the process overview (Figure 18).

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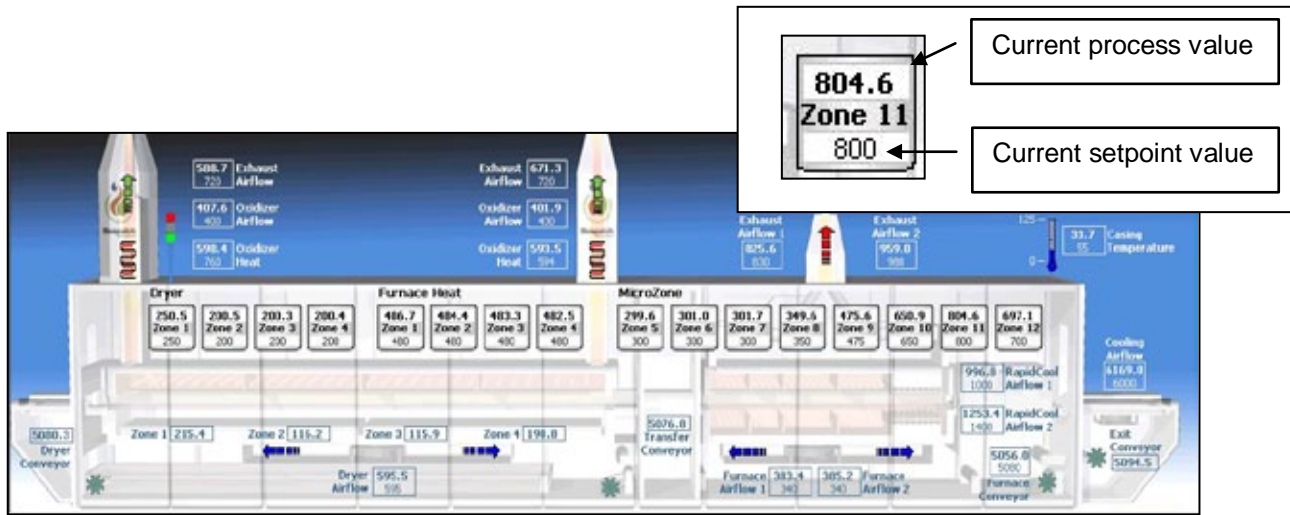


Figure 17. UltraFlex Furnace Home Screen—Furnace Status.

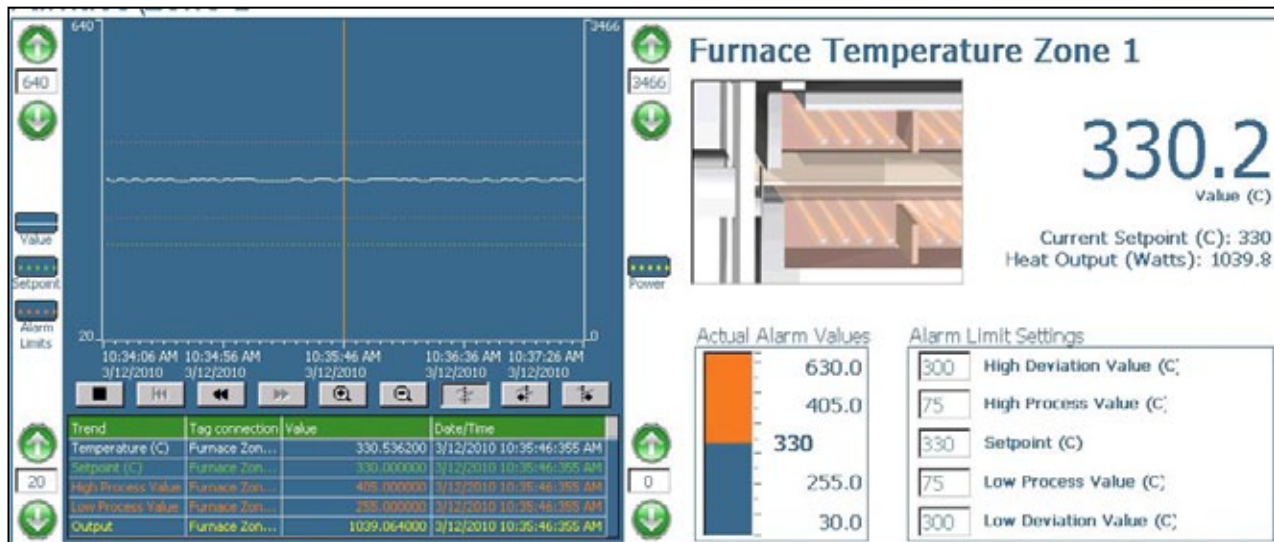


Figure 18. Typical Detail Screen for Furnace Temperature Zone 1.

### 5.1.1.5. Navigation Bar

The navigation bar on the UltraFlex furnace provides the user login as well as buttons for trending, recipes, alarms, setup, maintenance and the return to the home screen (Figure 19). **Press to Start** on the navigation bar displays a screen that allows the furnace to be started.



Figure 19. UltraFlex Furnace Home Screen—Navigation Bar.

### 5.1.1.6. UltraFlex Drying and Firing Furnace Modes

The UltraFlex Drying and Firing Furnace employs five modes to govern its use (Table 5). Operating the UltraFlex furnace usually involves primarily the Production mode along with the Idle and Cooldown modes. The Maintenance mode is not typically used by the operator.

Table 5. UltraFlex Firing & Drying Furnace Modes.

Mode	Primary Purpose	User
Idle Mode	The furnace is powered but awaiting instruction.	Operator, Supervisor
Stabilization Mode	The furnace is preparing to run a recipe.	Operator, Supervisor
Production Mode	Primary mode for running a recipe and producing wafers.	Operator, Supervisor
Cooldown Mode	Production mode has been shut down in anticipation of a new recipe, a new production schedule or maintenance.	Operator, Supervisor
Maintenance Mode	Allows maintenance personnel to maintain or repair the furnace.  <b>NOTE:</b> The furnace cannot run in Production mode while in Maintenance mode.	Supervisor, Maintenance Personnel

### 5.1.2. *Navigating the Home Screen*

After logging on with a User name and Password (as established by the administrator) the Home screen serves as the best window for monitoring the entire process. From the Home Screen, the user can navigate to these operations:

- **Run:** Start and stop the tool.
- **Trending:** Provides historical information and allows for the exporting of production historical data. Trending screens have user-configurable upper and lower parameters for precise windows into performance.
- **Recipes:** Allows for importing and exporting of recipes, along with setup screens for each of the recipes.
- **Alarms:** Lists alarm times, dates and more information.
- **Setup:** Allows for user administration, importing and exporting of recipes, calibration and other settings and setup functions. Generally used only at the initial stages of furnace set up.
- **Maintenance:** Provides a safe, non-production mode for furnace maintenance functions. Includes cleaning and calibration functions.

### 5.1.3. Trending Screen

The Trending screen provides options for accessing and downloading historical values for critical systems in the UltraFlex furnace (Figure 20), including the conveyors, heat and airflow. Each trending screen displays values, setpoints and outputs in relation to conveyor speed. Exporting data logs, records or histories typically takes roughly 20 minutes, depending on the amount of data. Available data may range from one to several weeks.

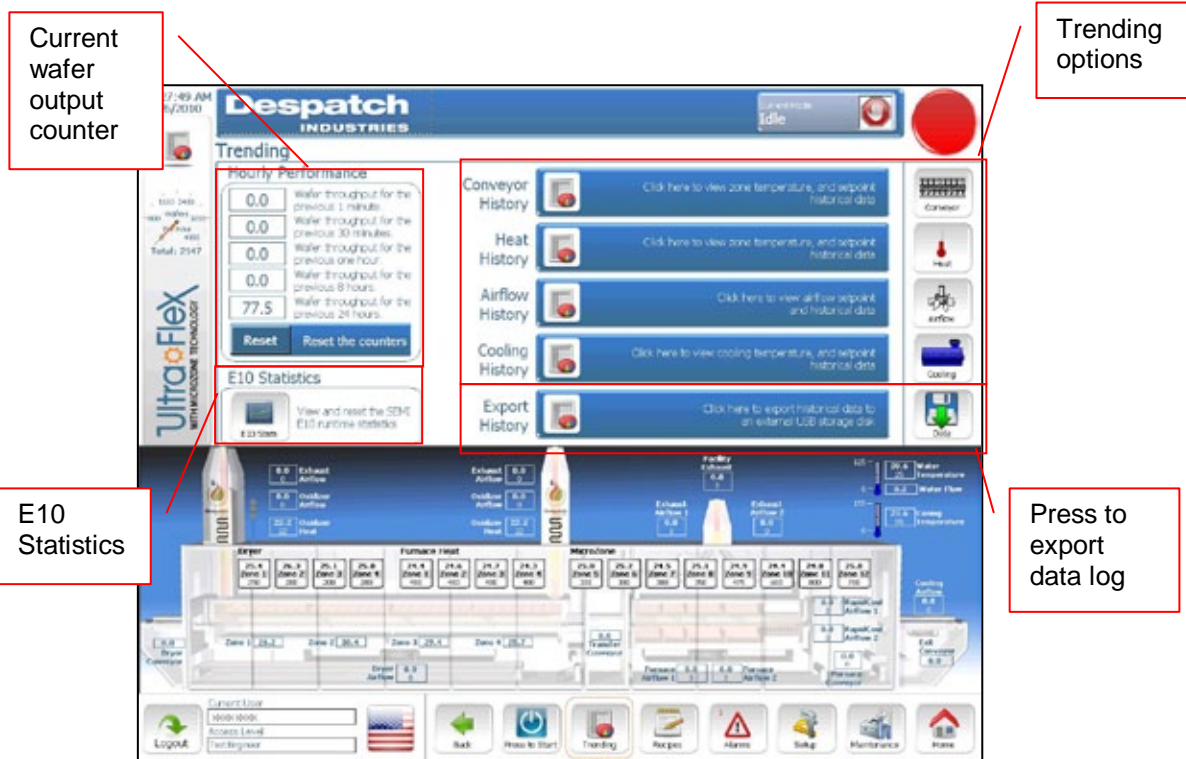


Figure 20. Trending Screen.

Press **Conveyor**, **Heat**, **Airflow** or **Cooling** for detailed trending screens. For instance, press **Heat** and then **Heat Zone 1** to access the History Trending/Furnace Zone 1 screen (Figure 21). Further trending options are listed on the right side of the screen. See Section 5.3 for more information about working with the trending screen.

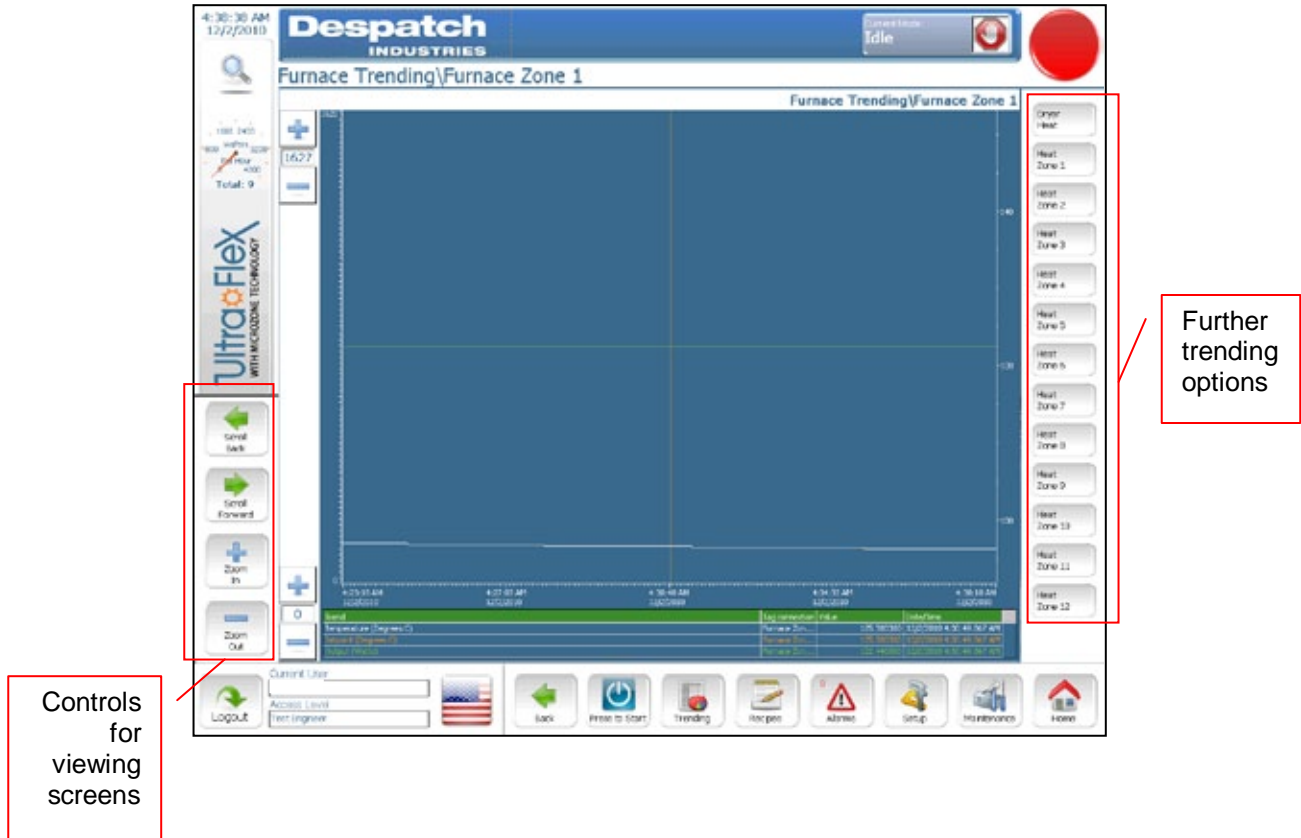


Figure 21. History Trending/Furnace Zone 1 Screen.

### 5.1.4. Recipe Screen

The Recipes screen allows importing new recipes from other storage devices as well as allowing new recipes to be entered manually, parameter-by-parameter. Press **Parameter Descriptions** for more information about parameters (Figure 22). See Section 5.4 for more information about working with recipes.



