OVENWATCH®

Users Guide

OvenWATCH®
Product Quality Monitoring System
Users Guide

A41-6928-00 Rev 4.0.1

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1.0 Introduction

1.1 Copyright

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1.2 Declaration of Conformity

Electronic Controls Design, Inc.
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(503) 659-6100 / (800) 323-4548
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Declaration of Conformity

Product:	"Xpert Ready" SMG W/PP	**Part number:**	E40-2875-40
	"Xpert Ready" SMG W/PP (RoHS)		E45-7647-40
	OvenWATCH® Station		E41-6928-42

The above product is in conformity with the following standards or other normative documents:

- Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment:
  EN55011:1992
- Electromagnetic compatibility generic immunity standard Part 1: Residential, commercial and light industry:
  EN50082-1:1992
- Safety requirements for electrical equipment for measurement, control, and laboratory use Part 1: General requirements:
  EN61010-1:1990, and Amendment 1:1992

Following the provisions of the following European Directives:

- Electromagnetic Compatibility Directive
  89/336/EEC
- Low-voltage Directive
  73/23/EEC

Signed: _____ **Date:** November 27, 2006

1.3 Declaration of Compliance

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Milwaukie, Oregon U.S.A. 97222-8825
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FAX: (503) 659-4422

Declaration of Compliance

EC Directive RoHS 2002/95/EC

Product:	"Xpert Ready" SMG (RoHS)	**Part number:**	E45-7647-45
	SMG Power Pack Battery (RoHS)		E45-7647-30
	"Xpert Ready" SMG W/PP (RoHS)		E45-7647-40

This document certifies that the products under the above mentioned part numbers manufactured by Electronic Controls Design, Inc. are in compliance with Directive 2002/95/EC of the European Parliament and of the Council of 27 January 2003 on the restriction of use of certain hazardous substances in electrical and electronic equipment (RoHS Directives). These products have been identified as RoHS compliant because they do not exceed the maximum limit for following six substances:

Substance	Maximum Limit (ppm)
Cadmium (Cd)	100
Lead (Pb)	1000 (1)
Mercury (Hg)	1000
Hexavalent Chromium (Cr6+)	1000
Poly Brominated Biphenyls (PBB)	1000
Poly Brominated Diphenyl Ethers (PBDE)	1000

(1) Maximum limit (ppm) does not apply to applications for which exemptions have been granted by the RoHS Directive.

Name: Rex Breunsbach

Signed: R. Breunsbach **Date:** 05/03/2006

Title: CEO

1.4 How to Use This Users Help Guide

This OvenWATCH® Users Help Guide explains how to use the ECD OvenWATCH® Product Quality Monitoring System and software.

This Users Help Guide is written for users of varied experience. If a section covers information you already know, feel free to skip to the next section.

- You **do not need** to be a computer expert to use this manual or the software.
- The manual assumes you are familiar with Microsoft® Windows®.

The hardware portions of this manual are written to reflect SuperM.O.L.E.® Gold firmware versions 9.08 and higher. The software portions reflect versions 1.12c and higher.

1.5 Terms Used

ECD. introduced the original M.O.L.E.® (Multichannel Occurrent Logger Evaluator) in 1986. Over the years ECD has produced several models of the M.O.L.E. ® for use in a wide variety of applications. In this Users Help Guide, we may refer to the SuperM.O.L.E.® **Gold** data recording device as the M.O.L.E. ®.

The following statements describe special terms that will be used in this Users Help Guide:

Informs the user that the note includes important information.

Informs the user that the note includes a handy tip.

Hardware Terms:

Informs the user that the note identifies conditions or practices that could result in damage to the equipment

Informs the user that the note identifies conditions or practices that could result in personal injury or damage to property other than the equipment.

- **"Xpert Ready"**, refers to the M.O.L.E. ® being configured to interface with the AutoM.O.L.E. Xpert 3 System.
- **Thermocouple**, may be referred to as T/C.

Software Terms:

- OvenWATCH® software may be referred to as **OW SPC**.
- **Workbook**, contains all of the worksheets and the uploaded data set saved with file extension (**.MOW**).
- **Worksheet**, the individual pages or sheets in the workbook file.
- **Data Set**, multiple data runs uploaded into the workbook file.
- **Data Run / Experiment**, the data uploaded from the **M.O.L.E.** ®.

1.6 Fonts Used

This manual uses a special font to indicate terms or words that can be found directly on the display of the oven computer.

For example:

On the ***File*** menu, select ***Open Workbook*** to open a new workbook file". This ***font*** indicates the words ***Open Workbook*** and ***File*** are actually found on the computer display as menu items.

1.7 Product Symbols

The following symbols may be present on the Product:

	Direct Current (DC) Power
	Alternating Current (AC) Power
	CAUTION: Whenever this internationally recognized symbol is used on the product, additional information concerning that particular feature or function appears in the manual.
	WARNING: Electric Shock or Energy Hazard

1.8 Cleaning Instructions

The product must never be immersed in water or any other cleaning agent. Wipe the exterior of the enclosure with a cloth dampened with water.

IPA alcohol is the only type of solvent that is acceptable to clean the M.O.L.E. or any of the system components. All other types are not recommended

To prevent product damage, do not clean the product using organic solvents.

1.9 Operator Safety Information

The safety information in this section is for the benefit of operating personnel. Warnings and Cautions will also be found throughout the manual where they apply.

Hardware changes or modifications to the components are not expressly approved by ECD. and could void the warranty of the product.

The warranty will not cover damage caused by neglect or abuse of this product. To maintain the safety features incorporated in this product, operation must be in strict compliance with the requirements specified herein.

For protection of the components, observe the following:

- **NEVER** permit the M.O.L.E. or the Power Pack battery to exceed the maximum specified internal temperature as permanent damage may result. (Refer to ***Appendix A: Specifications***).
- **NEVER** expose the M.O.L.E. or Power Pack battery to temperatures below the specified minimum for extended time periods. This may damage the re-chargable Power Pack battery.
- **NEVER** connect the M.O.L.E. input channels to objects at elevated electrical potentials. The input channels are not isolated from each other or from the data port common.
- **NEVER** operate the OvenWATCH® components in flammable or explosive atmospheres. Such usage constitutes a fire or explosion risk.
- **NEVER** immerse the OvenWATCH® components in liquids.
- **NEVER** subject the OvenWATCH® components to sharp impacts.
- **NEVER** excessively stress the PC Interface cable.
- **NEVER** expose the OvenWATCH® components to corrosive environments.

When removing the M.O.L.E. from any temperature environment, whether in a Thermal barrier or not, be careful of extreme temperatures and use protective gloves.

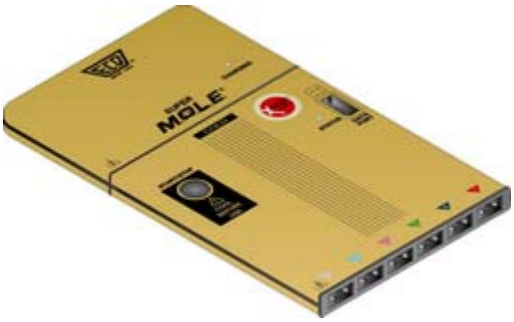
Battery Warnings:

- Replace the batteries with same type only. (Clock Battery: Panasonic No. BR2032, or equivalent). (Rechargeable Power Pack battery, ECD Part No. E45-7647-30). Using alternate batteries may present a risk of fire or equipment damage.
- Charge the “Re-chargeable” Power Pack battery using only the ECD approved charger.
- Do not attempt to recharge the Calendar/Clock battery, disassemble, or dispose of in fire. Always dispose of used batteries promptly and properly.
- Do not expose to temperature above 100°C (212°F).
- Keep the batteries away from children.
- The batteries may explode if mistreated.
- The batteries contain electrolytes.

2.0 System Description

2.1 SuperM.O.L.E.® Gold

The M.O.L.E.® is compact and durable. One end has input connectors for attaching up to six sensors and the other end is the removable Power Pack battery. The M.O.L.E.® also has a four-pin Data port, Start/Stop button, and an Activity LED.



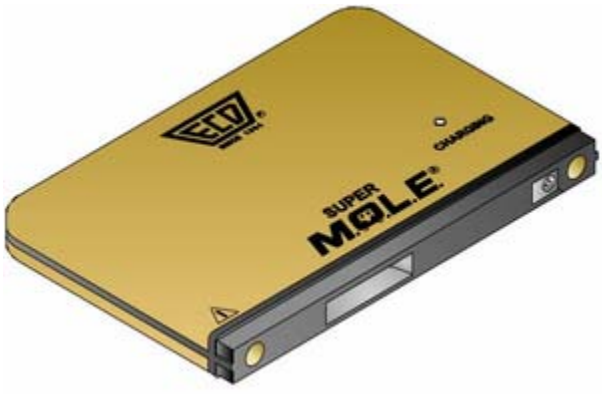
SuperM.O.L.E. Gold Features

M.O.L.E. functions:

- Thermocouple/Sensor Inputs:This is where Type “K” or “S” Thermocouples and the optional Relative Humidity sensors are connected.
- Start/Stop button: Allows the user to start and stop data collection.
- Power Pack battery: Supplies power to the M.O.L.E.
- Data Port: Transfers data through the PC Interface cable to the PC.
- Activity LED: Indicates what state the M.O.L.E. is in, such as: Power On (flashing at log interval), Power Off (no illumination), Data transfer (steady illumination), and Reset complete (quick flashing for 2 seconds).

2.1.1 Power Pack Battery

Because the M.O.L.E. is powered by the Power Pack battery, it is important to make sure it is charged and operating properly. OW SPC records the voltage of the Power Pack and reports this information in the M.O.L.E. status box. Refer to ***M.O.L.E. Status*** for more information.

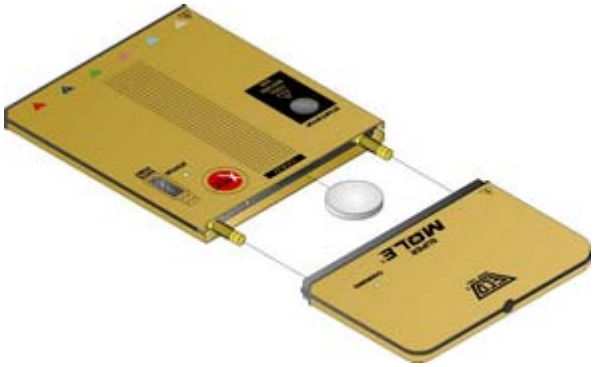


SMG Power Pack Battery

When the Power Pack needs to be re-charged use the charger supplied with the kit and the instructions in section Charging the Power Pack Battery. It is also recommended that a spare Power Pack battery be ordered so that one battery is charging while the other one is being used.

2.1.2 Calendar/Clock Battery

The M.O.L.E. has another battery that powers an internal calendar and clock. This battery is not rechargeable and has no status indicator. The expected battery life is about 2-3 years.

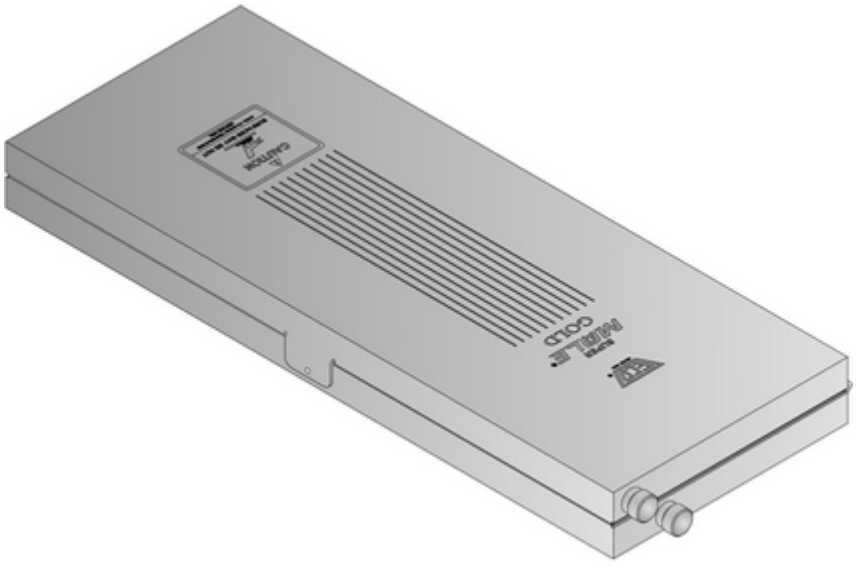


Calendar/Clock battery

If the M.O.L.E. calendar and clock does not seem to operate (it resets itself), the battery may be discharged. For information on replacing the calendar/clock battery refer to section *Changing the Calendar/Clock Battery*.

2.1.3 Uni-Barrier & Yellow Jacket

The Uni-Barrier with Yellow Jacket is the standard barrier in all our Lead-Free profiling kits, including the wireless RF kit. A thermal barrier is the protection the M.O.L.E. needs to ensure longevity through harsh environments. With piano-hinged stainless steel construction, sheathed in cool-to the touch high-temperature fabric, this barrier is rated for 17 minutes at 300C steady state ambient, ideal for lead-free reflow and wave soldering work.



Uni-Barrier

Uni-Barrier w/Yellow Jacket

This Barrier combination is light- weight and thin (32.5mm [1.28"]).

2.2 Station

The OvenWATCH® Station is a multipurpose Thermocouple Multiplexer and upload station where the user inserts the M.O.L.E. to record oven profile measures, upload data runs, and to charge the Power Pack Battery.

Station

Station Features:

- M.O.L.E. Port: This is where the M.O.L.E. is inserted into the Station to record and upload data or charge the Power Pack battery.
- Status Indicators: The status indicators are LED's that display the status of the oven (i.e. Power On, In Specification and Alarm).

2.3 Zone Temperature Probe

The Zone Temperature probe is installed inside the reflow oven and has K-Type T/C sensors positioned in the center of each oven zone along the length of the probe.

The OvenWATCH® system has two Zone Temperature probe styles available, a solid shell probe and a flexible probe. Either style may be installed depending on your oven requirements.

(Solid Shell) ***Flexible***

Zone Temperature Probe

This sensor is connected to OvenWATCH® Station and is the component that reports the actual zone temperatures.

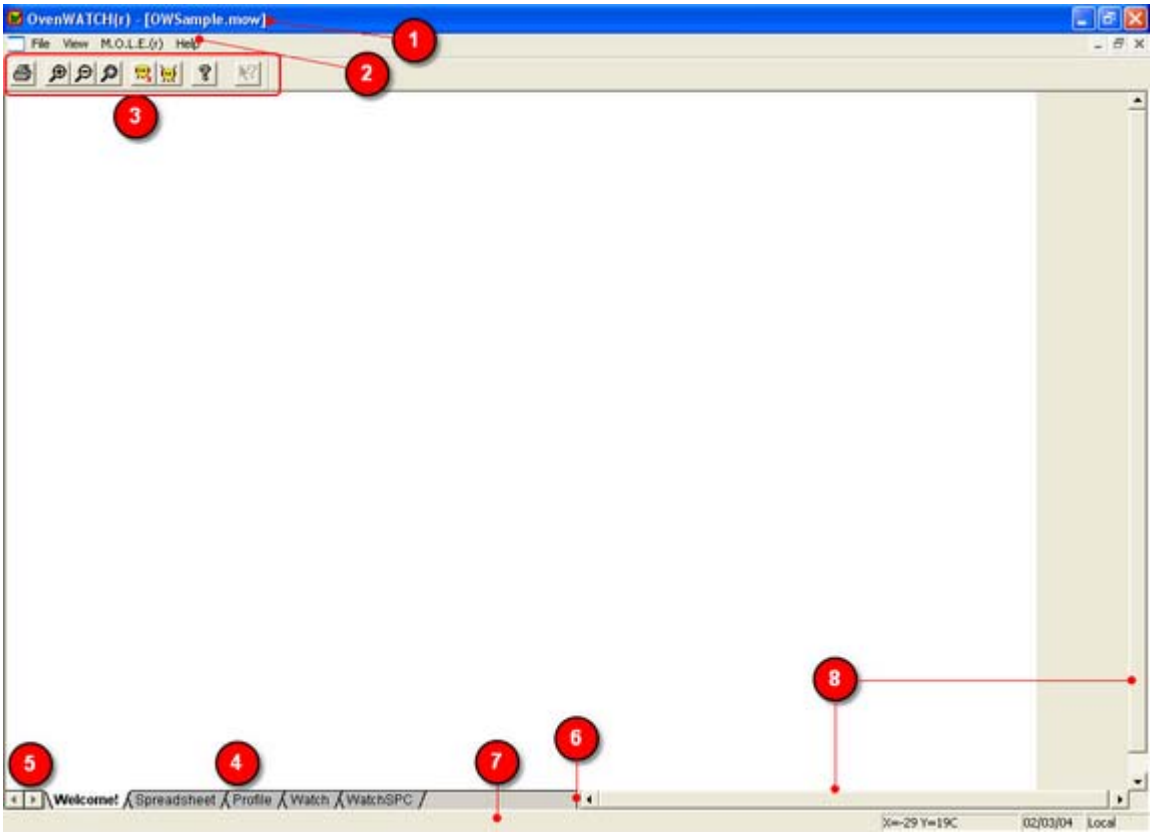
2.4 Software Description

This section presents an overview of a workbook management window. When the software is started, it will automatically load the previously saved workbook file.

The first time the software is started a sample file (i.e. OWSample.mpc) will be opened for users to familiarize themselves with the program. It is recommended when the user starts collecting process data, a new or exiting workbook should be used.

OW SPC Workbook Features

The workbook has several features as described in the following section.



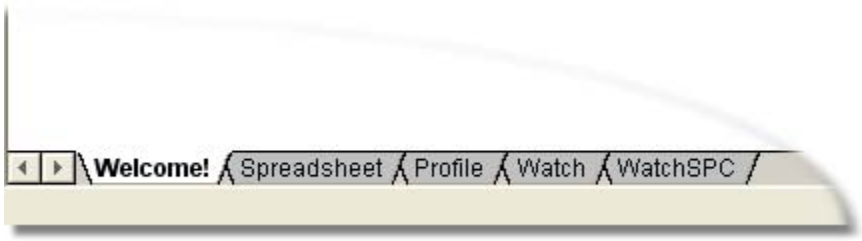
Workbook Features

❶ **Title Bar:** This bar contains the program name, version, and the active workbook file name.

❷ **Menus:** These menus contain the commands and tools for each worksheet. Each worksheet may contain different commands that supply specific support for each worksheet. Individual worksheet menus are described in detail in their specified sections of this manual.

❸ **Toolbar:** The Toolbar has buttons to serve as shortcuts to the menu commands. Individual worksheet toolbar buttons are described in detail in their specified sections of this manual. Each worksheet may have different items on the toolbar because of the different features offered by each worksheet.

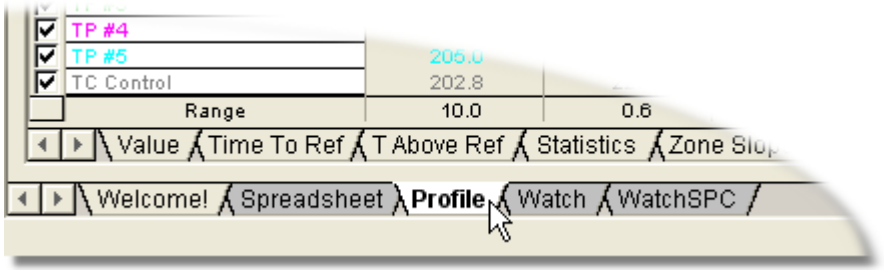
❹ **Worksheet Tabs:** These tabs are used to gain access to each worksheet. There are six standard worksheets and up to nine optional SPC sheets. These tabs are located on the bottom left of the display.



Worksheet Tabs

To a view worksheet, use the mouse pointer to click on a worksheet tab. The worksheet tab will then become highlighted, and the worksheet will now be visible.

The keyboard does not allow access to the worksheets. The only way to select the worksheet is by using the mouse pointer.



Selecting a Worksheet

❺ **Tab Scroll Arrows:** These arrows are used to view other worksheet tabs if the Horizontal scroll bar is covering them. Worksheet tabs may be hidden behind the horizontal scroll bar. To view them, the user can either use the Tab Scroll Arrows located on the left of the worksheet tabs, or use the Split-bar.

❻ **Split-bar:** The Split-bar on the tab bar lets the user slide the Horizontal scroll bar to the left or right, so all of the worksheet tabs can be viewed. This feature is located on the left edge of the Horizontal scroll bar.

❼ **Status Bar:** This bar on the bottom of the worksheet display, shows the available Help information, mouse pointer X-Y position, current date and time.

8. **Horizontal & Vertical Scroll Bars:** The worksheets have both Horizontal and Vertical screen scroll bars so the non-visible areas of the worksheet can be scrolled into view. The Horizontal scroll bar is located in the lower right corner and can be scrolled left or right by pressing the left or right arrows located on each end of the scroll bar. The user may also scroll the display by sliding the center scroll bar left or right. The Vertical scroll bar located on the right side of the screen has the same features as the Horizontal scroll bar except it scrolls the worksheet display up and down.

It is recommended that the minimum PC display area be set to 800 x 600. For best performance set the display to 1024 X 768. Refer to Microsoft® Windows® documentation for details.

3.0 Operation

3.1 Step 1 - Create a Baseline Profile

The OvenWATCH system requires a Baseline Profile to be established prior to recording profile measures.

If you have created profiles using a different program such as SuperM.O.L.E. Gold SPC and/or AutoM.O.L.E. Xpert the Import command on the Spreadsheet worksheet imports the profiles into the OvenWATCH software. (Refer to section ***Import*** for more information).

If you have an established Baseline Profile in the current workbook, you may proceed to *Step 2 – Create a Product*.

3.1.1 Experiment Setup

After the hardware is setup and the software is installed, use the following steps to perform an experiment using the SuperM.O.L.E. Gold.

1) Prior to beginning an experiment, compile a list that describes the product and conditions that are about to be tested. Calculate and write down the duration of the process. Document the Temperature setpoints, prescribed conveyor length and speed, or the prescribed process time. This product information can be added to the Workbook file using software features, after the collected data is uploaded to the software.
2) Make sure the M.O.L.E. Power Pack is fully charged. The battery status in the M.O.L.E. status box on the ***Profile*** worksheet displays the battery voltage at the time when the data is uploaded from the M.O.L.E.. The voltage level should be 4.8 volts or higher.

3) Insert the M.O.L.E. into the Station.

Power Pack Charger

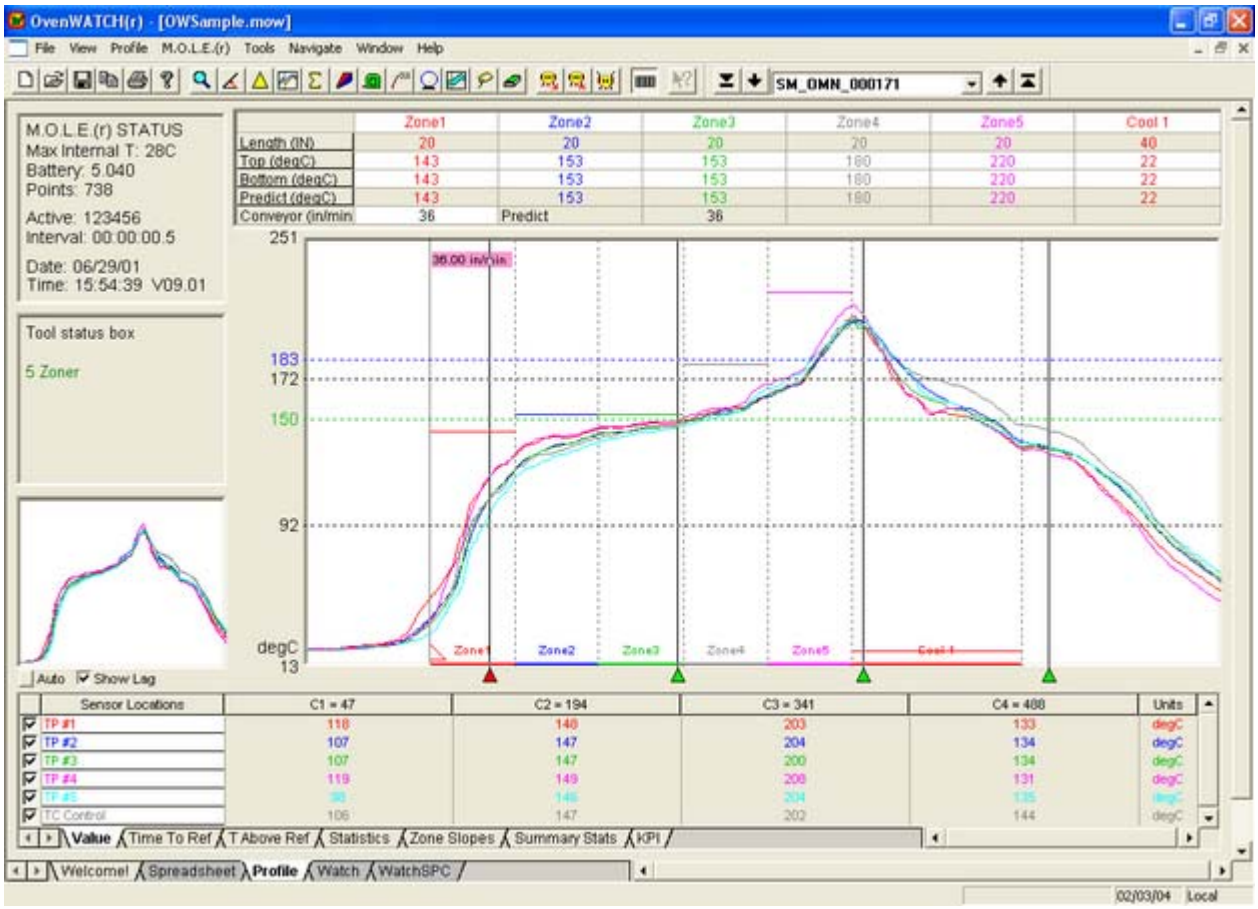
A completely discharged Power Pack takes about 14 hours to be fully charged.

The Power Pack battery can be charged continuously whenever the M.O.L.E. is not being used, however, if the M.O.L.E. is going to sit idle for five days or more, you may want to remove it from the Station.

4) Start the software program by double-clicking the OvenWATCH icon from the desktop or selecting it from the ECD OvenWATCH program sub-menu.

Program Group

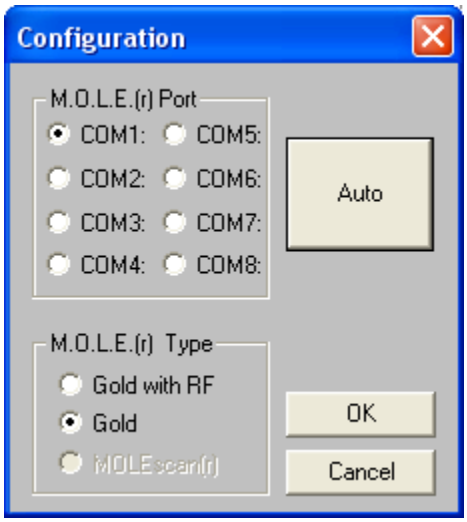
5) Open a desired workbook file and select the ***Profile*** worksheet tab.



Profile Worksheet

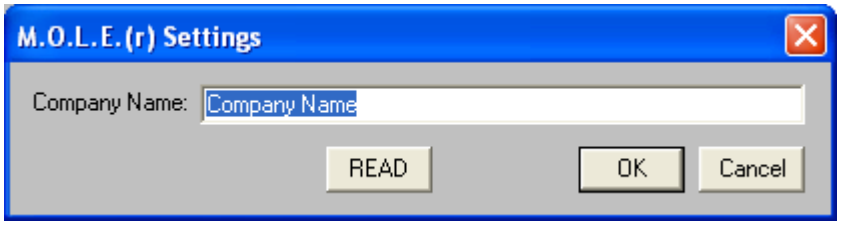
6) Select the ***Configuration Wizard*** command from the ***M.O.L.E.*** menu and the Configuration dialog box appears.

7) Click the ***Auto*** command button to have the software automatically find the COM port the M.O.L.E. is connected. If the M.O.L.E. is not detected, there is a communication problem (Refer to section ***Communications Problems*** for additional help).



Configuration

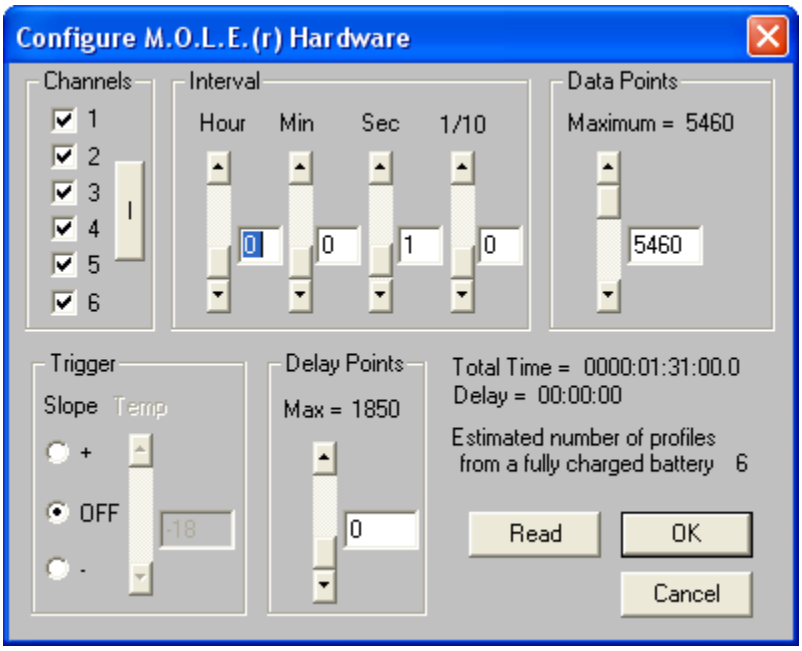
8) Click the ***OK*** command button to use the selection and continue to the M.O.L.E. Settings dialog box.
9) Type a company, operator, or machine name in the text box.



M.O.L.E. Settings

10) Click the ***OK*** command button to store the information in the M.O.L.E. and continue to the Configure M.O.L.E. Hardware dialog box.

11) Click the check box beside a corresponding channel to turn it “ON” or “OFF”. If a channel is “OFF”, it does not collect data for that channel, increasing battery life.



Configure M.O.L.E. Hardware

12) Enter an interval at which the M.O.L.E. records data points by using the slider(s) or manually typing in the corresponding text box. The maximum interval for the M.O.L.E. is 23:59:59 hours (one data point per day) and the minimum interval is 0.2 second (one data point every two-tenths of a second).

When using the M.O.L.E. with RF Option the minimum interval is 0.5 (one data point every five-tenths of a second) and when one channel is active, the minimum interval is 0.1 second (one data point every tenth of a second).

13) Enter the number of data points the M.O.L.E. will record during the data run. The maximum number is dependent on the number of channels turned on. The maximum data points the M.O.L.E. can collect are displayed above the text box. When the number of data points collected and the recording interval have been selected, the software displays the corresponding time the experiment will take beside ***Total Time*** = text in the lower right corner of the dialog box.

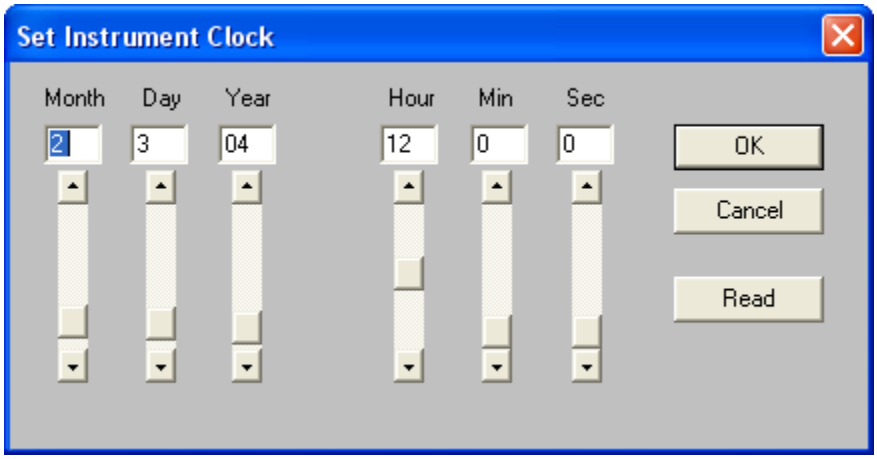
When M.O.L.E. configure options are modified, the data is calculated and then amount of profiles the user can expect from the power pack battery (based on a fully-charged power pack battery) is displayed in the lower right corner next to the Profiles Per Battery line.

Optional configurations:

- Enter a threshold temperature to “trigger” the M.O.L.E. to start recording data by using the slider or by entering it in the text box. When any active channel reaches that temperature, the M.O.L.E. will begin to record data. This option can trigger the profiler when the temperature cools down to the threshold temperature by selecting the ***(-)*** option button, or heating up to the threshold temperature by selecting the ***(+)*** option button. If this option is not used for temperature triggering, select the ***Off*** option button.
- Enter how many data points to delay “trigger” the M.O.L.E. to start recording data by using the slider or by entering it in the text box. The data point entered will “trigger” the start of data collection when the specified data point is reached in the process. The actual delay is equal to the ***Interval*** times the ***Pts Dly***.

14) Click the ***OK*** command button to save the configuration and continue to the Set Instruments Clock dialog box.

15) Enter the correct month, day, year, hour, minute, and second by adjusting the slider(s) or manually typing in the corresponding text box.



Set Instrument Clock

When the Set Instrument Clock dialog box appears the current computer clock setting is automatically entered in the text boxes.

16) Click the ***OK*** button to reset the clock.

17) Remove the M.O.L.E. from the Station and data can now be collected.

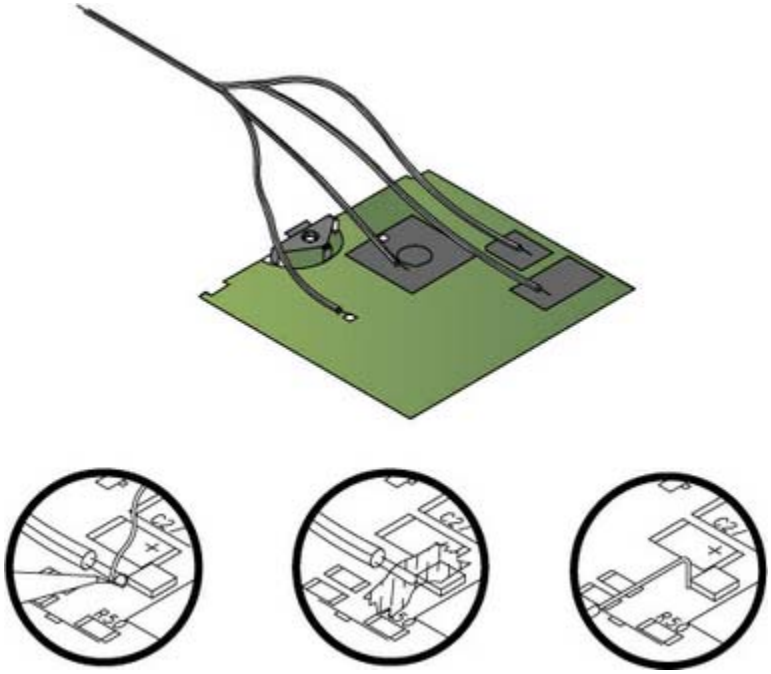
3.1.2 Data Collection

1) Attach sensors to test product.

When soldering a T/C sensor to a component with high temperature solder, use Kester SN10 (or equivalent) for 183°C eutetic solder or Kester SN5 (or equivalent) for no-lead soldering.

2) Unwind the sensor leads and attach the Micro connectors to the M.O.L.E.. Make sure to connect them to the same channel(s) that were configured to accept them. For example, if the M.O.L.E. is configured to have Channels 1 through 3 active, be sure the sensors are attached to the same three channels. (The connectors are polarized so they cannot be connected wrong).

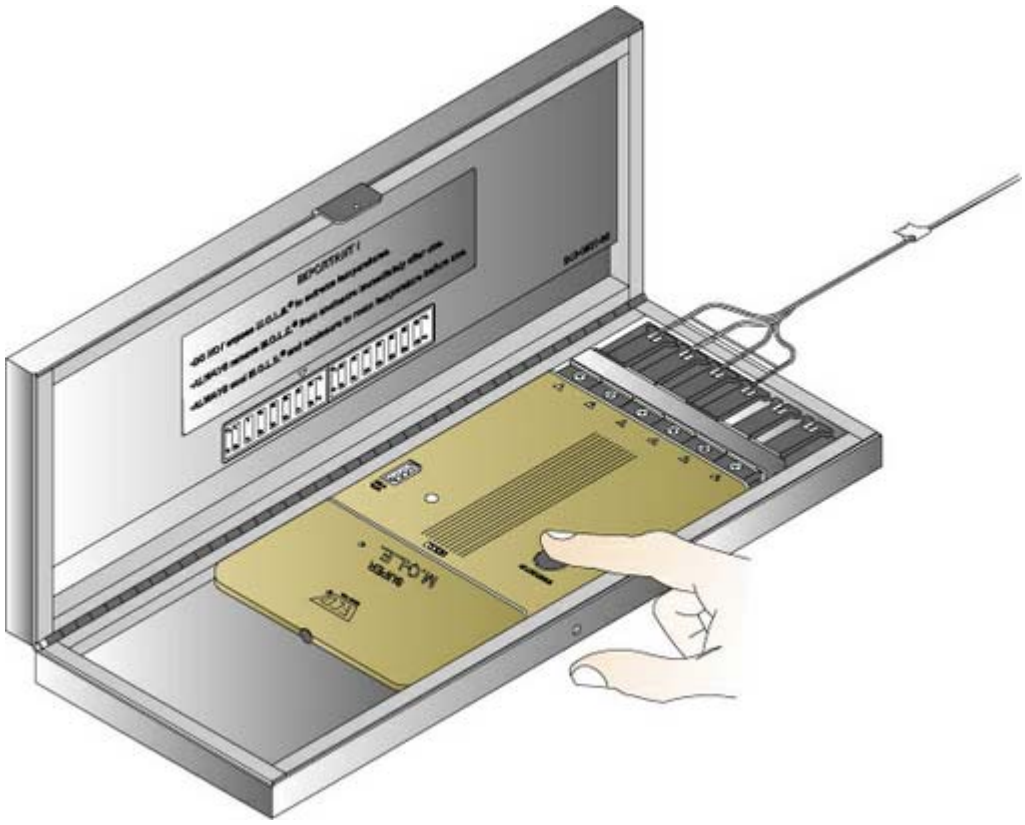
Kapton® tape, aluminum tape and Temprobeä can also be used to hold T/C wire to the test assembly.



T/C Attachment

If fewer than six sensors used, it is important that the unused channels are turned OFF.

3) Place the M.O.L.E. in the appropriate Thermal barrier making sure the Thermocouple and/or Sensor wires are not damaged.



M.O.L.E. Setup

4) After the oven stabilizes, press the Start/Stop button on the M.O.L.E. once to initiate data collection. When the M.O.L.E. is "ON", the Activity light will flash quickly and then flash at the log interval for the duration of the experiment.

The Start/Stop button will need to be pressed even if the M.O.L.E. is configured to start with the Trigger Temperature or Points Delay feature.

5) If you are using the 1.0" Uni-barrier to protect the M.O.L.E., insert the opposite end away from the T/C leads inside the Yellow Jacket barrier cover.

Never permit the M.O.L.E. to exceed the absolute maximum warranteed internal temperature, as permanent damage may result. The warranty will not cover damage caused by exceeding the maximum specified internal temperature.