Figure 22. Recipes Screen and Pop-up Screen for Parameters Descriptions.



### 5.1.5. Alarm Screen

The Alarms screen displays active or unacknowledged alarms (Figure 23). Press **Acknowledge** to recognize and disarm the highlighted alarm. Press **Info** for a text box to pop with further information about the alarm. Press **Alarm History** to display recent alarms (Figure 24). The Alarm History screen uses color coding to display four levels:

- Equipment Safety (Red)
- Irrecoverable Error (Black)
- Parameter Control Error (Blue)
- Attention Flags (Yellow)

See Section 5.5 for more information about working with the alarm screen. When a system event occurs (Figure 25), the operator should contact maintenance personnel or the Process engineer.

○

*There is a ten second delay between when a zone turns color and when the alarm is announced.*

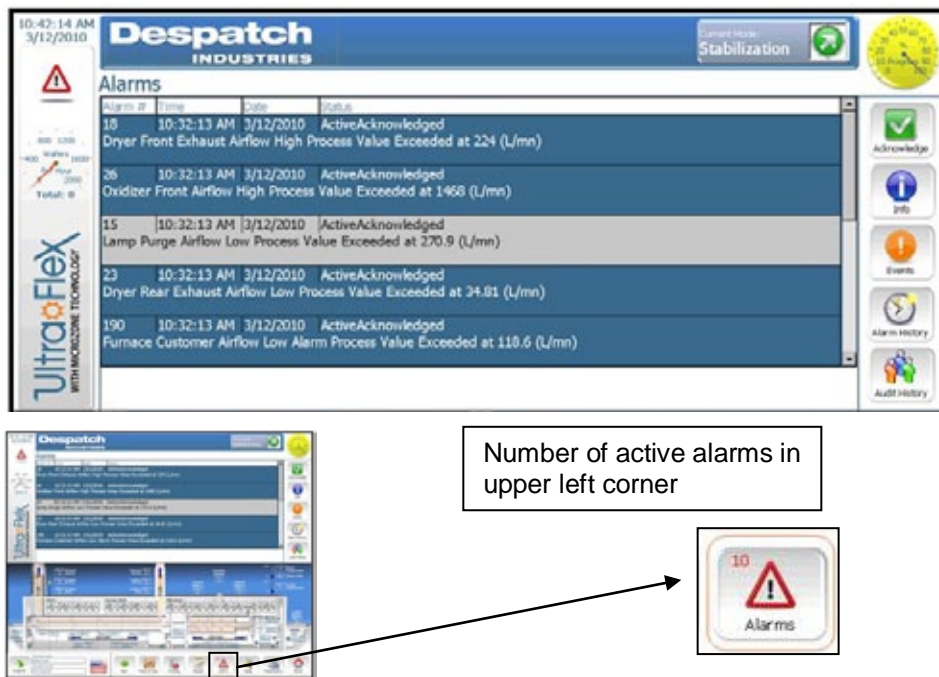


Figure 23. Alarms Screen and Close-up of Unacknowledged Alarms.

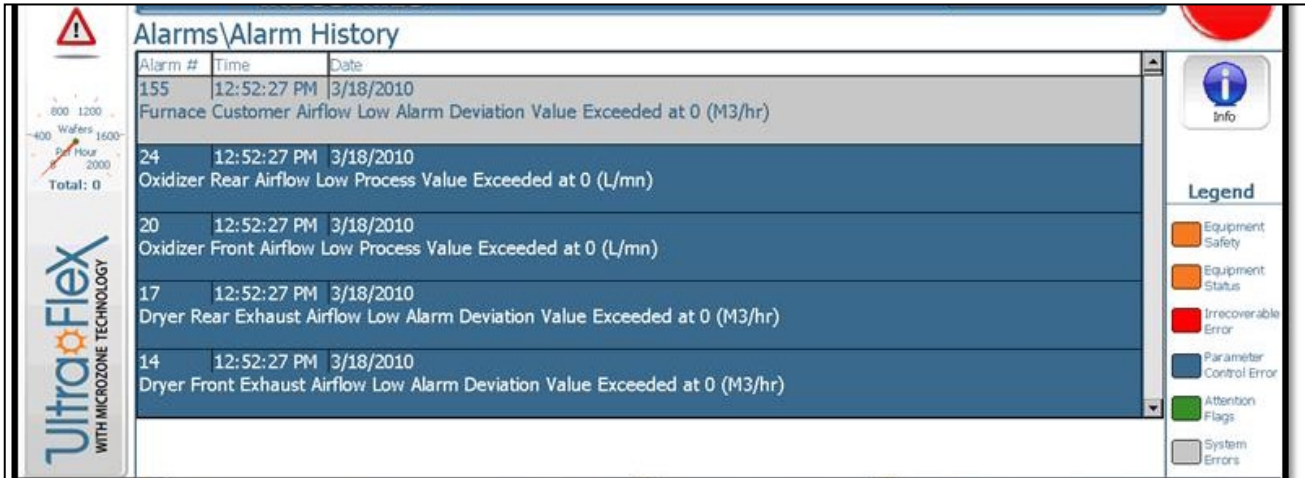


Figure 24. Alarm History Screen.

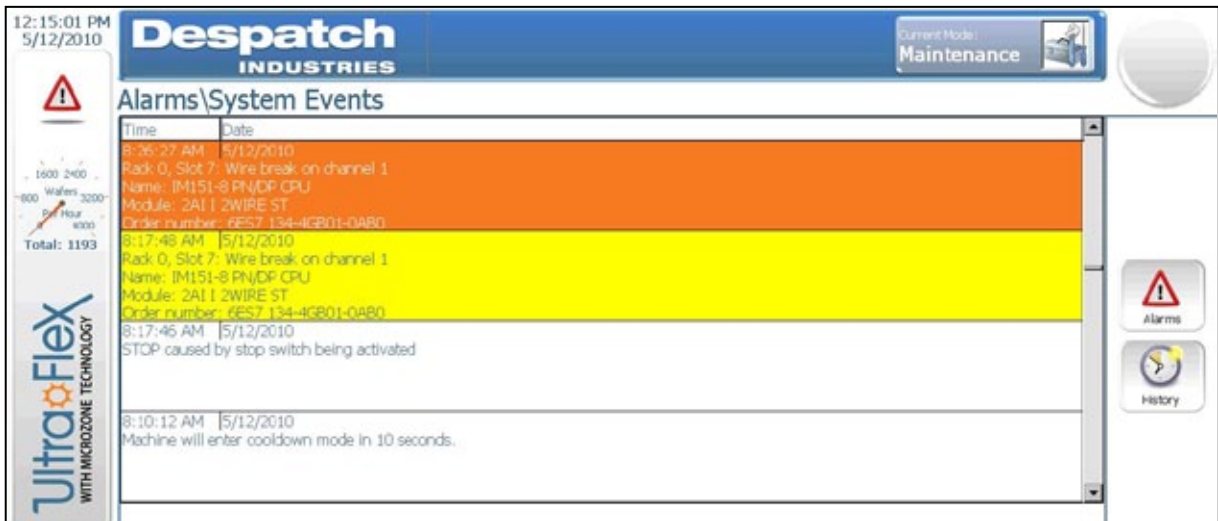



Figure 25. System Event Alarm Screen.

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### 5.1.6. Setup Screen

The Setup screen provides options for readying the UltraFlex furnace for production (Figure 26). The Setup screen is typically used at installation and then not again except for adjustments. Find information about managing users with the Setup screen in the Software and Hardware Setup section (4.2). See Section 5.6 for more information about working with the setup screen.



## Warning!

*Oxidizer airflow setpoints affect the ability of the dryer to draw out VOCs. Do not tamper with oxidizer airflow setpoints without consulting Despatch.*



Figure 26. Setup Screen.

### 5.1.7. Maintenance Screen

The Maintenance screen provides access to switches to isolate and test individual elements of the UltraFlex furnace (Figure 27). A red button indicates the system is currently disabled. A green button indicates the system is currently enabled. A square red button may appear to “Clear fault.”

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- **Airflow Valve Bank:** With the top switch set to **Manual**, enable any one system and read the pressure of that system at the bottom of the column. The pressure reflects the cumulative pressure of all enabled systems.
- **Furnace Airflow:** Enable, disable or change setpoint.
- **Zones 1-12:** Change setpoints
- **Misc. Outputs:** **Safety Relay OK** removes power from the UltraFlex furnace if not enabled. Enable or disable heat, lights and horn.

Maintenance Screen Closeup



Maintenance  
Screen

Figure 27. Maintenance Screen with Close-up.

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## 5.2. Startup and Run the UltraFlex Drying and Firing Furnace

Production Mode controls the way the tool functions in day-to-day operation. This section shows how to get to Production Mode.

### Automatic LEL Calculation Prior to Production Mode

Before completing any startup procedure, the UltraFlex furnace automatically calculates the wafers per hour it can safely produce without exceeding preset Lower Explosive Limits (LEL).

Before any Startup procedure, be prepared to enter these values (Figure 30):

- Weight of paste (per wafer) in grams
- Percentage of volatile solvent (by weight) in the paste. Consult the Material Data Safety Sheets (MSDS) provided by the paste manufacturer.

Using these values, the UltraFlex furnace calculates:

- Wafers per hour threshold that exceeds 25 percent LEL. This value generates a warning alarm (Figure 28).
- Wafers per hour threshold that exceeds 40 percent LEL. This value stops the Dryer conveyor from running.

O

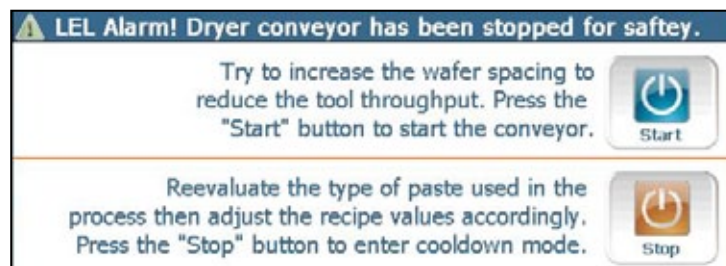


Figure 28. Confirm LEL Settings Dialogue Window.

### 5.2.1. Starting from Idle Mode

1. From the Idle Mode Home screen press **Press to Start** to load the Run window (Figure 29).
  - a. The currently loaded recipe is highlighted in the Recipe/Mode indicator box.
  - b. Select another recipe as needed from the drop down menu.
  - c. To set a new recipe, press **Recipes** to go to the Recipes screen. Or use the Recipe Selection pull-down menu.
2. Press **Start** to open the LEL Dialogue Window (Figure 30):
  - a. Enter the current paste weight
  - b. Enter the total percentage volatility.
  - c. Check Material Data Safety Sheets (MSDS) as necessary.
3. Press **Start** to start the tool and enter Stabilization Mode.



Figure 29. Start Production Mode from Idle Mode.

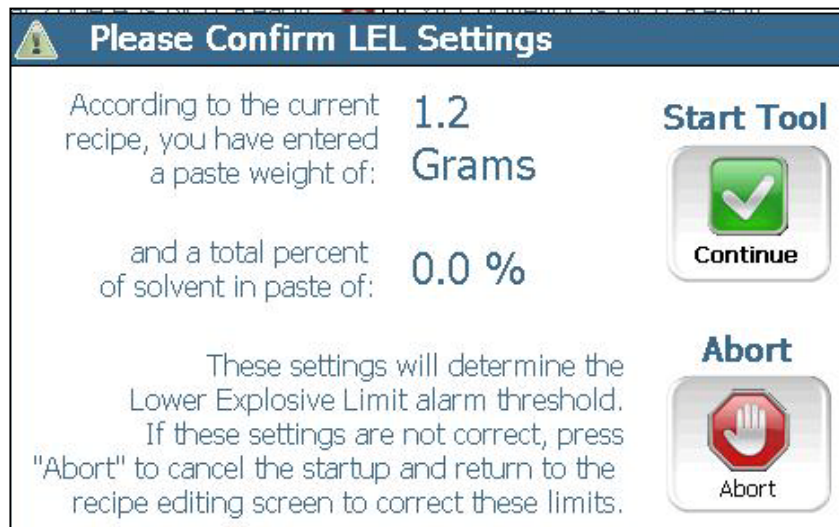


Figure 30. LEL Dialogue Window.



Figure 31. Stabilization Mode.

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4. Startup status is indicated for each component in the Run window. The tool is ready when operating within the process window limits for the ready delay setting (Figure 32). The default ready delay setting is three minutes. When all the tool components have stabilized, the tool enters Production Mode.



Figure 32. Tool in Production Mode.

### 5.2.2. Stopping from Production Mode

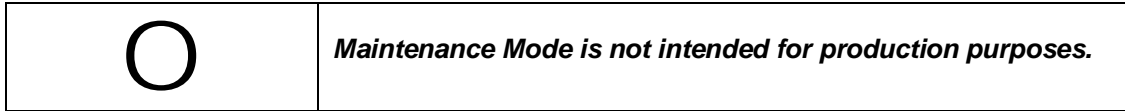
1. From the Production Mode home screen, press **Press to Stop** to open the Run window.
2. Press **Cooldown** (Figure 32).
3. For typical tool shut down, press **Normal**. Typical tool shut down process includes:
  - a. Heat shuts off first.
  - b. Exhaust airflow increases to 100 percent.
  - c. When temperature drops below the Cooldown threshold, airflow and conveyors stop and the tool enters Idle Mode.
4. For rapid tool shut down, press **Rapid**. Rapid tool shut down process includes:
  - a. Heat shuts off first.
  - b. The chamber opens roughly 80 mm.



***Though the chamber opens roughly 80 mm, the opening remains covered by the chamber casing.***

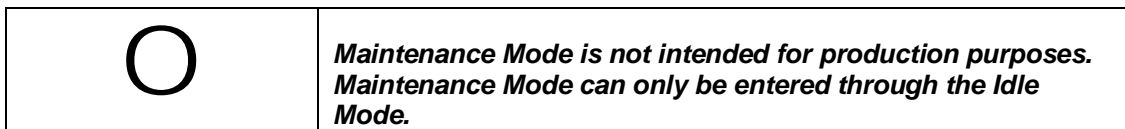
- c. Exhaust airflow increases to 100 percent.
- d. When temperature drops below the Cooldown threshold, airflow and conveyors stop and the tool enters Idle Mode.