6) Pass the thermally protected M.O.L.E. and test product through the process.

It is highly recommended that protective gloves are used when retrieving the M.O.L.E. from the oven and when opening the Thermal barrier.

7) As the test product and the M.O.L.E. emerge from the process, carry the test product with sensors attached and the M.O.L.E. in the Thermal barrier to a table or flat surface.

If you remove a sensor before the M.O.L.E. has stopped collecting data, the data for that channel might become distorted.

8) Open the Thermal barrier and if the Activity LED is still flashing this means the M.O.L.E. is still logging and it must be turned “OFF”. To turn the M.O.L.E. “OFF” press and **Hold** the Start/Stop button until the Activity LED turns off, and then release the button.

When turning the M.O.L.E. “OFF”, do not release the button until the light goes off. Pressing the Start/Stop button briefly will restart the data collection process and erase all the data in memory.

9) Remove the M.O.L.E. from the Thermal barrier. Handle it carefully, as the case may still be warm.

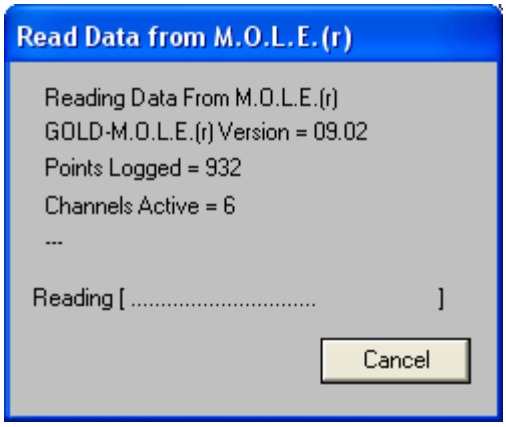
10) Disconnect the sensors from the M.O.L.E. and place it near the computer that has the software installed.

3.1.3 Transferring Data

When data is transferred from the M.O.L.E. to the PC, it is uploaded and saved in a Workbook file as a Baseline Profile.

To Read M.O.L.E. Data:

1) Insert the M.O.L.E. into the Station.
2) Select the ***Read M.O.L.E. Data*** command from the ***M.O.L.E. menu***, and the ***Read Data from M.O.L.E.*** status box appears showing the status of the uploading process. To discontinue click the ***Cancel*** command button at any time.



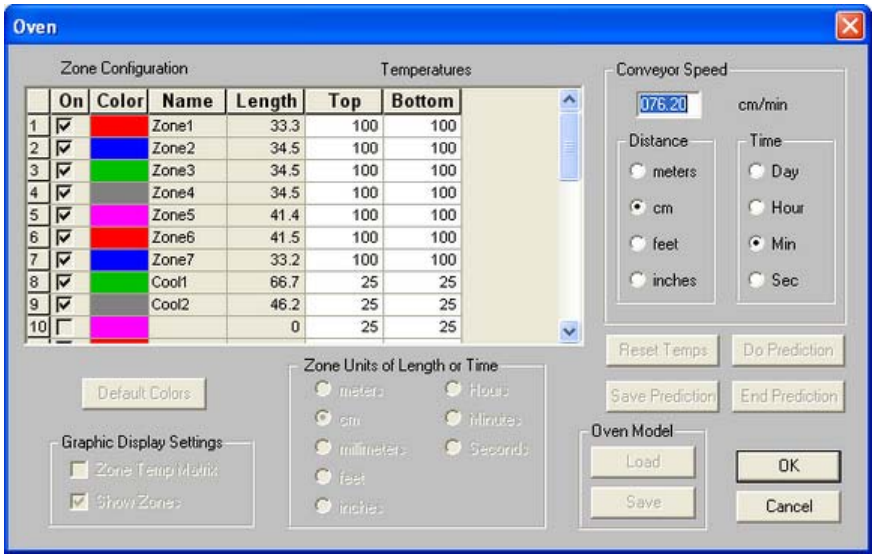
Read M.O.L.E. Data Status Box

If a message box appears stating that the M.O.L.E. is not responding, check the COM port configuration, cable connections, and/or the M.O.L.E. itself (i.e. battery).

3) When the data transfer is complete the data run is automatically uploaded into a data run row on Spreadsheet worksheet and the Oven dialog box appears.

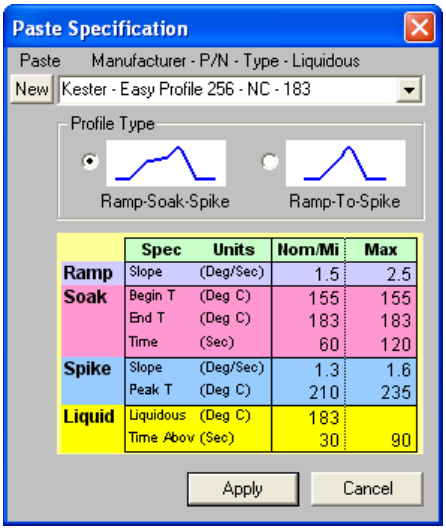
The software automatically populates the amount of Zones, names and lengths.

4) Enter the oven conveyor speed and zone temperatures into the oven dialog box.



Oven Settings

5) Select a solder paste from the list box and a Profile Type (Ramp-Soak-Spike or Ramp-To-Spike).



Select Paste

6) To complete the download process, select the ***Apply*** button to display the data run and oven information on the Profile worksheet Data Graph.

When the Data Graph is populated with a new profile, the software automatically aligns the X-axis maximum peak values for each Data Plot and the oven model so the results can be easily compared during analysis.

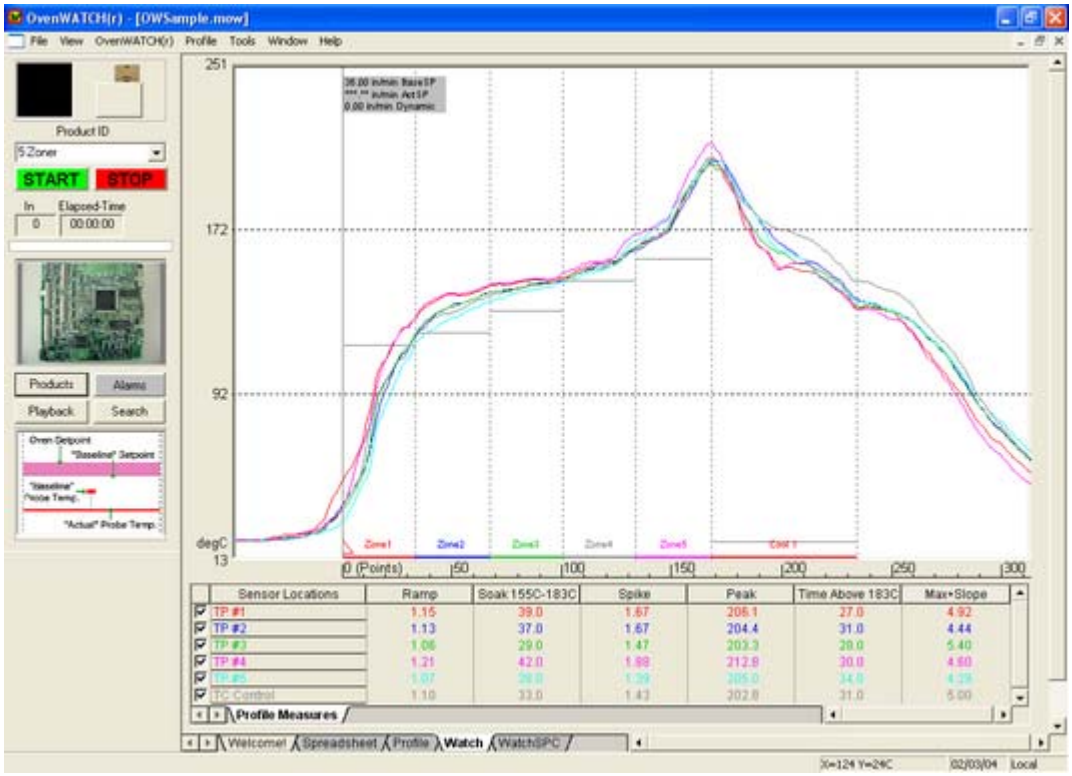
3.2 Step 2 - Create a Product

The first step to monitoring product quality is creating a product.

If you have product established, you may proceed to *Step 3 – Alarm Configuration*.

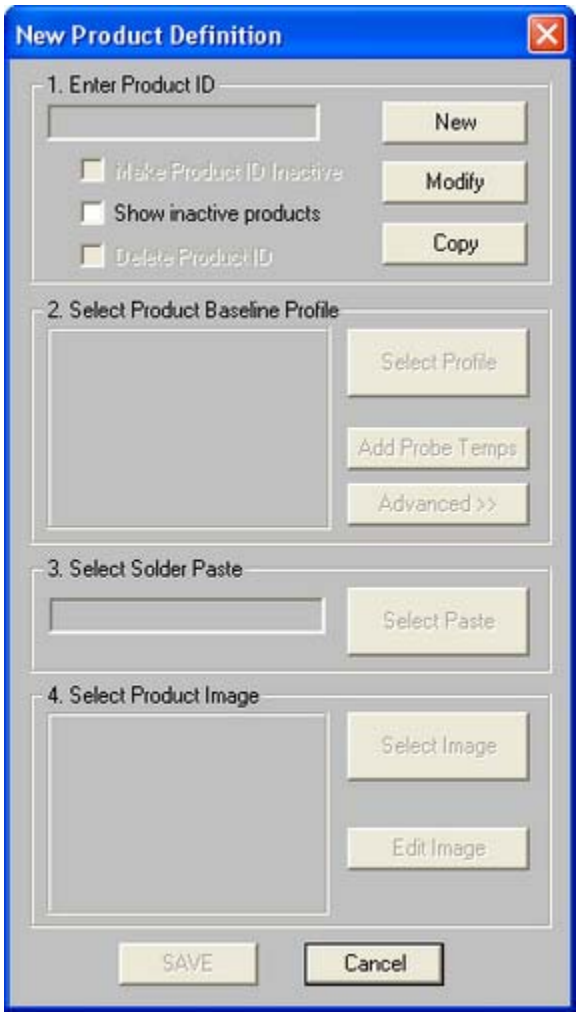
Creating a Product:

1) Select the ***Watch*** worksheet tab.



Watch Worksheet

2) Select the ***Products*** command button from the Watch control panel and the New Product Definition dialog box appears.



New Product Definition Dialog Box

3) Select the ***New*** command button to add a product or the ***Copy*** command button to clone an existing product.

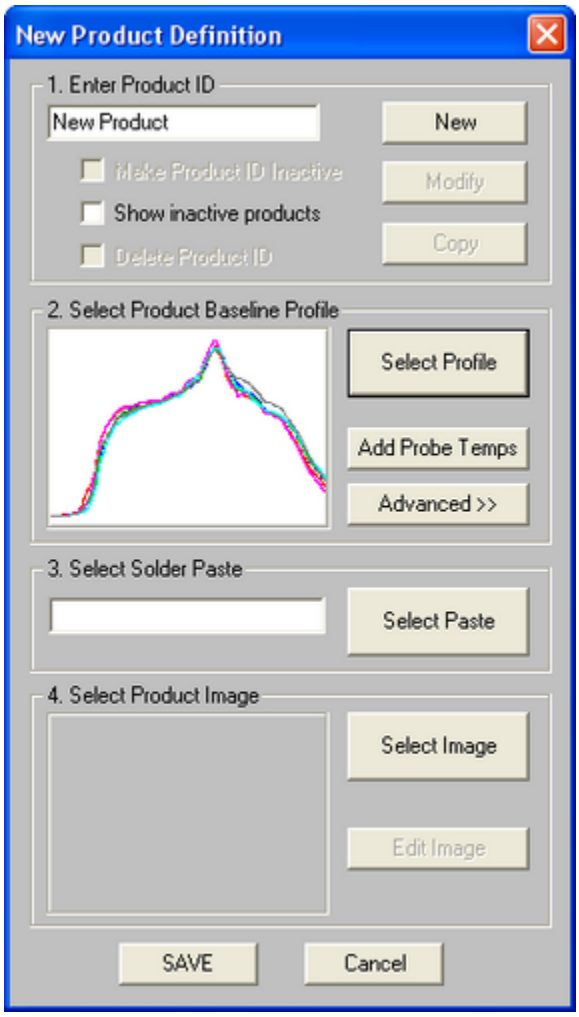
The Product options are password protected and have a preset password Admin. This password will be needed unless it has been changed. Refer to section *Passwords*.

4) Enter a new product ID in the ***Product ID*** text box.

If you decide to copy an existing product, you may use the following steps to modify the cloned product or you can save the existing configuration and proceed to *Step 3 – Alarm Configuration*.

5) Select the ***Select Profile*** command button and the software will automatically display the Spreadsheet worksheet where you can select the desired Baseline Profile for the product.

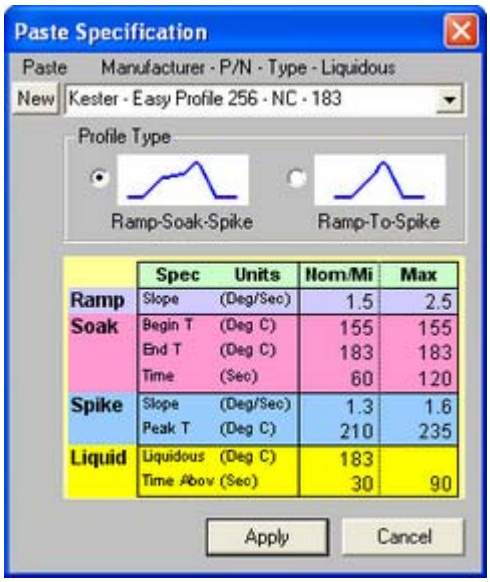
The number of zones in the Baseline Profile must match the number of zones in the oven.



Select Profile

- Select the ***Add Probe Temps*** command button to add the probe temperatures from the Baseline Profile.
- Select the ***Advanced*** command button to edit the Oven settings from the Baseline Profile.

6) Select the ***Select Paste*** command button to assign the desired paste and profile type.



Paste Specifications Dialog Box

7) Select the ***Select Photo*** command button to assign an identification photo.

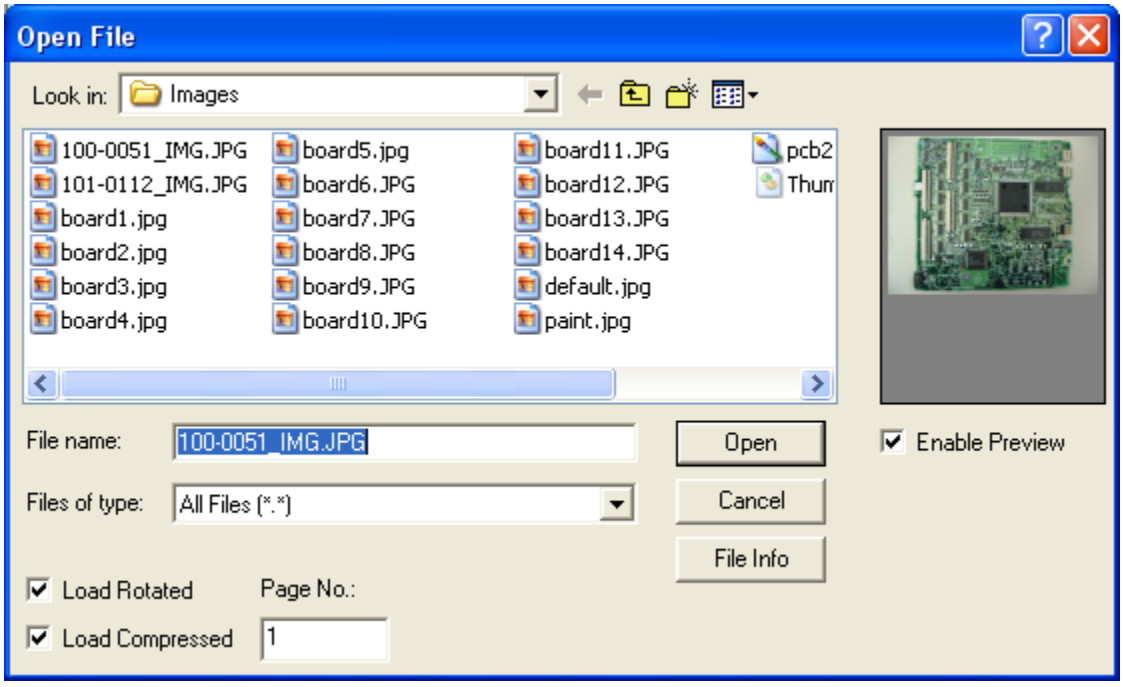
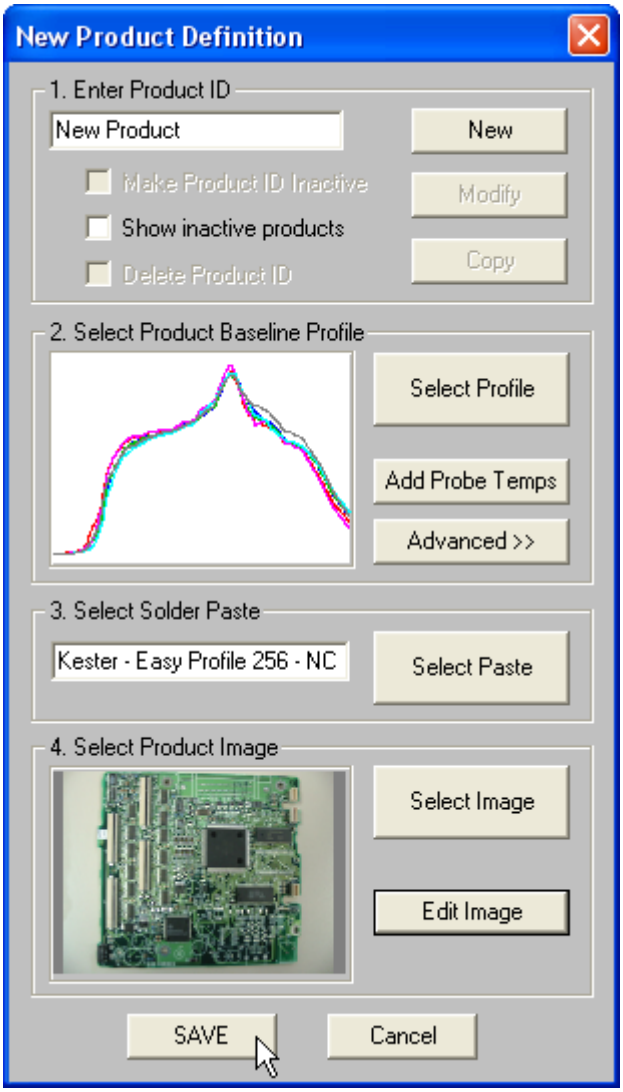


Image Dialog Box

Once a photo is assigned, the user can use the Photo Shop tools to enhance the photo by selecting the *Edit Image* command button on the New Product Definition dialog box.

8) Select the ***Save*** command button to save the new product



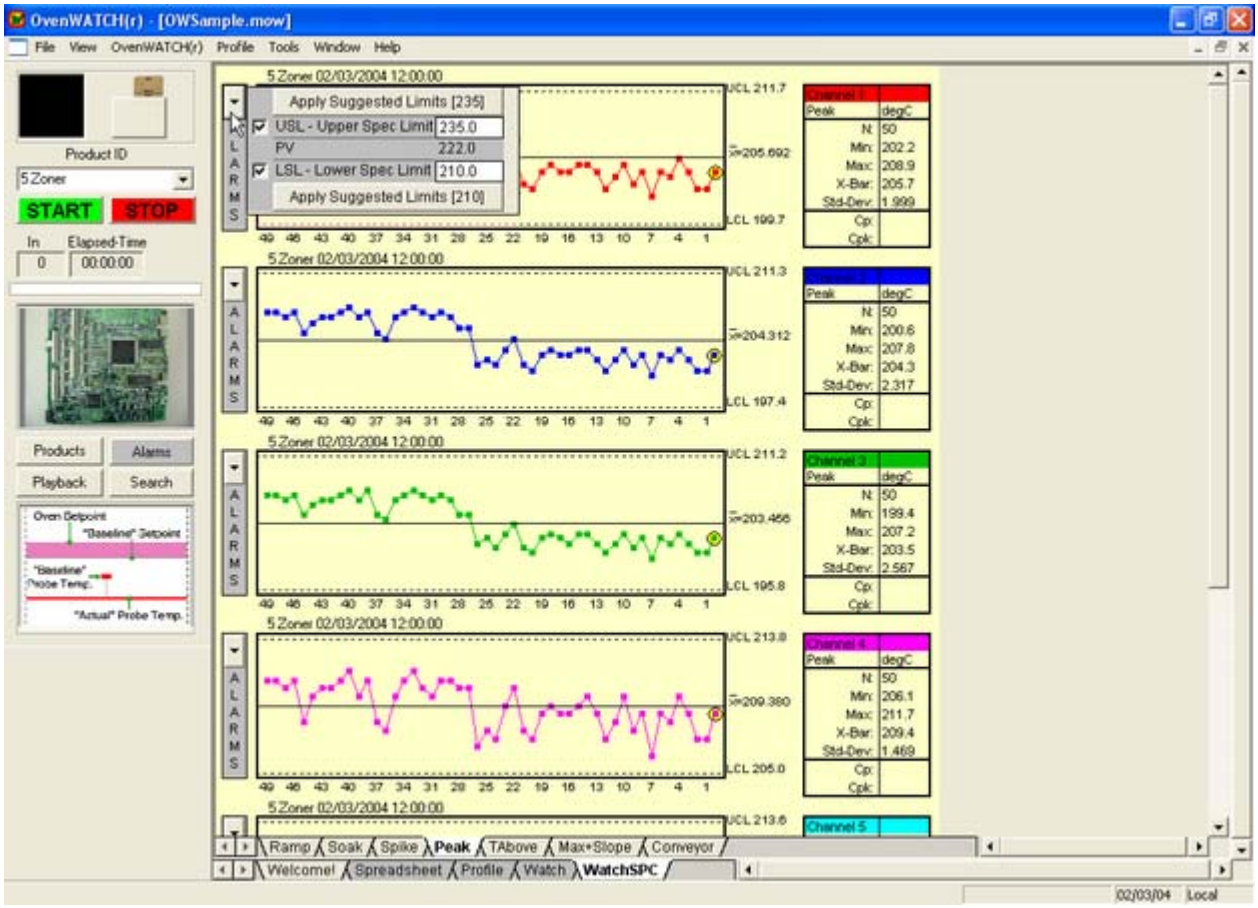
Completed New Product Definition

3.3 Step 3 - Alarm Configuration

The user can assign Alarms and the method of notification for the currently selected product.

To assign Alarms:

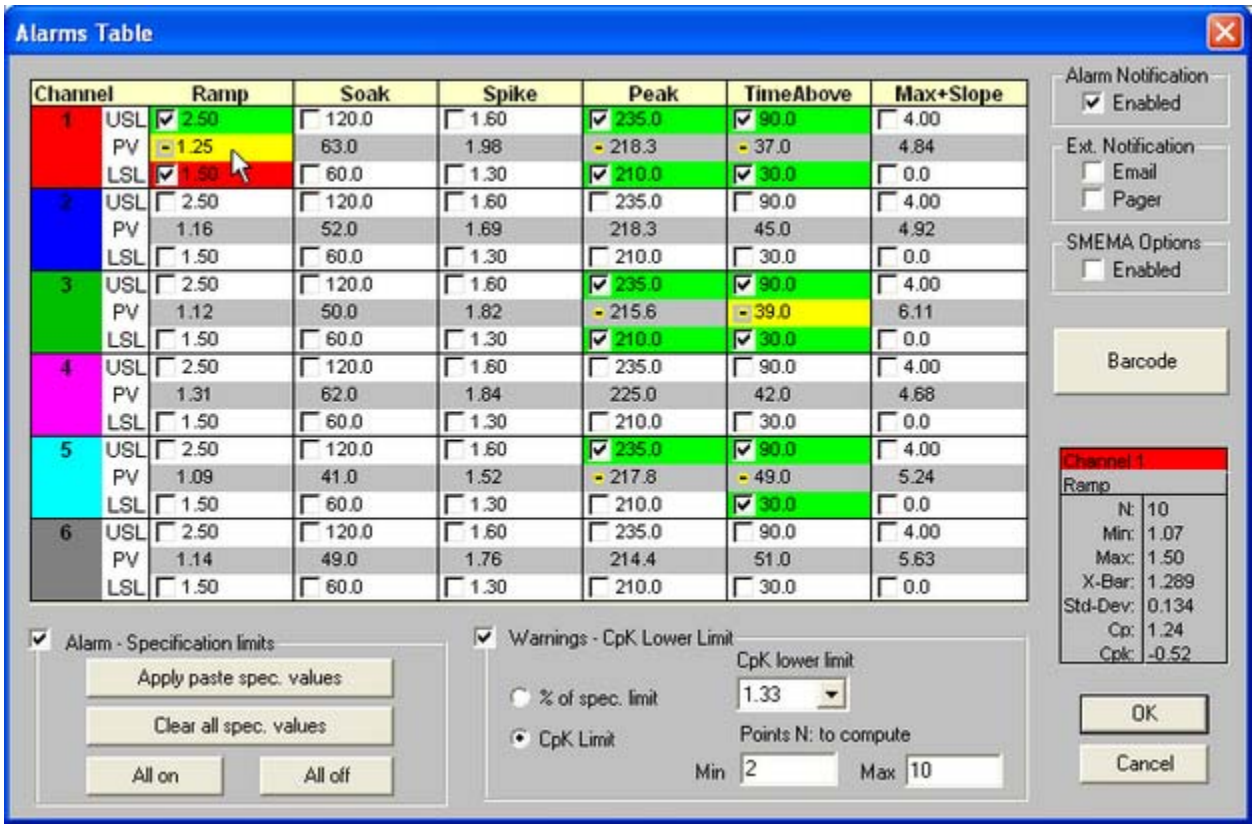
1) Select the ***Watch SPC*** worksheet tab.
2) Select a desired Alarm pop-up bar.



Local Alarms

3) Set an alarm by clicking the check box adjacent to the desired control/spec limit. To use the suggested Paste Spec limit values, click the Upper and/or Lower spec command buttons. This will auto-populate and check the alarm box for that Spec text box.
4) Repeat for all desired profile measures.

5) Select the ***Alarms*** command button from the Watch control panel and the global alarms table appears. The spec limits previously selected from the Watch SPC worksheet are populated on this global Alarms table. The user can decide to change the spec limits or add additional spec limits on this table.



Alarms-Table

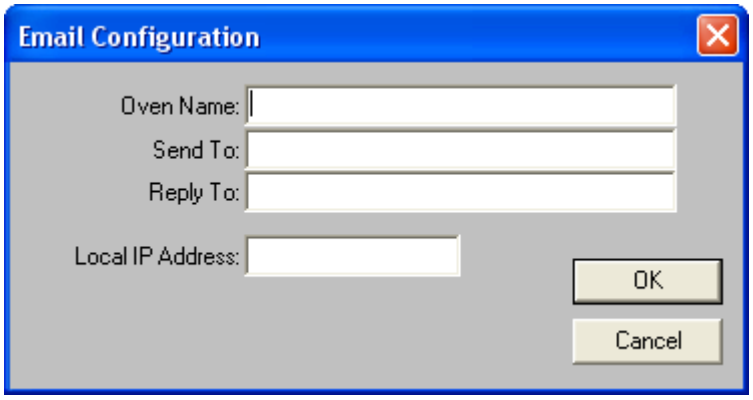
6) Select the ***Alarm – Specification*** limits check box to have the software enable alarms for the selected parameters. When the specification limits cells are **GREEN** the spec limits are not violated, if the cells are **RED** the spec limits have been violated.

7) Select the ***Warnings*** check box to have the software monitor the selected parameters and warn the operator when the parameters are approaching the specification limits. This warning can be based on a % of the spec limit or the parameters CpK limit. When a spec limit alarm is active for a parameter, a yellow circle will appear beside the Present Value (PV) of a parameter. If the value violates the specified warning level, the cell will turn **YELLOW**.

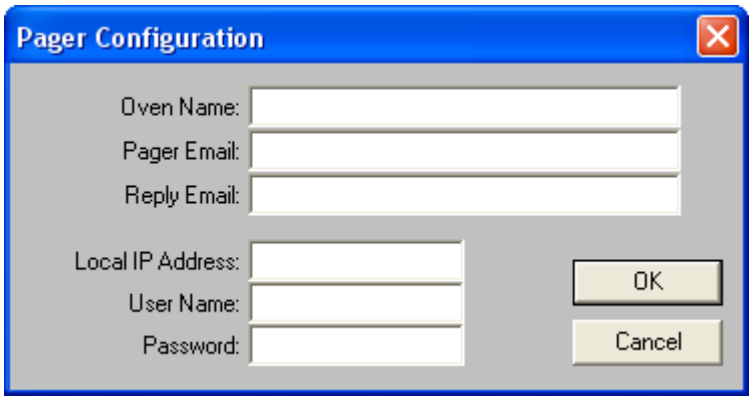
8) Select the ***Alarm Notification*** check box to activate the ***Alarms – List*** dialog box and have the OvenWATCH station alarm.

If the optional Light tower or SMEMA Interface is installed with the system, activating the Alarm Notification will also signal these options.

9) An external Alarm notification can also be activated. To activate, select the check box adjacent to Email and/or Pager options to activate. When either of these options are selected, the associated configuration dialog boxes appears.



Email Configuration Dialog Box



Pager Configuration Dialog Box

10) Enter the appropriate configuration information. You may have to contact your internal Information System Manager and your Pager service to get the correct settings.

11) Select the ***SMEMA Options*** check box to activate the alarm functions for the optional SMEMA option.

12) Select the ***Barcode*** command button to setup the optional barcodes and missing board detection.

If the *Barcode* alarm setup command button is dimmed, it must be authorized to prior to use. (Refer to Section *Software Authorization* for additional information)

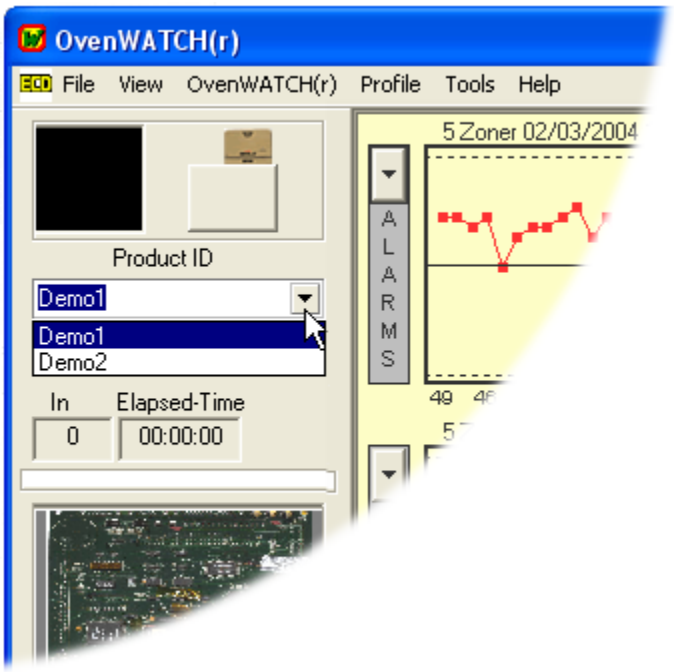
13) Select ***OK*** to accept the Alarm settings or ***Cancel*** to return to the worksheet.

3.4 Step 4 - Record Profile Measures

Now that a product has been properly configured, the user can start recording profile measures.

To record profile measures:

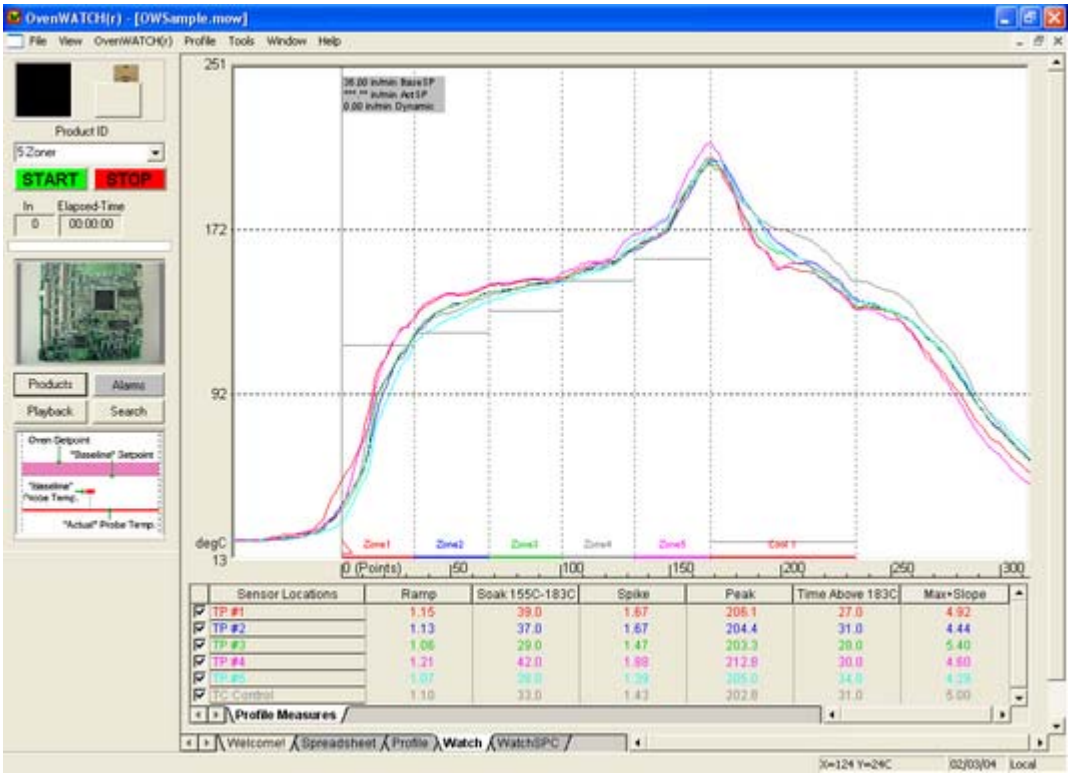
1) Select the pre-defined product from the Product ID selection box.



Product Selection Box

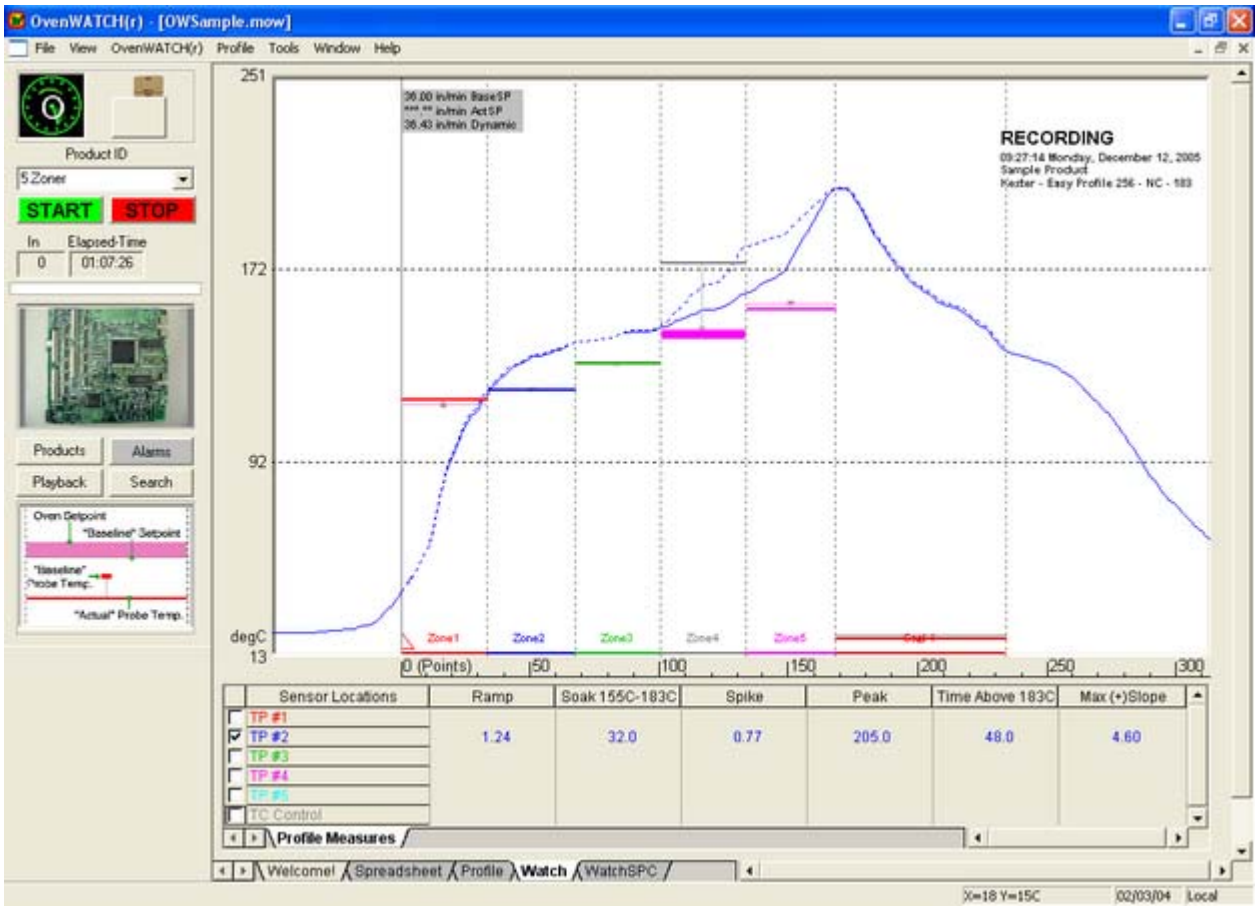
2) Start the product monitoring process by selecting the ***Start*** command button on the Watch Control panel.

The *Start* command can also be accessed on the *OvenWATCH* menu.



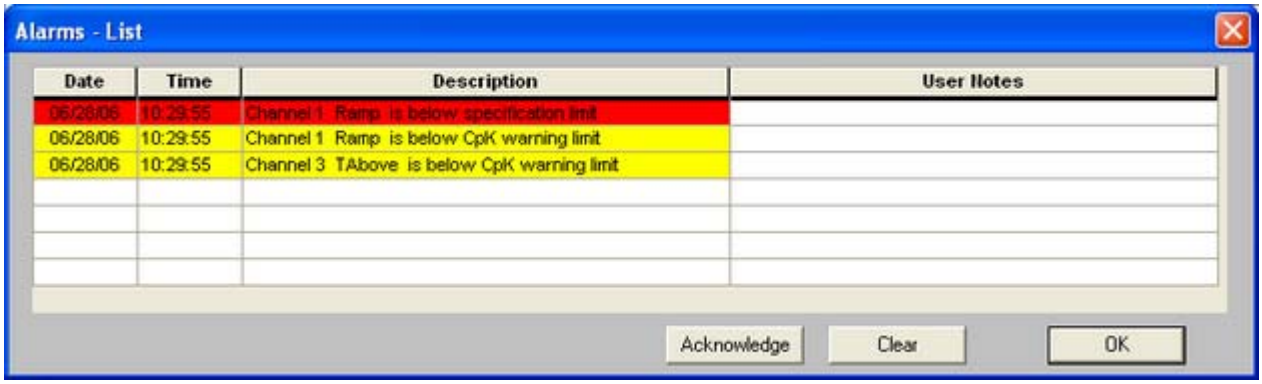
Start Recording

3) When the OvenWATCH is recording data a Dynamic Profile is displayed in the Data Graph as dashed Data plots. They represent a predicted profile based on the current temperatures and conveyor speed of the oven and the Baseline Profile.