### 5.2.3. Entering Maintenance Mode from Idle Mode



1. From the Production Mode home screen, press **Press to Stop** to open the Run window.
2. Press **Maintenance Mode** to open the Maintenance window.

### 5.2.4. Entering Maintenance Mode from Production or Cooldown Mode



## 5.3. Working with Trending

Trending (Figure 33) allows collected data to be viewed using customizable scales. Each of the major UltraFlex furnace systems is available for data monitoring, with heat, airflow and cooling data shown in comparison to conveyor speed.



Figure 33. Trending Main Screen.

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### 5.3.1. Working with Hourly Performance

The Hourly Performance section of the Trending screen provides wafer throughput performance for a variety of time ranges (Figure 33). Press **Reset** to zero all counters.

### 5.3.2. Conveyor

Press **Conveyor** to display current data points for the conveyor (Figure 34). Adjust upper and lower parameters using on-screen controls (See Section 5.1.1.2 for more information about on-screen controls).

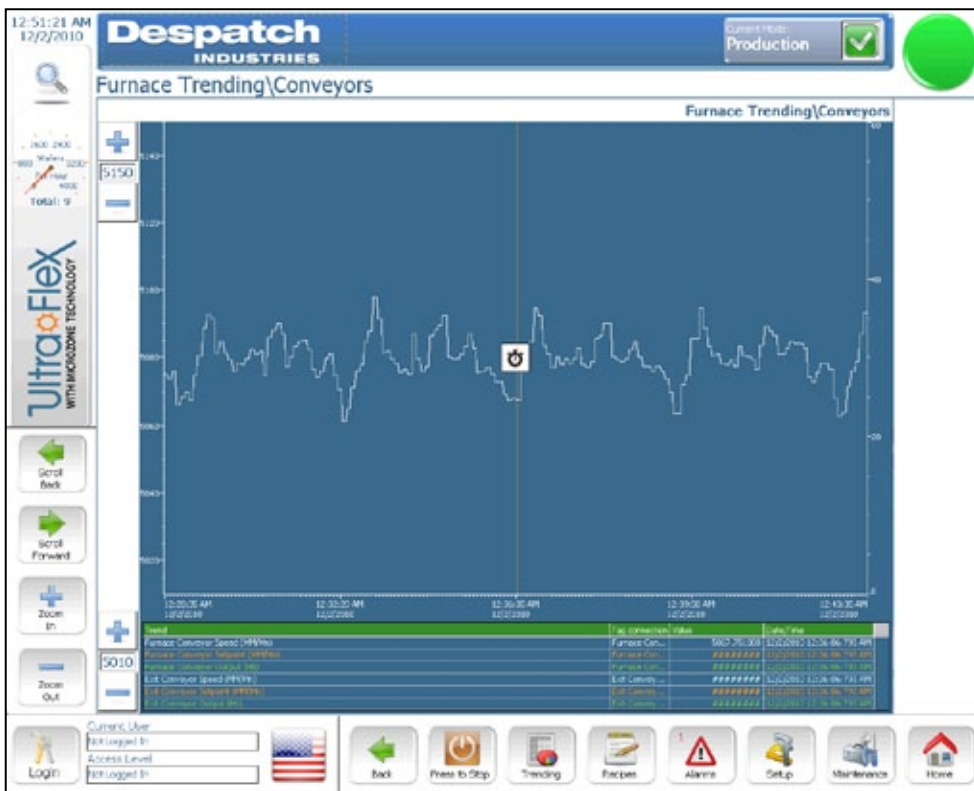


Figure 34. Conveyor Trending Screen.

### 5.3.3. Heat

Press **Heat** to display current temperature data points compared with conveyor speed. Choose the desired heat zone from the choices on the right of the screen (Figure 35). Adjust upper and lower parameters using on-screen controls (See Section 5.1.1.2 for more information about on-screen controls).

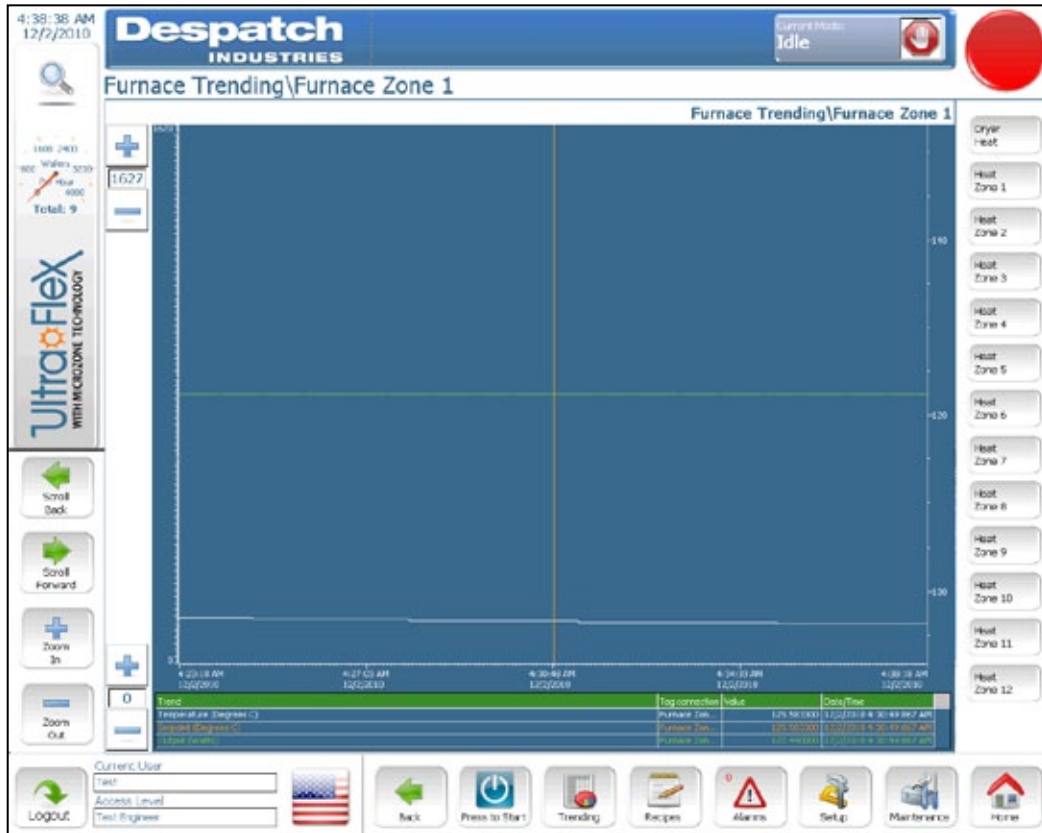


Figure 35. Heat Trending Screen.

### 5.3.4. Airflow

Press **Airflow** to display current data points compared with conveyor speed. Choose the desired section from the choices on the right of the screen (Figure 36). Adjust upper and lower parameters using on-screen controls (See Section 5.1.1.2 for more information about on-screen controls).

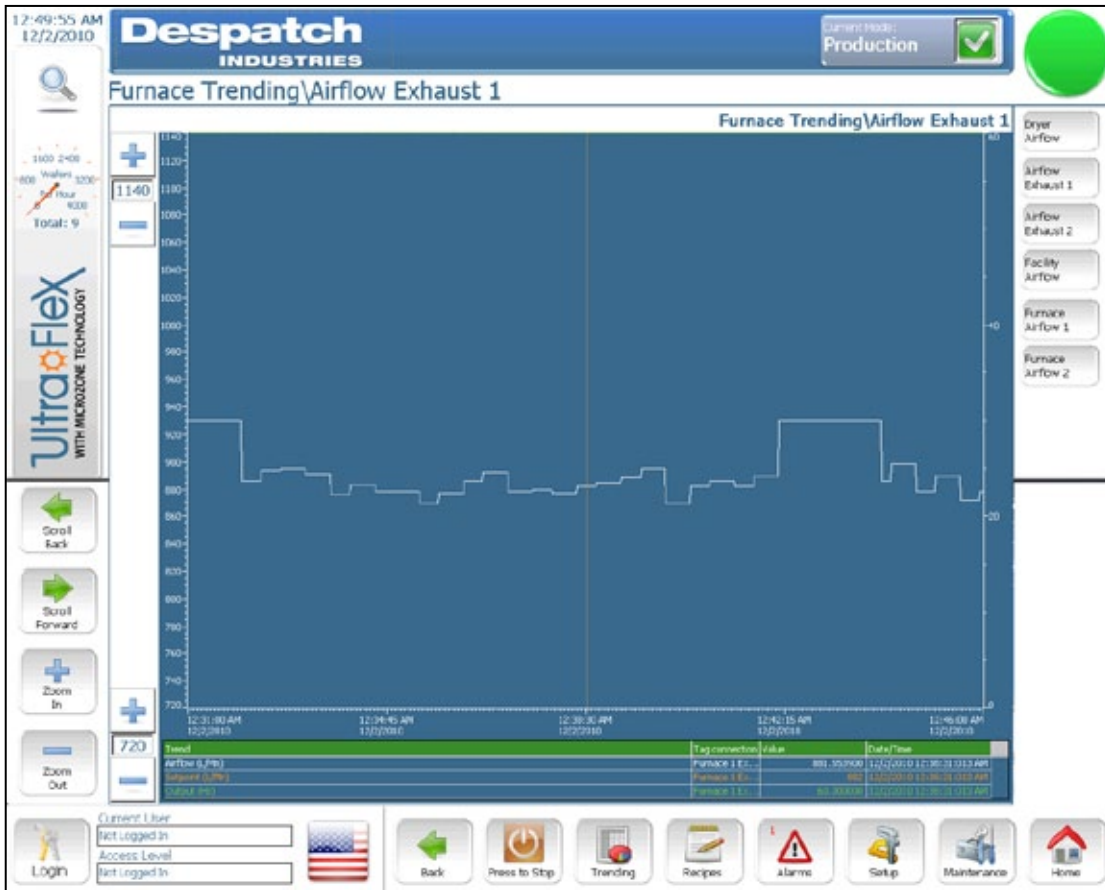


Figure 36. Airflow Trending Screen.

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### 5.3.5. Cooling

Press **Cooling** to display current data points compared with conveyor speed (Figure 37). Adjust upper and lower parameters using on-screen controls (See Section 5.1.1.2 for more information about on-screen controls).

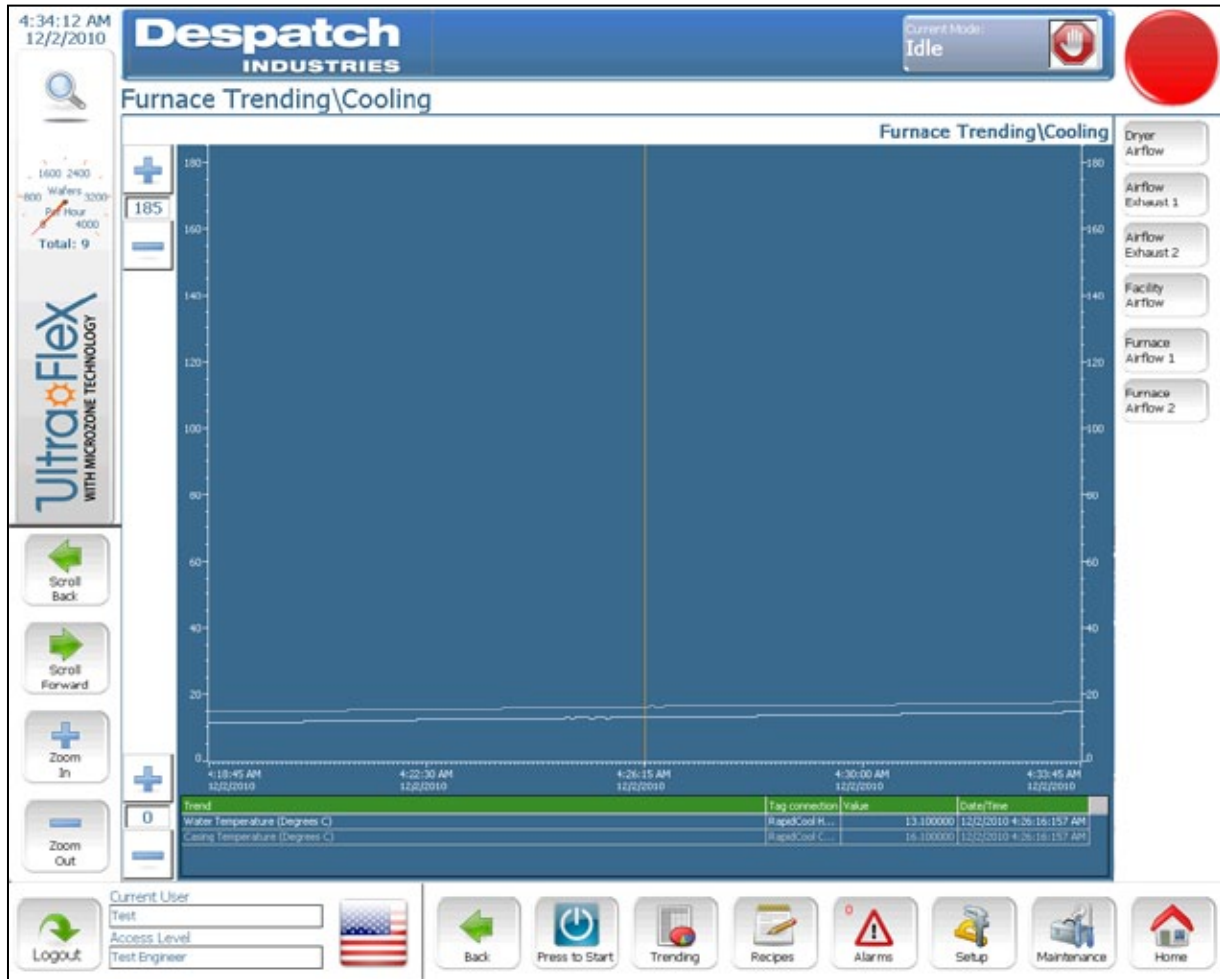


Figure 37. Cooling Trending Screen.