Dynamic Profile

If an alarm is triggered during the recording process, the ***Alarms - List*** appears.



Alarms-List

Once the ***Alarms-List*** appears select the Acknowledge command button to stop the alarm. Once it has been acknowledged the operator can then proceed to troubleshoot the problem. Once the problem has been resolved selecting the ***Clear*** command button will remove the alarm from the Alarms List.

Acknowledged Alarms will not sound again even if the alarm condition persists. Once the alarm condition is cleared, and the same alarm condition remains the alarm will be displayed in the Alarm List again.

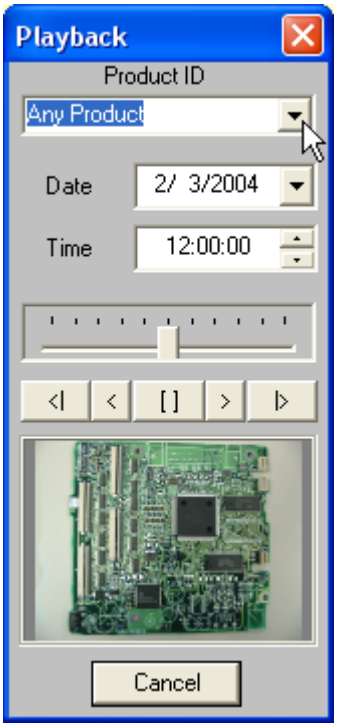
3.5 Step 5 - Playback

After product data has been recorded, the user can review all of the data recorded in the database by using the Playback command.

To review product data:

1) Select the ***Playback*** command button on the Watch Control panel and the Playback dialog box appears.

The *Playback* command can also be accessed on the *OvenWATCH* menu.



Playback

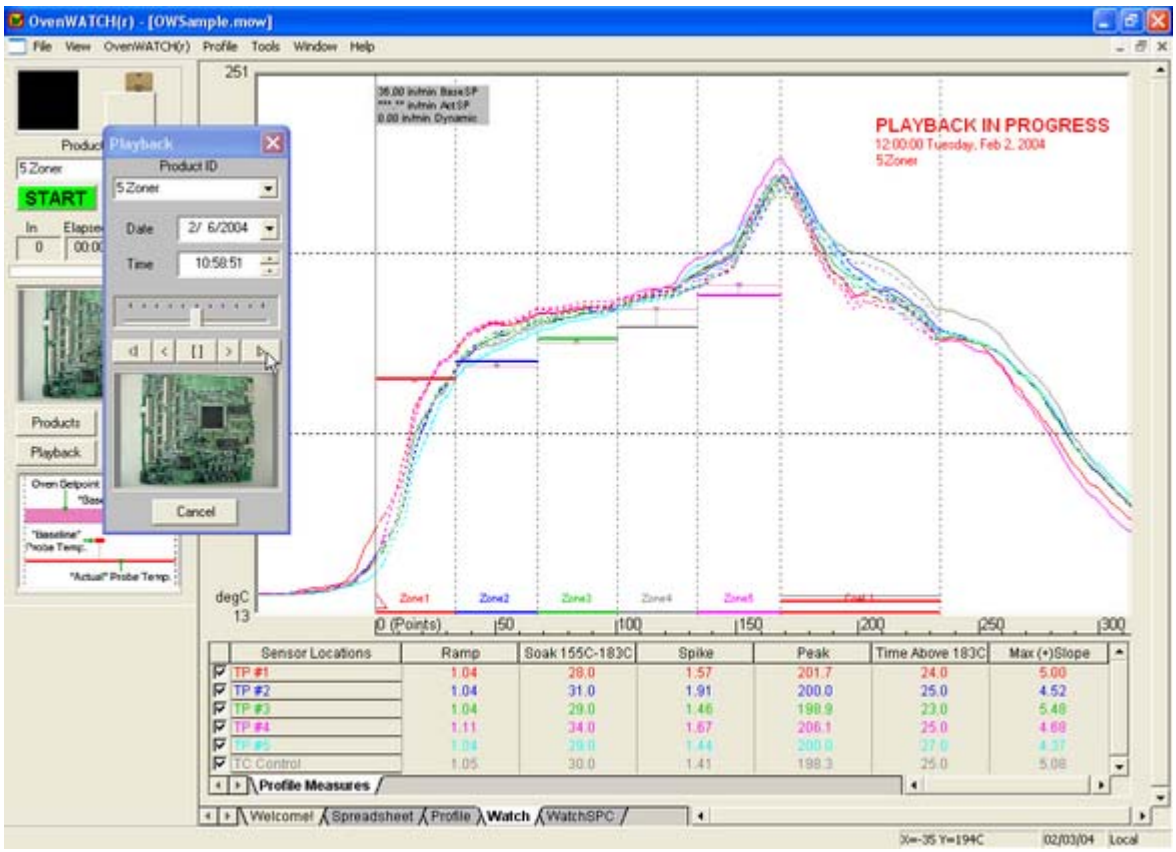
2) Select a product from the Product ID drop-down box.
3) Select a playback start date and time.

After selecting a Product the user can start the playback process without specifing a start date or time. If a start date or time is not specified the software will automatically rewind 24 hours from the displayed date and time.

4) Select the Play forward or Play back button to start the Playback process. The software will search the database for the closest logged data points that match the selected product and time.

When playing back data, if the specified date and time criteria is before the first logged data point for the selected product, the software will automatically forward to the first data point logged. If the date and time criteria is after the last point logged the playback will remain idle.

5) When the playback process has started a playback label appears in the upper right corner of the Data Graph.



Playback

6) To stop the playback process press the stop button [ ] located between the play forward and play back buttons.

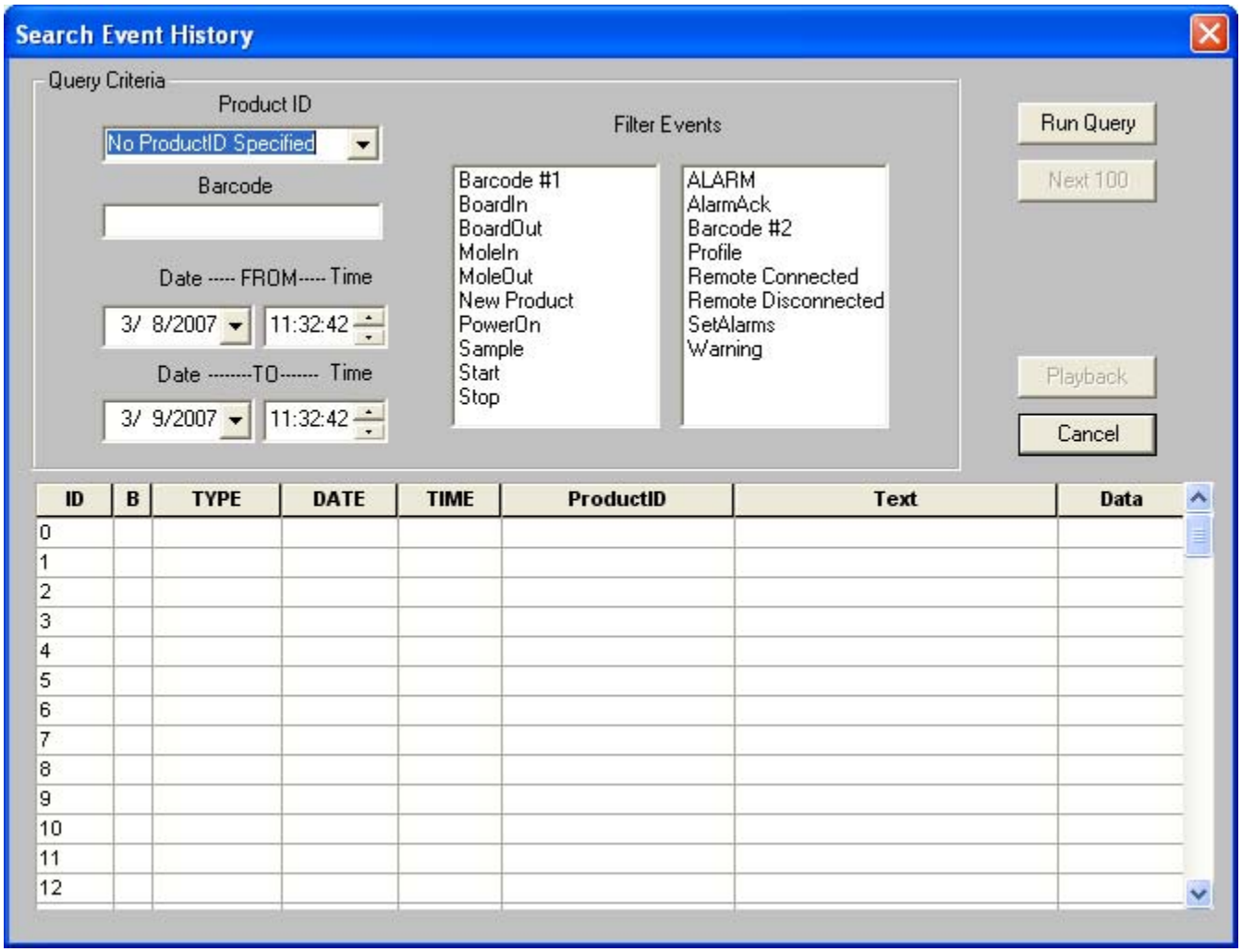
3.6 Step 6 - Search

As previously discussed in Step 5 – Playback, recorded profile measures can be reviewed using the Playback command. Search works with the Playback command by allowing the to search for a certain recorded event and then starting the Playback at the exact time the specific event occurred.

To search events:

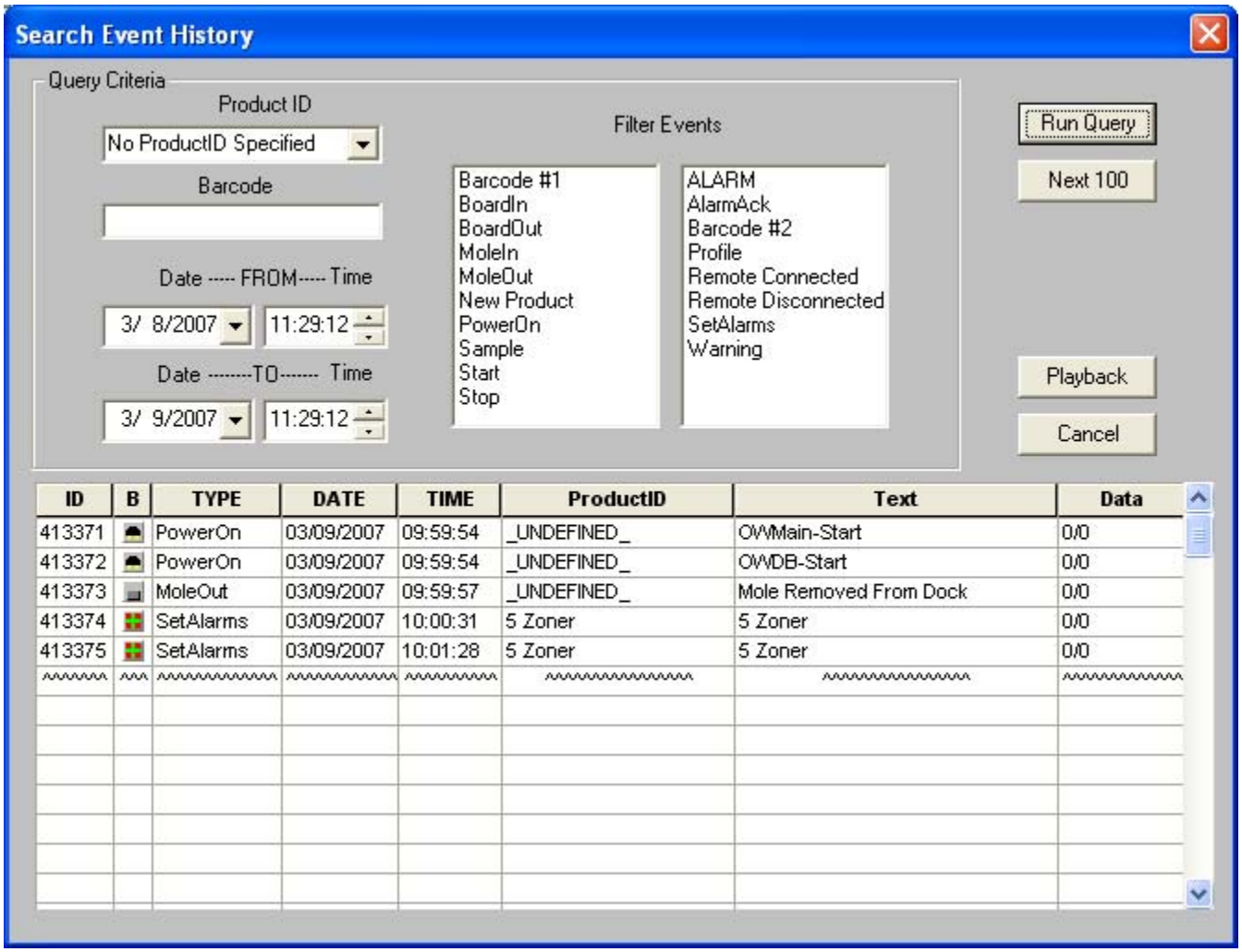
1) Select the ***Search*** command button on the Watch Control panel.

The *Search* command can also be accessed on the *OvenWATCH* menu.



Search Event History Dialog Box

2) Select the criteria and search will then find events to match. The user can also select a product from the Product ID drop-down list or select the desired date and time criteria. To search for specific events select a desired event(s) in the Filter Events list box and select the ***Run Query*** command button.



Search Results

Once the search is complete the user can select an event and then use the Playback command to display it on the Data Graph.

To search events for all products select the *Run Query* command button without selecting any search criteria.

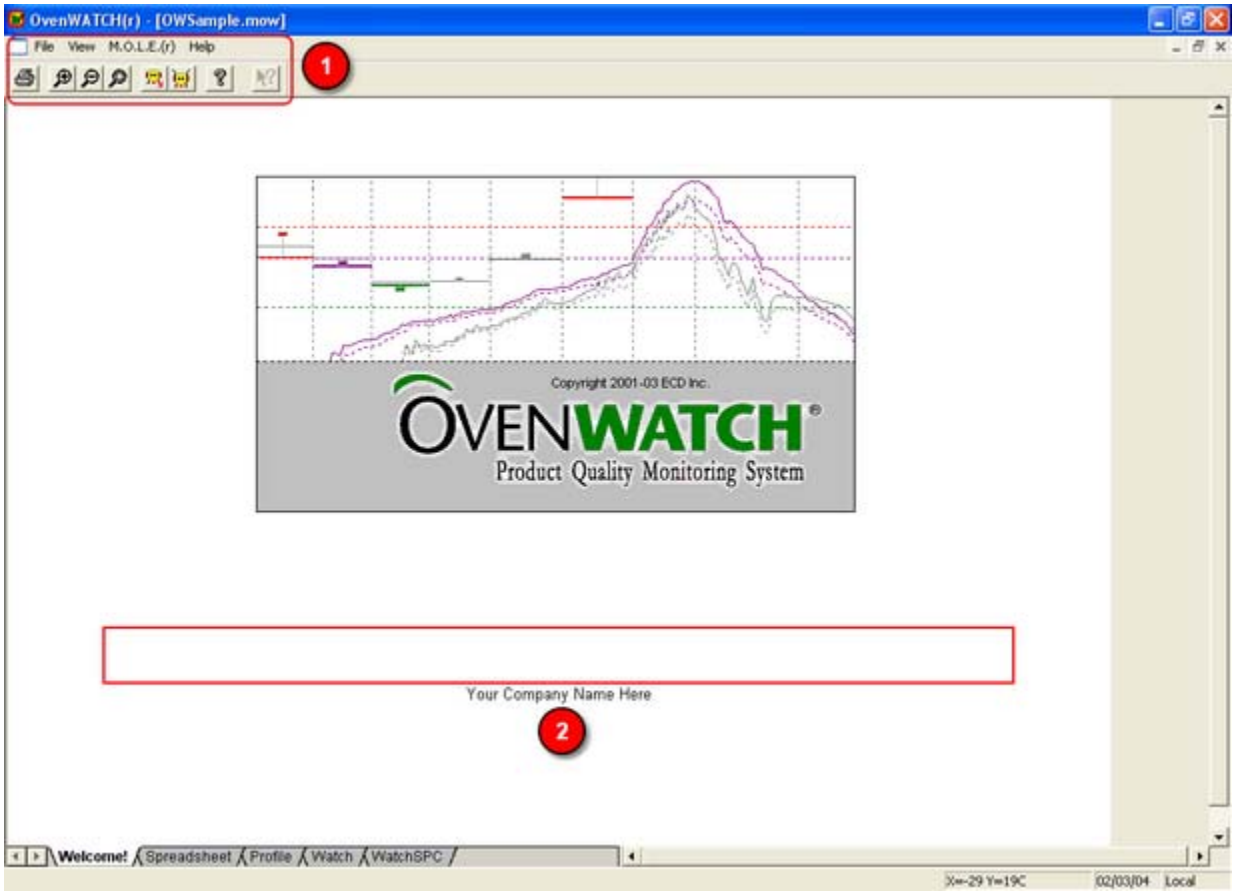
4.0 Worksheet Descriptions

4.1 The Welcome Worksheet

The Welcome worksheet is the introductory worksheet. This worksheet contains an introductory illustration and a text box for entering a company or workbook name.

Welcome worksheet features:

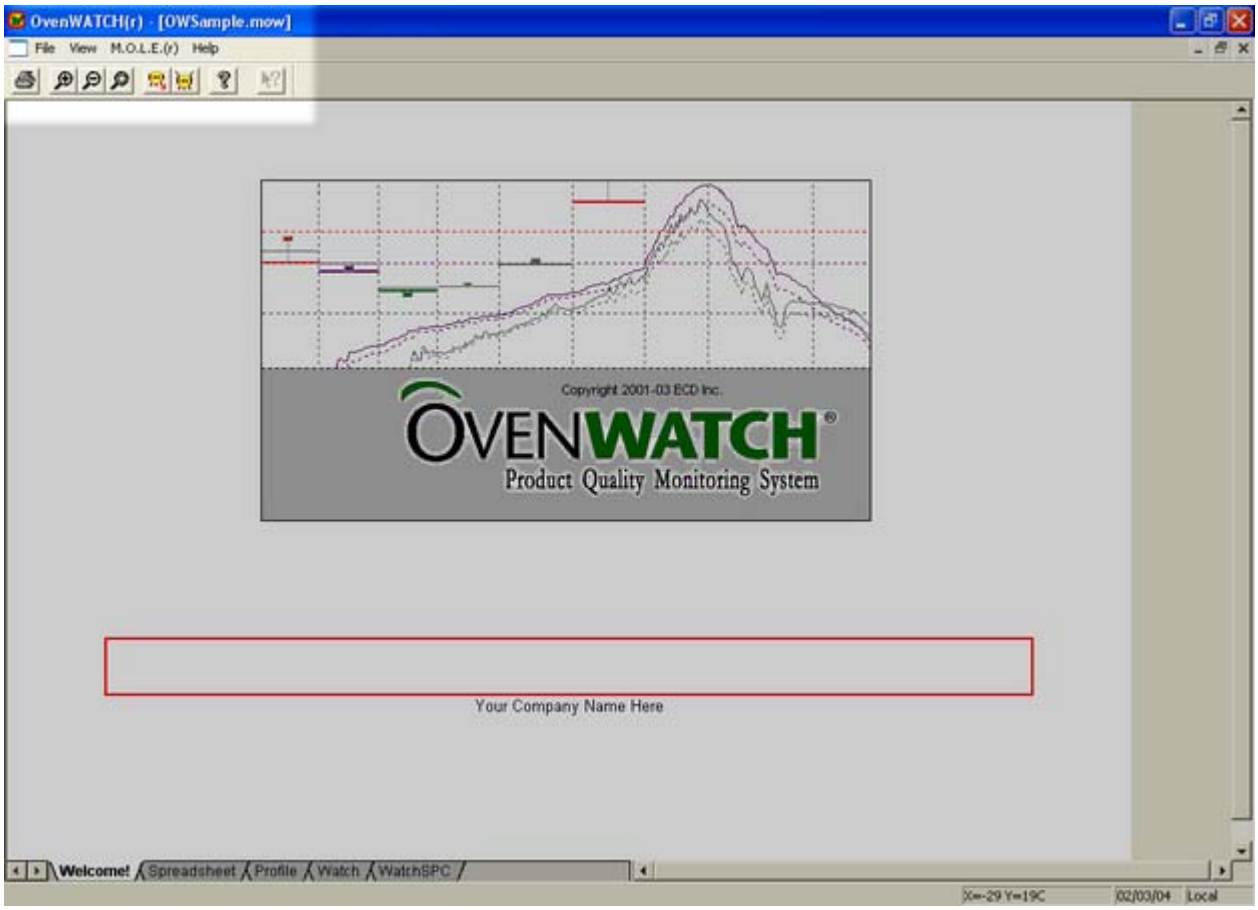
- Menus and Toolbar
- Company/Report Name Text Box



Welcome Worksheet

4.1.1 Menus and Toolbar

- **Menus**: File, View, M.O.L.E., and Help.
- **Toolbar Buttons**: Print, Zoom In, Zoom Out, 100%, Read M.O.L.E., Receive RF, and About.



Welcome Worksheet Menus and Toolbar Buttons

4.1.2 Company/Report Name

The text box located on the bottom half of the Welcome worksheet allows the user enter a company or report name.

To enter a name:

1) Using the mouse pointer, highlight the text in the text box.
2) Type a desired name and then hit the [***enter***] key to accept or [***esc***] to cancel.

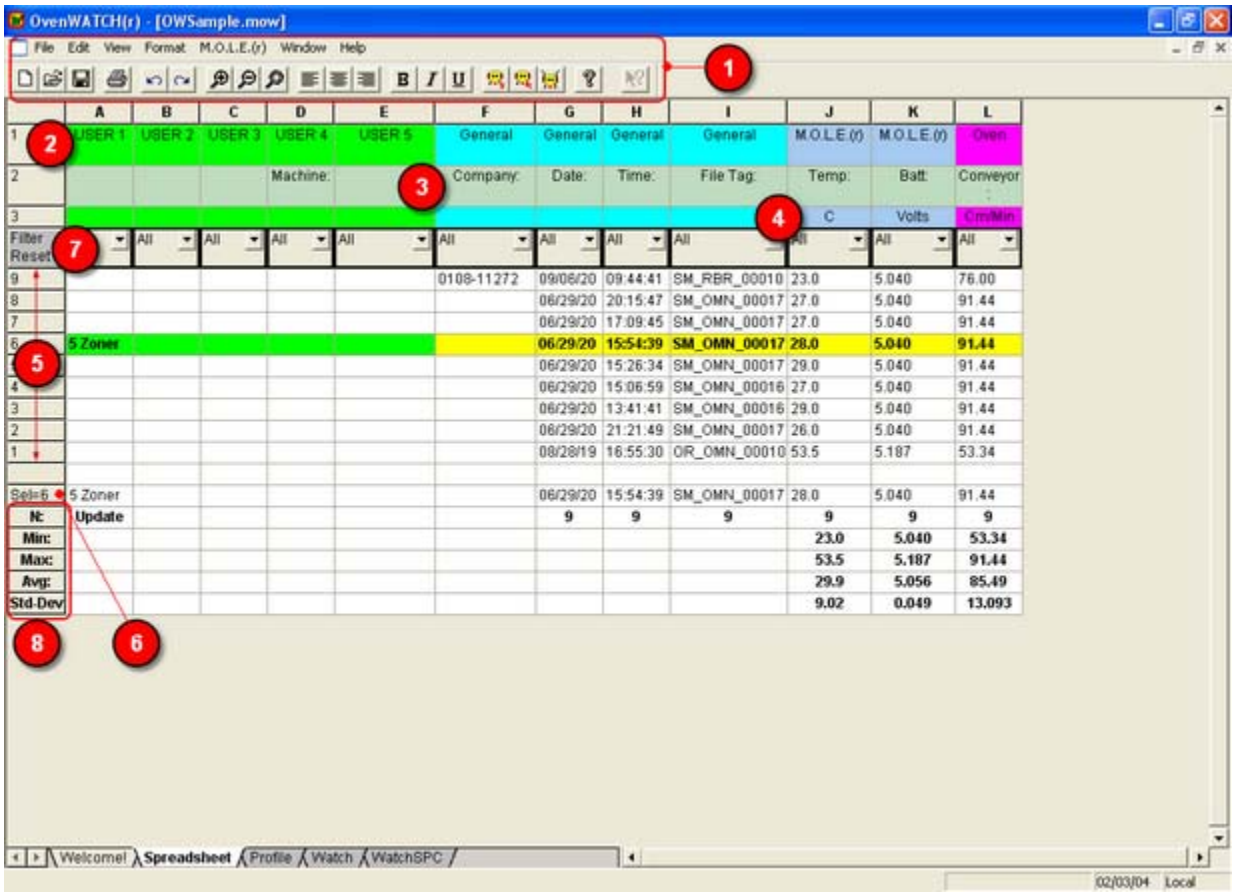
Entering a Company Name

4.2 Spreadsheet Worksheet

The Spreadsheet worksheet contains Baseline Profile data that is collected by the M.O.L.E. and put into standard spreadsheet format. Each row in the spreadsheet represents one data run.

Spreadsheet Worksheet features:

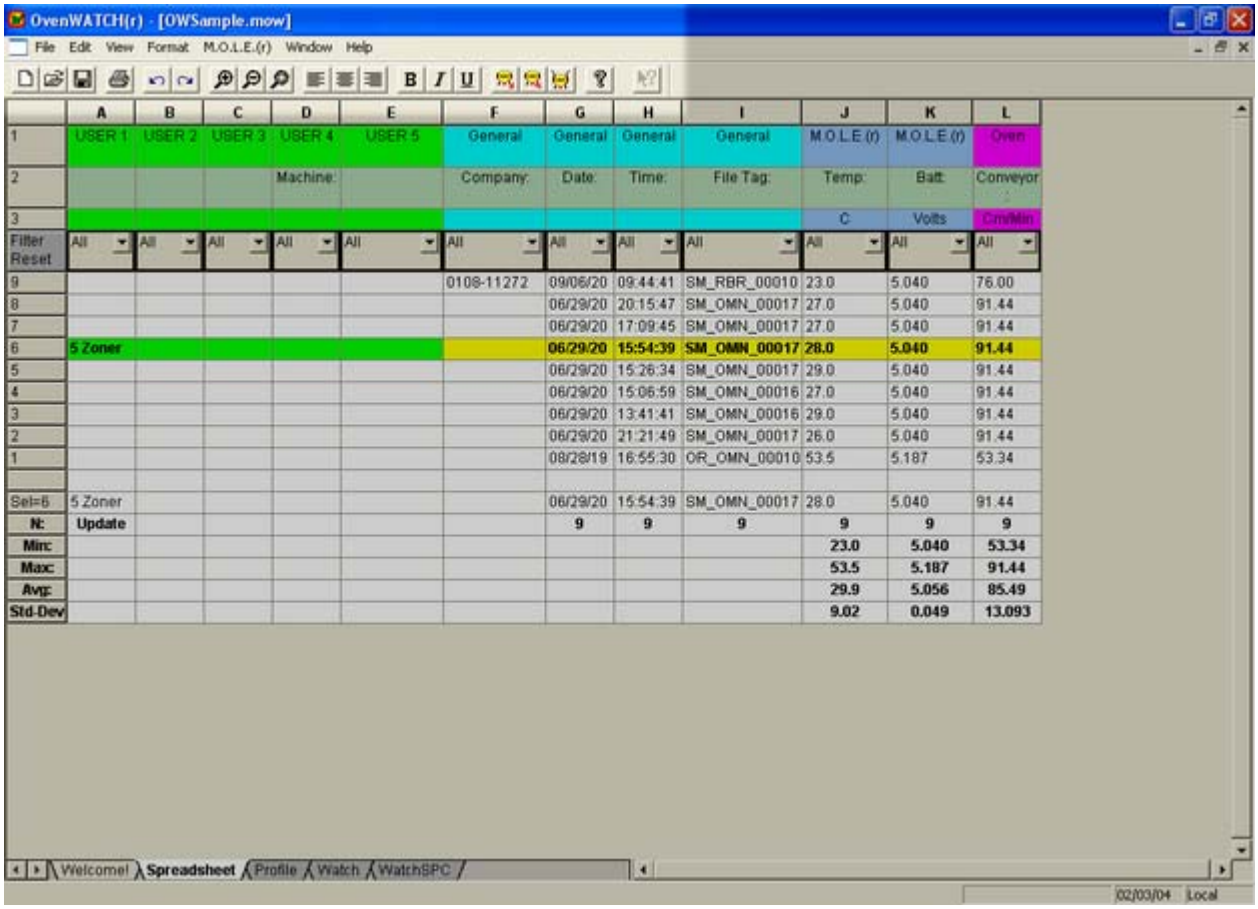
1. Menus and Toolbar
2. Parameter Groups (color coded)
3. Parameter Labels
4. Parameter Units
5. Data Run Rows
6. Selected Data Run
7. Filters
8. Statistics



Spreadsheet Worksheet

4.2.1 Menus and Toolbar

- **Menus**: File, Edit, View, Format, M.O.L.E., Window, and Help.
- **Toolbar Buttons**: New, Open, Save Workbook, Print, Undo, Redo, Zoom In, Zoom Out, 100%, Align Left, Center, Align Right, Bold, Italic, Underline, Read M.O.L.E., Configure M.O.L.E., Receive RF, and About.



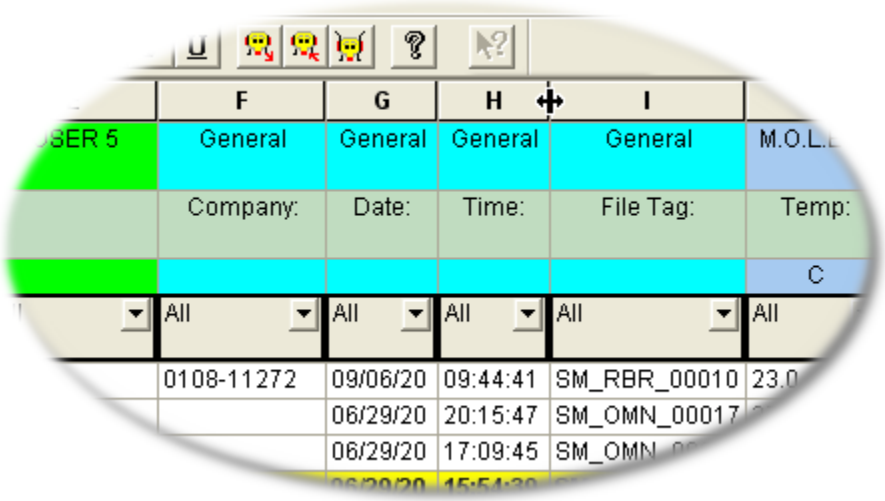
	A	B	C	D	E	F	G	H	I	J	K	L
1	USER 1	USER 2	USER 3	USER 4	USER 5	General	General	General	General	M.O.L.E.(r)	M.O.L.E.(r)	Oven
2				Machine:		Company:	Date:	Time:	File Tag:	Temp:	Batt:	Conveyor
3										C	Volts	Cm/Min
Filter Reset	All	All	All	All	All	All	All	All	All	All	All	All
9						0108-11272	09/06/20	09:44:41	SM_RBR_00010	23.0	5.040	76.00
8							06/29/20	20:15:47	SM_OMN_00017	27.0	5.040	91.44
7							06/29/20	17:09:45	SM_OMN_00017	27.0	5.040	91.44
6	5 Zoner						06/29/20	15:54:39	SM_OMN_00017	28.0	5.040	91.44
5							06/29/20	15:26:34	SM_OMN_00017	29.0	5.040	91.44
4							06/29/20	15:06:59	SM_OMN_00016	27.0	5.040	91.44
3							06/29/20	13:41:41	SM_OMN_00016	29.0	5.040	91.44
2							06/29/20	21:21:49	SM_OMN_00017	26.0	5.040	91.44
1							08/28/19	16:55:30	OR_OMN_00010	53.5	5.187	53.34
Sel=6	5 Zoner						06/29/20	15:54:39	SM_OMN_00017	28.0	5.040	91.44
N:	Update						9	9	9	9	9	9
Min:										23.0	5.040	53.34
Max:										53.5	5.187	91.44
Avg:										29.9	5.056	85.49
Std-Dev										9.02	0.049	13.093

Spreadsheet Worksheet Menus and Toolbar Buttons

4.2.2 Parameter Groups

Parameter Groups are the headers for a specific group of data parameters collected by the M.O.L.E.. They are color coded with the associated Parameter Labels so they can be easily identified together.

The width of each parameter column can be adjusted to be larger or smaller by placing the mouse pointer over a split line dividing the parameter columns and sliding it to the desired width.



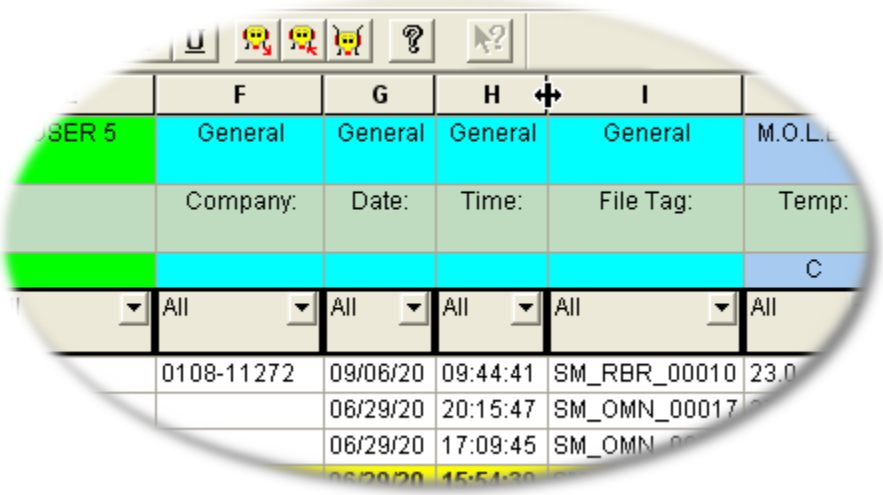
Parameter Group

The Parameter Groups are defined as the following:

User Defined Parameter Group:	The user can customize these parameter columns, which can be used to identify a row with unique information about that run (i.e. shift, operator, line number, part number). This information will also appear in the Tool Status box on the Profile worksheet.
General Parameter Group:	This group contains file information associated with the run such as; date and time, (of profile) and the data file tag.
M.O.L.E. Parameter Group:	This group contains the physical condition of the M.O.L.E. at the end of the run.
Oven Parameter Group	This group contains the conveyor speed that is configured by the user.

4.2.3 Parameter Labels

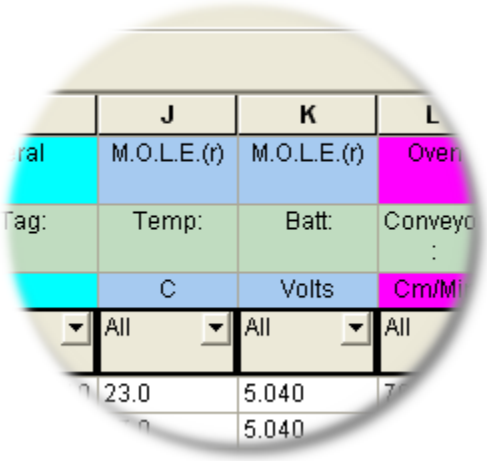
The Parameter Labels are where all of the specific parameters for each group are listed.



Parameter Label

4.2.4 Parameter Units

The Parameter Units are the units of measurement for that parameter. For example, in the M.O.L.E. Group Parameter, the Parameter Label Temp: is in °C.



Parameter Units

4.2.5 Data Run Rows

All of the Baseline Profiles uploaded into a workbook file are listed on the Spreadsheet worksheet as individual data run rows. The first data run uploaded into the workbook file is on the bottom and the most recent data run uploaded is on the top.

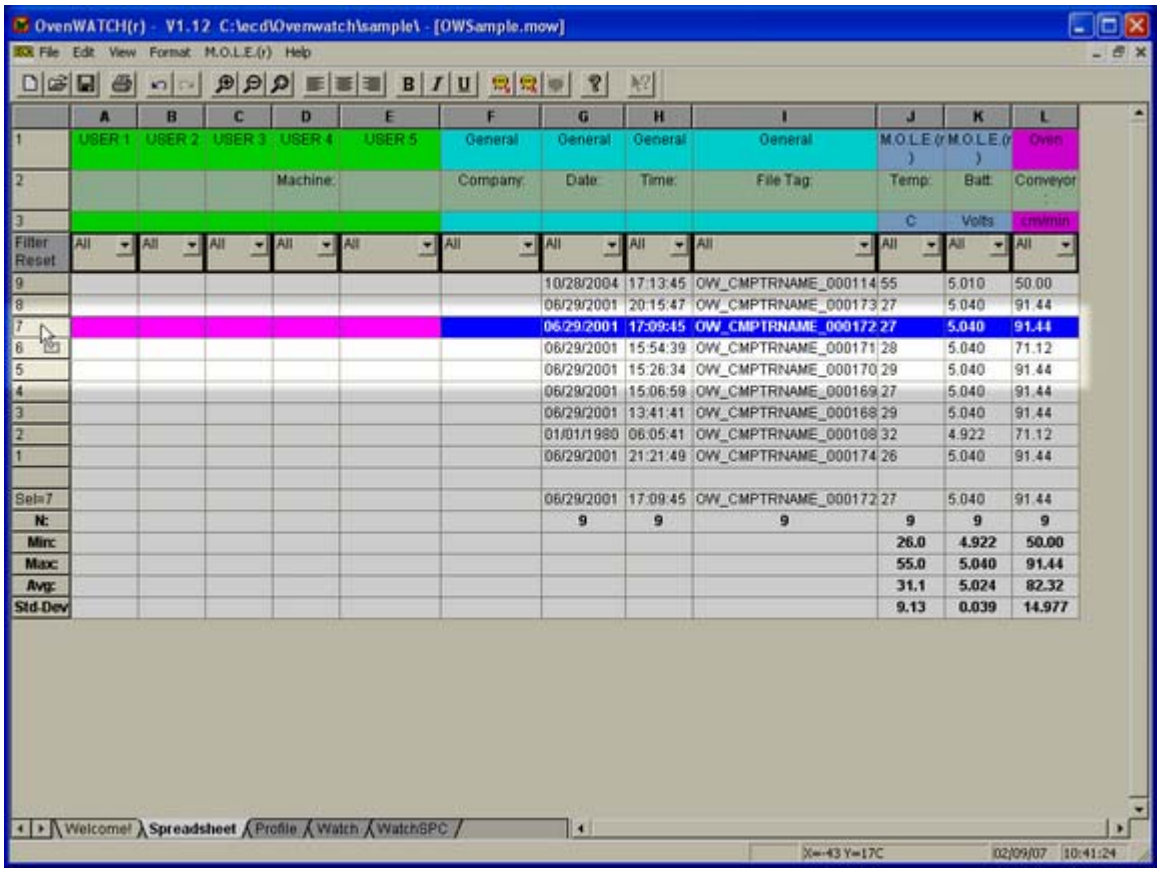
When any data run row is selected, all of the cells in the entire row are highlighted in purple and blue. The purple cells indicate that the cells can be modified and the blue cells indicate the data cannot be modified.

When any individual data cell in a data run row is selected, all of the cells in the entire row are highlighted in green and yellow. The green cells indicate that the cells can be modified and the yellow cells indicate the data cannot be modified.

The data run rows can also be moved into any order desired. This is useful when the user wants to place similar data runs together.