### 5.3.6. Data

Press **Data** to display the screen (Figure 38) for downloading **Event History**, **Alarm History**, **Trending History** or **Diagnostic History** data. Despatch recommends the front USB port for downloading recipes and exporting data. Reserve the rear USB port for data logging (Figure 39).



#### **Caution!**

*Use only the rear USB port for datalogging purposes. The rear USB port is more secure for longer-term use and provides less opportunity for the memory stick to be dislodged.*



Exporting data from the UltraFlex furnace requires a blank 4GB USB memory stick be inserted into the front USB port (Figure 39). **4GB is the maximum size for the memory stick that can be inserted into either USB port.**



Do not leave the external memory stick in the front USB port during normal operation or log data may be stored to it (and thus not stored to the usual rear memory unit).



Data logging will cease during data exporting operation.



Figure 38. Data Logging Screen.

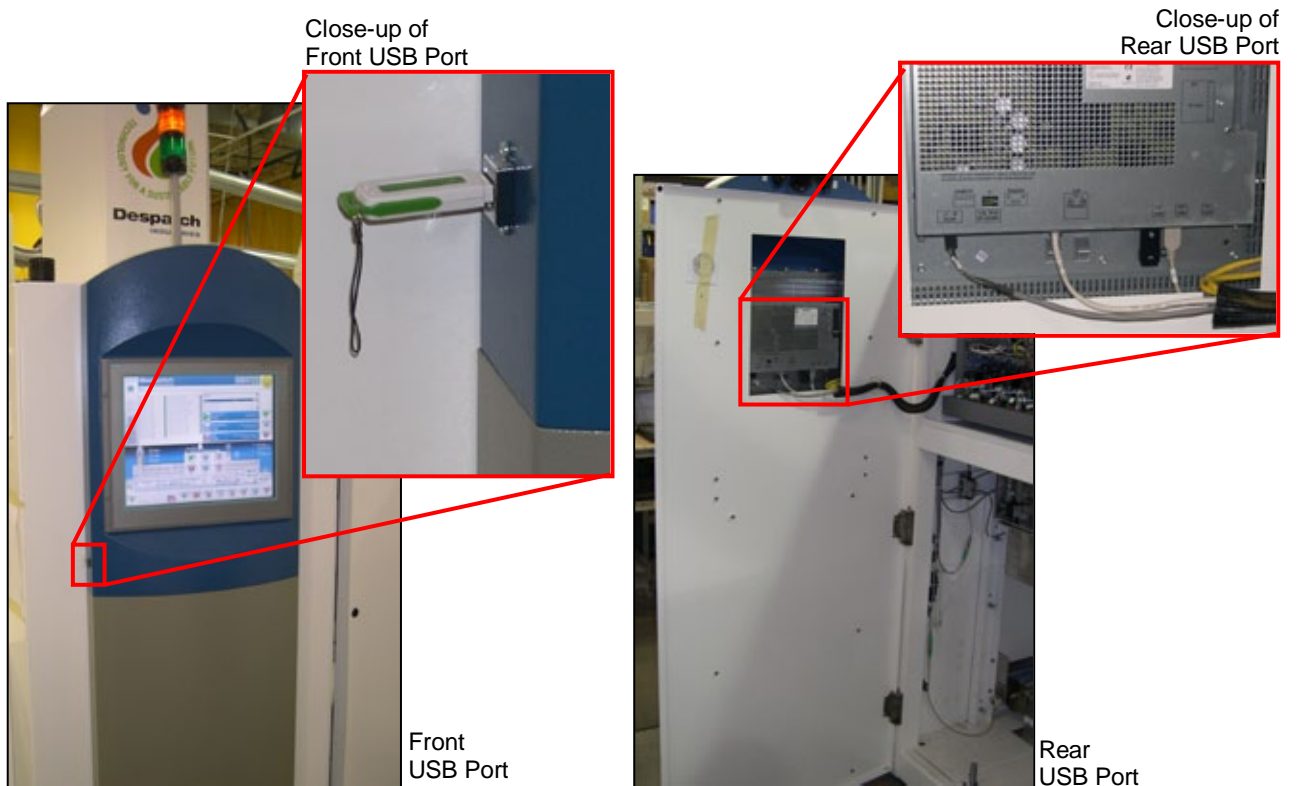


Figure 39. Front and Rear USB Ports.

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### 5.3.7. E10 Statistics

E10 Reporting defaults at **Enable**. Use the drop down menu to switch to **Disable** if desired (Figure 40).

#### 5.3.7.1. E10 States

Press **E10 Stats** from the Trending screen to display the E10 Statistics screen (Figure 40). E10 Statistics uses these six states to organize and communicate the UltraFlex furnace uptime details:

- Productive State (**Productive Time**): Time the tool is performing its intended function. An example of Productive Time might be regular production.
- Standby State (**Standby Time**): Time the tool is ready for the Productive State, but is not being operated. An example of Standby Time might be when the operator is unavailable, perhaps on break or at lunch.
- Engineering State (**Engineering Time**): Time the tool is ready for the Productive State but is instead operated to conduct engineering tests
- Scheduled Downtime State (**Scheduled Downtime**): Time the tool is not available to perform its intended function because of planned downtime events
- Unscheduled Downtime State (**Unscheduled Downtime**): Time the tool is not in a condition to perform its intended function because of unplanned downtime events
- Non-Scheduled State (**Nonscheduled Time**): Time the tool is not scheduled to be used for production. An example of Nonscheduled Time might be an unworked shift.

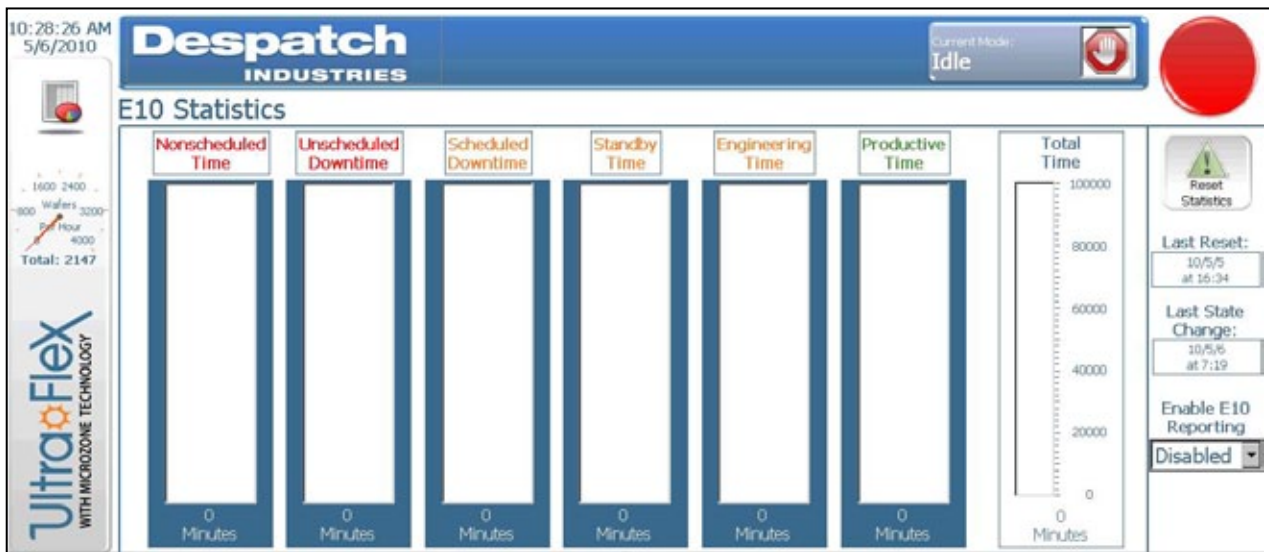


Figure 40. E10 Statistics Screen.

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For more information on E10 Statistics, refer to the official document at [www.semi.org](http://www.semi.org):  
*SEMI E10-0304E10 Specification for Definition and Measurement of Equipment Reliability, Availability, and Maintainability (RAM).*

### 5.3.7.2. Operator Initiated States

With every tool mode change, a dialogue window displays so the operator can choose the current E10 state (Figure 41).



Figure 41. Operator Selects Equipment State.

## 5.4. Working with Recipes

The UltraFlex furnace interior is a combination of lamps, materials and geometry that result in a unique furnace environment. Furnace-zone temperature setpoints approximate the temperature desired at the wafer. For initial recipe generation, verify the setpoint temperatures and adjust using the thermocouple-fixtured substrate designed specifically for the UltraFlex furnace environment (available from Despatch). Use cell electrical performance measurements and other metrology to arrive at an optimal thermal recipe. Contact Despatch for assistance with Process Engineering and optimization needs.



### 5.4.1. Enter a New Recipe

Enter a new recipe by pressing **New** on the Recipe screen and updating the value for each parameter from the default values (Figure 43). Recipes typically include a setpoint, a high and low alarm deviation, and high and low process deviation for each parameter.

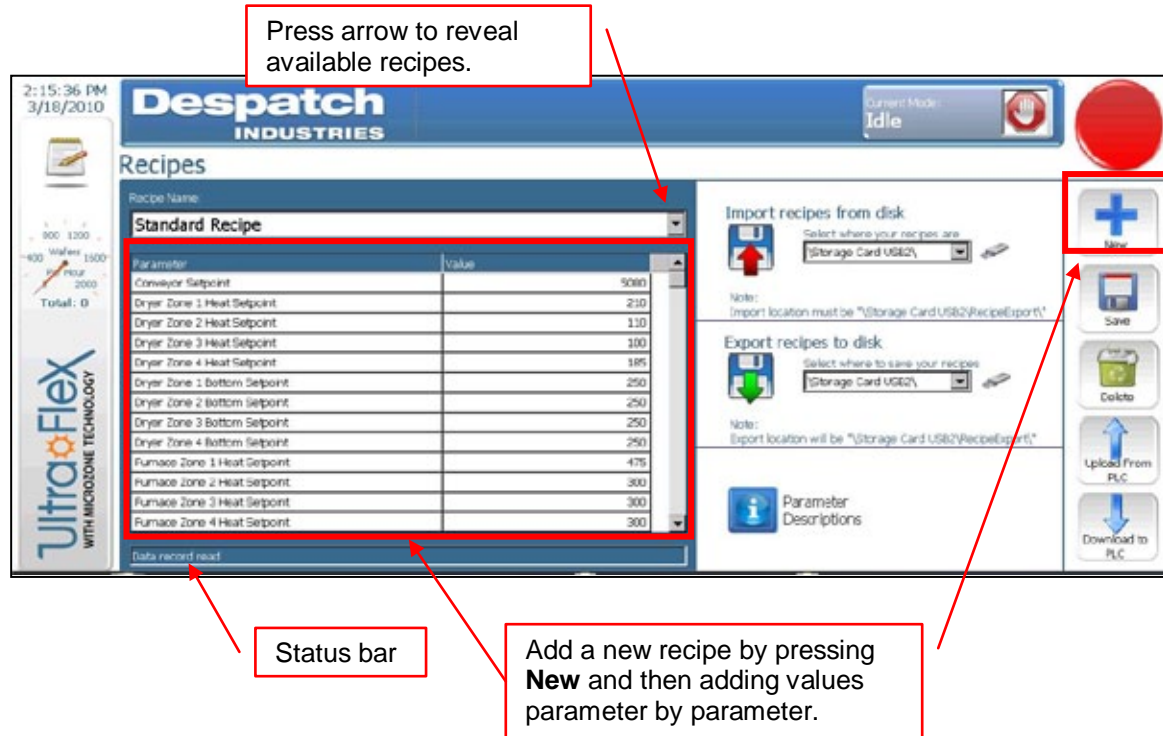


Figure 42. Work with Existing or New Recipes Using the Recipe Screen.

Note that recipes must be named and saved to be retained. Recipes not saved will be lost.

### 5.4.2. Working with Existing Recipes

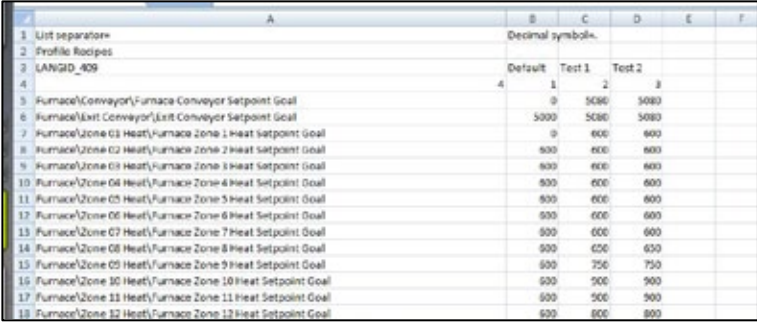
#### 5.4.2.1. Load Existing Recipe

Press the down arrow (Figure 42) to display recipes currently available and pick the desired recipe. Recipe will load all parameters.

### 5.4.2.2. Import a Recipe

Import existing recipes into the UltraFlex furnace using **Import recipes from disk** from the Recipes screen (Figure 43). The current recipe running on the UltraFlex furnace can also be uploaded for editing (press **Upload from PLC**).

**Recipes imported from disk should be in CSV format. See the "Saved Recipe" Microsoft Excel file you received with your UltraFlex furnace.**



LANGID_409	Default	Test 1	Test 2
Furnace/Conveyor/Furnace Conveyor Setpoint Goal	0	5080	5080
Furnace/Exit Conveyor/Exit Conveyor Setpoint Goal	5000	5080	5080
Furnace/Zone 01 Heat/Furnace Zone 1 Heat Setpoint Goal	0	600	600
Furnace/Zone 02 Heat/Furnace Zone 2 Heat Setpoint Goal	600	600	600
Furnace/Zone 03 Heat/Furnace Zone 3 Heat Setpoint Goal	600	600	600
Furnace/Zone 04 Heat/Furnace Zone 4 Heat Setpoint Goal	600	600	600
Furnace/Zone 05 Heat/Furnace Zone 5 Heat Setpoint Goal	600	600	600
Furnace/Zone 06 Heat/Furnace Zone 6 Heat Setpoint Goal	600	600	600
Furnace/Zone 07 Heat/Furnace Zone 7 Heat Setpoint Goal	600	600	600
Furnace/Zone 08 Heat/Furnace Zone 8 Heat Setpoint Goal	600	600	600
Furnace/Zone 09 Heat/Furnace Zone 9 Heat Setpoint Goal	600	750	750
Furnace/Zone 10 Heat/Furnace Zone 10 Heat Setpoint Goal	600	900	900
Furnace/Zone 11 Heat/Furnace Zone 11 Heat Setpoint Goal	600	900	900
Furnace/Zone 12 Heat/Furnace Zone 12 Heat Setpoint Goal	600	800	800

### 5.4.2.3. Change a Recipe Value

Changing a recipe value requires that the user enter their password and comment about the change (Figure 43). This log in/comment process allows changes to be carefully tracked and provides useful information when examining the logs.