To change the data run order:

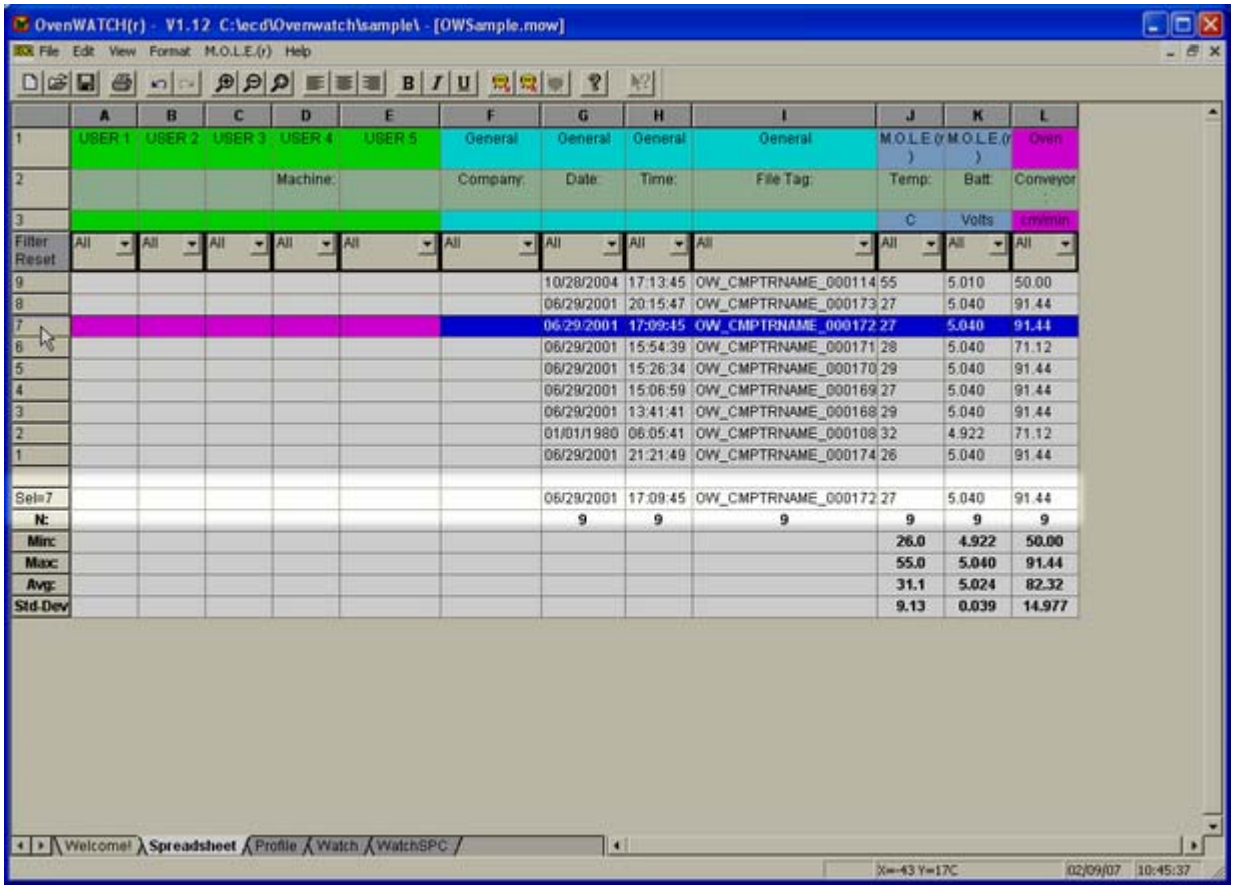
1) Select the number cell of a row with the mouse pointer. The row will then become highlighted in purple and blue.
2) Drag the row and drop it to a desired location.



Drag and Drop Data Rows

4.2.6 Selected Data Run

When a data run row is selected, the data for that row will be shown in the Sel= row located at the bottom of the data run rows.



	A	B	C	D	E	F	G	H	I	J	K	L
1	USER 1	USER 2	USER 3	USER 4	USER 5	General	General	General	General	M.O.L.E.(r)	M.O.L.E.(r)	Oven
2				Machine:		Company:	Date:	Time:	File Tag:	Temp:	Batt:	Conveyor
3										C	Volts	cm/min
Filter Reset	All	All	All	All	All	All	All	All	All	All	All	All
9							10/28/2004	17:13:45	OW_CMPTRNAME_000114	55	5.010	50.00
8							06/29/2001	20:15:47	OW_CMPTRNAME_000173	27	5.040	91.44
7							06/29/2001	17:09:45	OW_CMPTRNAME_000172	27	5.040	91.44
6							06/29/2001	15:54:39	OW_CMPTRNAME_000171	28	5.040	71.12
5							06/29/2001	15:26:34	OW_CMPTRNAME_000170	29	5.040	91.44
4							06/29/2001	15:06:59	OW_CMPTRNAME_000169	27	5.040	91.44
3							06/29/2001	13:41:41	OW_CMPTRNAME_000168	29	5.040	91.44
2							01/01/1980	06:05:41	OW_CMPTRNAME_000108	32	4.922	71.12
1							06/29/2001	21:21:49	OW_CMPTRNAME_000174	26	5.040	91.44
Sel=7							06/29/2001	17:09:45	OW_CMPTRNAME_000172	27	5.040	91.44
N:							9	9	9	9	9	9
Min:										26.0	4.922	50.00
Max:										55.0	5.040	91.44
Avg:										31.1	5.024	82.32
Std-Dev										9.13	0.039	14.977

Selected Data Run

Selected rows and columns can be “copied” by pressing keys (CTRL + C) and then “pasted” (Ctrl + V) into other spreadsheet applications.

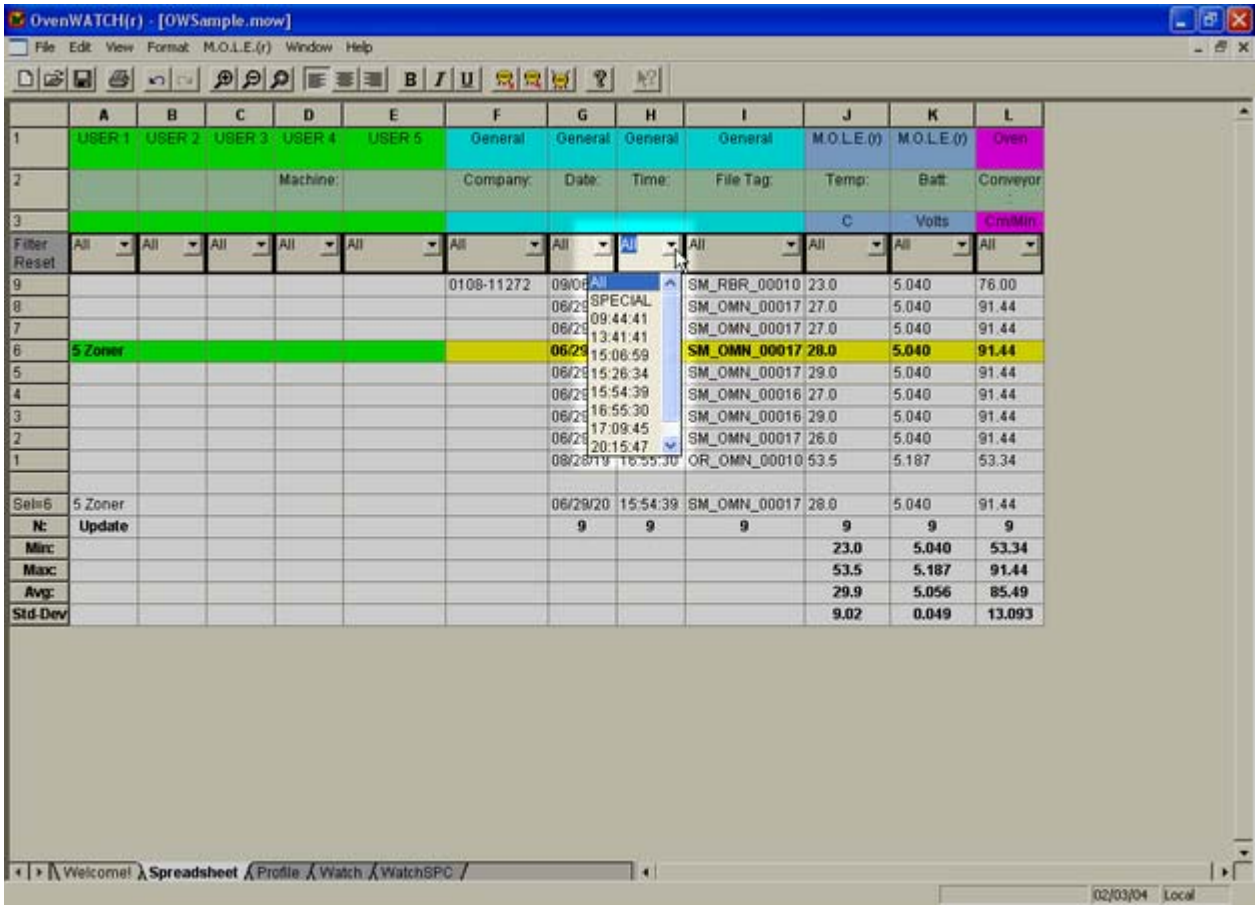
4.2.7 Filters

There are Filters for each parameter label that filter specific data out of runs listing.

Filtering more than one column at a time acts as a Logical AND Function. All conditions of all set filters must be met for data row(s) to remain visible.

How to use the Filter function:

1) Click the ***Filter*** button to reveal the unique data as populated in that column under that particular parameter label.
2) Select a desired data value to filter, or the two standard filters ***All*** and ***Special***.



Filter Function

To use the All option:

1) Select ***All*** to reset the filter for that column and view all of the data run rows that meet the other column filters.

To use the Special option:

1) Select ***Special*** to select data run rows within a range of values. There are multiple options to select information to filter by clicking the appropriate relational operators option button. The user can either select data from a populated list or type it in the text box on the top of the column.

=	**equal to**	**>=**	**greater than or equal to**
>	**greater than**	**<=**	**less than or equal to**
<	**less than**	**<>**	**Not equal to**

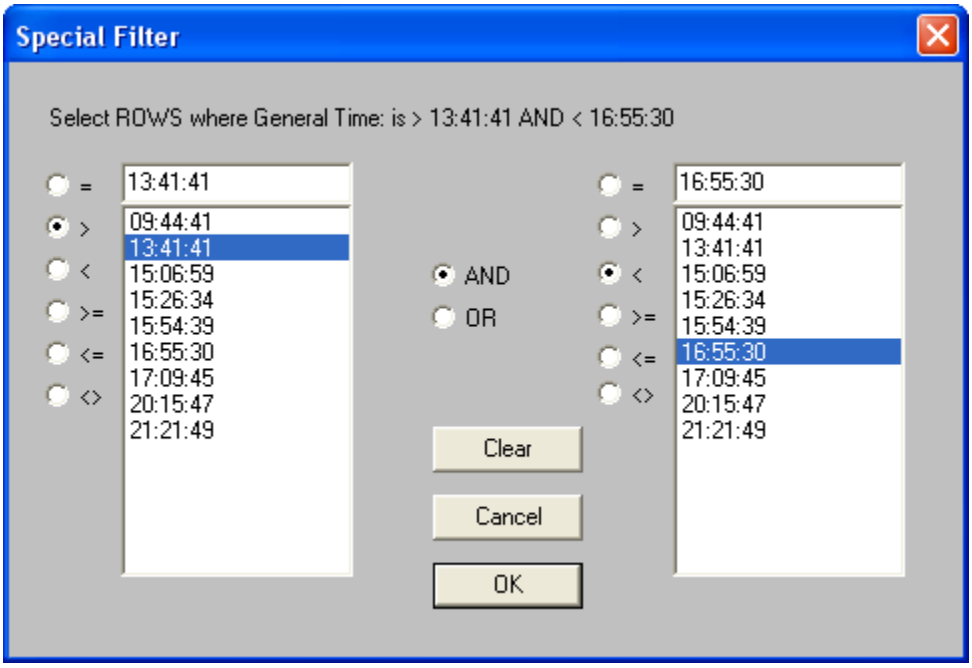
Filter option buttons

2) Select a data filter by:

- Clicking the greater than relational operator option button beside the left data column.
- Click a parameter value from the list or type it in the text box.
- Click the ***AND*** logical operator option button.
- Click the less than relational operator option button beside the right data column.
- Click a parameter value from the list or type it in the text box.

The Clear command button can be selected at any time to clear the selections and the new values can be selected.

3) Click the ***OK*** command button to accept the selected data filters or ***Cancel*** to return to the worksheet without executing the filter request.



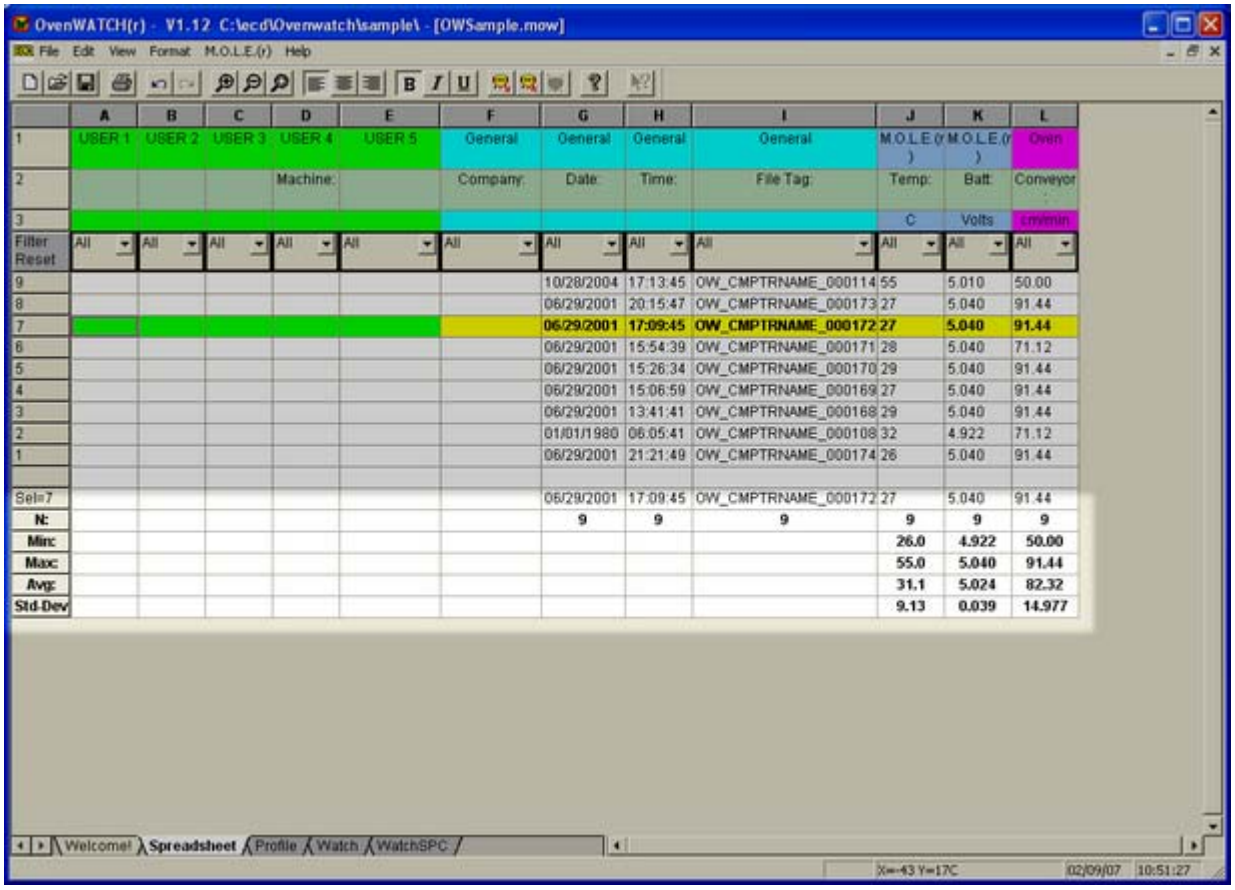
Special Filter Feature Dialog Box

In this example, the data filtered would be all times between, but not including ***13:41:41*** and ***16:55:30***.

To reset all of the data set rows to restore the entire set of collected data, click the Filter Reset button on the Spreadsheet worksheet.

4.2.8 Statistics

There are rows located on the bottom of the Spreadsheet worksheet, which are the combined calculations for all the data runs that are currently being viewed in the Spreadsheet worksheet display. The following information is the definitions for each Statistics row:



	A	B	C	D	E	F	G	H	I	J	K	L
1	USER 1	USER 2	USER 3	USER 4	USER 5	General	General	General	General	M.O.L.E.(r)	M.O.L.E.(r)	Oven
2				Machine:		Company:	Date:	Time:	File Tag:	Temp:	Batt:	Conveyor
3										C	Volts	cm/min
Filter Reset	All	All	All	All	All	All	All	All	All	All	All	All
9							10/28/2004	17:13:45	OW_CMPTRNAME_000114	55	5.010	50.00
8							06/29/2001	20:15:47	OW_CMPTRNAME_000173	27	5.040	91.44
7							**06/29/2001**	**17:09:45**	**OW_CMPTRNAME_000172**	**27**	**5.040**	**91.44**
6							06/29/2001	15:54:39	OW_CMPTRNAME_000171	28	5.040	71.12
5							06/29/2001	15:26:34	OW_CMPTRNAME_000170	29	5.040	91.44
4							06/29/2001	15:06:59	OW_CMPTRNAME_000169	27	5.040	91.44
3							06/29/2001	13:41:41	OW_CMPTRNAME_000168	29	5.040	91.44
2							01/01/1980	06:05:41	OW_CMPTRNAME_000108	32	4.922	71.12
1							06/29/2001	21:21:49	OW_CMPTRNAME_000174	26	5.040	91.44
Sel=7							06/29/2001	17:09:45	OW_CMPTRNAME_000172	27	5.040	91.44
N:							**9**	**9**	**9**	**9**	**9**	**9**
Min:										**26.0**	**4.922**	**50.00**
Max:										**55.0**	**5.040**	**91.44**
Avg:										**31.1**	**5.024**	**82.32**
Std-Dev										**9.13**	**0.039**	**14.977**

Statistics

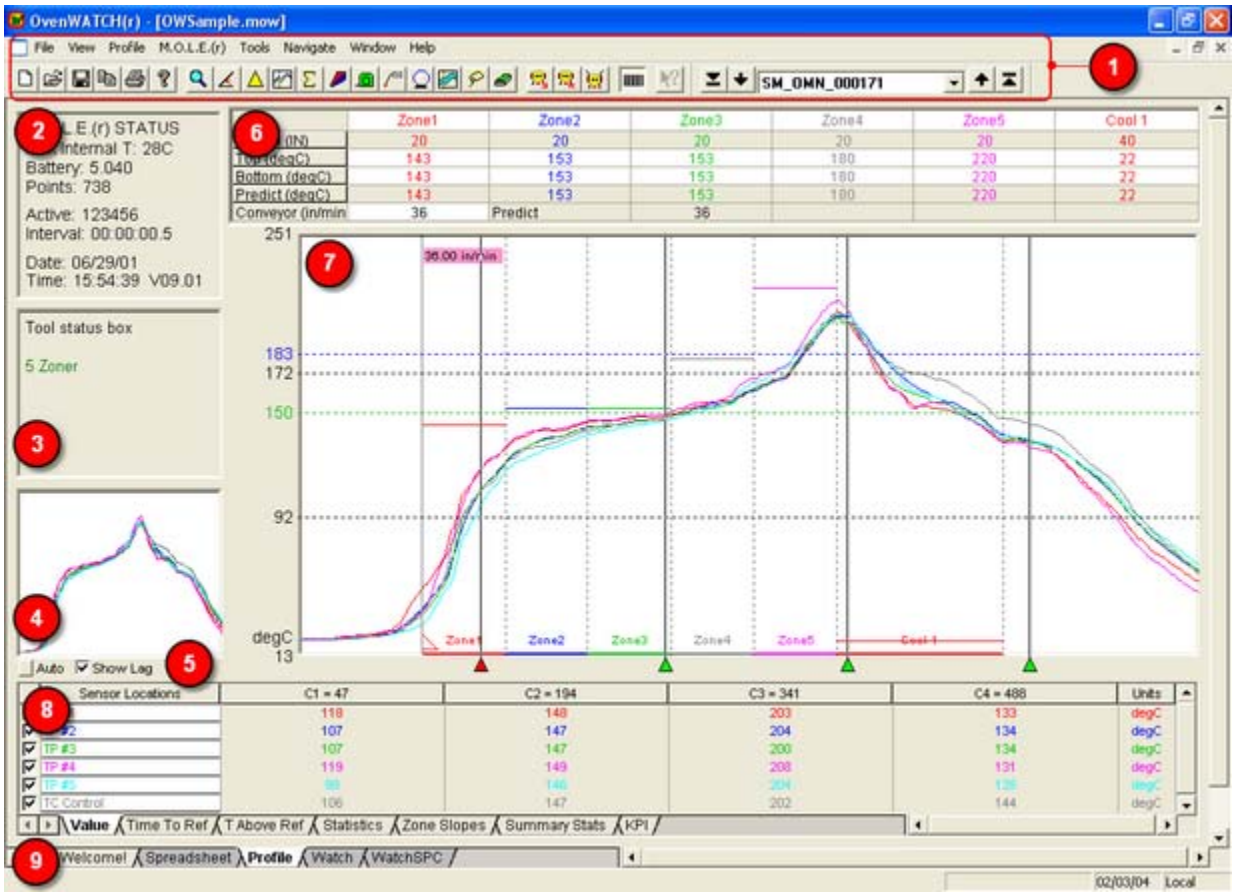
- N = Number of samples included in the calculations
- Min. = The lowest value in the parameter column.
- Max. = The highest value the parameter column.
- Avg = The average of all values in the parameter column.
- Std. Dev. = The standard deviation of the values in that column.

4.3 Profile Worksheet

The Profile worksheet is where a selected data run is represented graphically. The software allows the user to analyze the data and to compute statistics based on the data.

Profile worksheet features:

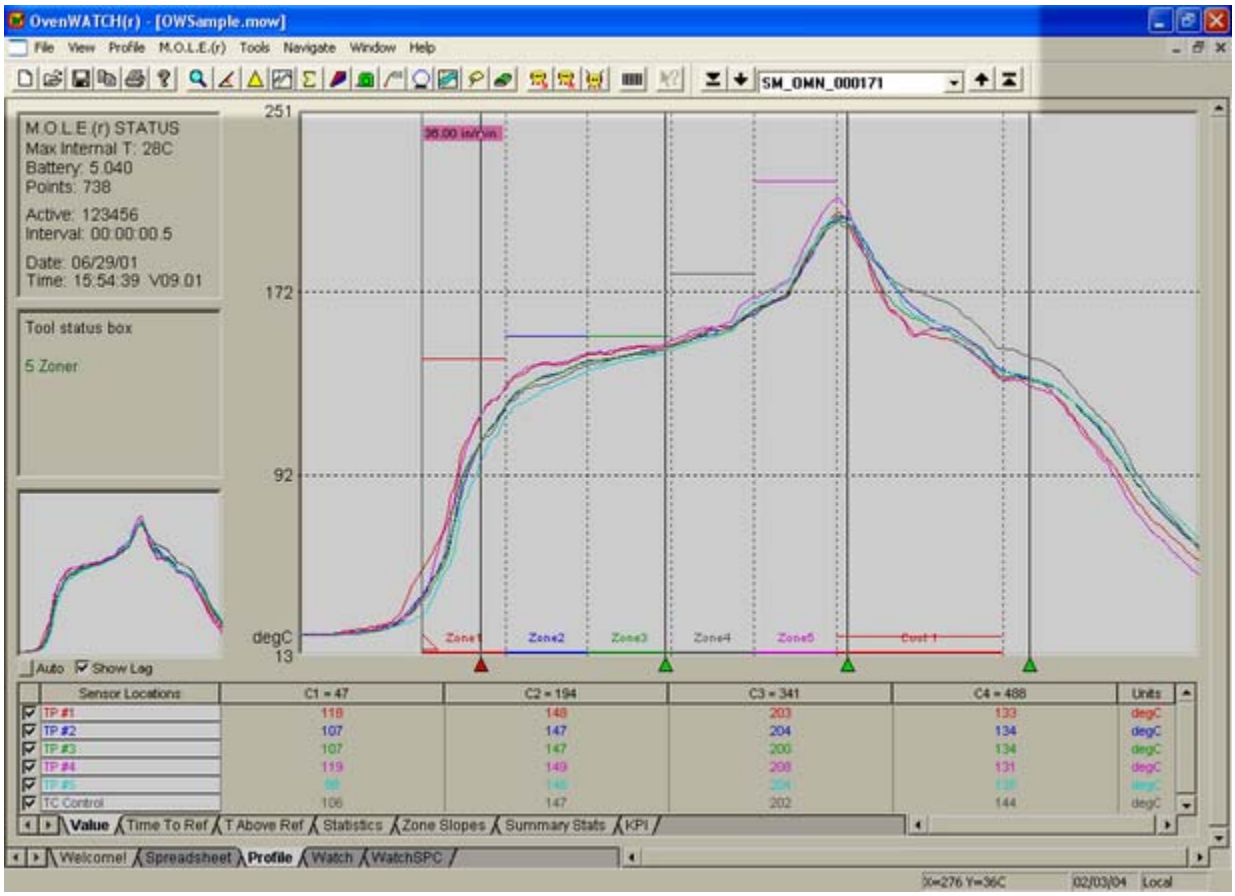
1. Menus and Toolbar
2. M.O.L.E. Status
3. Tool Box Status
4. Magnify Map
5. Auto Lag
6. Zone Matrix
7. Data Graph
8. Data Table
9. Status Bar



Profile Worksheet

4.3.1 Menus and Toolbar

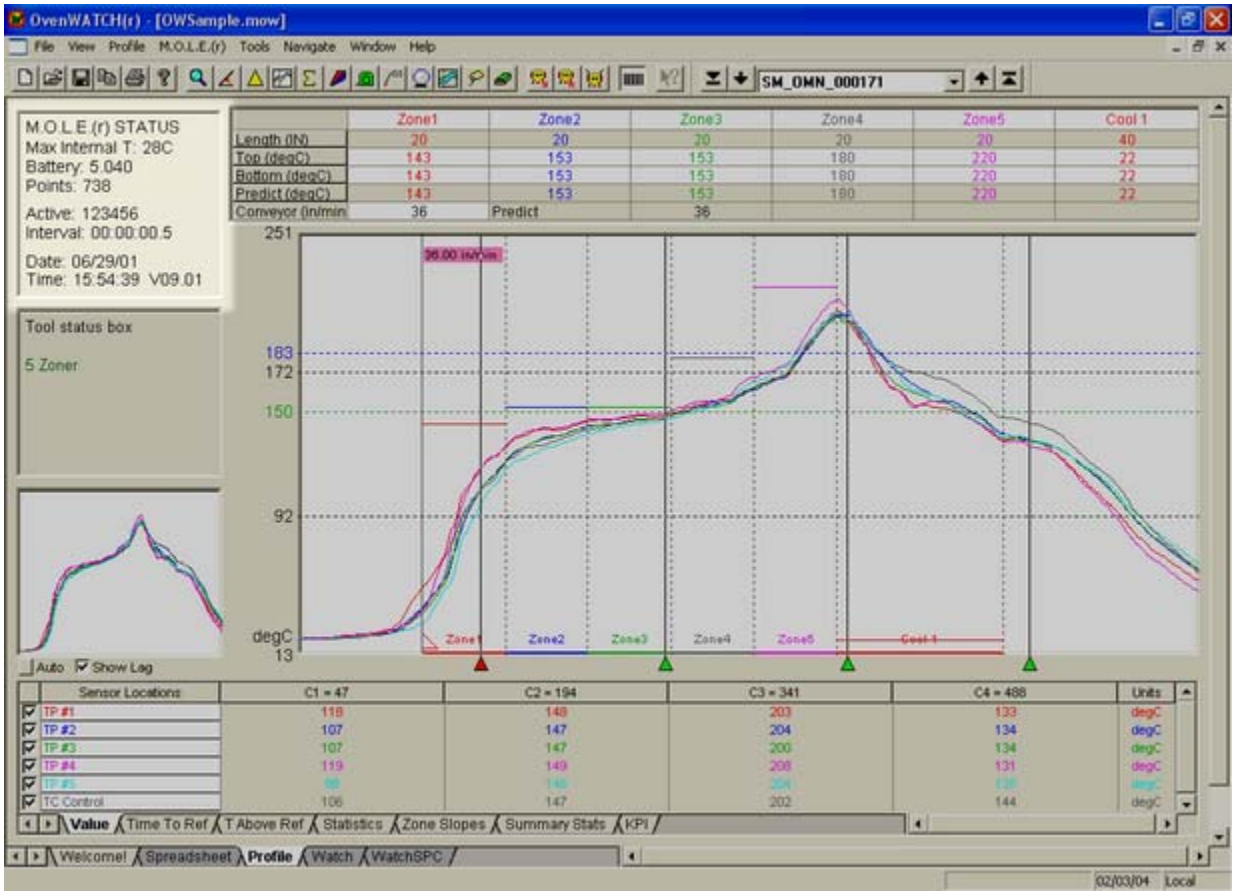
- **Menus**: File, View, Profile, M.O.L.E., Tools, Navigate, Window, and Help.
- **Toolbar Buttons**: New Workbook, Open Workbook, Save Workbook, Copy, Print, About, Magnify, Slope, Peak Difference, Overlay, Total Heat, 3-D, Measure, Notes, Prediction, Tolerance Band, Erase Objects, Erase All, Read M.O.L.E., Configure M.O.L.E., Receive RF, Zone Matrix, First (data run), Back (to previous data run), Next (data run), and, Last (data run).



Profile Worksheet Menus and Toolbar Buttons

4.3.2 M.O.L.E. Status

The ***M.O.L.E. STATUS*** box contains information about the status of the M.O.L.E. while it collected data for the selected Baseline Profile.



M.O.L.E. Status Window

- ***Max Internal T:*** This is the highest internal temperature logged during the displayed profile and is displayed in degrees Celsius. If the highest temperature logged is in the specified internal operating temperature range of is 0-54°C, it appears in BLACK. When the internal temperature is 55°C and above, it appears in RED indicating that the M.O.L.E. has reached the temperature warning zone.

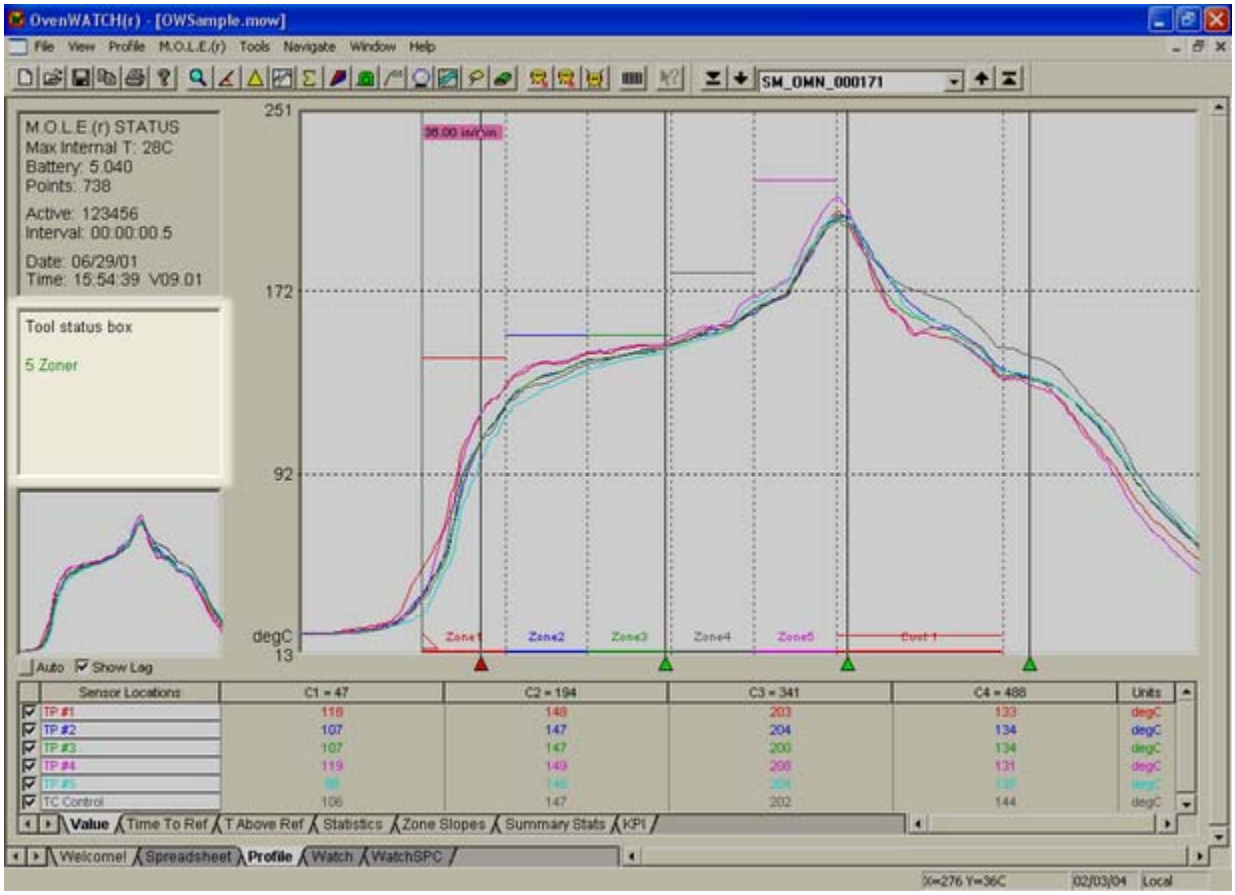
The software has two different internal temperature thresholds. 55-64°C is the M.O.L.E. is approaching the maximum recommended operating temperature of 65°C. Above 65°C is the maximum internal operating range.

- ***Battery:*** The battery voltage measured during the upload of that run. The nominal range for normal operation is 4.1 to 4.7V.
- ***Points:*** The number of data samples recorded at the configured interval.

- ***Active:*** Indicates which channels were active during the experiment. A number means an active channel; a "***O***" is an inactive channel. An "***X***" means an open or out of range T/C was detected on that channel during the data run.
- ***Interval:*** Time between data shown in hours, minutes, seconds, and tenths of seconds data points: hh:mm:ss.t.
- ***Date:*** Date of last data point logged.
- ***Time:*** Time of last data point logged.
- ***V:*** Firmware Version displays the operating code of the M.O.L.E. (This is where customer service will ask you to find the version number for the M.O.L.E.)

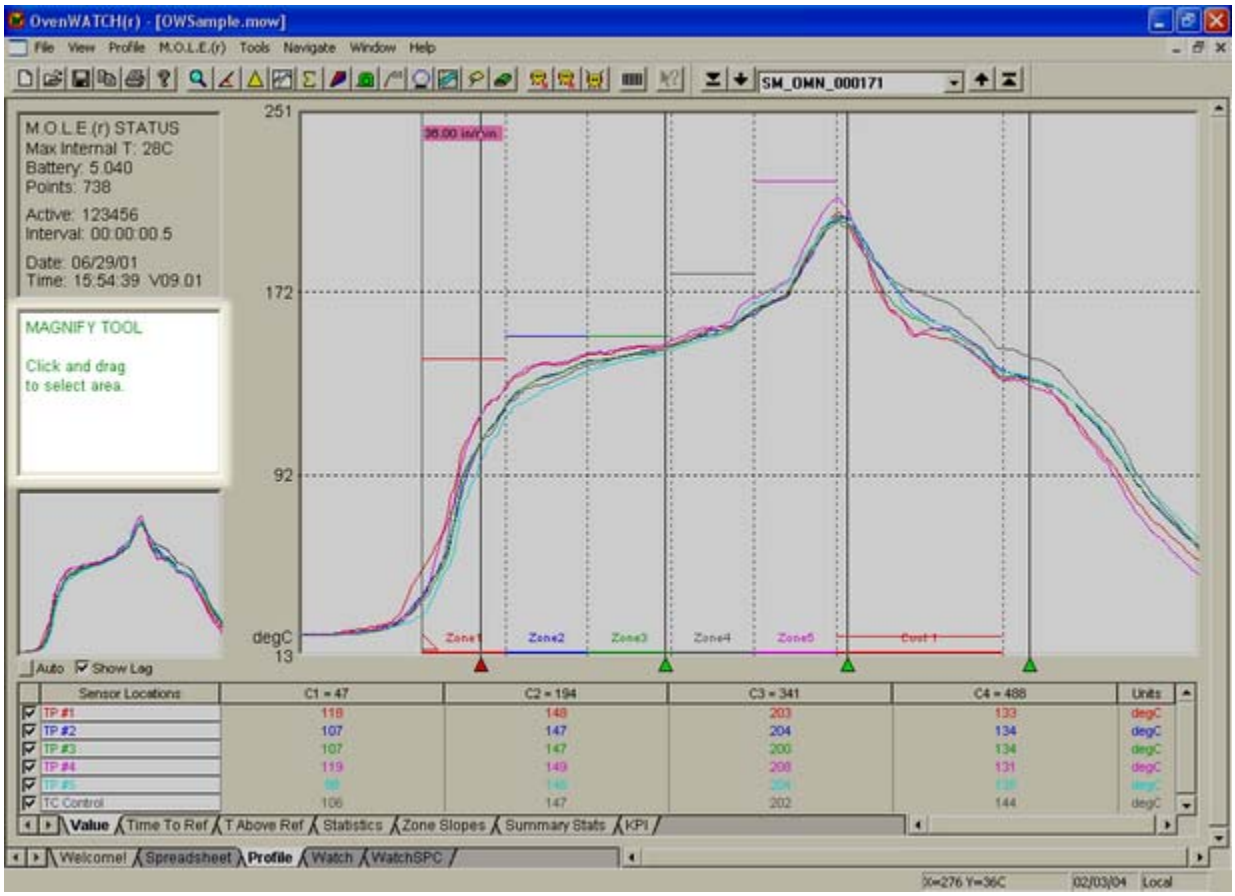
4.3.3 Tool Status Box

The Tool Status box displays information on how to use a selected tool command and other information during tool use. Prior to using a tool command, the Tool Status box displays the Spreadsheet worksheet User definable column information that is associated with the selected Baseline Profile.