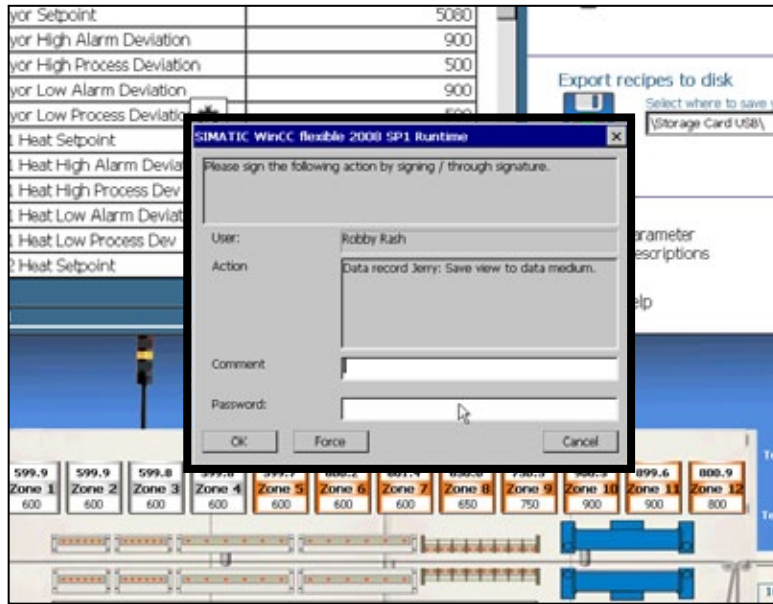


Figure 43. Recipe with Comment Dialogue Box Open.

#### 5.4.2.4. Export a Recipe


Export recipes by pressing **Export recipes to disk**. Exported recipes are saved as CSV files which can be opened with Microsoft Excel (Figure 44). Save a recipe by pressing **Save**. Download a recipe for use by the UltraFlex furnace by pressing **Download to PLC**.

	<b>Save any changes to Recipe values prior to downloading to the PLC.</b>
---	---

**5.4.2.5. Edit a Recipe on a PC**

Recipes from the UltraFlex furnace can be exported as CSV files and opened with Microsoft Excel. Recipes files use two columns (Figure 44):

- Column A is the name of the recipe item
- Column B is the value of the named recipe item

	<p><b><i>Certain UltraFlex furnace information must not be altered for correct performance.</i></b>  <b><i>Rows 1 and 2 on the CSV file must not be altered. Column 4 on the CSV file must not be altered.</i></b></p>
---	--


To change a value, type the new value in the appropriate cell.

To add a recipe:

1. Copy all the data from a column that closely matches the new recipe values.
2. Give the recipe a new name (Row 3, Column 1)
3. Give the recipe a new number (Row 4, Column 1)
4. Edit the values and save the file.

	A	B	C	D
1	List separator=	Decimal symbol=.		
2	Profile Recipes Profile Recipes Profile Recipes Profile Recipes			
3	LANGID_410	Default		
4		4	1	
5	Dryer\Conveyor\Dryer Conveyor Setpoint Goal	0		
6	Dryer\Zone 01 Top\Dryer Zone 1 Top Heat Setpoint Goal	600		
7	Dryer\Zone 02 Top\Dryer Zone 2 Top Heat Setpoint Goal	300		
8	Dryer\Zone 03 Top\Dryer Zone 3 Top Heat Setpoint Goal	300		
9	Dryer\Zone 04 Top\Dryer Zone 4 Top Heat Setpoint Goal	300		
10	Dryer\Zone 01 Bottom\Dryer Zone 1 Bottom Heat Setpoint Goal	300		
11	Dryer\Zone 02 Bottom\Dryer Zone 2 Bottom Heat Setpoint Goal	300		
12	Dryer\Zone 03 Bottom\Dryer Zone 3 Bottom Heat Setpoint Goal	300		
13	Dryer\Zone 04 Bottom\Dryer Zone 4 Bottom Heat Setpoint Goal	300		

**Figure 44. Recipe File Saved as CSV File.**

	<p><b><i>Use unique names for recipes. Unless recipes are given unique names, they will overwrite previous recipes with that name.</i></b></p>
---	--

#### 5.4.2.6. Save a Recipe

Save a recipe by pressing **Save** and identifying the save location. Successful save indicated by “Data record saved” in Status bar (Figure 42).

#### 5.4.2.7. Delete a Recipe

Delete a recipe by highlighting in the Recipe Name area and pressing **Delete**. A pop up confirmation window will appear asking: “Do you really want to delete RECIPE NAME in Recipe Profile? Yes or No.”


Press **Yes**.


Successful deletion indicated by “Data record deleted” in Status bar (Figure 42).

### 5.4.3. Recipes and the PLC

The current recipe running on the UltraFlex furnace can be uploaded for editing (press **Upload From PLC**). Recipes that have been edited can be loaded for use on the UltraFlex furnace by pressing **Download to PLC**. Watch for “Transfer Completed” in the status bar after downloading to PLC.



	<i>Recipes downloaded to the PLC begin running immediately.</i>
---	---

	<i>Any recipes being viewed when uploading from the PLC will be lost unless they have been saved.</i>
---	---

#### 5.4.4. Help with Recipes

Press **Parameter Descriptions** for a pop up screen that provides more information about recipe parameters (Figure 22).



## 5.5. Working with Alarms

The Alarms screen displays active (unacknowledged) simple and complex alarms. **Simple alarms** include those generated by the HMI. Items are examined once per second for whether they are simple alarms and simple alarms have a ten-second delay. Examples of simple alarms include the conveyor running too slowly or a temperature excursion. **Complex alarms** are generated by the PLC. Complex alarms have no delay and have no changeable limits. Examples of complex alarms include safety interlocks, high limits and drive faults.

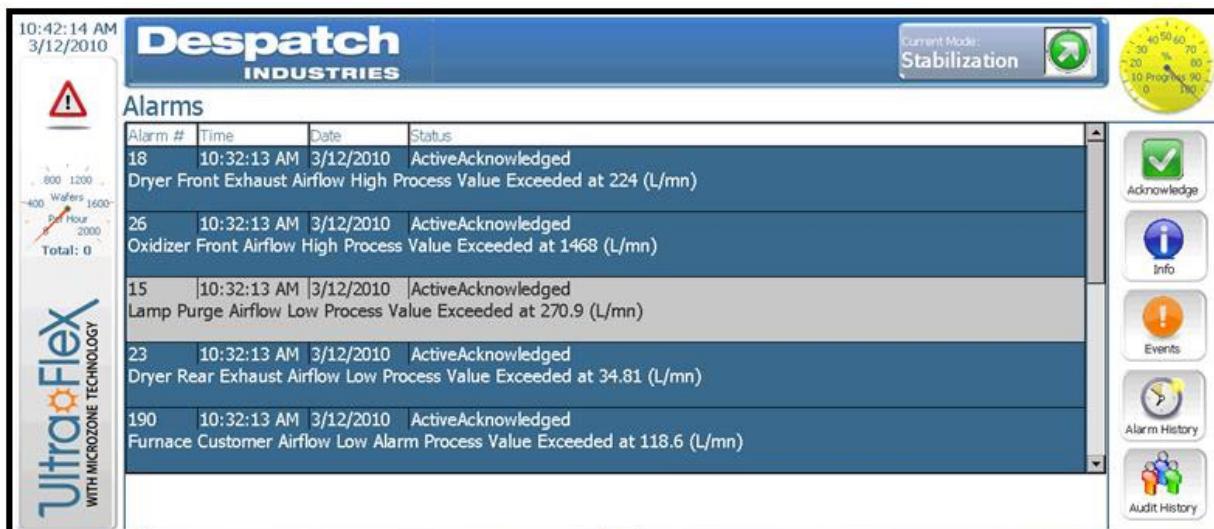


Figure 45. Alarms Screen.

### 5.5.1. Acknowledge Alarms

Acknowledge alarms by pressing **Acknowledge** from the Alarms screen (Figure 45) or from the pop-up window that appears when a new alarm is generated. Acknowledging an alarm:

- Silences the alarm horn
- Ensures no future alarms will be generated, unless some other parameters is exceeded
- Acknowledging a VFD alarm sends the “Fault Reset” command to the VFD
- Acknowledging a High Limit alarm sends the “Reset Limit” command to the RUI.

### 5.5.2. Info

Select the desired alarm and press **Info** for more detailed information about the alarm.

### 5.5.3. Events

Press **Events** for a list of non-tool related messages (Figure 46).

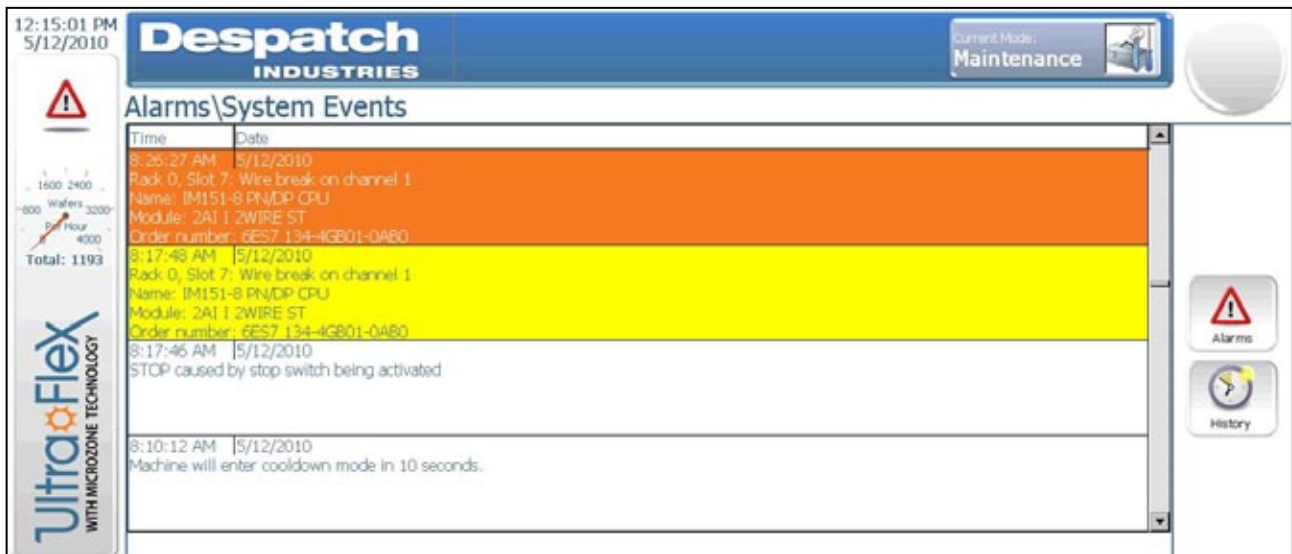


Figure 46. Alarms Events Screen.

### 5.5.4. Alarm History

Press **Alarm History** to display the Alarm History Screen (Figure 47). The legend on the right of the screen explains the correspondence between color and kind of alarm.

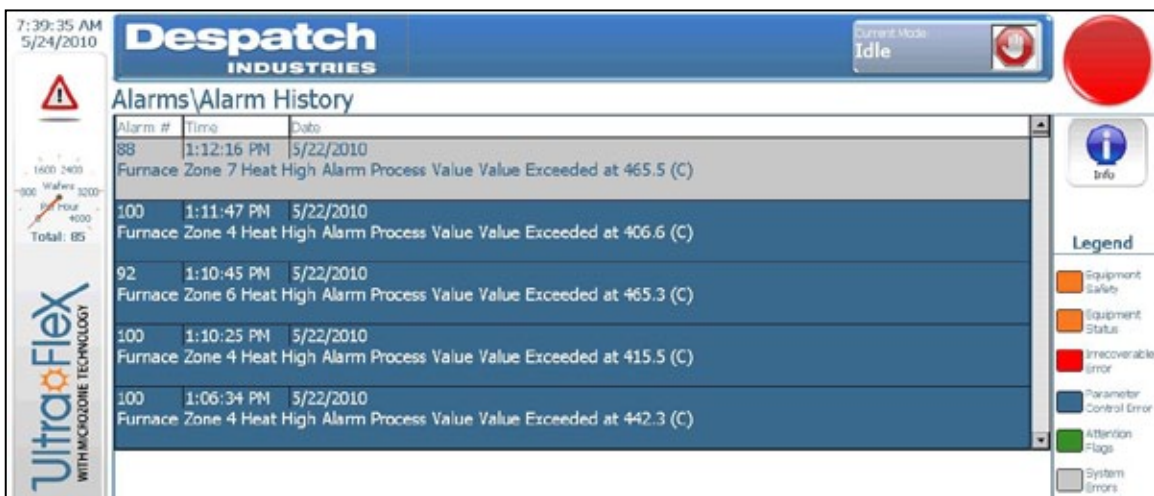


Figure 47. Alarm History Screen.

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### 5.5.5. Audit History

Press **Audit History** to display the Audit History Screen (Figure 47). Move around the audit history screen using the navigation buttons on the right side of the screen (Figure 48).



Figure 48. Audit History Screen.

### 5.6. Working with Setup



The UltraFlex Drying and Firing furnace keeps an audit trail which requires that every change be logged in by a user with a valid user name.



#### **Warning!**

***Oxidizer airflow setpoints affect the ability of the dryer to draw out VOCs. Do not tamper with oxidizer airflow setpoints without consulting Despatch.***



### 5.6.1. User Administration

Adding a user or changing user privileges requires use of the user administration functions (Figure 49). Adding or changing functions includes user names, passwords, user group identification and specifying a logoff time. See Section 4.2.2 for steps to adding a user or changing user privileges.

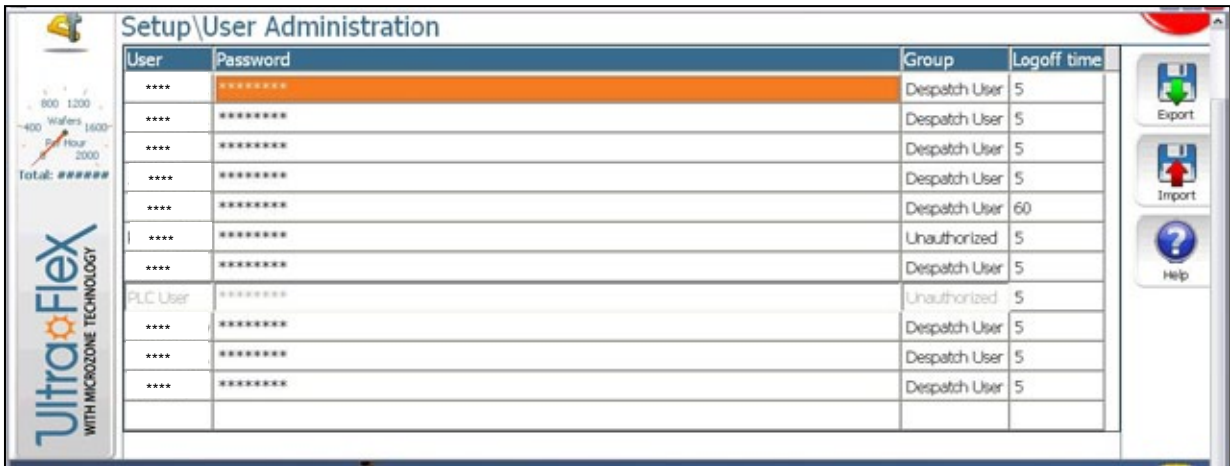


Figure 49. User Administration Screen.

#### 5.6.1.1. Export and Import

The Export and Import features are intended for copying user information from one UltraFlex furnace for use on another. This list is not editable. Exporting and importing both make use of the USB memory stick placed in the USB port (Figure 39) in the front of the UltraFlex Furnace.

Press **Export** to send a user information file to the USB memory stick this default location:

\Storage Card USB2\UserAdminExport\useradmin.txt

Press **Import** to retrieve a user information file from the USB memory stick. The Import command looks for the user information at this location:

\Storage Card USB2\UserAdminExport\useradmin.txt

### 5.6.1.2. Help

Press **Help** for a listing of available access levels and instructions for adding a user (Figure 50).



Figure 50. User Administration Help Screen.

### 5.6.2. Tool Calibration

Press **Calibration** to display the Tool Calibration screen (Figure 51).

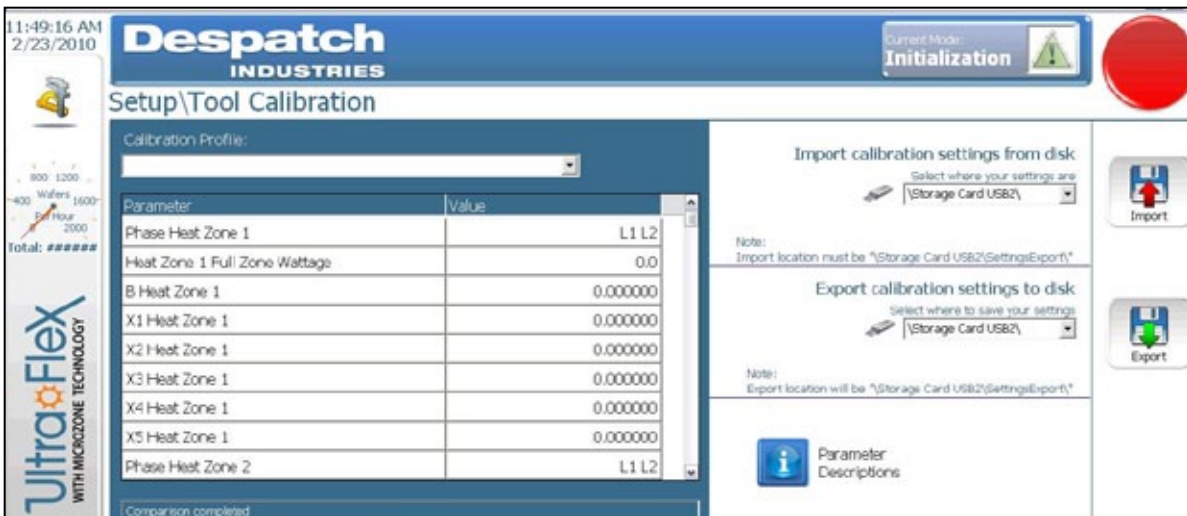


Figure 51. Tool Calibration Screen.

### 5.6.2.1. Import and Export

The Import and Export features are intended for restoring original settings or copying in new settings sent from the factory. The settings are not editable. **Import** and **Export** both make use of the USB memory stick placed in the USB port (Figure 39) to the side of the HMI/operator interface.

Press **Import** to retrieve calibration settings from the USB memory stick. The Import command looks for the user information at this location:

\\Storage Card USB2\

Press **Export** to send calibration settings to the USB memory stick this default location:

\\Storage Card USB2\



The maximum capacity for the USB memory stick placed in the USB port is 4 gigabytes.

### 5.6.3. Creating an UltraFlex Furnace Screen Shot

Create a screenshot of the currently displayed window by inserting a USB stick into the front USB port (Figure 39). Press the **Despatch Industries** logo at the top left of the screen (Figure 52). A bitmap (bmp) image of the screen is placed on the USB drive. Copy multiple images by clicking the logo again. Each image is labeled “CAPT001.bmp,” “CAPT002.bmp,” and so on.



Figure 52. Press the Despatch Logo to Create a Screen Shot on the USB stick.


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## 5.7. Working with Maintenance Mode

### 5.7.1.1. Chamber Lift

Press and hold **Chamber Lift** to lower the chamber for maintenance procedures (Figure 53).

	<p><b>Warning!</b></p> <p><i>Warn personnel before opening or closing the furnace chamber. The chamber lift may be actuated only when outside doors are in place. Defeating the outside door switch sensors may result in damage to equipment and/or harm to personnel.</i></p>
---	---

	<p>Access to Chamber Lift is available only in Maintenance Mode. The chamber casing may only be opened when the temperature is below 300° C. If above 300° C, follow user prompts for Quick Cooldown mode.</p>
---	--

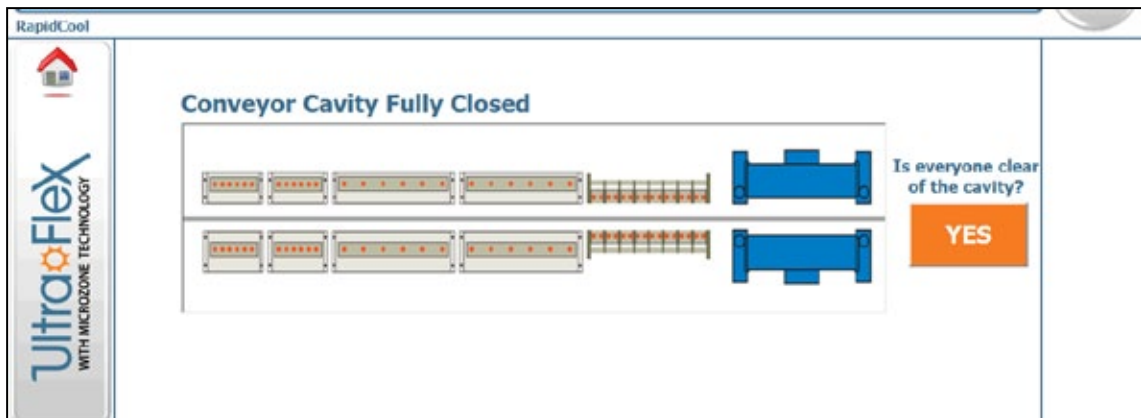


Figure 53. Conveyor Chamber Lift Verify Screen.

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### 5.7.1.2. Display

Click **Display** from the Maintenance screen to calibrate or clean the screen (Figure 54). Follow on-screen directions.

**O** When calibrating the UltraFlex furnace touch screen, carefully press the center of each calibration crosshair from perpendicular to the screen. Use a pencil eraser or stylus for best results.

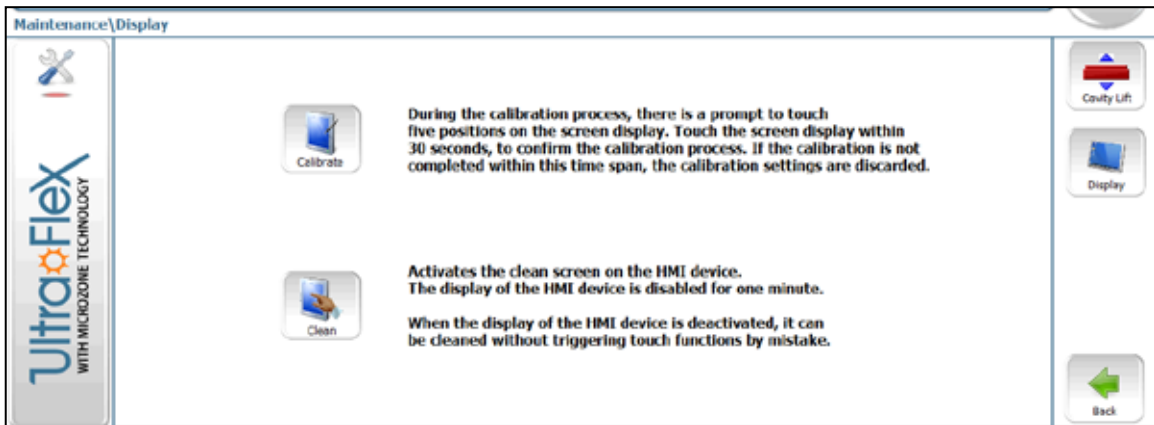


Figure 54. Display Screen.

### 5.7.1.3. Status

Click **Status** for an all-inclusive display setpoints, values and output. The Status screen allows for at-a-glance troubleshooting (Figure 55).

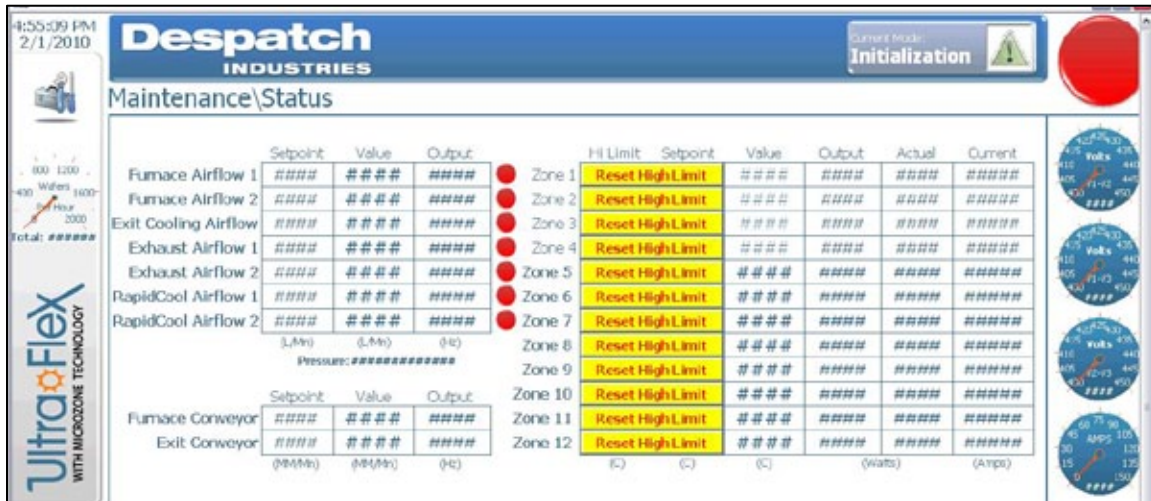


Figure 55. Status Screen for Troubleshooting.

#### 5.7.1.4. Exit

Press **Exit** to close down the UltraFlex furnace software. Exit is available only to process engineers (or via remote access to Despatch employees).

## 6. Preventive Maintenance

Item	Daily	Weekly	Monthly	Every 3-6 months	Annually	As Needed
<b>General Preventive Maintenance</b>						
Inspect Alarm and Event logs	X					
Visually inspect gauges for water flow and air pressure	X					
Check key process parameters		X				
Check E-stop operator (2.5.1)				X		
Inspect electrical cabinets					X	
Test high limit heater controls				X		
Clean broken wafers from dryer and/or furnace						X
Clean dust from Conveyor shafts						X
Clean debris from Automation Light Source						X
<b>Control Systems</b>						
TouchScreen						Clean (6.1.1)
Panels				Clean (6.1.2)		Clean (6.1.2)
Chamber Seals				Inspect (6.1.3)		
<b>Conveyor Systems</b>						
Conveyor		Clean (6.2.4.2)	Inspect (6.2.4.1)			Replace
Bearings				Inspect (6.2.1)		
Drive Roller				Inspect & Maintain (6.2.2)		
Encoder		Inspect & Clean (6.2.3)				
Motors				Inspect & Maintain (6.2.5)		

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Item	Daily	Weekly	Monthly	Every 3-6 months	Annually	As Needed
Conveyor Guides					Inspect (6.2.6)	
Quartz Rods		Clean (6.2.7.2)		Inspect (6.2.7.1)		
Conveyor Take Up			Inspect (6.2.8)		Inspect (6.2.8)	
<b>Chamber Systems</b>						
Heater Lamps	Inspect (6.3.1.1)					Replace (6.3.1.2)
Thermocouples						Replace (6.3.2)
Insulation						Inspect (6.3.3)
Dryer Casing		Clean (6.3.4)				
Protective Glass Layer		Inspect every 2 weeks (6.3.5)				
<b>Cooling Systems</b>						
Coils				Inspect (6.4.1)		
Water Filter			Inspect (0)			Replace (0)
Process Plumbing Assy				Inspect (6.2.9)		
<b>Exhaust Systems</b>						
Duct Hoses			Inspect (6.5.1)	Inspect (6.5.1)		
Exhaust Flow Balance Plate			Inspect (6.5.3)			
VOC						(6.5.5)
<b>Lift Systems</b>						
Lift chains				Inspect (6.6.1)		Maintain (6.6.2)
Pneumatic cylinders			Inspect (6.6.1)			
Optical Sensors, slides and guides					Inspect (6.6.1)	

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## 6.1. Control Systems Maintenance

### 6.1.1. Touch Screen Maintenance and Calibration

- The UltraFlex furnace touchscreen is designed for maintenance-free operation.
- Clean the screen as needed with a soft cotton cloth and commercial cleaner.
- If the touchscreen seems distorted, exhibits parallax or is difficult to read, consult the Siemens Simatic HMI Device manual included with the tool documentation.