Tool Status Box

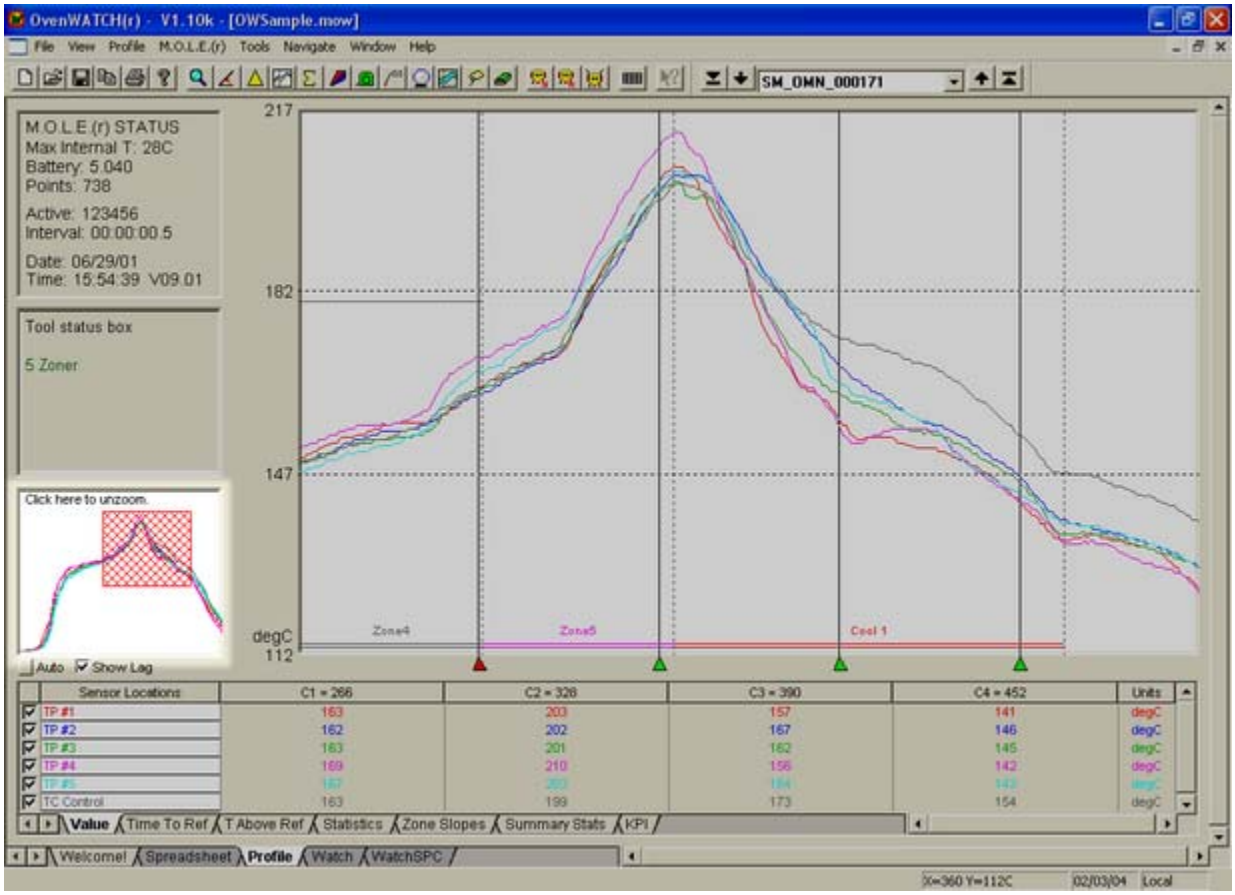
When a Tool command such as Magnify is selected, a tip message appears in the box indicating how to use the Magnify tool by displaying “Click and drag to select area”.



Tool Status Message

4.3.4 Magnify Map

The Magnify Map displays a small map of the entire profile and indicates the area currently magnified with a red crosshatched box.



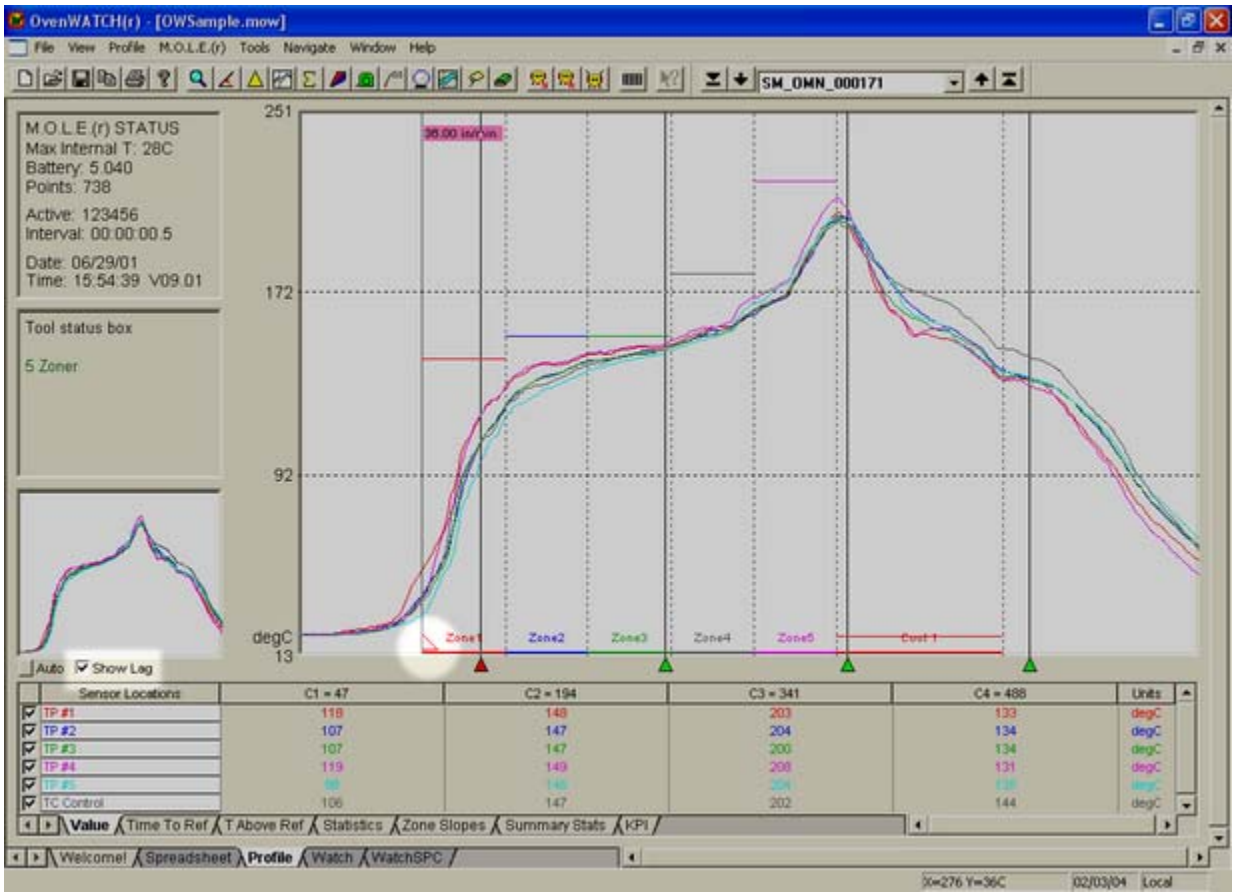
Magnify Map

For more information on the Magnify command refer to section *Magnify Tool*.

4.3.5 Auto Align

If sensors are placed along a line parallel to the direction of flow in a conveyorized process so they enter and exit oven zones at different times, the resulting Data Plots lag behind one another. Auto Lag automatically aligns the X-axis maximum peak values for each Data Plot so the results can be easily compared during analysis.

A Conveyor speed must be set to properly use Auto Lag. Refer to section *Zone Matrix* and/or *Oven Configure* for more information.



Channel Lag Indicator

To use Auto Lag:

1) Select the ***Auto Lag*** command button. The channel lag values will automatically be calculated, and the Data Plots adjust to reflect them. When Channel lag is enabled, a check mark appears in the ***Show Lag*** check box and a small triangle appears on the lower end of the process origin line.

If Channel Lag values were previously entered in the Channel Lag dialog box, Auto Lag will automatically overwrite the current values. Refer to section *Sensors* for more information.

To disable the Channel Lag:

1) Click the ***Show Lag*** check box to remove the check mark and return the Data Plot(s) to the original positions.

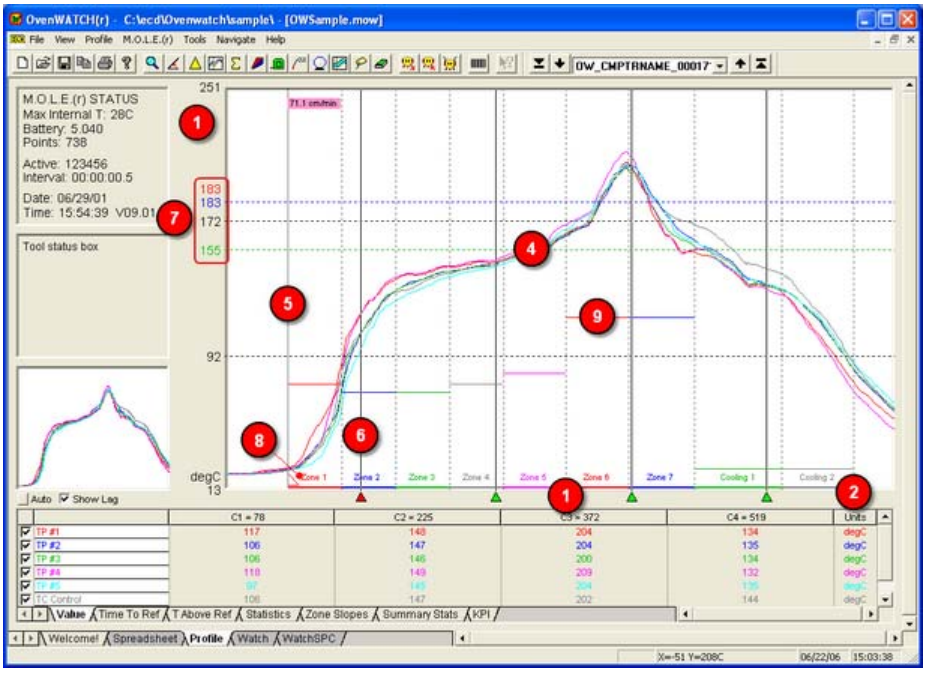
Auto Lag only used displayed channel Data Plots. Auto Lag values will not be calculated for channels that are not displayed.

4.3.6 Data Graph

The Data Graph is a display that shows the data collected from the Baseline Profile overlaid on a graph. The user can analyze and highlight various process features with the tools listed below.

Data Graph features:

1. X and Y-Axes and Labels
2. X-axis Scales
3. Autoscaling
4. Data Plots
5. Process Origin
6. X-Cursors
7. Temperature Reference Lines
8. Zones and Zone Sizes
9. Zone Temperatures



The Data Graph

The Data Graph features are described in the sections that follow. Some of these features described are also controlled using the appropriate menu options. Refer to ***Menu and Tool Commands*** for more information.

4.3.6.1 X and Y-Axes

The Y-axis (vertical) displays the scale of the measured temperature. Lower values are at the bottom and higher values at the top.

The Y-axis includes temperature labels on the left side of the graph. These four temperatures divide the vertical axis into four equal parts and are automatically scaled to fit the current Y-axis limits. These units can be displayed in Celsius or Fahrenheit using the ***Units*** command in the ***Preferences*** sub-menu on the Spreadsheet worksheet.

The X-axis (horizontal) displays values data points collected. The X-axis can be converted from data points to time or distance using the ***Units*** command in the ***Profile*** menu.

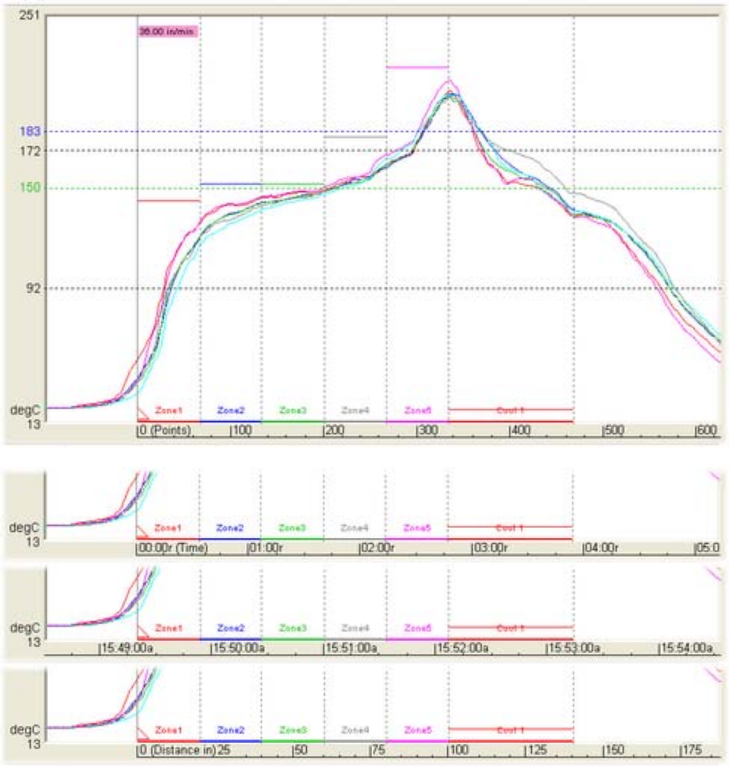
To see the X-value of any location on the Data Graph, the software provides three different methods:

- The X/Y Readout in the Status bar continuously displays both X and Y-values at the location of the mouse pointer. Details of this feature are described in section Status Bar.
- The X-value at the position of each X-Cursor is displayed in the Data table when the ***Value*** statistic is active.
- The X-and Y-values for each data point in the raw data is listed in a table when the ***List-Print Data*** command is used.

4.3.6.2 X-axis Scales

The user can select four different types of X scales for the X-axis. The scales are Point, Time – Relative (time measure from process origin), Time – Absolute (Time of day) and Distance. To change, select the ***Units*** command in the ***Profile*** menu.

The scale is displayed only when a data tab other than Value is selected.



Scale Types

The Distance scale will not be accurate until an accurate conveyor speed is set.

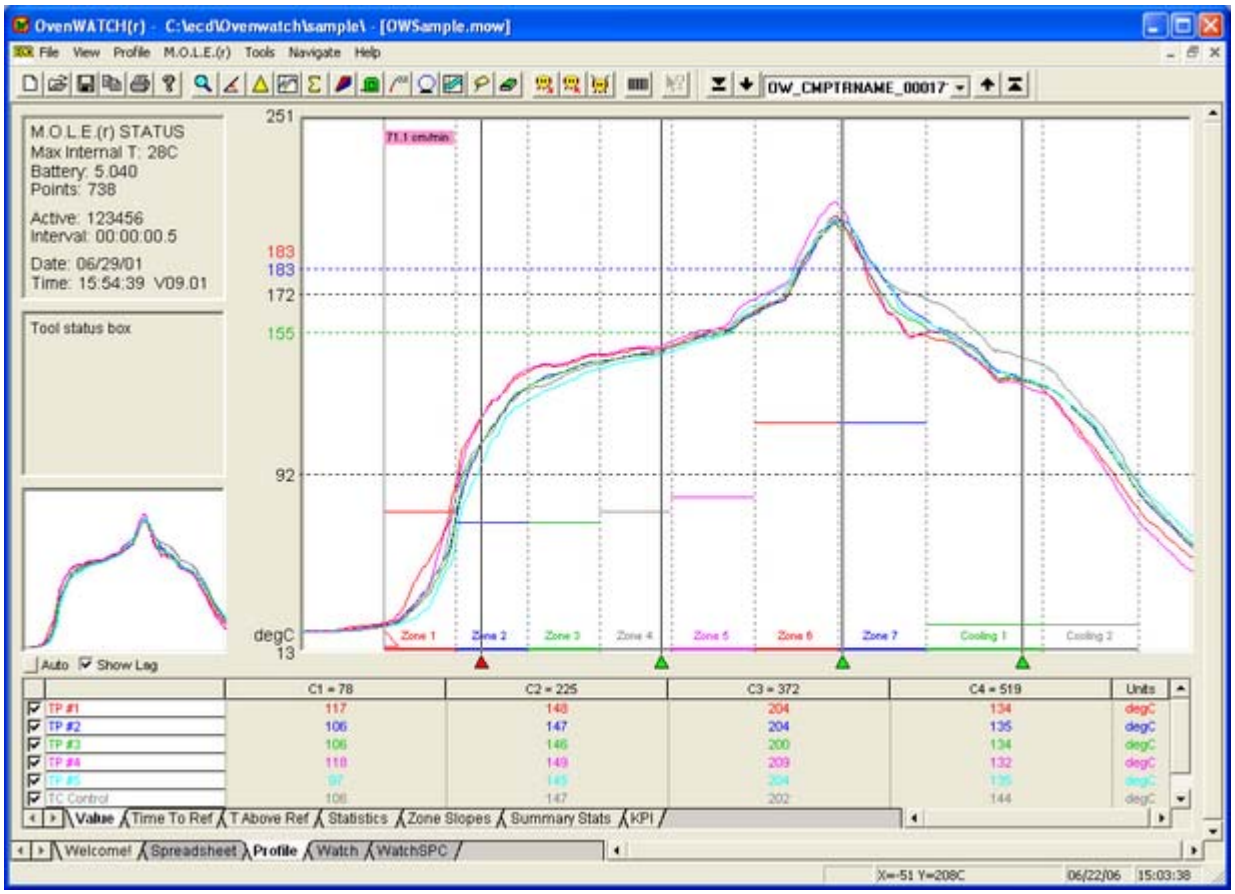
4.3.6.3 Autoscaling

The software includes a powerful ***Autoscaling*** option to automatically scale the Data Graph so the data will always be visible and easy to work with. The software will automatically select a range of values for the Y-axes to ensure that all the data fits on the screen. The user can change the range of Y-values displayed in ***Manual*** mode by entering a manual mode using the ***Scaling*** command in the ***Profile*** menu.

Another way to scale the graph's X and Y-axes is to use the Magnify tool described in section *Magnify Tool*.

4.3.6.4 Data plots

The Data Plots in the Data Graph represent the data for each of the sensors connected to the M.O.L.E.. Each sensor is represented by a different color that corresponds to the color of its sensor location description in the Data Table.



Data Plots

A Data Plot in the Data Graph can be suppressed or restored at any time by clicking the check box with the corresponding sensor description in the Data Table. This allows the user to view any combination of the Data Plots or individually.

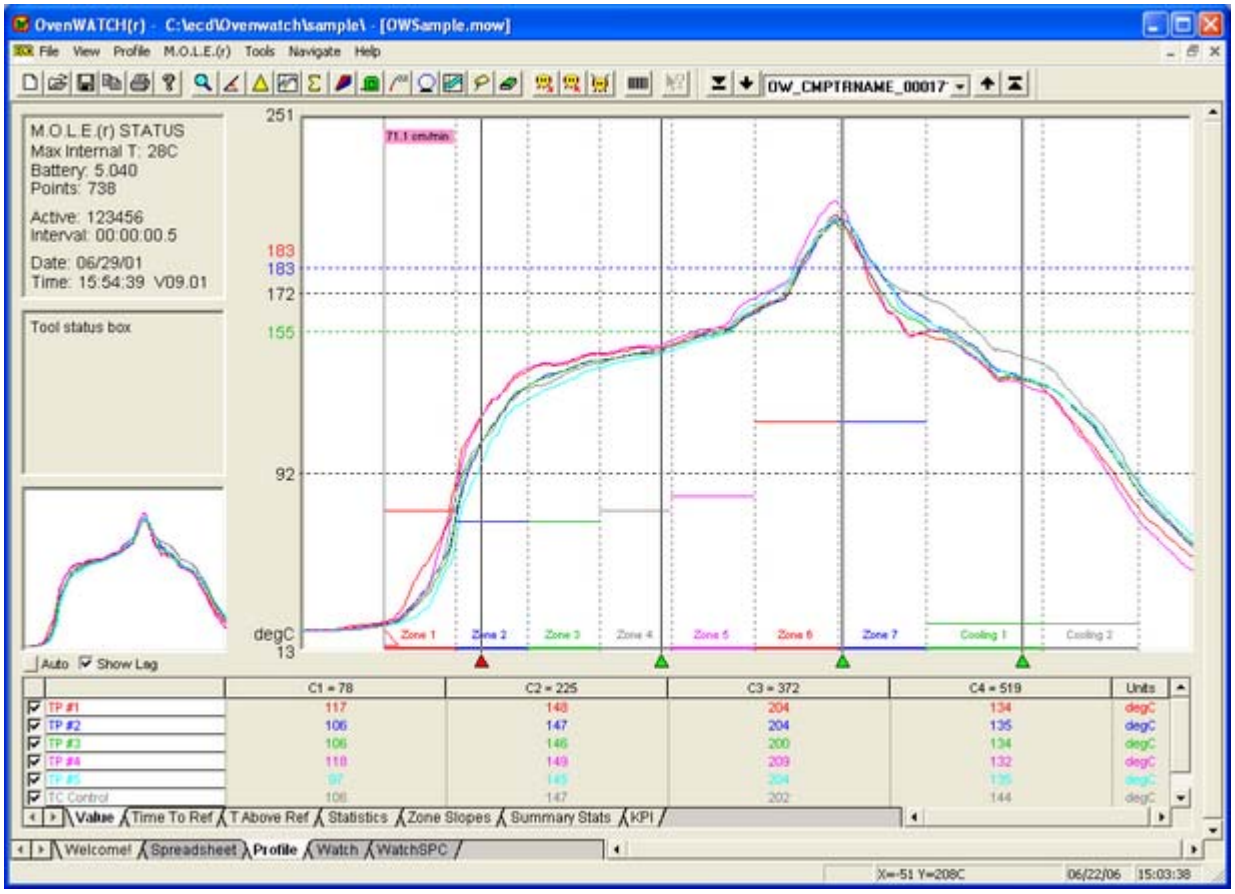
When two or more Data Plots overlap the same values, the Data Plots overwrite each other. For example, if the Data Plot that represents the sensor connected to channel 5 and channel 1 have the same value, the channel 5 Data Plot will only appear unless the user suppresses it.

When printing a Data Graph in black and white, suppressing one or more Data Plots is useful for clearing a view of a Data Plot that is obscured by others near it.

When printing the Data Graph in black and white, the Notes tool can be used to help identify each Data Plot.

4.3.6.5 Process Origin

The Process Origin is a gray vertical line at the left edge of the Data Graph to indicate where the process starts. When Points or Distance units are being used for the X-values, the X-values to the left of the Process Origin are displayed as negative and those to the right as positive.



Process Origin

To move the Process Origin:

1) Select the Process Origin line by positioning the mouse pointer anywhere on the line.
2) Press and hold the left mouse button.
3) Move the line by dragging it left or right.
4) Release the mouse button when the Process Origin is at the desired location.

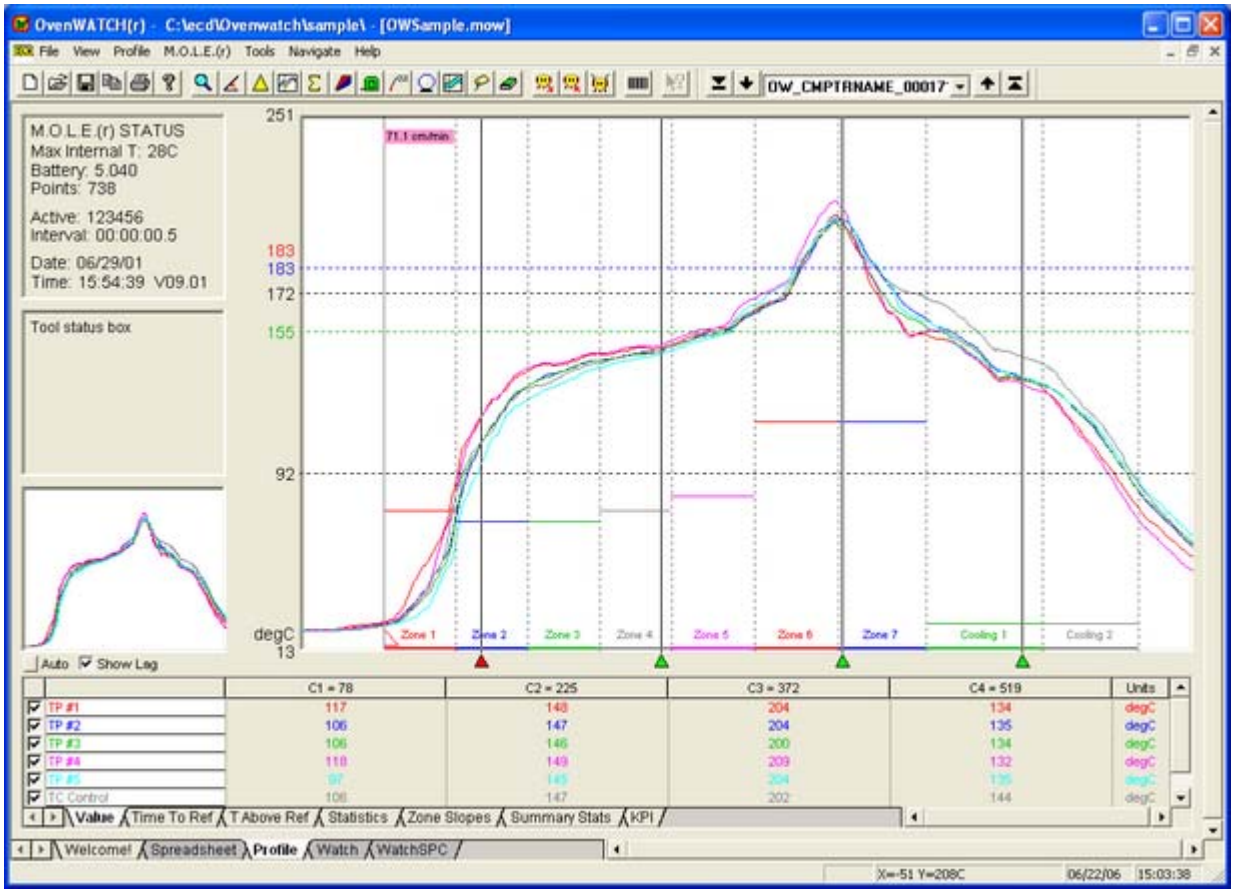
The X/Y Readout in the Status Bar indicates the true position of the Process Origin while it is being moving. After the mouse button is released, the X-Readout changes to zero at the Process Origin and displays negative numbers for X when the mouse pointer is moved to the left of the Process Origin.

X-Cursor values are automatically adjusted when the Process Origin is moved.

To display the distance of a conveyor process along the X-axis, adjust the Process Origin to the data point that was recorded at the start of the conveyor process. Now set the conveyor speed in the ***Oven Configure*** dialog box located in the ***Profile*** menu.

4.3.6.6 Conveyor Speed Indicator

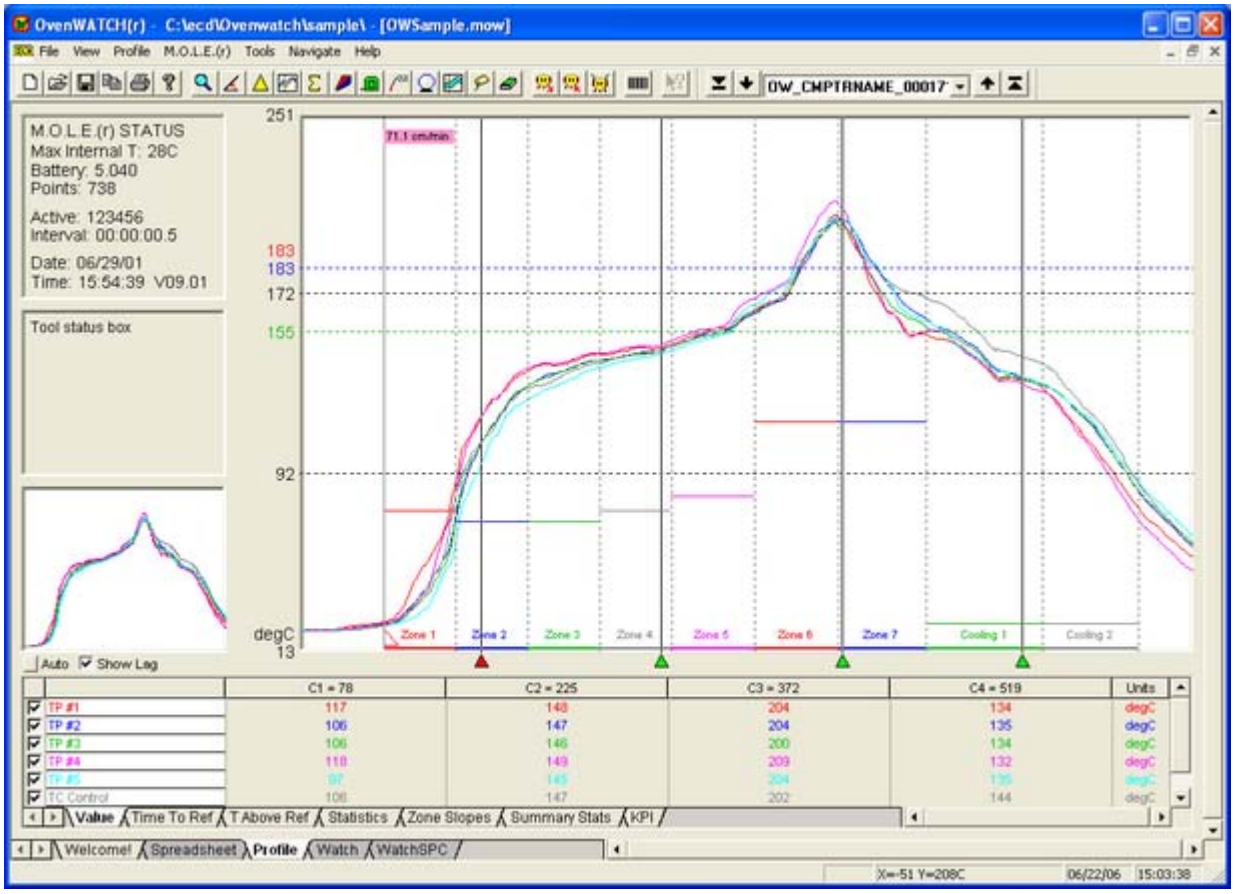
The Conveyor Speed Indicator displays the speed of the conveyor when the Baseline Profile data was recorded. It is a Magenta flag located at the top of the Process Origin.



Conveyor Speed Indicator

4.3.6.7 X-Cursors

The Data Graph has four X-cursors that indicate the temperature values at the intersection of a Data Plot with each X-cursor. When the ***Value*** Data Tab is selected, these values are displayed in the Data Table in four data columns labeled ***C1***, ***C2***, ***C3***, and ***C4***, representing X-cursor 1 through X-cursor 4 respectively.



X-Cursors

To move an X-Cursor:

1) Select the ***Value*** Data Tab.
2) Position the mouse pointer over the X-cursor grip (the small triangle below a X-cursor) then press and hold the left mouse button and drag it left or right releasing the mouse button when the X-cursor is at the desired location.

- The user can also press the [***tab***] key to toggle select an X-cursor. When the desired X-cursor is selected, the small triangle will turn red. Then pressing either the left or right arrow keys will step the X-cursors. Each step is one pixel or one degree which ever is larger. This feature achieves cursor positions that are more precise.

Moving the selected cursor can be pushed into other cursors causing them to move them ahead of it.

The position of an X-cursor controls the values displayed in the Data Table. When an X-cursor is moved, values in the Data Table are automatically updated.

The Data Table includes a row for each of the sensors on the M.O.L.E.. The numbers in the four columns indicate the Y-values at the intersection of a Data Plot with an X-cursor. Refer to ***Value*** for more information.

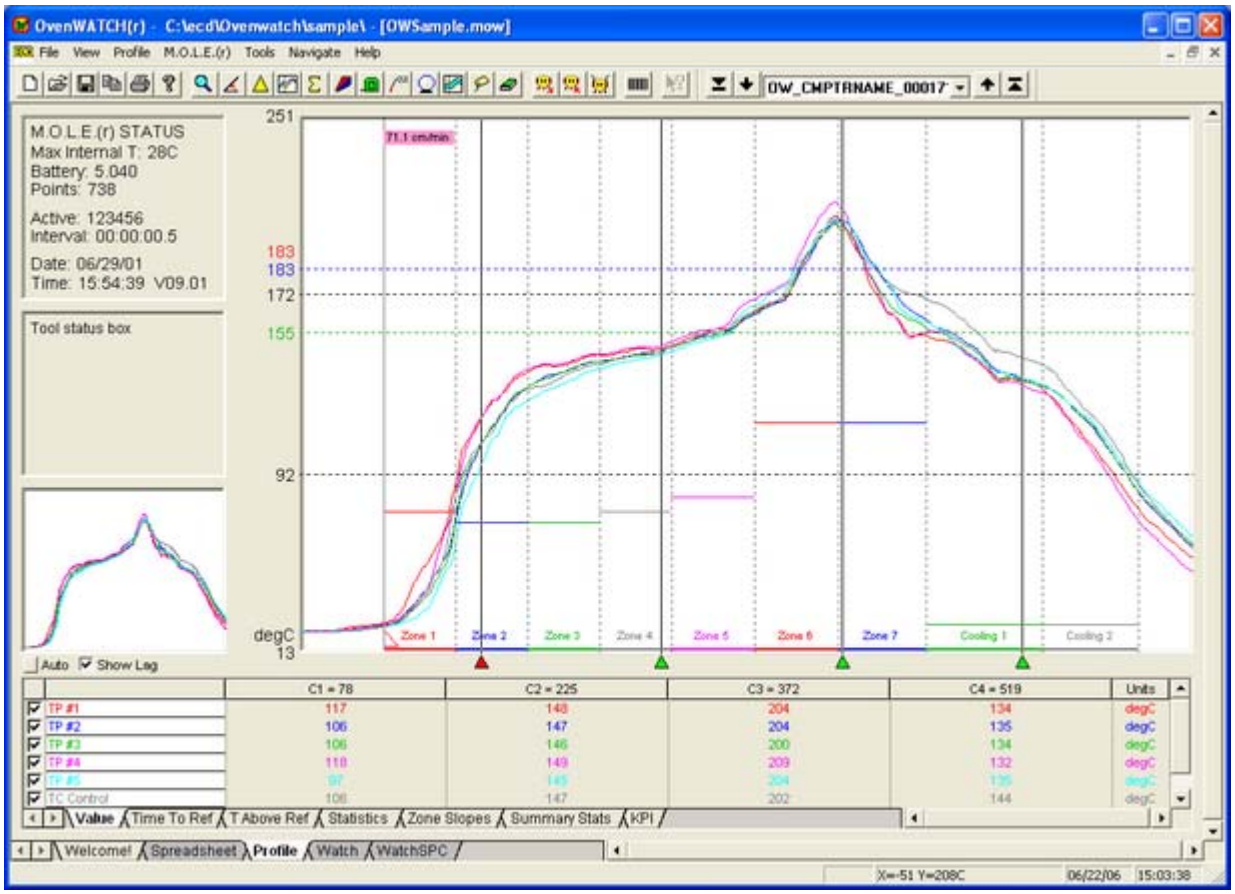
When an X-cursor is dragged to a new position, it automatically snaps to the closest real X-value. Notice on highly magnified graphs that the cursor jumps from point to point. In an extreme case, if the graph is so highly magnified that there are no real X-values to move to, the X-cursors cannot be moved at all.

The Process Origin is the initial point from which all X-axis position data is calculated. After releasing the Process Origin at the appropriate point on the graph, X-cursor values are recalculated and displayed.

4.3.6.8 Temperature Reference Lines

Temperature Reference Lines are colored horizontal lines that are positioned within the range of Y-values in the graph. Up to three Temperature reference lines can be added to the Data Graph using the ***Temp Ref Lines*** command in the ***Profile*** menu.

In this example the Low Temp Ref Line is **Green** and located at 155°C. The Medium and High Temp Ref Lines are **Blue** and **Red** which are located at 183°C.

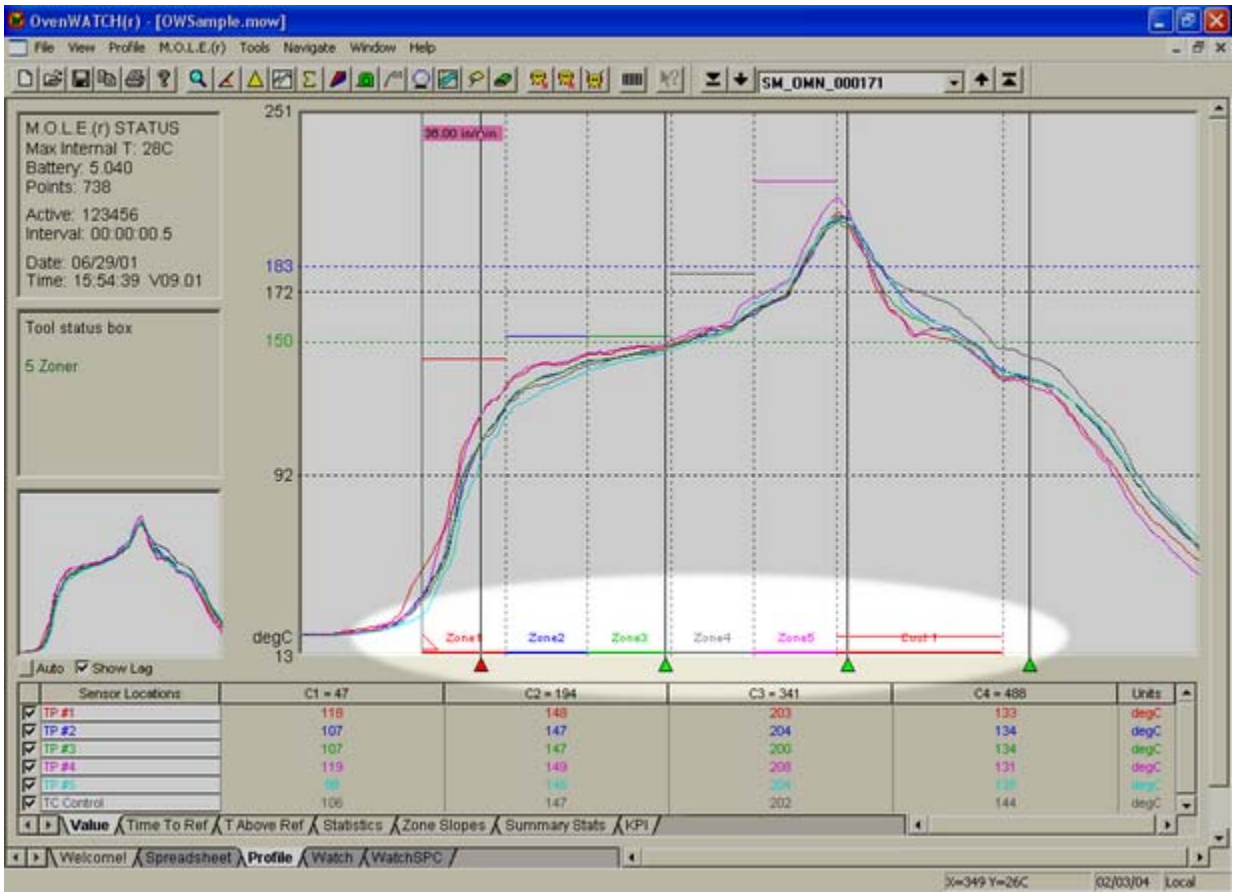


Temperature reference lines

Temperature Reference Lines are used in analysis when the ***T Above Ref*** (Time above the Reference Line) statistic is active. ***T Above Ref*** statistic is described in section ***T Above Ref***.

4.3.6.9 Zones and Zone Sizes

The X-axis can be divided into zones that represent oven zones in a process. As many as thirty zones can be specified using the Zone ***Configure*** fields on the ***Oven Configure*** dialog in the ***Profile*** menu. Zones sizes are defined in units of length or time.