### 6.1.2. Panels

Clean the UltraFlex furnace panels every six months or as needed.

### 6.1.3. Chamber Seals

Inspect the chamber seal for cuts every three to six months. Replace as necessary.

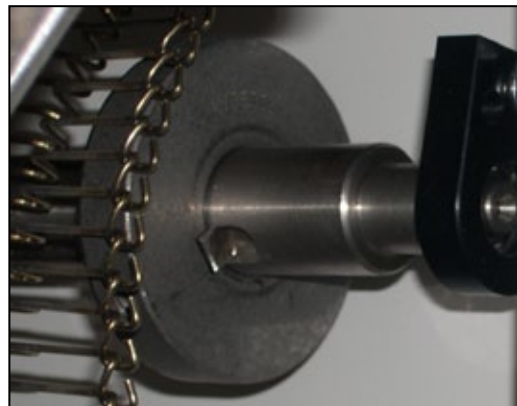
## 6.2. Conveyor Systems Maintenance

### 6.2.1. Bearings

Inspect bearings on each shaft every three months. Listen for whistling or grinding sounds and replace bearings as necessary (Figure 56).

### 6.2.2. Drive Roller

Inspect the drive roller chain every three months and lubricate as necessary.



**Figure 56. Listen for Sounds of Bearing Failure every Three Months.**

### 6.2.3. Encoder

Each conveyor motion detector (encoder) detects each tooth of a 15 tooth sprocket as it passes the sensor. The UltraFlex contains two encoders, one for the furnace conveyor and one for the dryer conveyor. If an object jams the conveyor, the sensor signals a “Belt Motion Alarm” and provides “Conveyor Fail Interlock” output, which de-energizes the conveyor Fail Interlock Relay and heat.

#### 6.2.3.1. Inspect & Clean

Inspect the encoder weekly for dust (Figure 57). Clean using a soft cotton cloth.

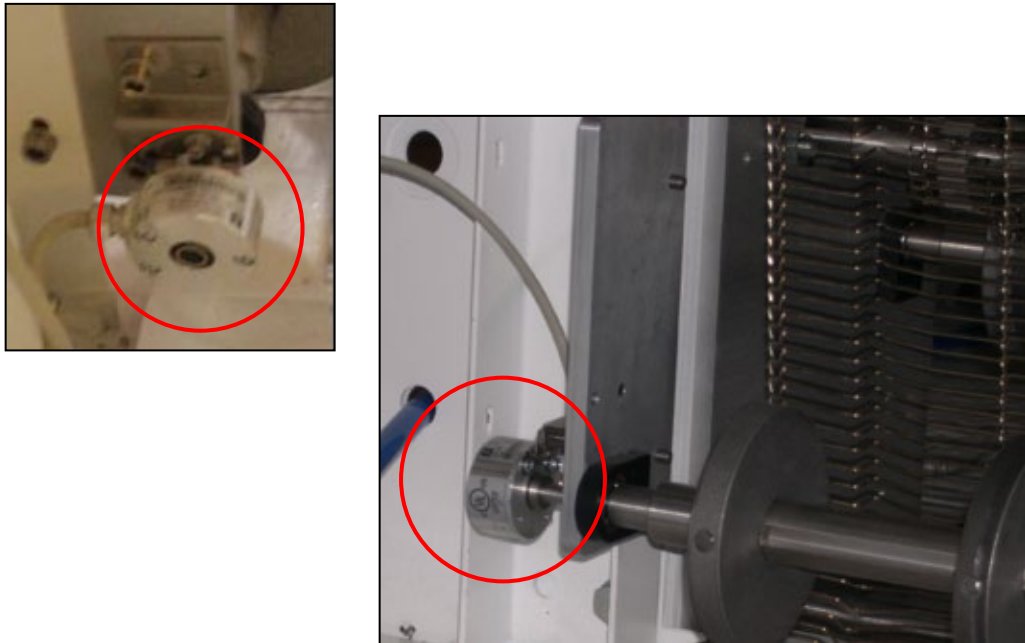


Figure 57. Inspect and Clean Encoder Weekly.

### 6.2.4. Conveyor

#### 6.2.4.1. Inspect

- Inspect for slippage, tracking and wear monthly.
- Inspect flanged rollers for wear and positioning.
- Inspect toothed rollers daily for wear and to ensure belt is in the correct position, that is, centered.

#### 6.2.4.2. **Clean**

Clean the conveyor weekly using the Ultrasonic Belt Cleaner (if available).


#### 6.2.5. **Motors**

Inspect the drive motor chains every three months and lubricate as necessary.

#### 6.2.6. **Conveyor Guides**

Annually inspect the Teflon guides by the conveyor for grooves cut by the conveyor.  
Replace Teflon guides as necessary.

#### 6.2.7. **Quartz Rods**

	<p><b>Caution!</b></p> <p><i>Never touch a quartz rod with a bare hand. Contact between a quartz rod and a bare hand substantially reduces the life of the rod. Always use powder-free nitril or latex gloves when handling the quartz rods.</i></p>
--	--

##### 6.2.7.1. **Inspect**

Inspect quartz rods every three months for signs of wear and squaring off of the rounded surfaces. Replace as necessary.

##### 6.2.7.2. **Clean**

Clean the quartz rods weekly. Dust or other materials on the quartz rods may affect temperatures.

1. Open each oven clamshell.
2. Wearing powder-free nitril or latex gloves, remove each quartz rod and clean with alcohol.
3. Vacuum the lower Dryer and Furnace oven trays.
4. Inspect insulation and repair as necessary.

### 6.2.8. Conveyor Take-up

Check monthly that the swing arm moves freely. Annually inspect the conveyor take-up for ease of movement (Figure 58).

- Review position of conveyor take-up to see if the belt has stretched
- Ensure the conveyor take-up arm is as high as possible, otherwise proximity switch will alarm
- Take out links as necessary
- Check pressure on pneumatic cylinder is within range (2-4 psi)

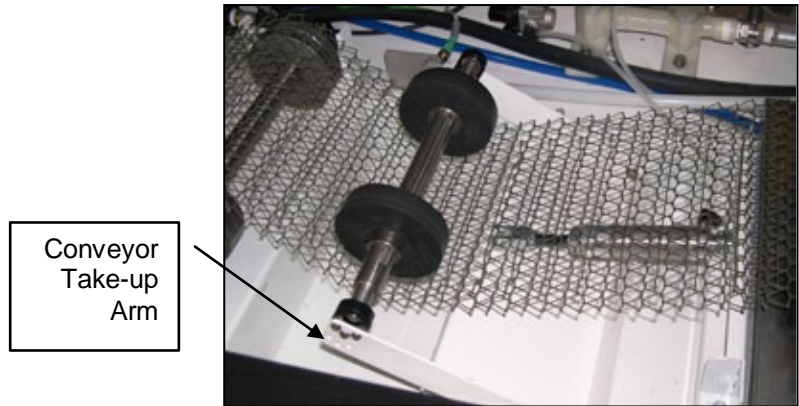


Figure 58. Inspect Conveyor Take-up for Ease of Movement.

### 6.2.9. Process Plumbing Assembly

Inspect process plumbing every six months for signs of leakage (Figure 59). Repair/replace as necessary.

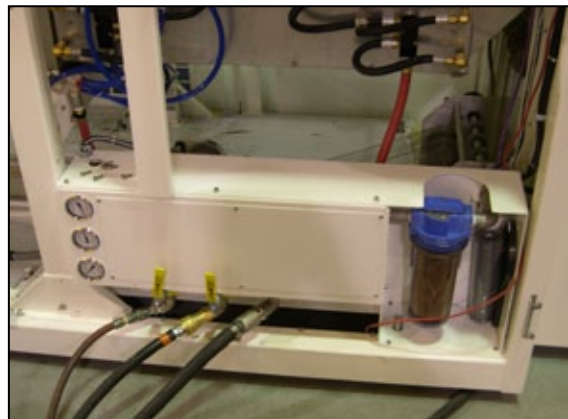



Figure 59. Inspect Plumbing for Leaks every Six Months.


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## 6.3. Chamber Systems

### 6.3.1. Heater Lamps

	<p><b>Warning!</b></p> <p><i>Wait until the furnace has cooled before opening side doors to replace heater lamps.</i></p>
---	---

	<p><b>Caution!</b></p> <p><i>Never touch a heater lamp with a bare hand. Contact between a heater lamp and a bare hand substantially reduces the life of the heater lamp. Always use powder-free nitril or latex gloves when handling heater lamps.</i></p>
---	---

#### 6.3.1.1. Inspect

Inspect IR lamps before starting the UltraFlex Furnace. Lamp inspection involves using the Maintenance Mode:

1. From **Maintenance Mode** (3.1.8), press **Chamber Lift** to lower the chamber (5.7).
2. From **Maintenance Mode**, manually set heat zones to 15-25% using drop down menus.
3. Visually verify that the lamps in each zone are illuminated.
4. Reset setpoints to zero after verifying lamps are functioning and noting those that are non-functional.
5. Allow the UltraFlex Furnace to cool and replace lamps as needed (6.3.1.2).
6. After inspecting, verifying and replacing non-functional lamps, close the chamber.

#### 6.3.1.2. Replace

1. After furnace has cooled to a safe temperature, open side doors.
2. Remove lamp box covers from both sides of the zone requiring lamp replacement (Figure 60).
3. Remove Wago blocks from both sides and then remove the lamp.
4. Using gloves, slide the replacement bulb into position.
5. Verify that the orange seal (on both ends of the bulb) was not damaged during installation.

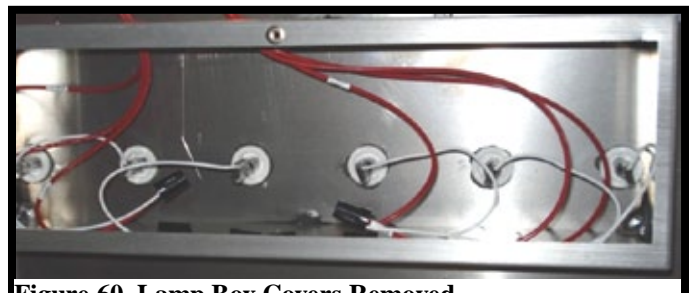


Figure 60. Lamp Box Covers Removed.

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6. Connect the wires together and reattach Wago blocks (Figure 61).
7. Re-install lamp box covers and the side doors.
8. Verify that the lamp functions (6.3.1.1).

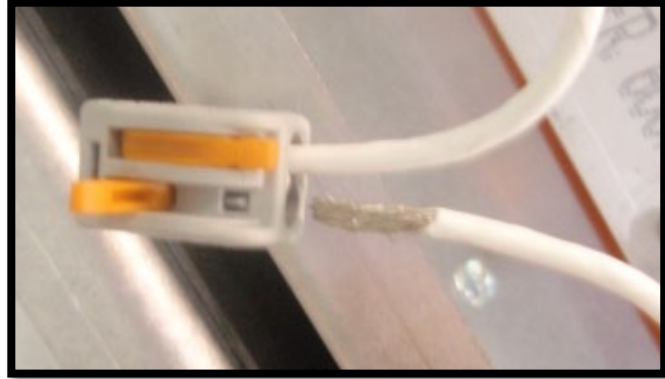


Figure 61. Attach Wago block.

### 6.3.2. Thermocouples

No inspection is needed for thermocouples, but replace as indicated by a failure alarm (“Thermocouple Open”).

1. After furnace has cooled to a safe temperature, open the side doors.
2. Identify thermocouple to be replaced (Figure 62).
3. Remove thermocouple requiring replacement
  - 3.1. Unscrew compression fitting top nut.
  - 3.2. Gently remove Thermocouple from top.
  - 3.3. Inspect hole for insulation damage and repair if needed
  - 3.4. Slide new compression ring and nut on Thermocouple and slide into place.
4. Tighten compression fitting.
5. Close side doors.



Figure 62. Replace Thermocouple.

### 6.3.3. Insulation

Visually inspect insulation in upper and lower chambers of the dryer and furnace for breaks and cracks.



#### **Caution!**

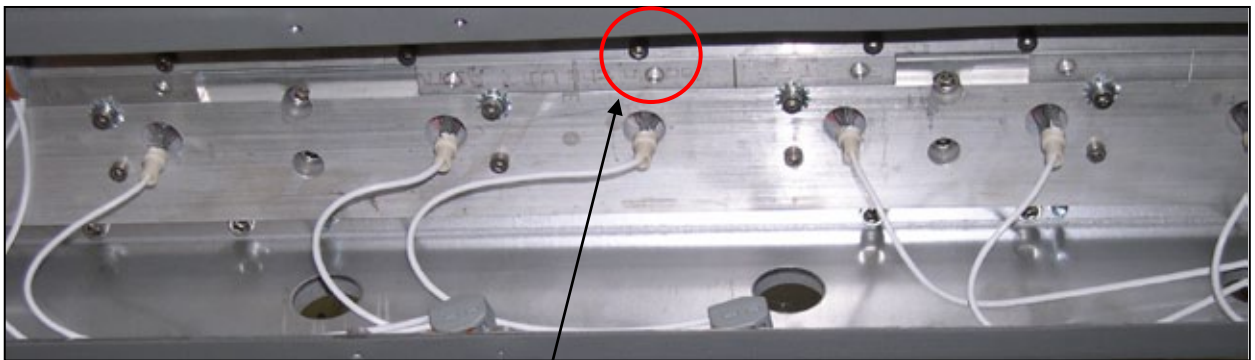
***Avoid touching the insulation unless necessary for the procedure.***



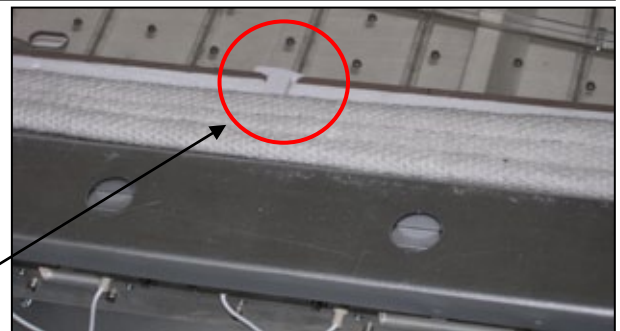
Unlike the Despatch CDF Furnace, the UltraFlex Furnace insulation does not require patching. Individual pieces of insulation must be replaced in their entirety.

Clean and replace as necessary.

1. Remove the lamp box covers to gain access to screw holding the white insulation "T" piece in place (Figure 63).
2. Remove screw and insulation "T" piece.
3. Replace insulation "T" piece as necessary.



Screws that retain insulation "T" pieces.



Insulation "T" piece above conveyor belt

**Figure 63. Replace Insulation "T" Piece.**

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### 6.3.4. *Dryer Casing*

Frequently wipe the dust and/or VOC contaminants off the dryer casing with a soft cotton cloth and isopropyl alcohol.

### 6.3.5. *Protective Glass Layer*

Inspect every other week. Clean as necessary.

## 6.4. *Cooling/Ventilation Systems*

	<p><b>Caution!</b></p> <p><i>Do not blow air through cooling coils. Flow meter failure will result.</i></p>
---	---

### 6.4.1. *Coils*

Inspect coil for leaks every six months. Flush the coils only once: when the facility is first starting. Coils should not be flushed again.

## 6.5. *Exhaust Systems*


### 6.5.1. *Duct Hoses (3" & 4")*

- Inspect monthly for breakage. No maintenance required.
- Inspect every six months for leaks, holes and burnt binder build-up

### 6.5.2. *Exhaust Venturi Port*

No physical inspection required. Watch for failure alarms on-screen.



	<p><b>Warning!</b></p> <p><i>Cool furnace before servicing exhaust venturi port.</i></p>
---	--

### 6.5.3. Exhaust Flow Restrictor Plate

Inspect the restrictor plates monthly (Figure 64). Remove exhaust housing to access the restrictor plate (Figure 65). Clean or replace as necessary.



**Figure 64. Restrictor Plate.**

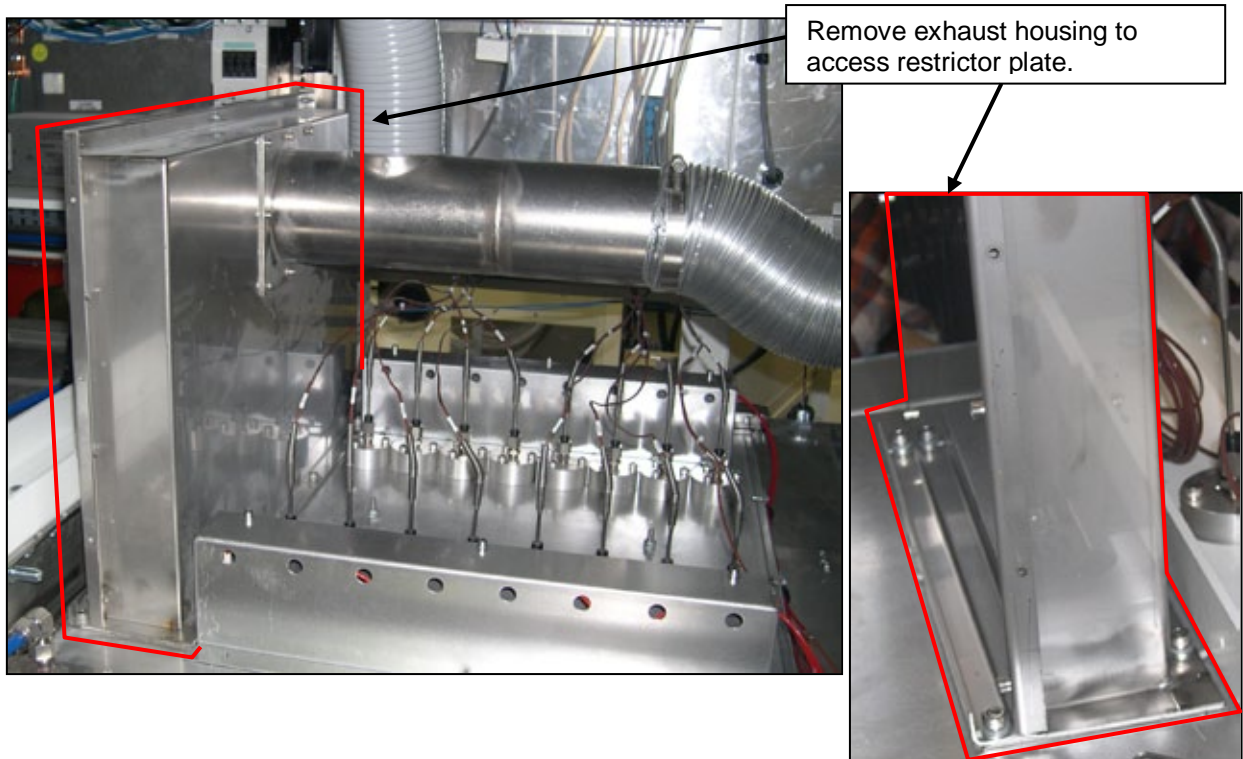


Figure 65. Remove exhaust housing to access restrictor plate.

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#### 6.5.4. Water Filter

Inspect monthly for cracks in “O” rings and that to ensure the element is not clogged. Use the actuator valve on top of the filter to bypass the filter. Replace as necessary (Figure 66).



Figure 66. Inspect Water Filter Monthly and Replace Filter as Necessary.

#### 6.5.5. VOC



#### **Warning!**

*Do not perform preventive maintenance functions on the VOC Thermal Oxidizer while operational. Operating temperatures for the VOC Thermal Oxidizer make it dangerous for personnel.*

#### 6.6. Lift Systems



#### **Warning!**

*Lift systems are serviced only by Despatch personnel.*

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**Warning!**

*Warn personnel before opening or closing the furnace chamber. The chamber lift should be actuated only when outside doors are closed (depending on access level).*



**Caution!**

*Defeating the outside door switch sensors may result in damage to equipment and/or harm to personnel.*



Access to Chamber Lift is available only in Maintenance Mode. The chamber casing may only be opened when the temperature is below 300° C. If above 300° C, follow user prompts for Rapid Cooling/Cooldown mode.

**6.6.1. Inspect**

- Inspect lift chains for wear and abrasion every six months.
- Inspect pneumatic cylinders monthly.
- Inspect optical sensors, slides and guides annually.

**6.6.2. Clean & Maintain**

- Clean and lubricate lift chains annually and as needed.
- Wipe dust from the optical sensors with a soft cloth.

### **6.6.3. Chamber Lift Troubleshooting**



Access to Chamber Lift is available only in Maintenance Mode. The chamber casing may only be opened when the temperature is below 300° C. If above 300° C, follow user prompts for Quick Cooldown mode.

#### **6.6.3.1. Chamber Does Not Lift**

1. Check for obstructions.
2. Check whether electrical controls are powered.
3. Check that air pressure is supplied and correct.

#### **6.6.3.2. Chamber Lifts But Does Not Close or Does Not Close Completely**

1. Check for obstructions.
2. Check that air pressure is correct.

## 6.7. Insulation Burn-off

Over time, furnace insulation and exhaust boxes can become contaminated with excessive paste residue/solvent (Volatile Organic Compounds or VOCs) due to the drying process (Figure 67). Contamination often occurs in the dryer and dryer exhausts. Many variables (like paste make-up and throughput) play a factor in the degree of buildup. Monthly (and other intervals as needed) preventive maintenance can help decrease contaminate buildup.



Figure 67. Contaminated Dryer Zone Before (left) and After (right) Insulation Burn-off procedure.

Despatch has developed two insulation burn-off profiles:

- Burn-off Profile 1 (**Recipe Name: Burnoff(1)**): This long-duration, slow-ramp process that can be used for tools with heavier buildups of condensate.
- Burn-off Profile 2 (**Recipe Name: Burnoff(2)**): This shorter-duration process is intended for use on a regular basis, where condensate buildup is minimal.

Both profiles can be added to the operating software in the maintenance portion of the program and use the settings listed below.



**Note: Burn-off procedures—especially those with long-duration cycle—can increase temperatures within facility ductwork to a level where condensed solvent within the ductwork may react. Clean facility ductwork in advance of the burn-off cycle to prevent problems.**

**Despatch recommends removal of the stack section directly above the dryer and furnace exhaust to provide additional excess air in the remainder of the facility exhaust ductwork.**

**Despatch cannot be liable for damage to facility ductwork that may be due to excessive temperatures in the ductwork during the burn-off cycle.**

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### 6.7.1. Procedure for Insulation Burnoff



**The operator must remain near the tool during the burnoff process.**

1. Remove a section of stack above the dryer exhaust points to allow a gap of at least 6 inches (15 cm).
2. Inspect facility ductwork prior to running Burnoff procedure. If ductwork is contaminated it should be cleaned and/or replaced prior to running procedure.
3. Inspect dryer and dryer exhaust ductwork for contamination. Any significant buildup in the ductwork should be removed prior to running the procedure. If the dryer is badly contaminated the “recovery procedure” should be used.
4. Note ramp rate settings so you can return to these values after this procedure.
5. Load recipe (Table 6) from a cold start or when the tool is in a warmed-up state.



**Adjust each zone’s ramp rate in the PID Loop Tuning and Control Screen to ensure the proper slow temperature increase.**

**Table 6. Burnoff Recipe Settings.**

		Dryer				Furnace					
		Zone				Zone					
		1	2	3	4 (Opt)	1	2	3	4	5	6
Recipe	Temp	450	500	550	600	650	700	750	800	800	800
Burnoff (1)	Ramp Rate	10 degrees C per minute				20 degrees C per minute					
Burnoff (2)	Ramp Rate	20 degrees C per minute				40 degrees C per minute					
<b>Belt Speed</b>		75 in./min									

6. Run the chosen recipe for 45 minutes after the machine has reached 550 degrees C in the final dryer zone.
7. After one hour at the highest temperature allow the machine to cool and open the chamber for inspection and cleaning of any internal debris.
8. After completing the initial burn-off, remove and inspect venturi tubes in the exhaust.
9. Return the ramp rate settings to their original state and load production recipe.

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### **6.7.2. Recommendations for Reducing Paste Contamination**

1. Operate the dryer at as high of a temperature as the process will allow. At today's high belt speeds, VOC's are driven off later in the dryer, leaving less time for them to be diluted with fresh air and swept out of the dryer through the exhaust system.
2. Operate the dryer with as much dilution air as possible. The dryer must receive a minimum of 600 SCFH (17,000 LPH). The more dilution air introduced into the dryer, the more VOCs will be swept out, keeping the dryer cavity cleaner longer.
3. Set the exhaust venturis (on the entrance and exit exhausts) to match the dilution air volume introduced to the dryer). The dryer chamber should be operated at a pressure slightly negative to the room (to prevent paste odors from escaping).
4. Please contact your Despatch Service Representative if you require assistance conducting these procedures.



## 7. Appendices

### 7.1. *Using UltraFlex Furnace Data Files: Data & Diagnostic Logs*

The UltraFlex furnace produces data files from a variety of inputs within the tool. These data files can serve as snapshots of the particular process and profiles used. The data files are organized into two separate files: Data Logs and Diagnostic Logs.

- Data Logs include data points such as temperatures, airflow quantities and setpoints.
- Diagnostic Logs include data points such as line voltage and amperage.

Data and diagnostic logs are produced on a first in first out format. Data and diagnostic logs are regularly overwritten (every two weeks to every month) unless exported or saved to external USB storage using the Trending Screen. (See Section 5.1.3).



Export data and diagnostic logs only during non-production times. Exporting logs while the tool is running in Production Mode may introduce script errors into the transferred logs.

Contact Despatch for more information on viewing data and diagnostic logs.

### 7.2. *UltraFlex Furnace Alarms*

The default actions for each type of alarm:

- All Conveyors:
  - High Alarm Deviation: No Action
  - High Process Alarm: No Action
  - Low Process Alarm: No Action
  - Low Alarm Deviation: Enter Cooldown Mode
- All Airflows:
  - High Alarm Deviation: No Action
  - High Process Alarm: No Action
  - Low Process Alarm: No Action
  - Low Alarm Deviation: Enter Cooldown Mode
- All Heat:
  - High Alarm Deviation: Enter Cooldown Mode
  - High Process Alarm: No Action
  - Low Process Alarm: No Action
  - Low Alarm Deviation: No Action

### 7.3. *Ultrasonic Belt Cleaner*

When so equipped, the ultrasonic belt cleaner can be used to remove unwanted compounds from the furnace conveyor belt. The cleaner submerges the belt in ultrasonic energized de-ionized water. All functions of belt cleaning are software-controlled, and can be run only during Maintenance mode. In general, follow on-screen prompts for operating the ultrasonic belt cleaner.



***Caution!***

***Operation of the ultrasonic transducer without adequate water may damage unit.***

# Despatch

INDUSTRIES

## **GLOBAL HEADQUARTERS**

Despatch Industries  
8860 207th Street West  
Minneapolis, MN 55044  
USA

US toll free: 1-888-337-7282  
international/main: 1-952-469-5424  
fax: 1-952-469-4513

info@despatch.com  
www.despatch.com

## **SERVICE AND TECHNICAL SUPPORT**

service parts: 1-800-473-7373  
international service/main: 1-952-469-8230  
service fax: 1-952-469-8193

service@despatch.com

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