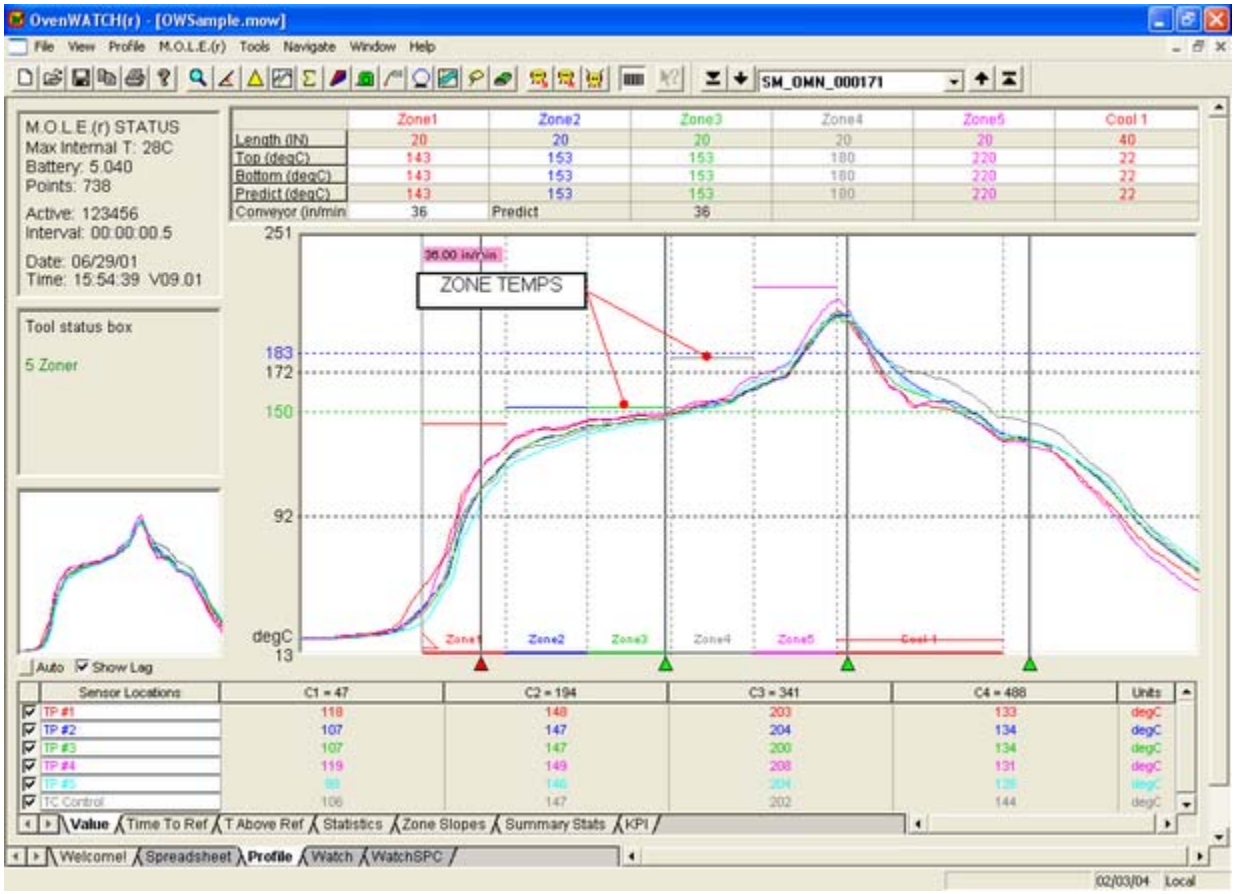


Zones

To view zones along the X-axis, click the ***Show Zones*** option button on the ***Oven Configure*** dialog box. When zones are displayed, they appear as two colored lines along the bottom of the data graph and as dotted vertical lines that extend top to bottom. The first zone begins at the Process Origin. When the Process Origin is moved, the zones move with it.

4.3.6.10 Zone Temperatures

Two zone temperatures can be established for each zone using the ***Zone Temps*** fields on the ***Oven Configure*** dialog box. These temperatures might represent upper and lower boundaries for the acceptable range of values in that zone or the settings of upper and lower heating elements in that zone.

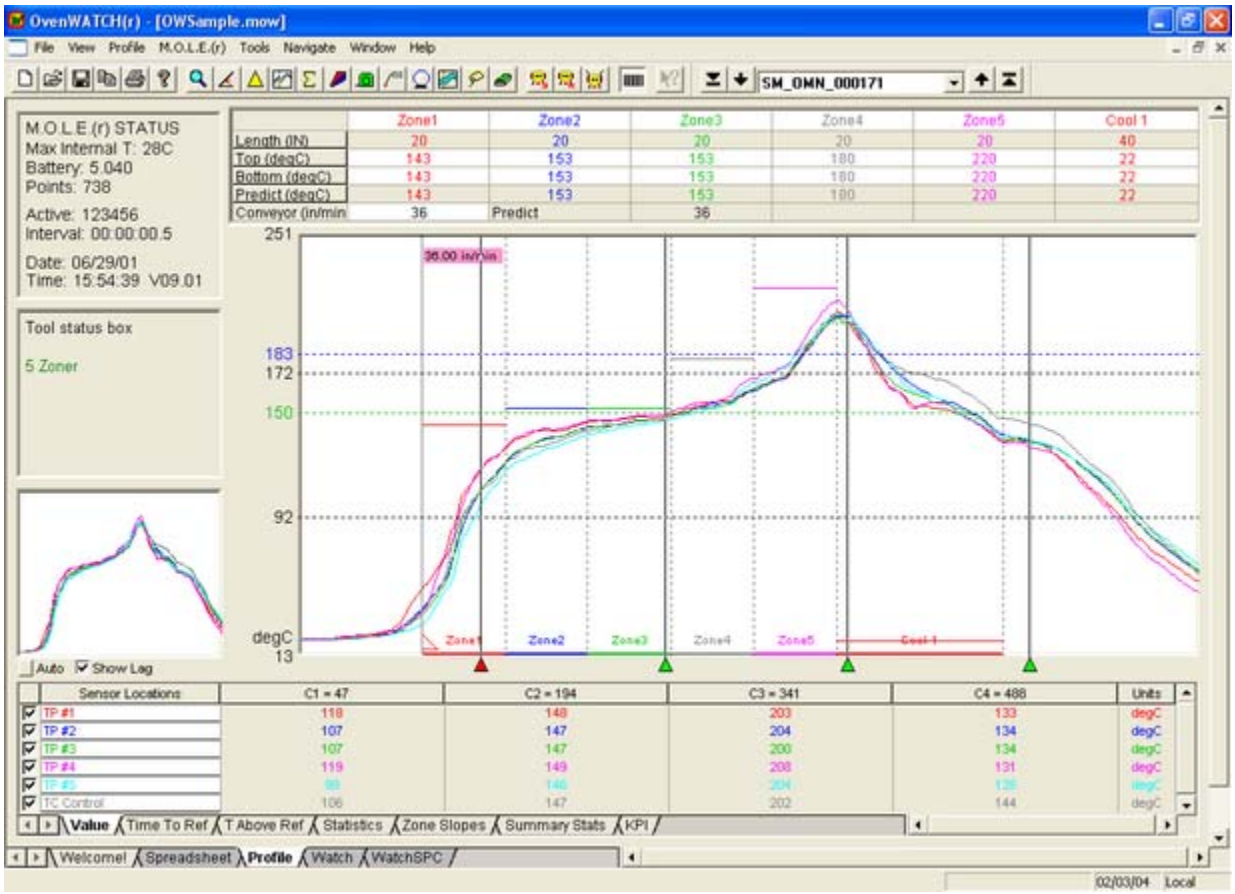


Zone Temperatures

Zone Temperature Lines appear in the Data Graph as colored bars at the temperature set for each zone. (Zone Temperatures can be displayed only after zone sizes are defined). Upper Zone Temperature Lines appear in the Data Graph as solid colored bars and the lower Zone Temperature Lines are dashed.

4.3.6.11. Zone Matrix

A Zone Matrix appears above the Data Graph, when the ***Zone Matrix*** command in the ***Profile*** menu is selected. The user can enter value(s) for the Top and Bottom zone temperatures in the white cells of the matrix.



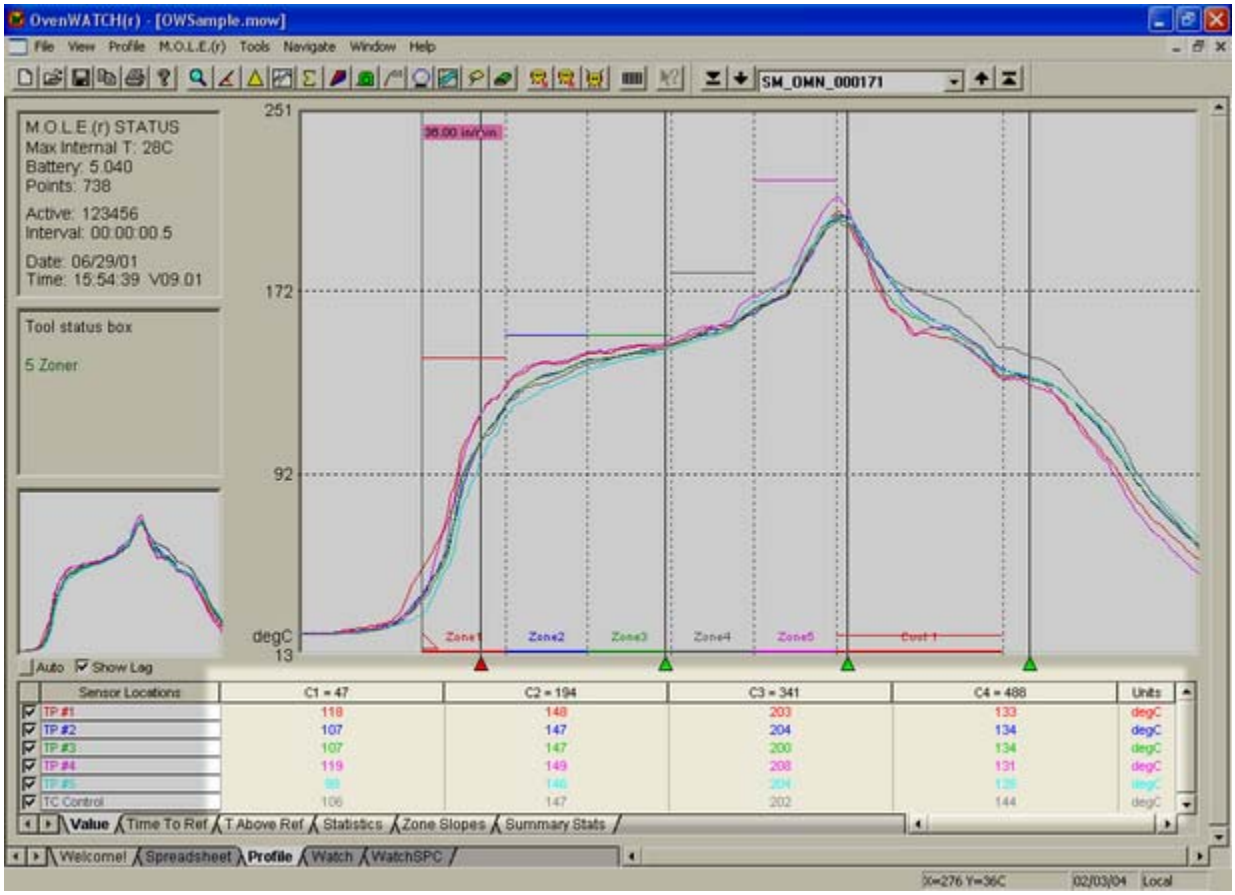
Zone Matrix

4.3.7 Data Table

The Data Table includes various values depending on which Data Tab is selected. The rows always indicate the channel and the columns vary depending on which data tab is active.

Data Table features:

- Sensor Locations
- Channel Check Boxes
- Data Tabs
- Value Pop-up
- Show/Hide Columns
- Change Summary Stats Settings
- Change Slope Calculator



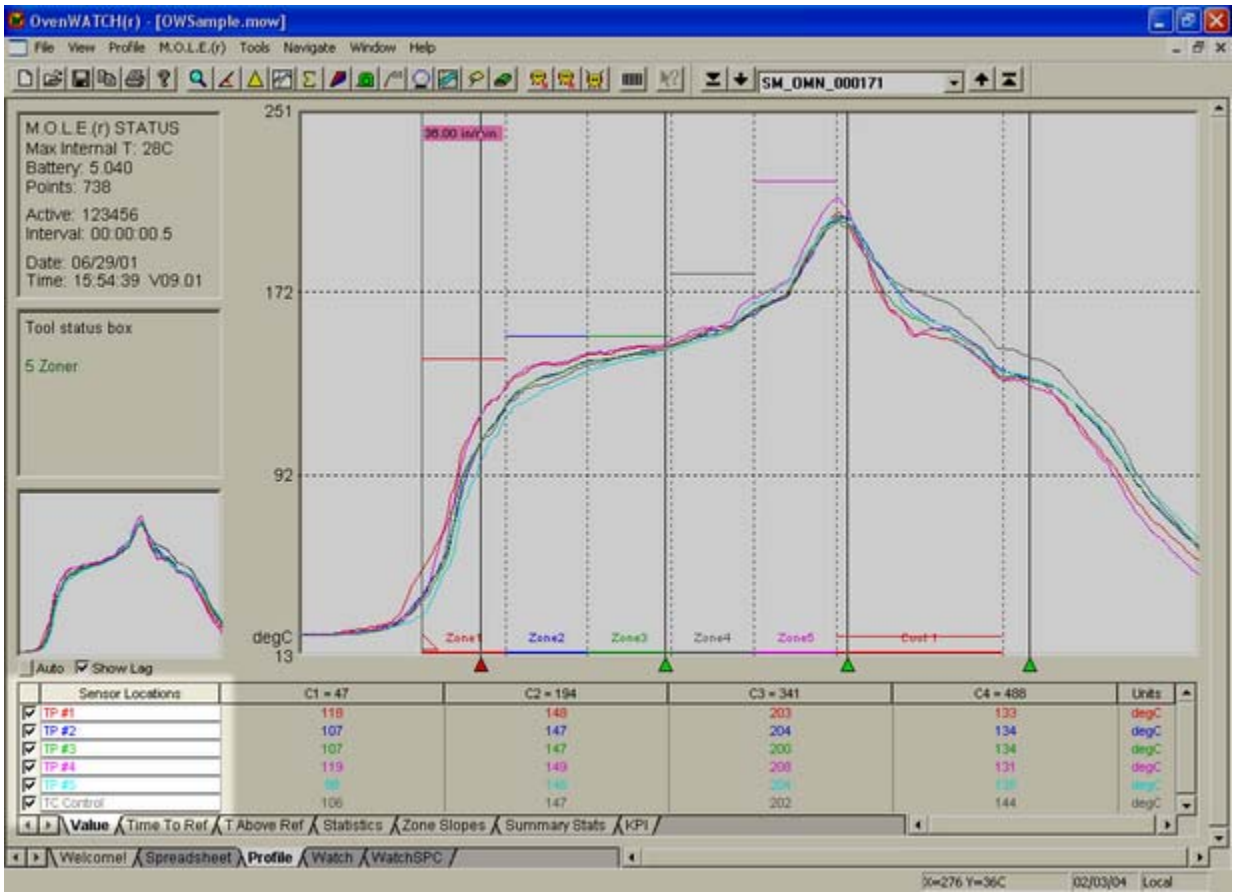
Data Table

4.3.7.1 Sensor Locations

The location for each sensor labeled in the Data Table. The color and description indicates which Data Plot on the Data Graph it designates.

To change a Sensor location description:

1) Click the cell to the right and type the desired name and press the [***enter***] key, or use the ***Sensors*** command in the ***Profile*** menu.



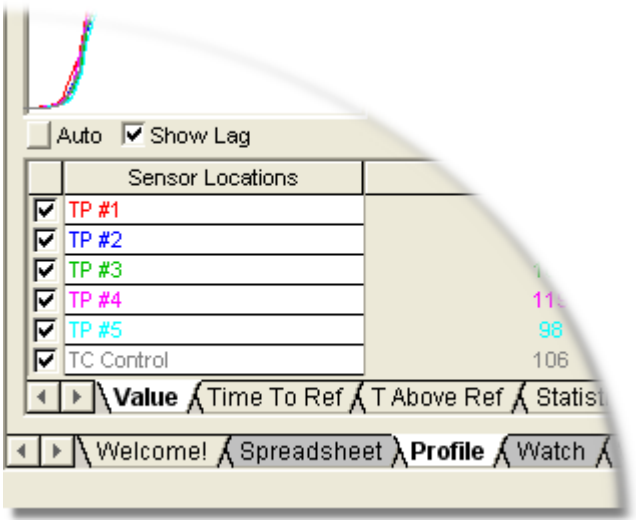
Channel Descriptions

4.3.7.2 Channel Check Boxes

The Channel check boxes control whether the associated Data Plot is displayed on the Data Graph and whether the data for that channel are included in the data table.

To view or remove a Data Plot:

1) Click the channel check box beside a sensor location description to turn it “ON” or “OFF”.



Channel Check Boxes

4.3.7.3 Data Tabs

Data Tabs is where the user can view a variety of sensor information in the Data Table.

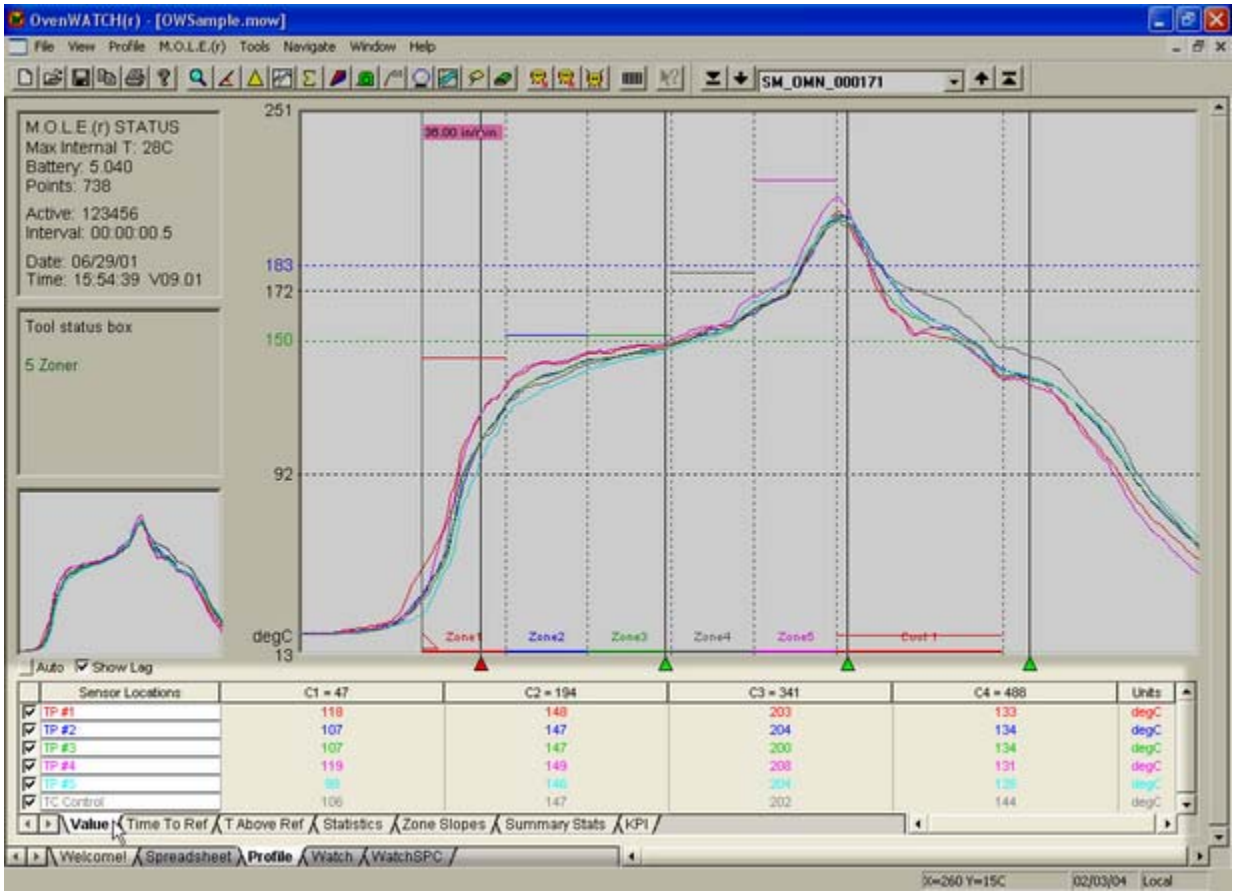
The Data Tabs are:

- Value
- Time to Ref
- T above Ref
- Statistics
- Zone Slopes
- Summary Statistics
- KPI (Key Process Indicators)

When the Magnify tool is used to zoom in on a portion of the Data Graph, the Data Table displays the statistics for those values that are displayed. (This feature does not apply to the Summary Stats Data Tab).

4.3.7.3.1 Value

When the ***Value*** Tab is selected, the Data Table lists the temperature at the point where an X-cursor intersects a Data Plot. There are four X-cursors and the positions can be changed at any time by moving the X-cursor (Refer to the descriptions in ***X-Cursors***). As an X-cursor is moved, the values in the Data Table are automatically updated.

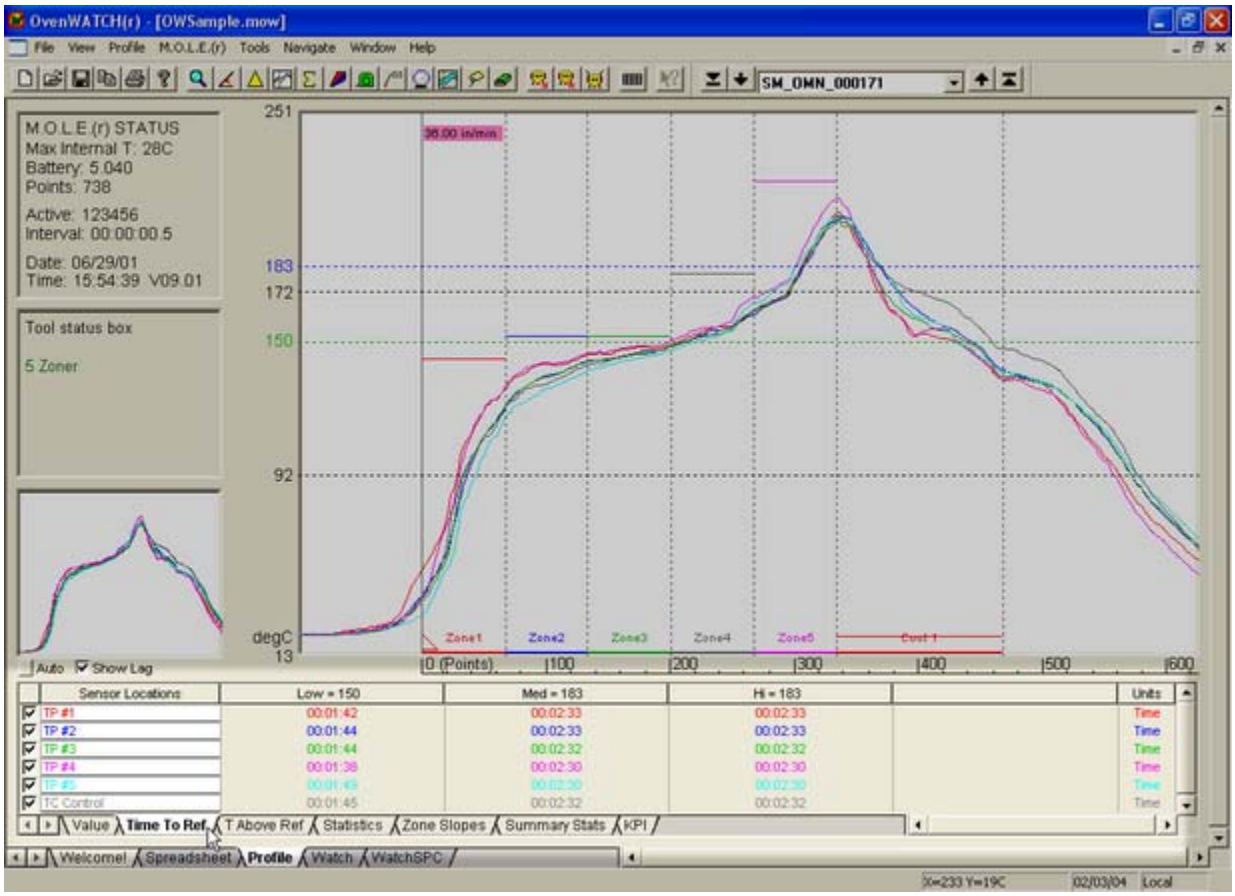


Value Data Tab

Values in the Data Table depend on the units of the X and Y-axis.

4.3.7.3.2 Time to Reference

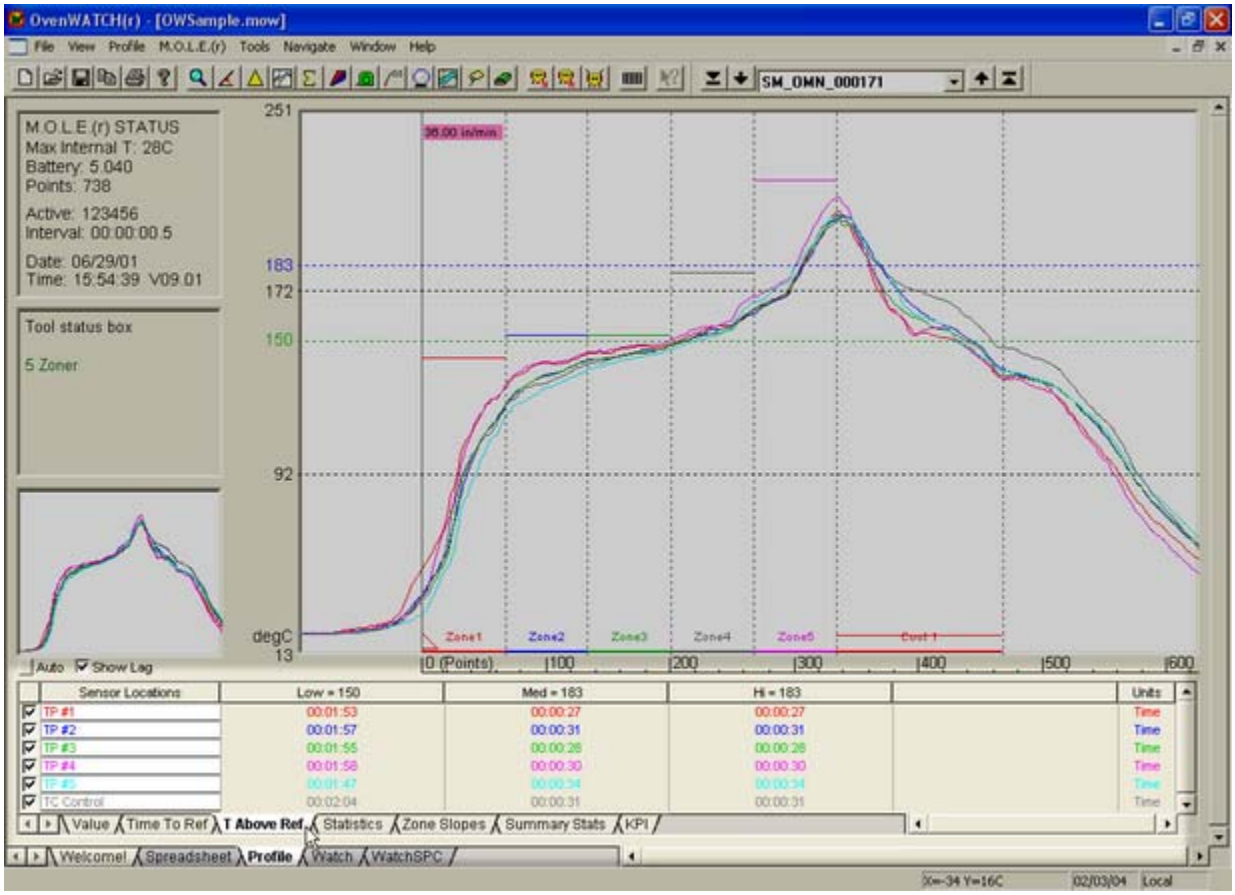
When the ***Time to Reference*** Tab is selected, the Data Table displays the time it takes the channels to reach fixed Temperature Reference Line(s). Times are expressed as HH:MM:SS (H=hours, M=minutes, S=seconds). Up to three Temperature Reference Lines can be added to the Data Graph that are used in this statistic by using the ***Temp Ref Lines*** command in the ***Profile*** menu.



Time to Ref Data Tab

4.3.7.3.3 T Above Ref

When the ***T Above Ref*** Tab is selected, the Data table shows the amount of time each sensor measured data above the Temperature reference lines. Times are expressed as HH:MM:SS (H=hours, M=minutes, S=seconds) and are the total time above reference line regardless of when the value was above.



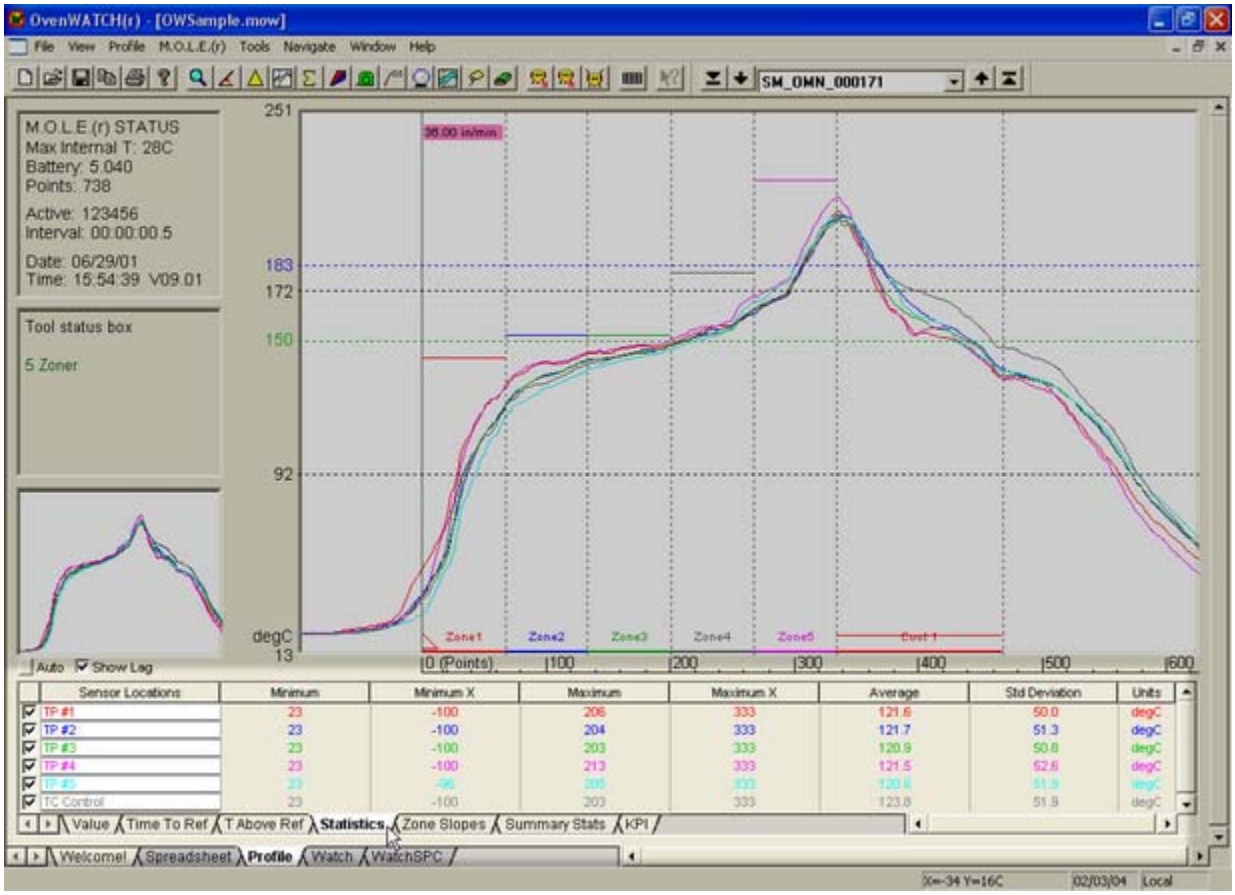
T Above Ref Data Tab

Temperature reference lines can be added, deleted, or moved at any time using the *Temp Ref Lines* command in the *Profile* menu.

4.3.7.3.4. Statistics

When the ***Statistics*** Tab is selected, the first four columns of the Data Table displays the minimum and maximum temperature found for each Data Plot and the value of X (time, distance, or point number) at which it occurred.

The last two columns of the Data Table displays the Average (Mean) and Standard Deviation of the temperature values recorded for each sensor.

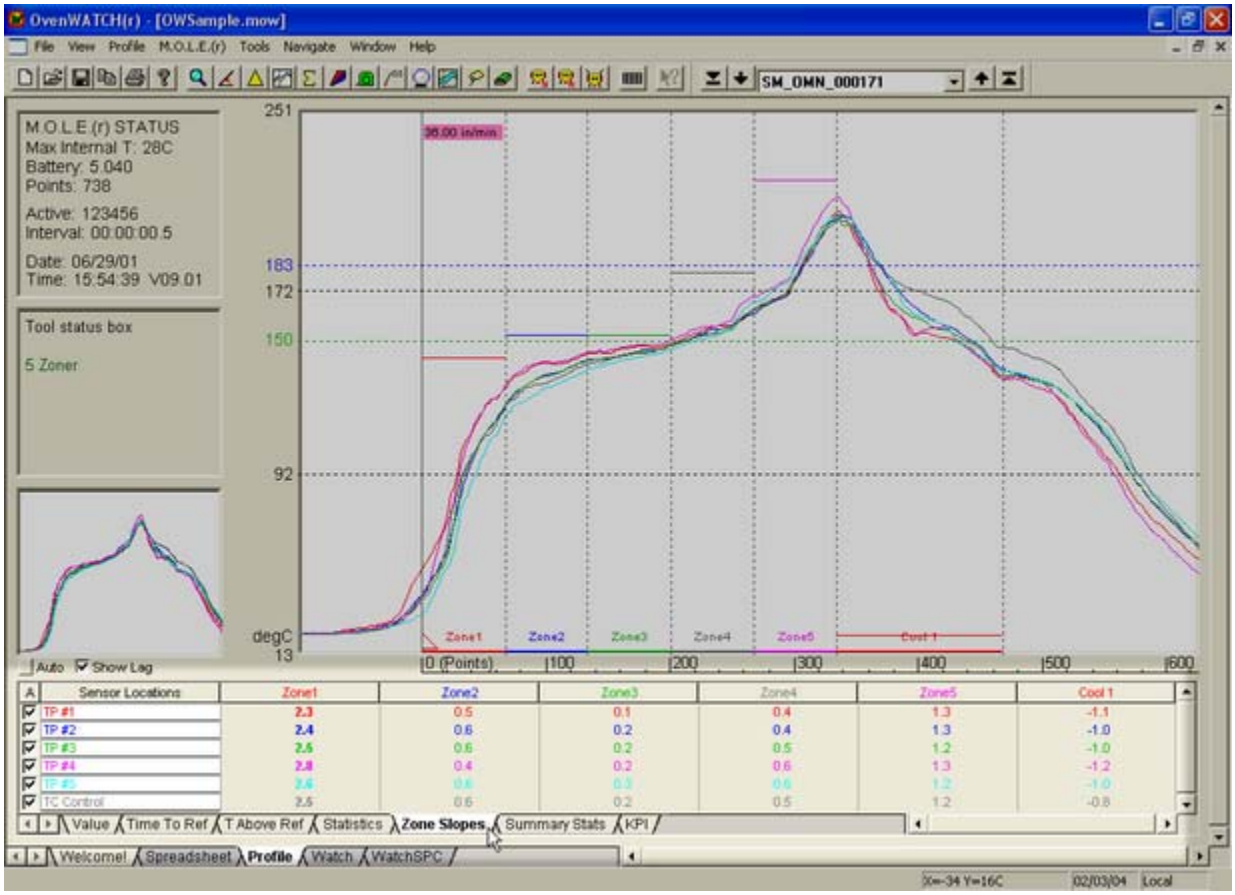


Statistics Data Tab

If a portion of the Data Graph is magnified using the Magnify tool, the Data Table displays the Mean and Standard Deviation of the values currently displayed.

4.3.7.3.5 Zone Slopes

When ***Zone Slopes*** is the active data tab, the Data Table displays the average slope in degrees/second of each Data Plot in each zone. The **bold** value in the data table is the Maximum slope for that profile. The example below has all six of the Maximum slopes located in zone 2.

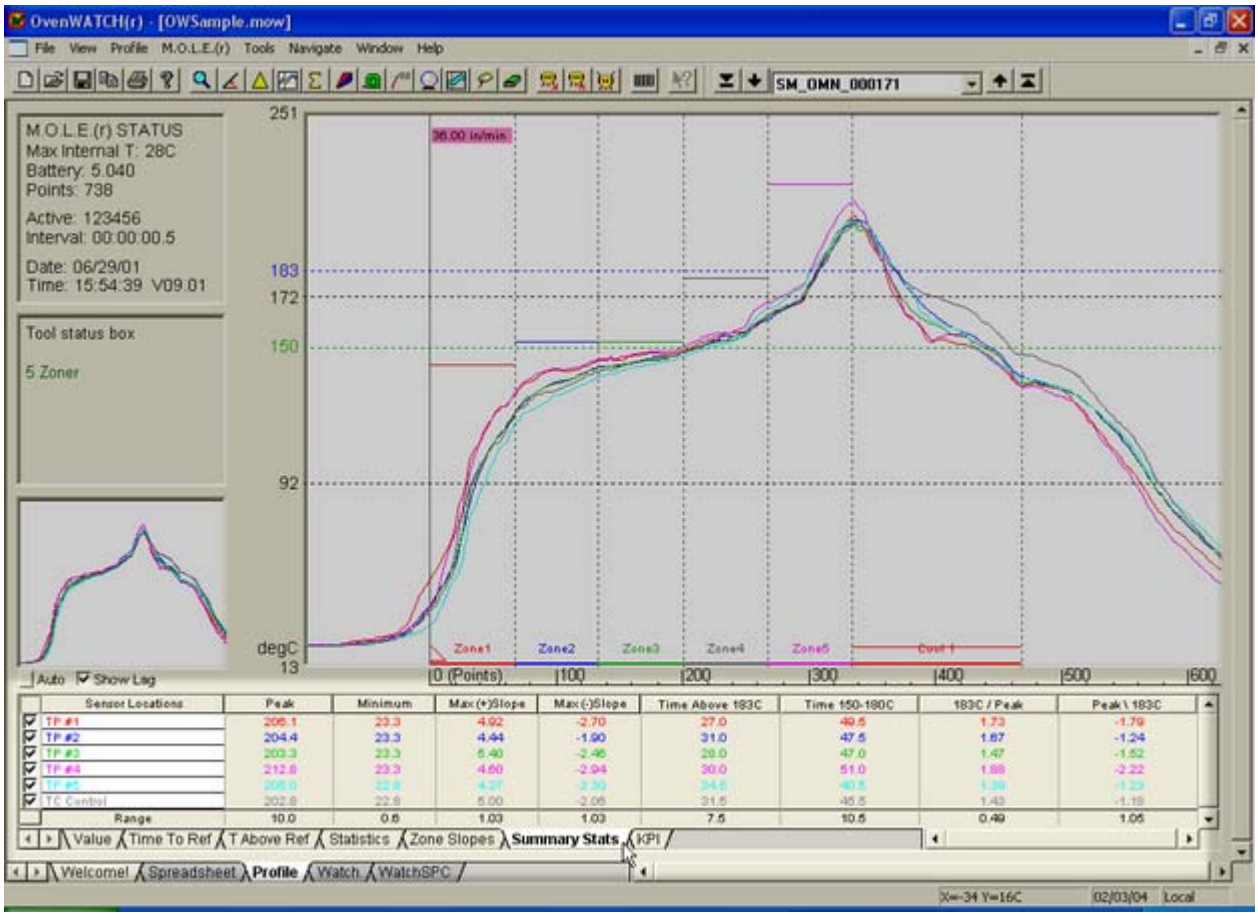


Zone Slopes Data Tab

The Slope Tool can also be used to determine the slope between any two points in the graph. Refer to *Slope Tool* for more information.

4.3.7.3.6 Summary Statistics

When ***Summary Stats*** is the active data tab, the Data table displays a summary of primary statistics from the Profile. The summary statistics are always derived from the entire profile.

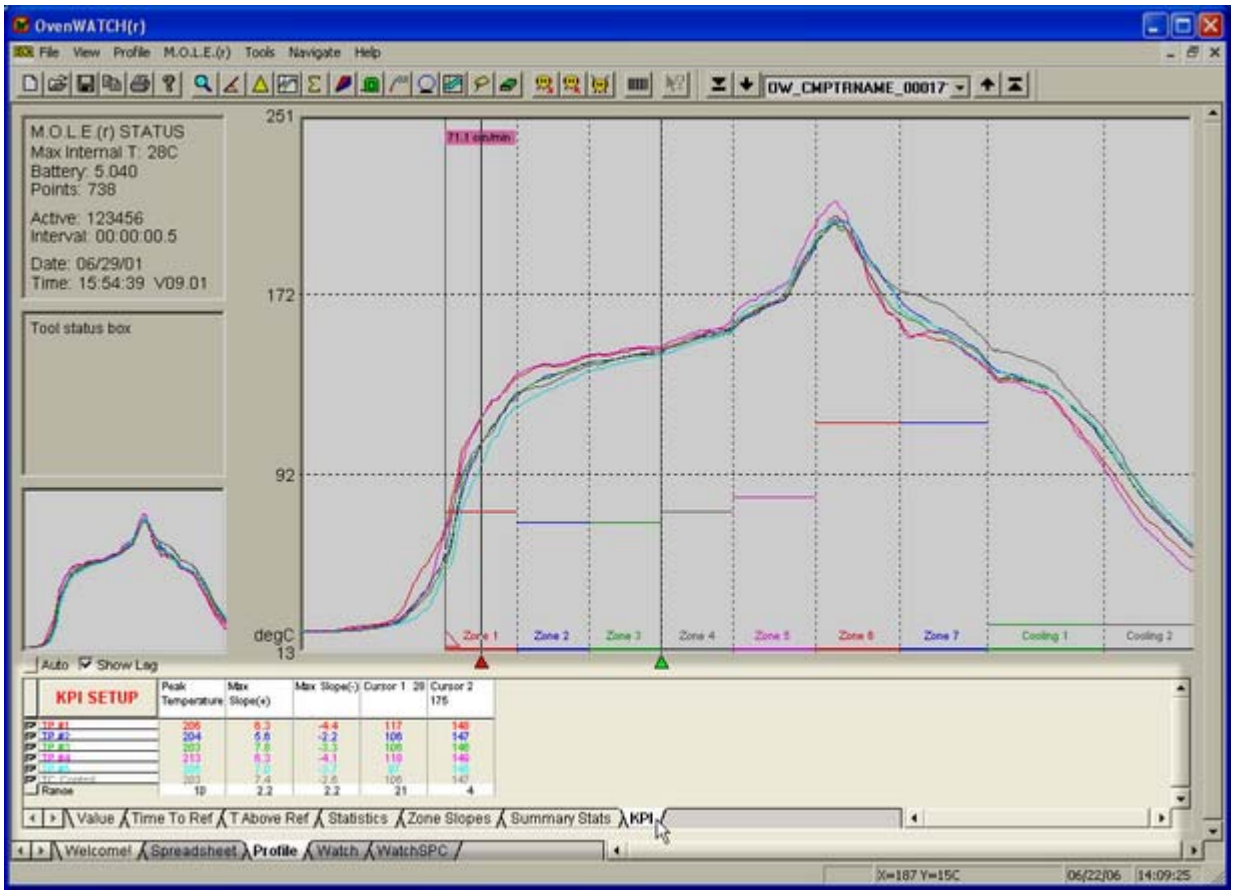


Summary Stats Data Tab

When the Magnify tool is used to zoom in on a portion of the Data Graph, the Data table statistics remain the same.

4.3.7.3.7 KPI (Key Process Indicators)

When ***KPI*** is the active data tab, the Data Table displays statistics from the Profile configured by the user. This is useful so the user can display the most important information that best suits their needs or application.

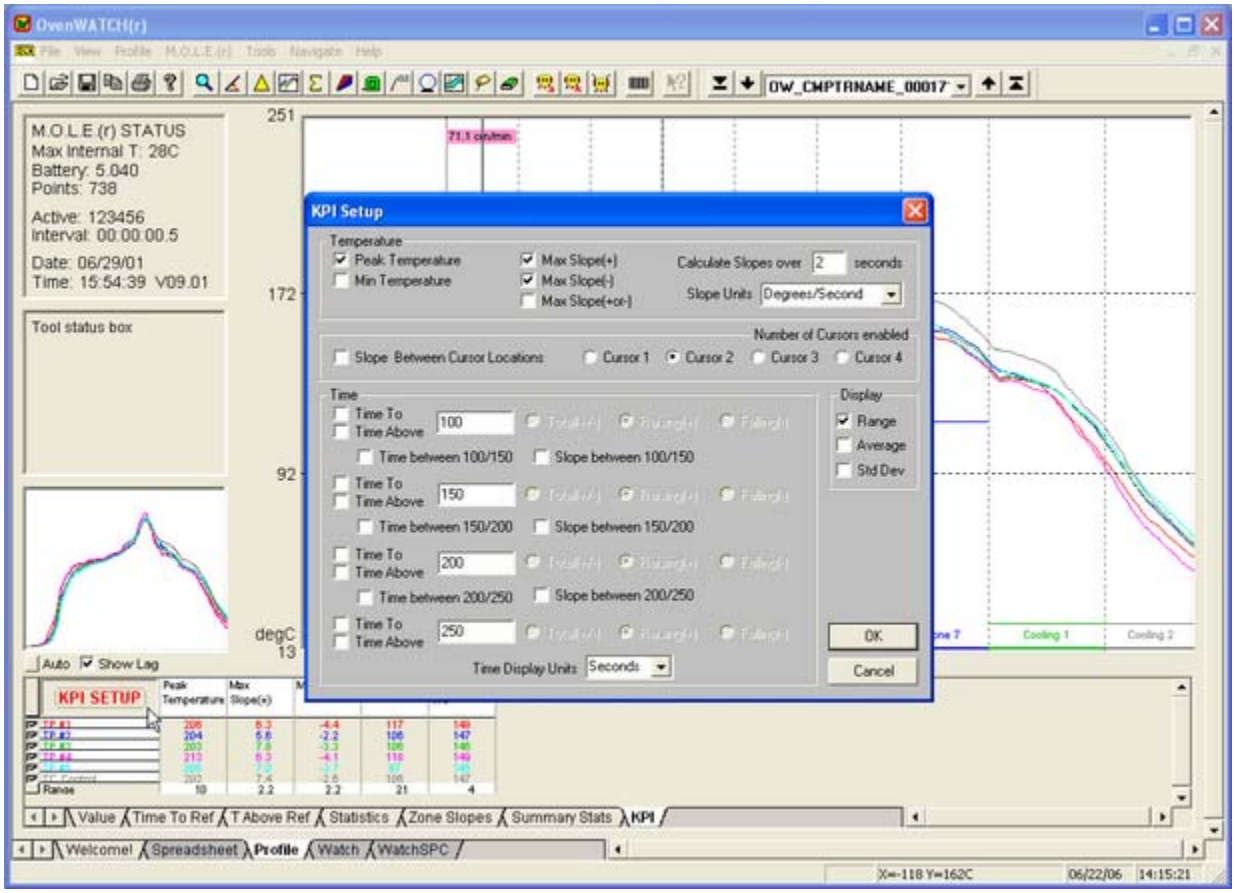


KPI Data Tab

Key Process Indicators Setup:

1) Make sure the ***KPI Data Tab*** is active.
2) Click the ***KPI Setup*** button above the Sensor Locations descriptions.

The KPI Setup can also be activated by right-clicking a column header.



KPI Setup

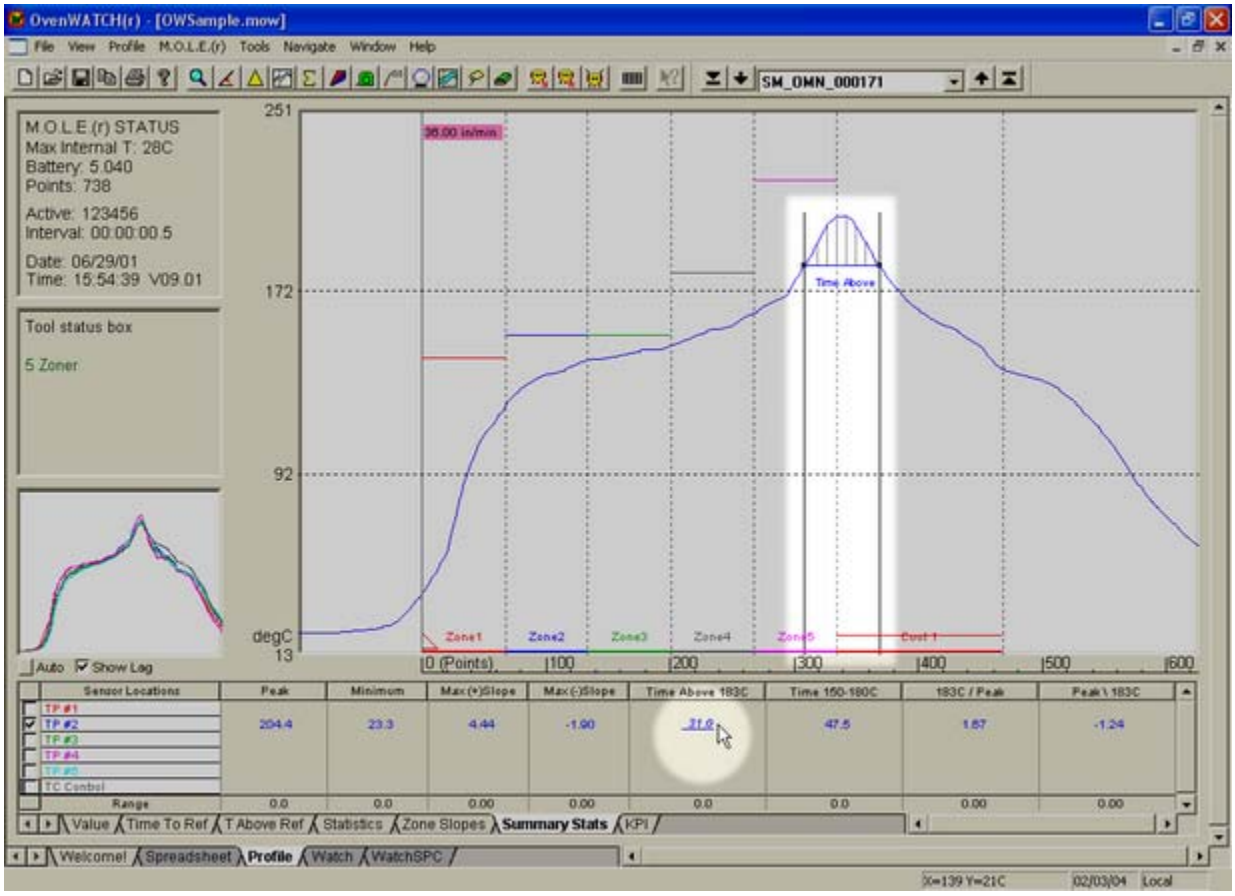
3) Click the desired parameters to display in the Data Table. The parameters are grouped by Temperature, Cursor data with slope between, and Time. The user can also select to display Range, Average and Standard Deviation rows for each of the columns.
4) When finished select the ***OK*** button to display the new settings or ***Cancel*** to return to the worksheet without making any changes.

A maximum of 12-16 parameter columns can be displayed at one time. As columns populate the Data Table, they are automatically sized to fit. It is recommended that the most beneficial column information is displayed to achieve the best results.

4.3.7.4 Value Pop-up

Each value in the Data Table can be displayed as a Value Pop-up. A Value Pop-up is graphically illustrated on the Data Graph showing how and where that value was extracted from the profile.

Only one Value Pop-up can be displayed on the Data Graph at a time.



Value Pop-up

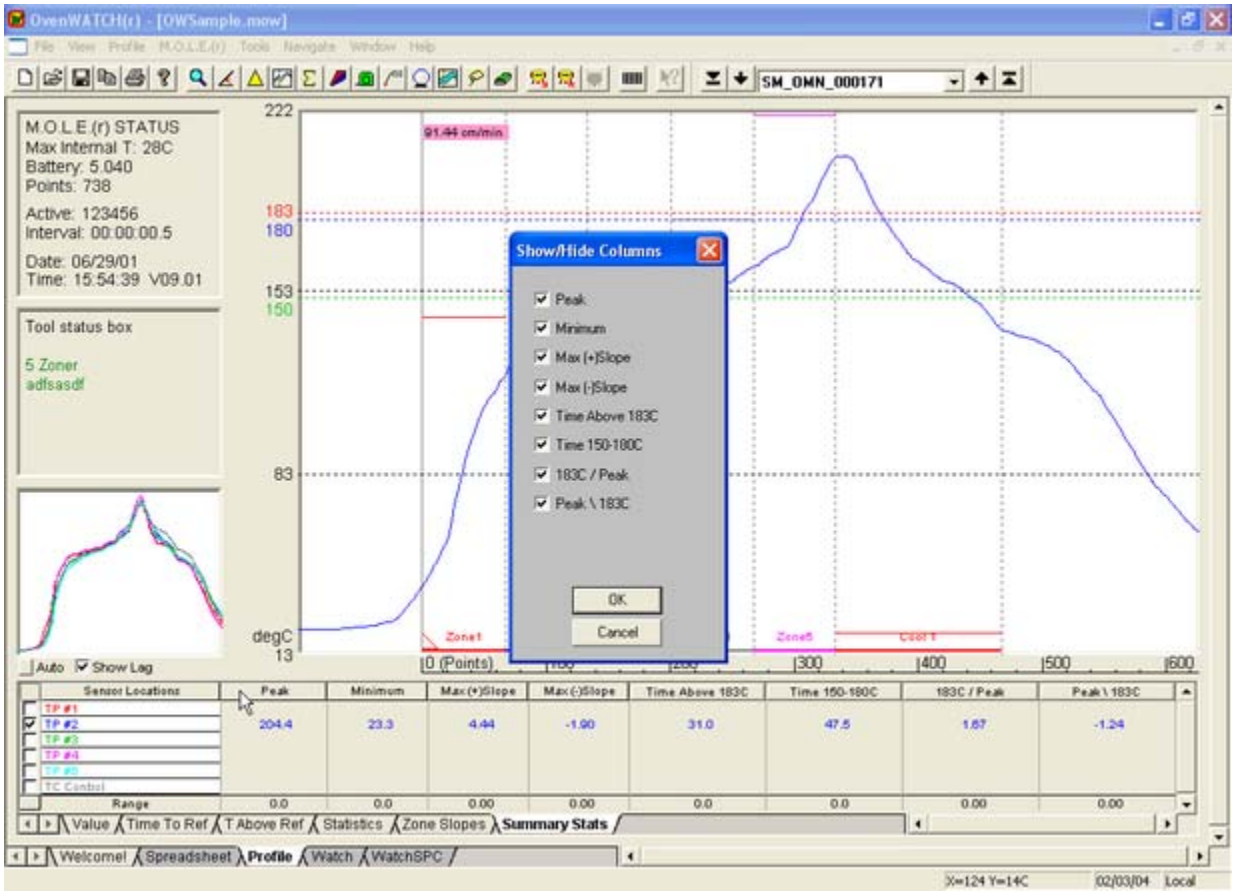
To display a Value Pop-up:

1) Select the Profile worksheet.
2) Move the mouse cursor and hover over a desired value in the Data Table. That value will automatically be displayed on the Data Graph where that value was extracted.

The last displayed Value Pop-up will remain on the Data Graph until the user selects a different worksheet.

4.3.7.5 Show/Hide Columns

Data Table parameter columns on the Profile worksheet can be hidden. This is useful when an operator wants to focus attention to the most important parameter columns.



Show/Hide Columns

To display Show/Hide columns:

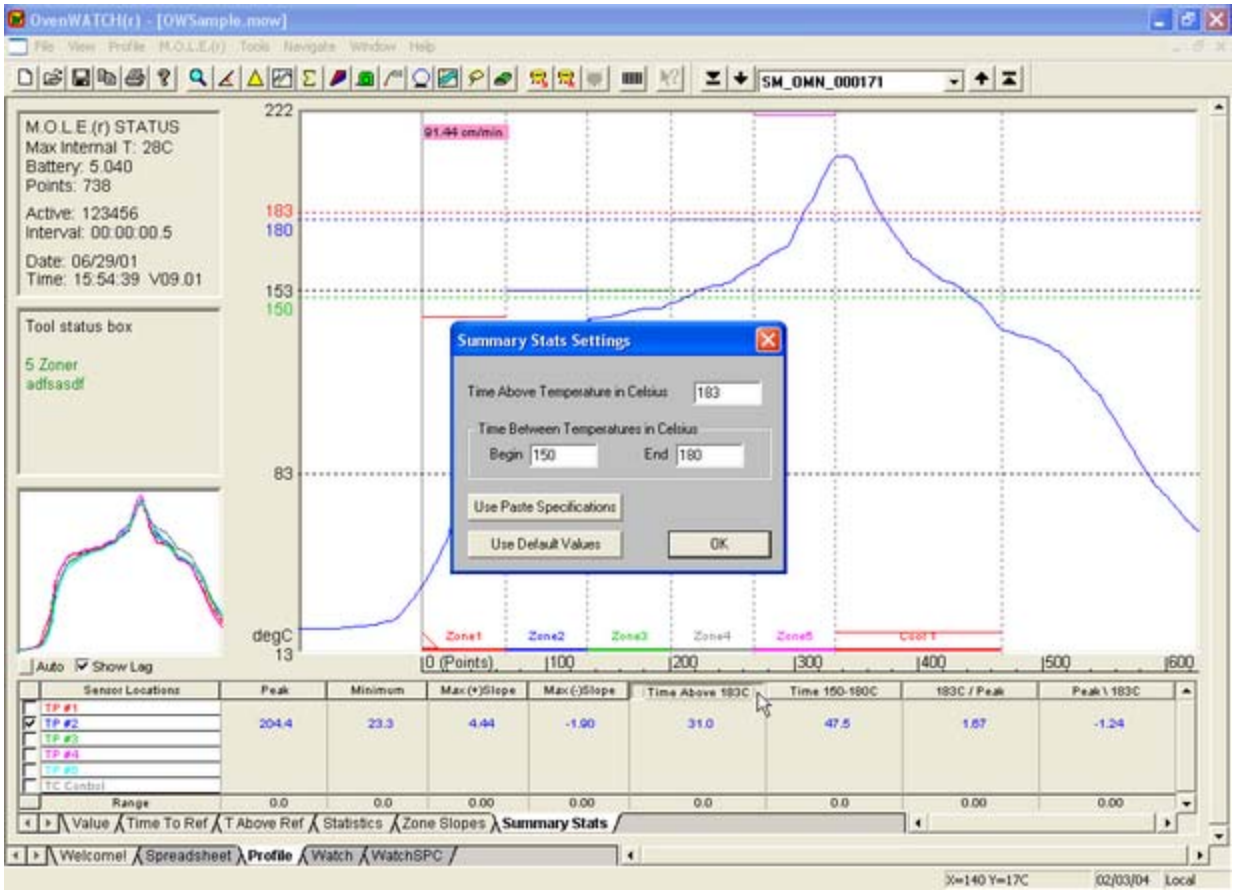
1) Select the Profile worksheet.
2) Right click a parameter column header.
3) Clear a parameter check box to hide or select to display.

Hidden Parameter columns do not affect the data being collected for that parameter. If all Parameter columns are hidden, right-click the Sensor locations column header to open the Show/Hide column dialog box.

4.3.7.6 Change Summary Stats Settings

When creating a new workbook, a dialog box appears allowing the user to specify Summary Statistics settings based on a Paste Specification or the user selected values.

If the process changes or an operator wishes to perform test experiments, these settings can be changed by clicking a parameter column header on the Profile worksheet.



Change Summary Stat Settings

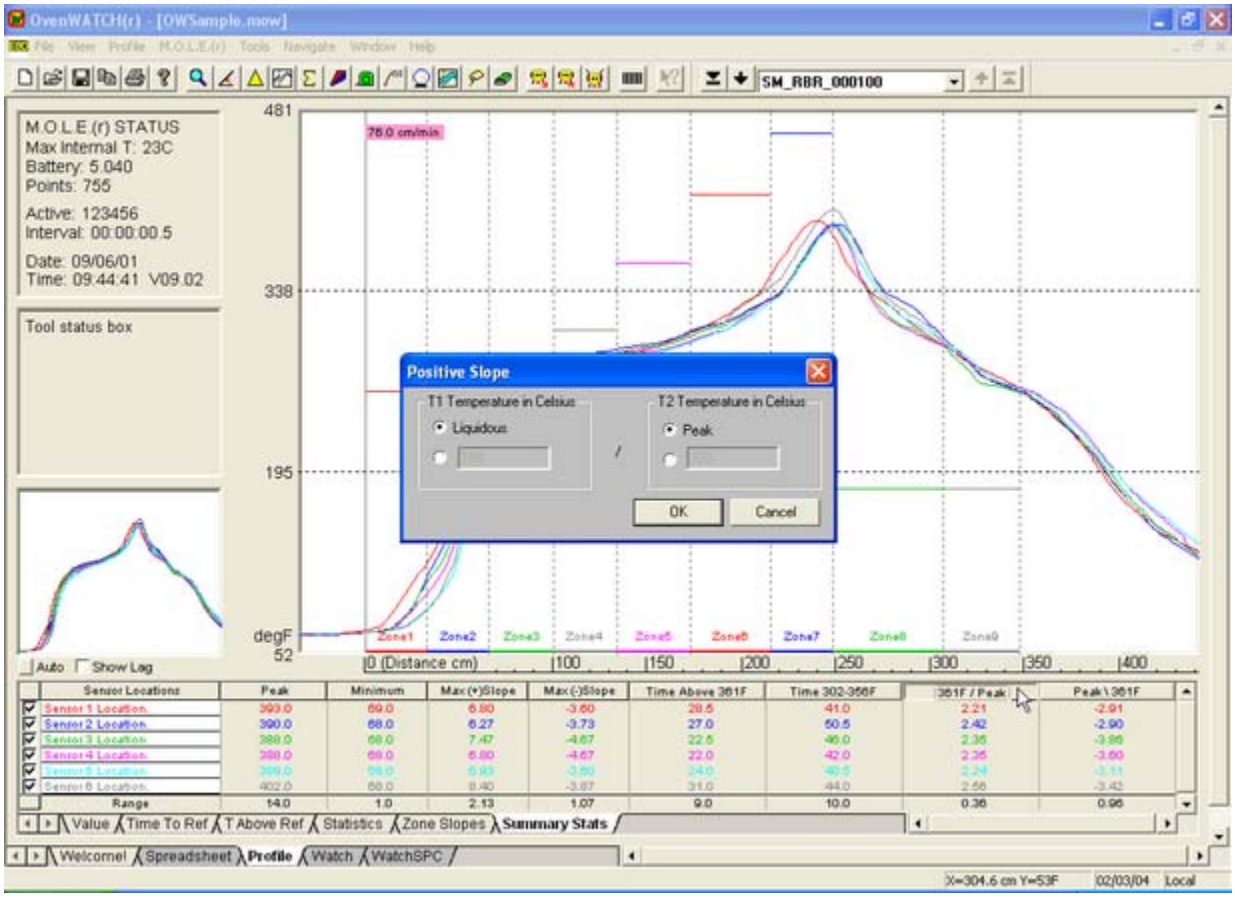
<u>To Change Summary Stats Settings:</u>

1) Select the Profile worksheet.
2) Select the Summary Stats tab.
3) Click the Time Above or Time between column header.
4) Change the desired Summary Stats settings and select the ***OK*** command to accept.
5) Once the new settings have been accepted, the software prompts the user to decide if these new settings should be applied to future data run profiles.

4.3.7.7 Change Slope Calculator

Positive and negative slope profile parameter calculator allows the user to calculate straight line slopes between any two temperatures. (Default to liquidous and liquidous to peak).

If the process changes or an operator wishes to perform test experiments, these settings can be changed by clicking a parameter column header on the Profile worksheet.



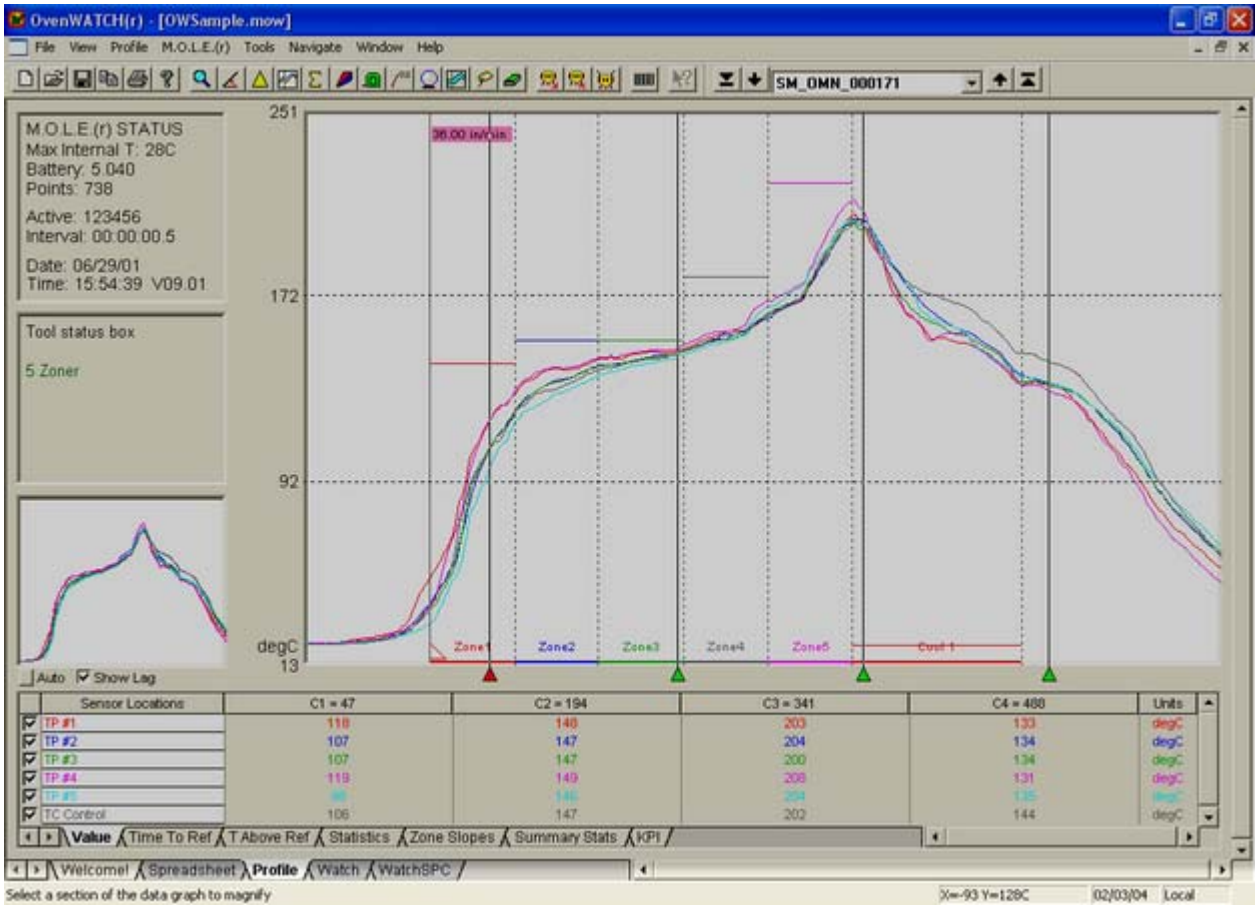
Slope Calculator

<u>To Change Slope Calculator:</u>

1) Select the Profile worksheet.
2) Select the Summary Stats tab.
3) Click a Peak Slope column header.
4) Change the desired settings and select the ***OK*** command to accept.
5) Once the new settings have been accepted, the software prompts the user to decide if these new settings should be applied to future data run profiles.

4.3.8 Status Bar

The Status Bar displays the available Help information, X-Y position of the mouse pointer, Date and if the AutoM.O.LE.® Mailbox is Local or Remote.



Status Bar Features

Help Information:

When the mouse pointer is placed over a Toolbar button the left side of the Status bar will display the action that button performs.

X/Y Readout:

It is easy to find the exact X and Y-values of any point on the Data Graph using the mouse pointer. The X/Y Readout continuously displays the X and Y-axes values of the mouse pointer location.

The units displayed for X and Y-values are the same as those displayed on the graph. The user can select between °F and °C for the Y-value units. The X-value units can be a data point number, time, or distance. Units can be changed on the X and Y-axes at any time by selecting the ***Units*** command in the ***Profile*** menu.

While using the Magnify tool, the X/Y Readout displays the size of the selected area of interest.

Other ways to view exact X- and Y-coordinates of a data point is to select the Value Tab.

Date and Time:

This area of the Status bar displays the current time and date of the PC.

Mailbox Location:

This area of the Status bar indicates if the AutoM.O.L.E.® Mailbox is located on the Local or a Remote computer (Refer to section ***Read M.O.L.E. Data*** for more information about the Mailbox).

4.3.9 Copy Button

A Copy Button can be accessed on the Profile worksheet Toolbar. This button copies the Profile worksheet to the clipboard so it can be pasted into other applications.

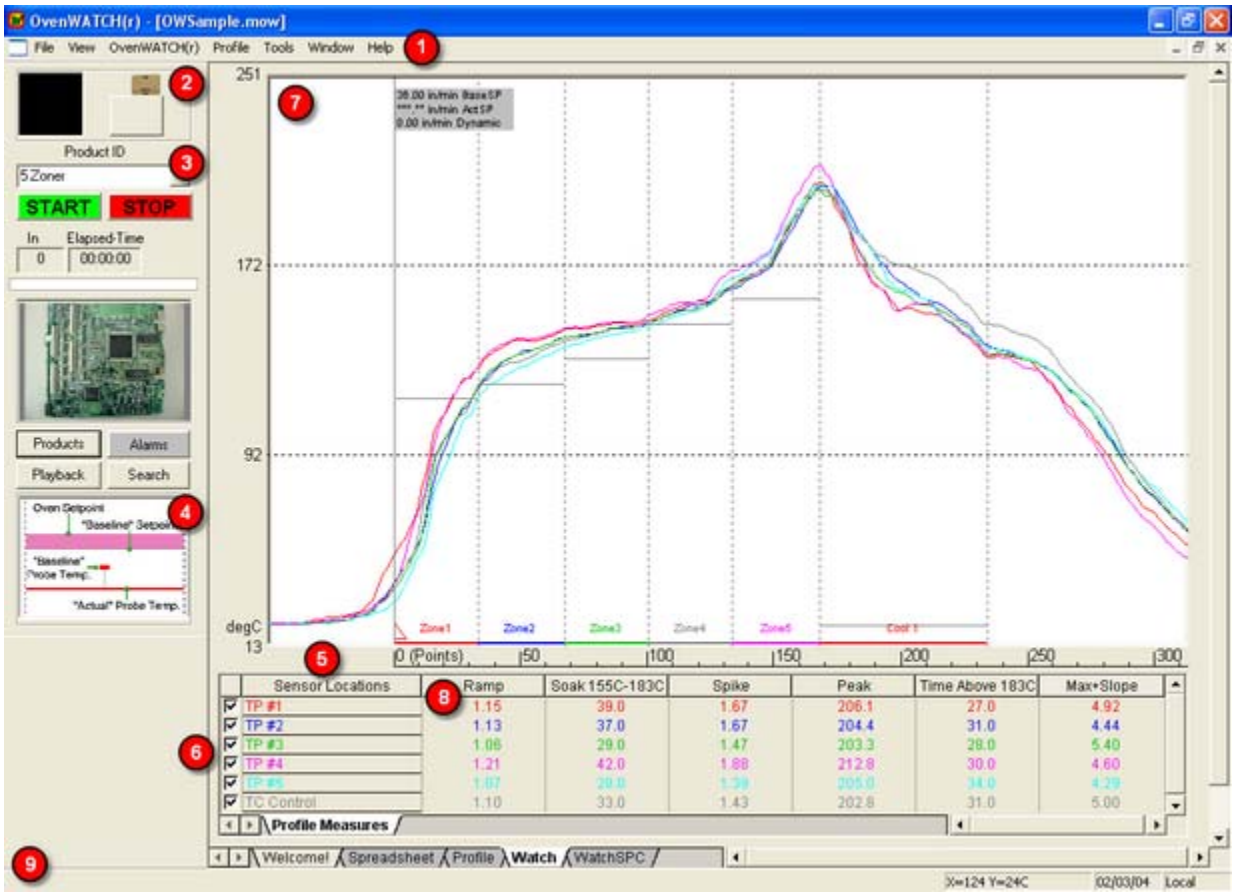
Copy Button

4.4 Watch Worksheet

The Watch worksheet is where defined product compares real-time data (i.e. “Dynamic” Profile) to an established data run (i.e. “Baseline” Profile) and is displayed on the Data Graph.

Worksheet features:

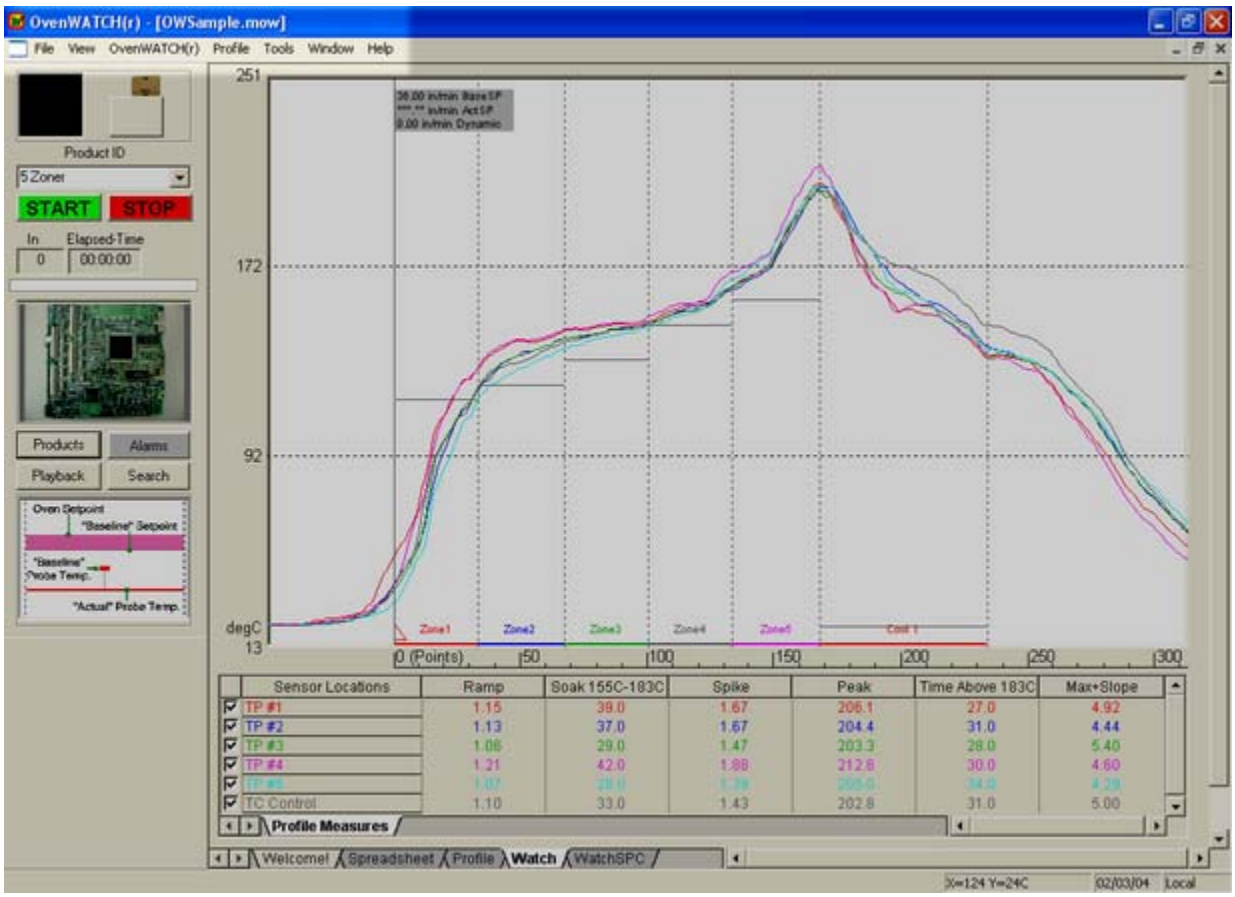
- ❶ Menus
- ❷ Status Indicators
- ❸ Watch Control Panel
- ❹ Zone Temperature Legend
- ❺ Sensor Locations
- ❻ Channel Check Boxes
- ❼ Data Graph
- ❽ Data Table
- ❾ Status Bar



Watch Worksheet

4.4.1 Menus

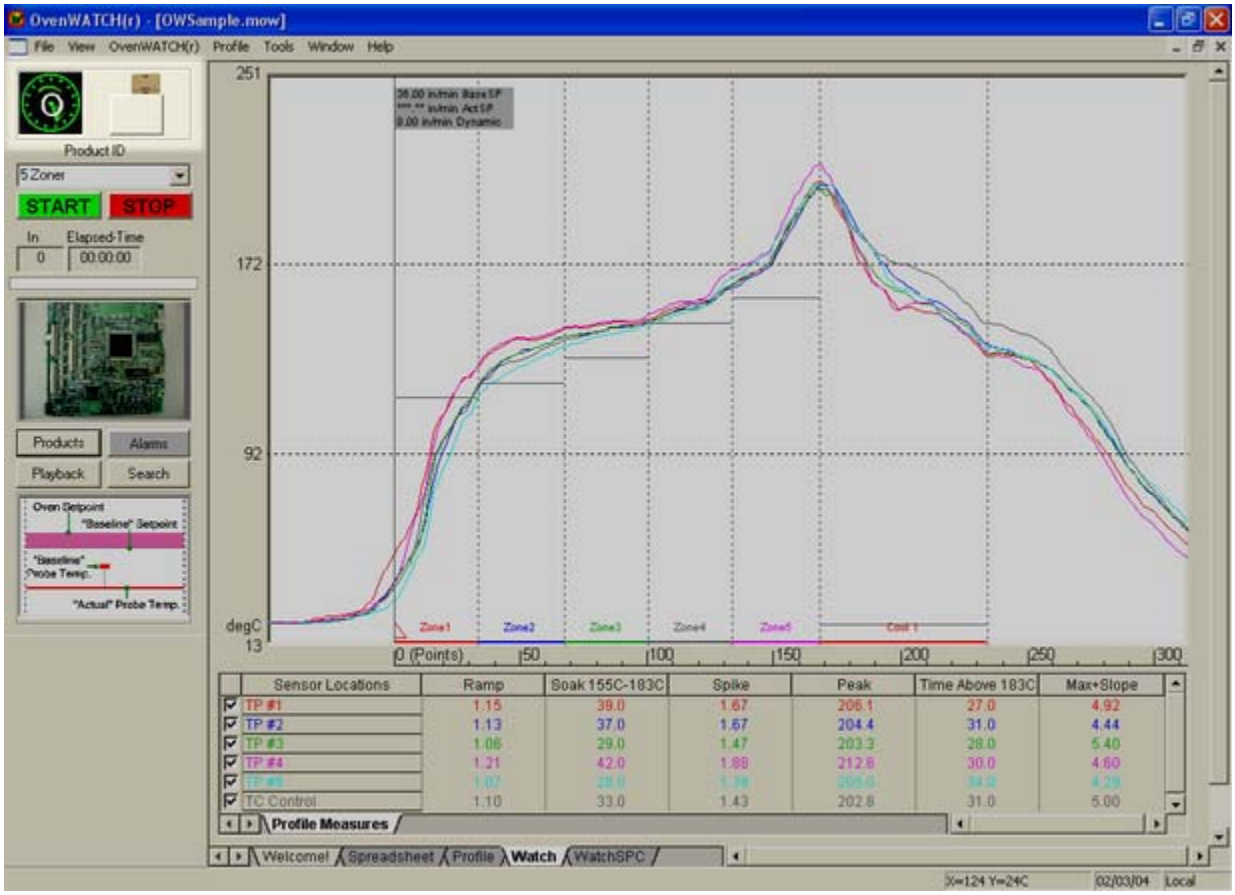
- **Menus**: File, View, OvenWATCH, Profile, Tools, Window, and Help.



SPC Worksheet Menu Bar and Tool Buttons

4.4.2 Status Indicators

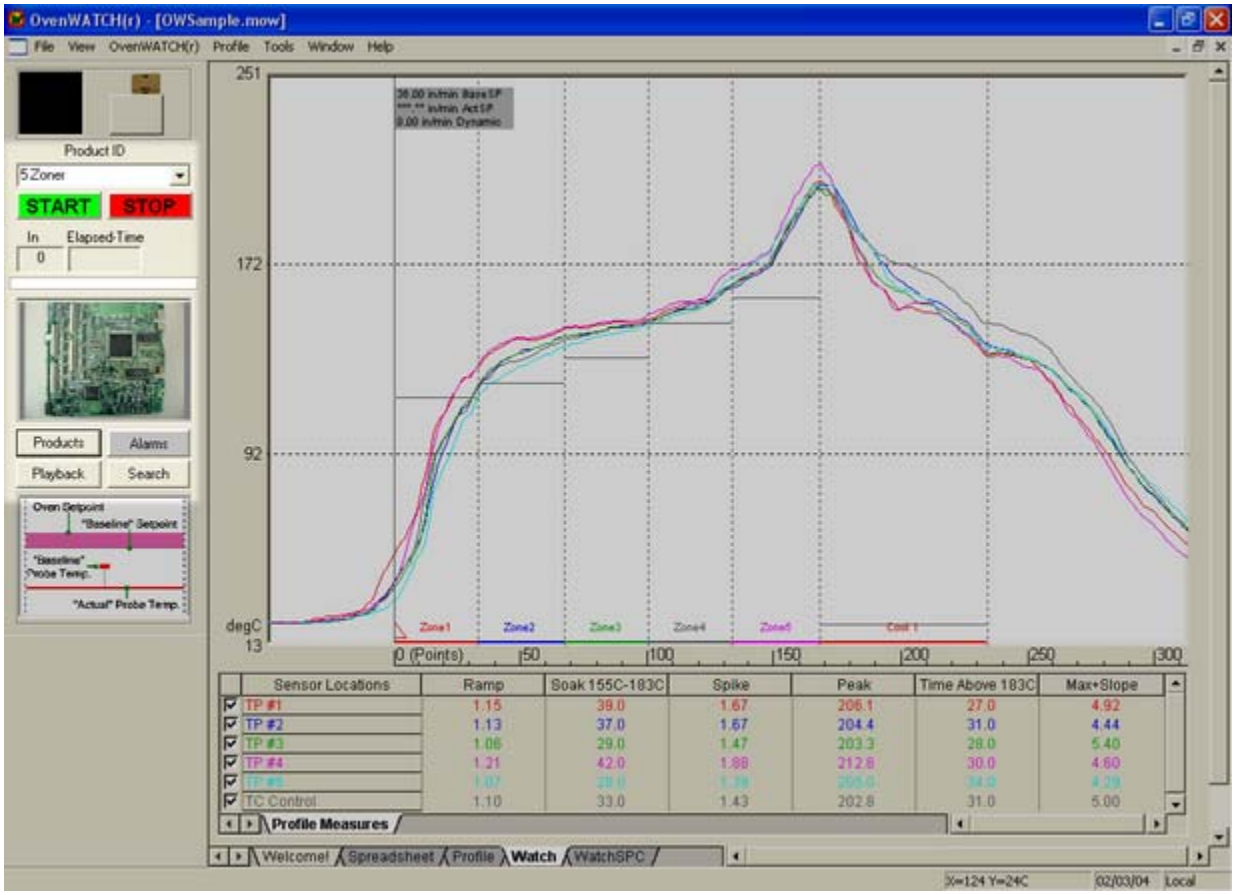
The Status Indicators are activated when the OvenWATCH is recording oven/product data and when the M.O.L.E. is inserted into the Station.



Status Indicators.

4.4.3 Watch Control Panel

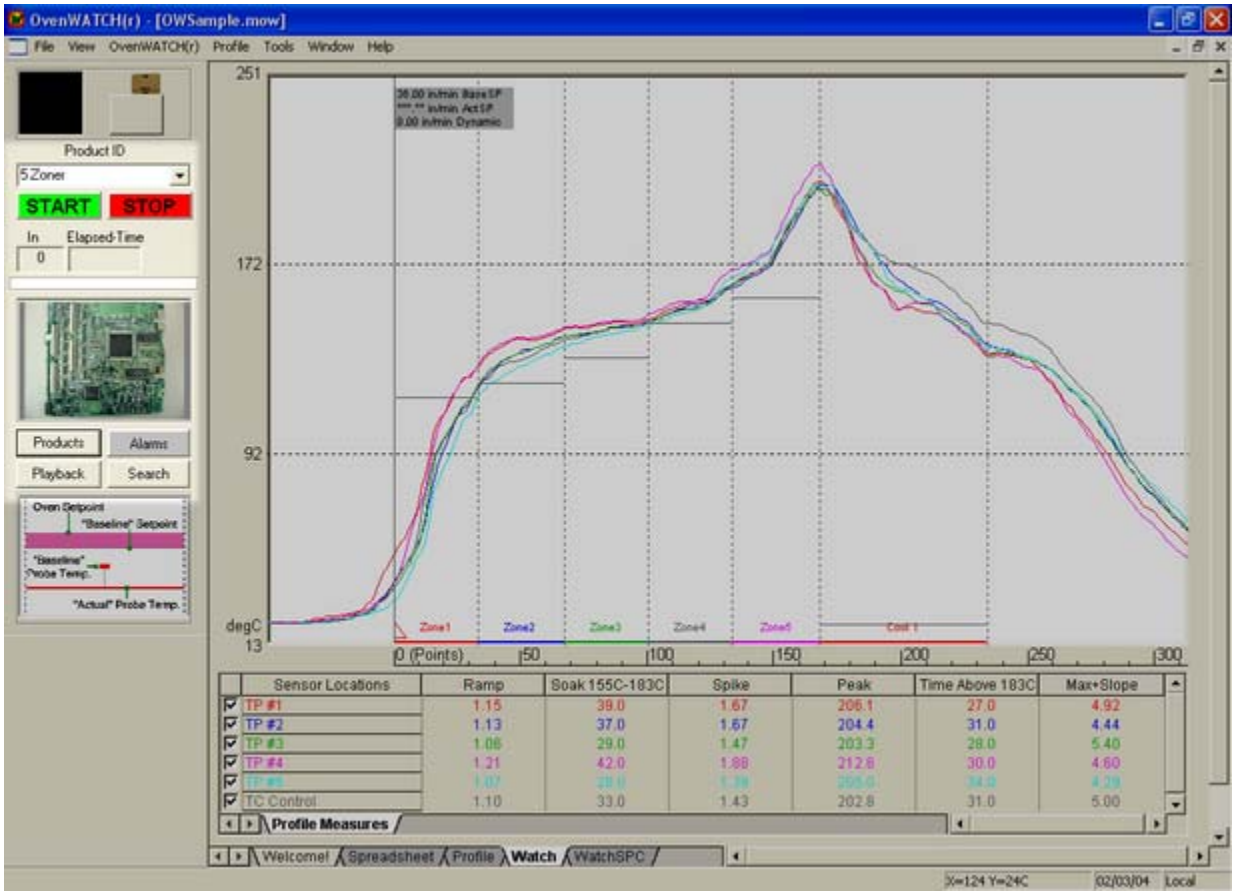
The Watch Control Panel is where product is defined and selected for quality monitoring.



Watch Control Panel

4.4.3.1 Product Selection Box

When a product is ready to run, use the Product Selection Box to select the pre-defined product.

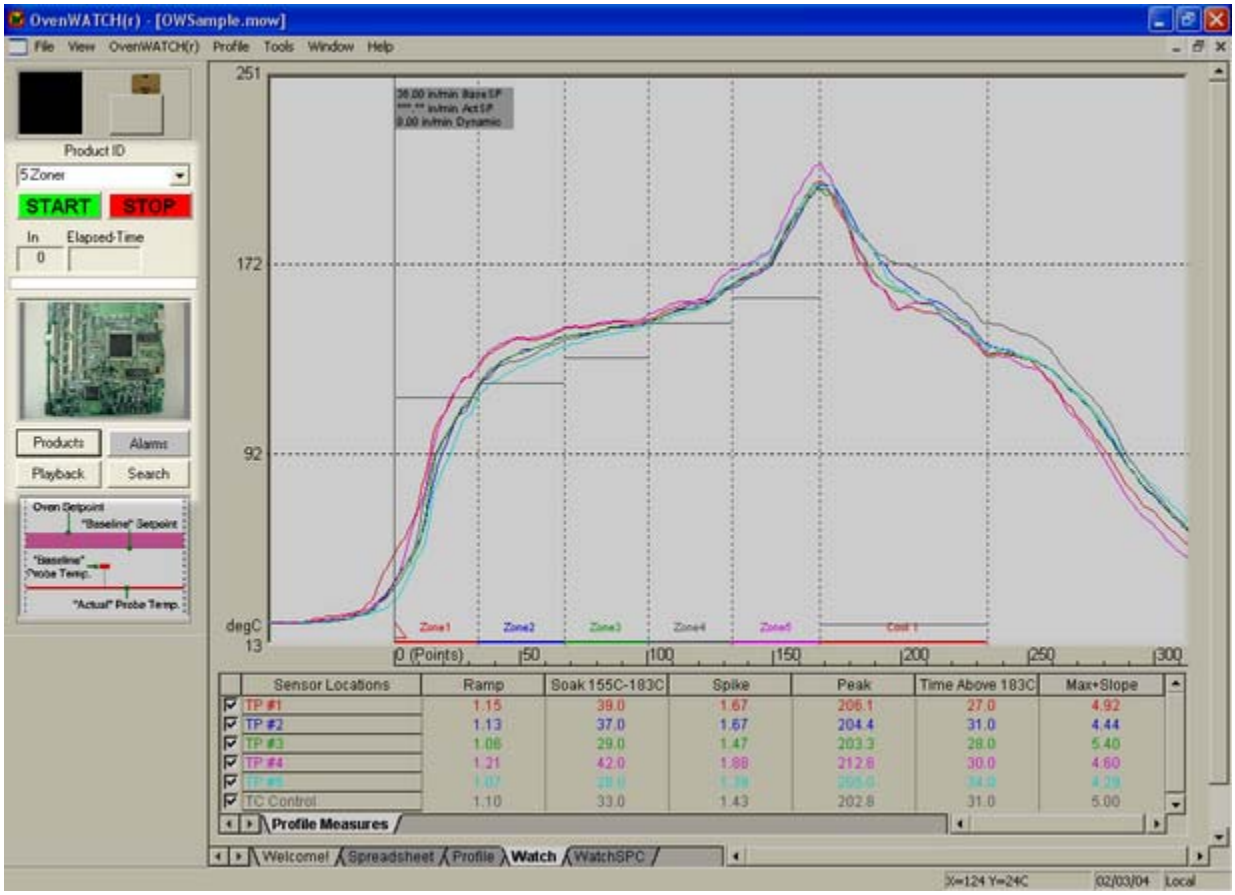


Product Selection Box

The product is defined using the ***Products*** command from the ***OvenWATCH*** menu and is listed alphabetically (refer to section ***Products*** for information on defining product).

4.4.3.2 Recording Controls

The OvenWATCH recording controls start and stop the recording process, display the elapsed recording time and product in/out information.



Recording Controls

Recording Controls:

- **Start/Stop Watch:** Starts and stops the OvenWATCH recording process.
- **Product Counter:** Displays the elapsed time since the start.
- **Product Tracker:** A graphic representation of the product position in the oven.

If an board Out sensor is installed, it will be detected automatically by the software and an *Out* counter will appear after the *Elapsed Time* box.

4.4.3.3 Product Identifier

The Product Identifier is an identification photo of the selected product. This photo can be viewed at a larger scale by clicking it.

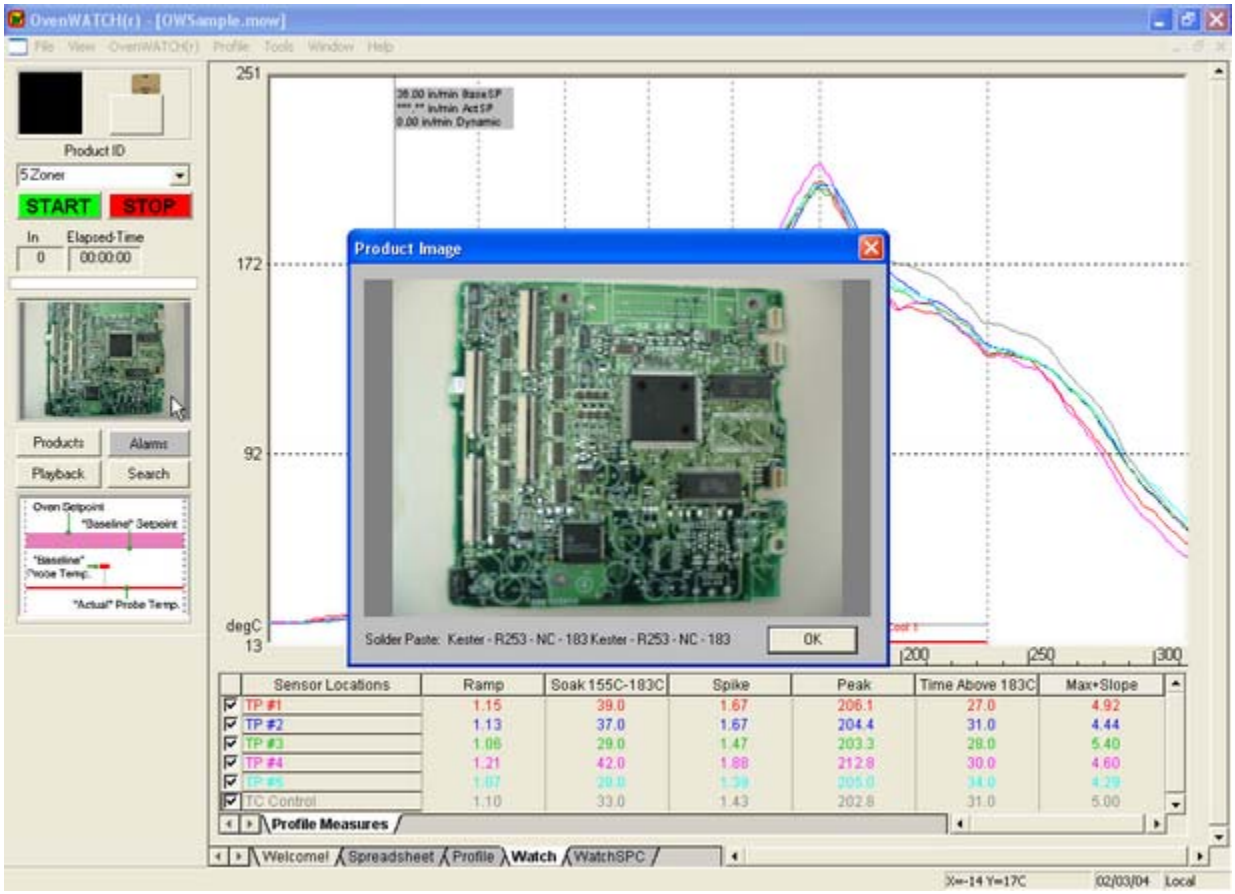
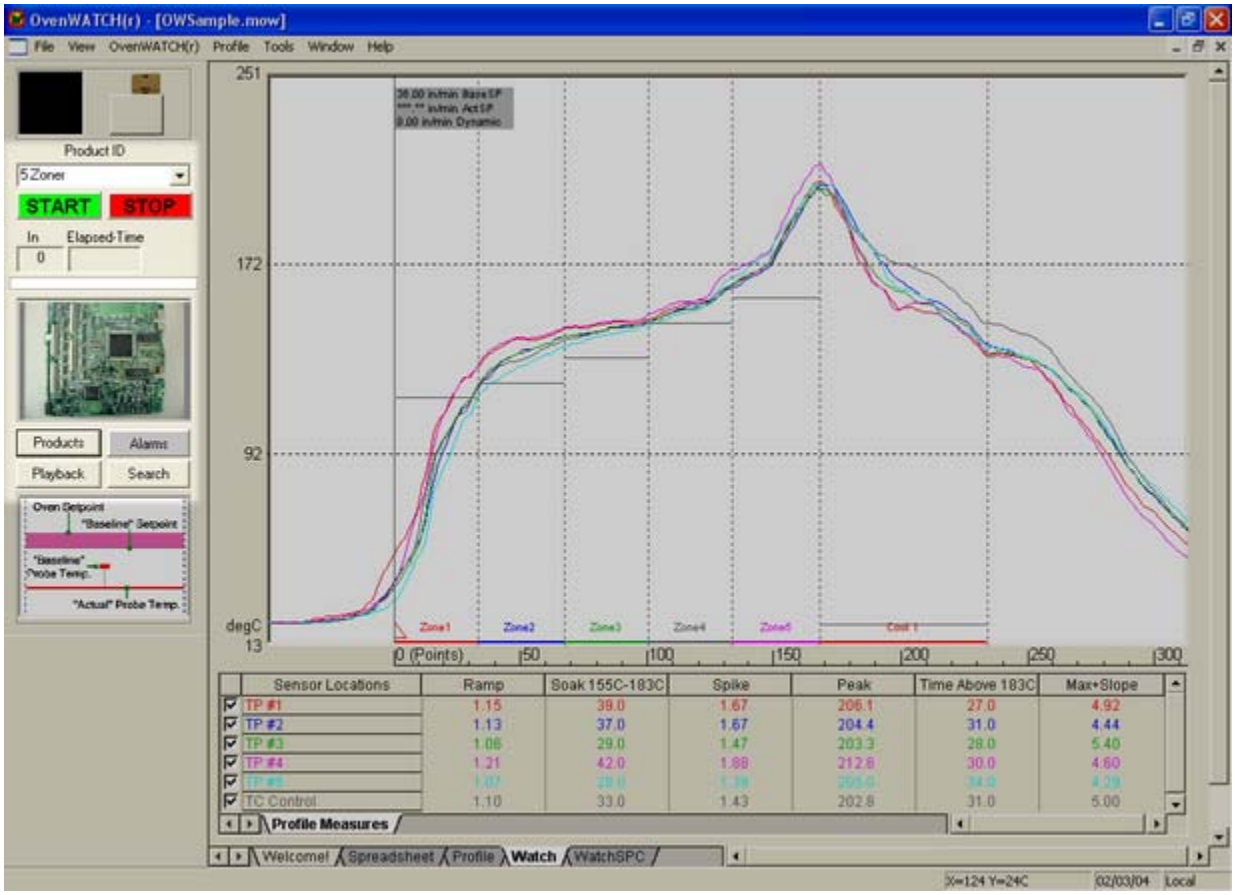


Photo Identifier

Using editing tools this photo can be enhanced with the ***Photo Shop*** command in the ***Tools*** menu (refer to section ***Photo Shop*** for detailed information).

4.4.3.4 Product Controls

The Product Controls is in essence the command center for defining and reviewing recorded product data.



Product Controls

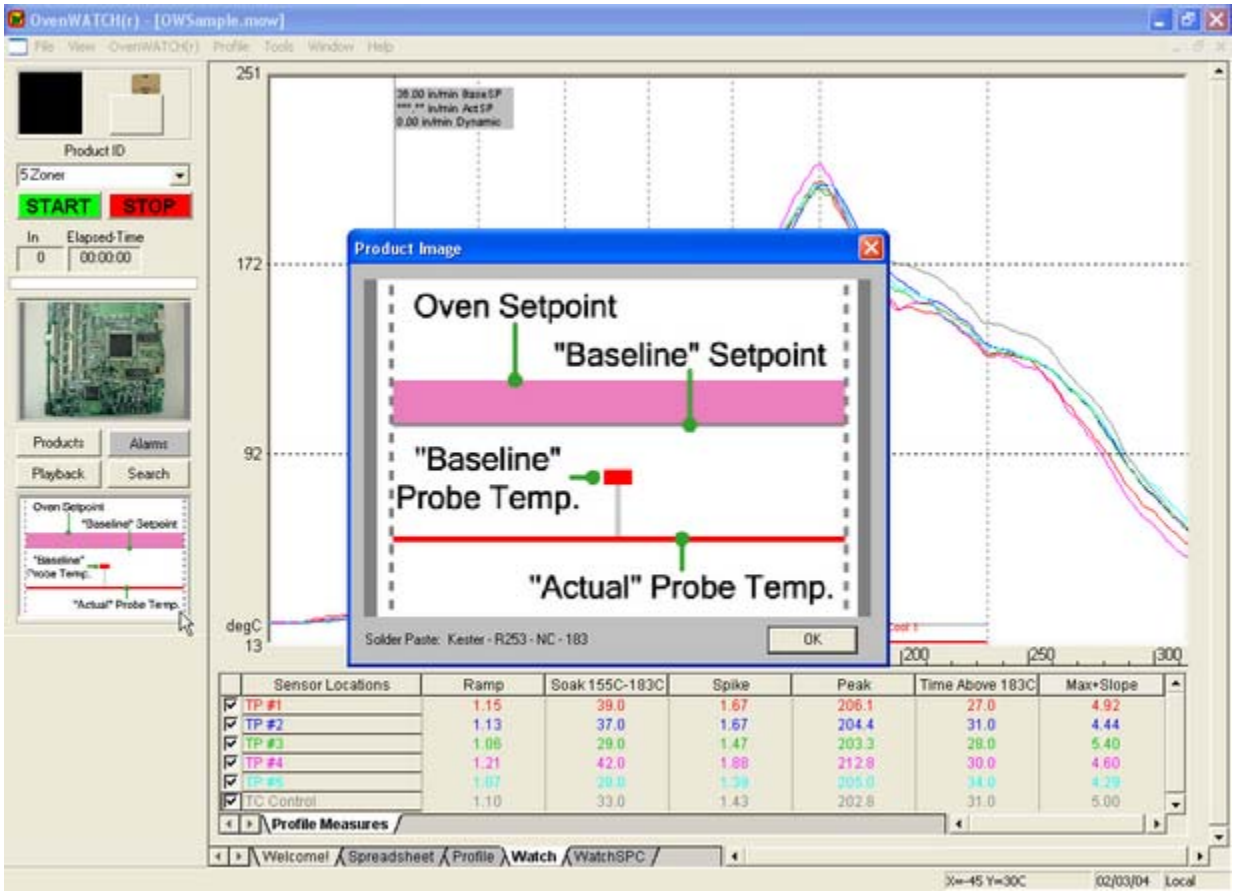
Product Controls:

- **Products:** Defines and edits new and existing product.
- **Alarms:** Defines global SPC Alarms for the currently selected product.
- **Playback:** Reviews recorded product data.
- **Search:** Searches event history for all defined products.

The Product Controls can also be accessed in the ***OvenWATCH*** menu (refer to section ***OvenWATCH*** Menu for detailed information).

4.4.4 Zone Temperature Legend

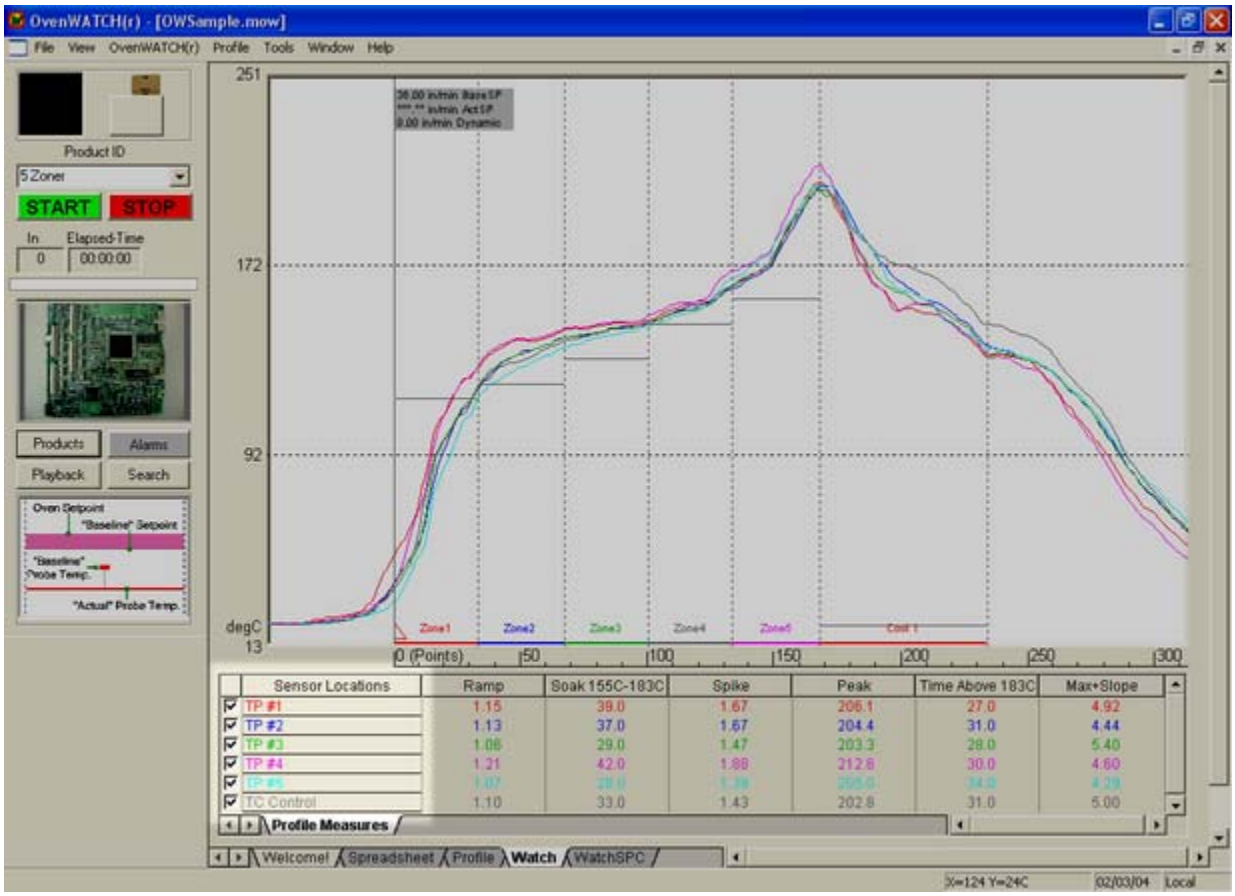
This legend describes the zone model temperatures that are displayed during the recording process. This legend can be viewed on a larger scale by clicking it.



Magnify Map

4.4.5 Sensor Locations

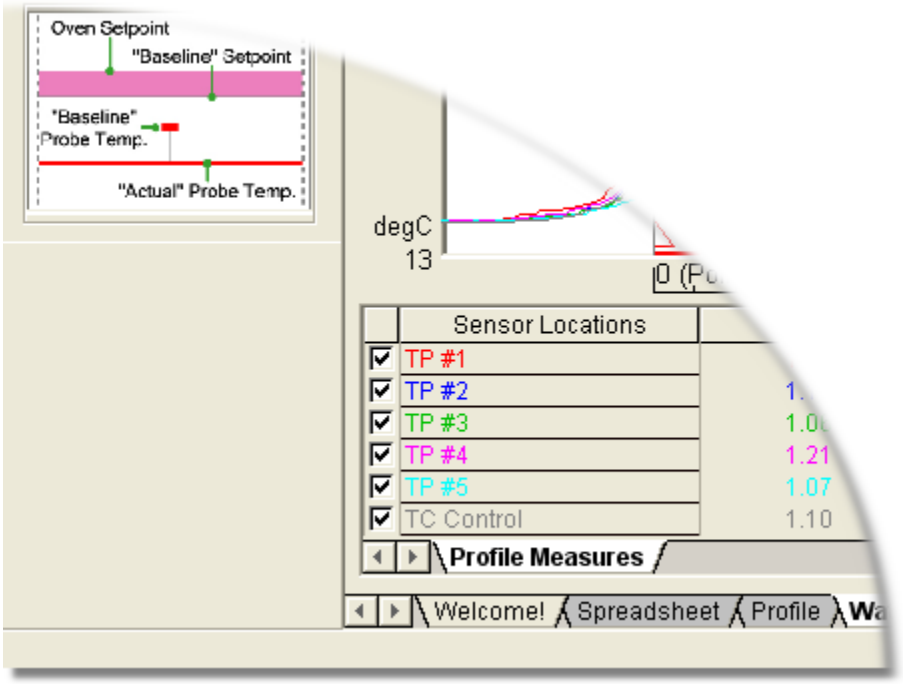
Sensor Locations are descriptions of the location for each sensor labeled in the Data Table. The color and description indicates which Data plot on the Data Graph it designates. These descriptions are pre-defined when creating the Baseline Profile.



Sensor Descriptions

4.4.6 Channel Check Boxes

The Channel check boxes control whether the associated Data plot is displayed on the Data Graph and whether the data for that channel are included in the data table. To view or remove a Data plot, click the channel check box beside a sensor location description to turn it “ON” or “OFF”.



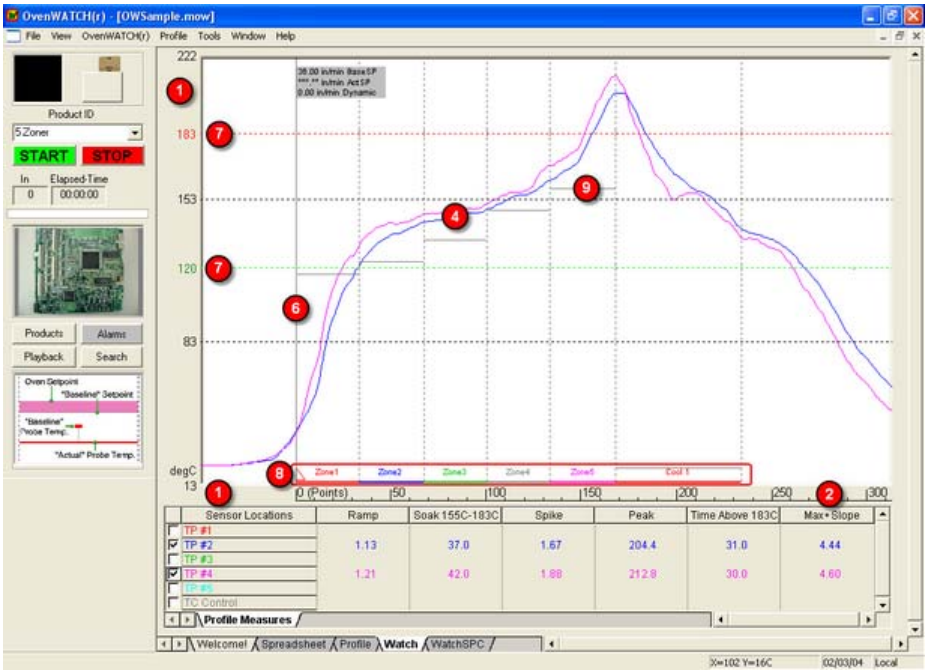
Channel Check Boxes

4.4.7 Data Graph

The Data Graph is a display where the Baseline and Dynamic Profile for a product is overlaid on a graph.

Data Graph features:

1. X and Y-Axes
2. X-axis Scales
3. Autoscaling
4. Baseline Profile
5. Dynamic Profile
6. Process Origin
7. Temperature Reference Lines
8. Zones and Zone Sizes
9. Baseline Setpoints



Data Graph

The Data Graph features are described in the sections that follow. Some of these features described are also controlled using the appropriate menu options. Refer to section ***Menu and Tool Commands*** for more information.

4.4.7.1 X and Y-Axes

The Y-axis (vertical) displays the scale of the measured temperature. Lower values are at the bottom and higher values at the top.

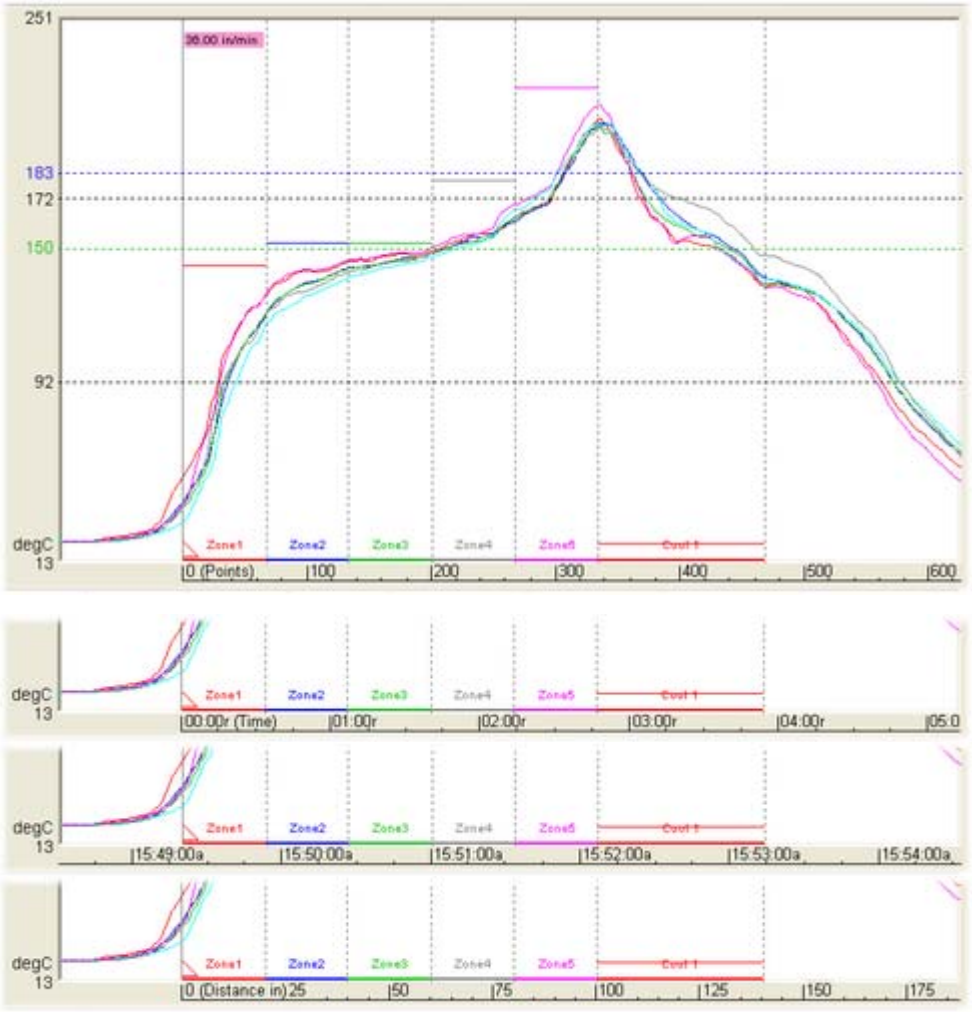
The Y-axis includes temperature labels on the left side of the graph. These four temperatures divide the vertical axis into four equal parts and are automatically scaled to fit the current Y-axis limits. These units can be displayed in Celsius or Fahrenheit using the ***Units*** command in the ***Preferences*** sub-menu on the Watch worksheet.

The X-axis (horizontal) displays values data points collected. The X-axis can be converted from data points to time or distance using the ***Units*** command in the ***Profile*** menu.

To see the X-value of any location on the Data Graph, the X/Y Readout in the Status bar continuously displays both X and Y-values at the location of the mouse pointer. Details of this feature are described in section ***Status Bar***.

4.4.7.2. X-axis Scales

The user can select four different types of X scales for the X-axis. The scales are Point, Time – Relative (time measure from process origin), Time – Absolute (Time of day) and Distance. To change, select the ***Units*** command in the ***Profile*** menu.



Scale Types

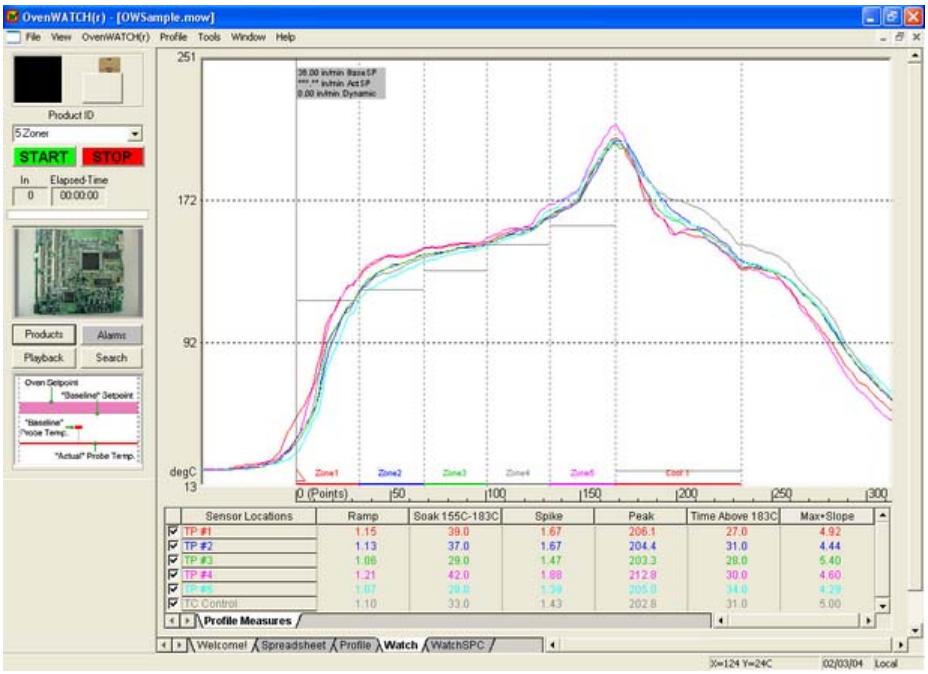
The Distance scale will not be accurate unless an accurate conveyor speed was set in the Baseline Profile.

4.4.7.3 Autoscaling

The software includes a powerful ***Autoscaling*** option to automatically scale the Data Graph so the data will always be visible and easy to work with. The software will automatically select a range of values for the Y-axes to ensure that all the data fits on the screen. The user can change the range of Y-values displayed in ***Manual*** mode by entering a manual mode using the ***Scaling*** command in the ***Profile*** menu.

4.4.7.4 Baseline Profile

The Baseline Profile is previously collected data by the M.O.L.E. that represents the best profile for a product. The Baseline Profile is used to help calculate values for the Dynamic Profile.



Baseline Profile

A Baseline Profile Data plot represents each of the sensors connected to the M.O.L.E. which are different colors that correspond to the color of its sensor location description in the Data table.

A Data plot can be hidden or viewed at any time by clicking the check box with the corresponding sensor description in the Data table. This allows the user to view any combination of the Data plots or individually.

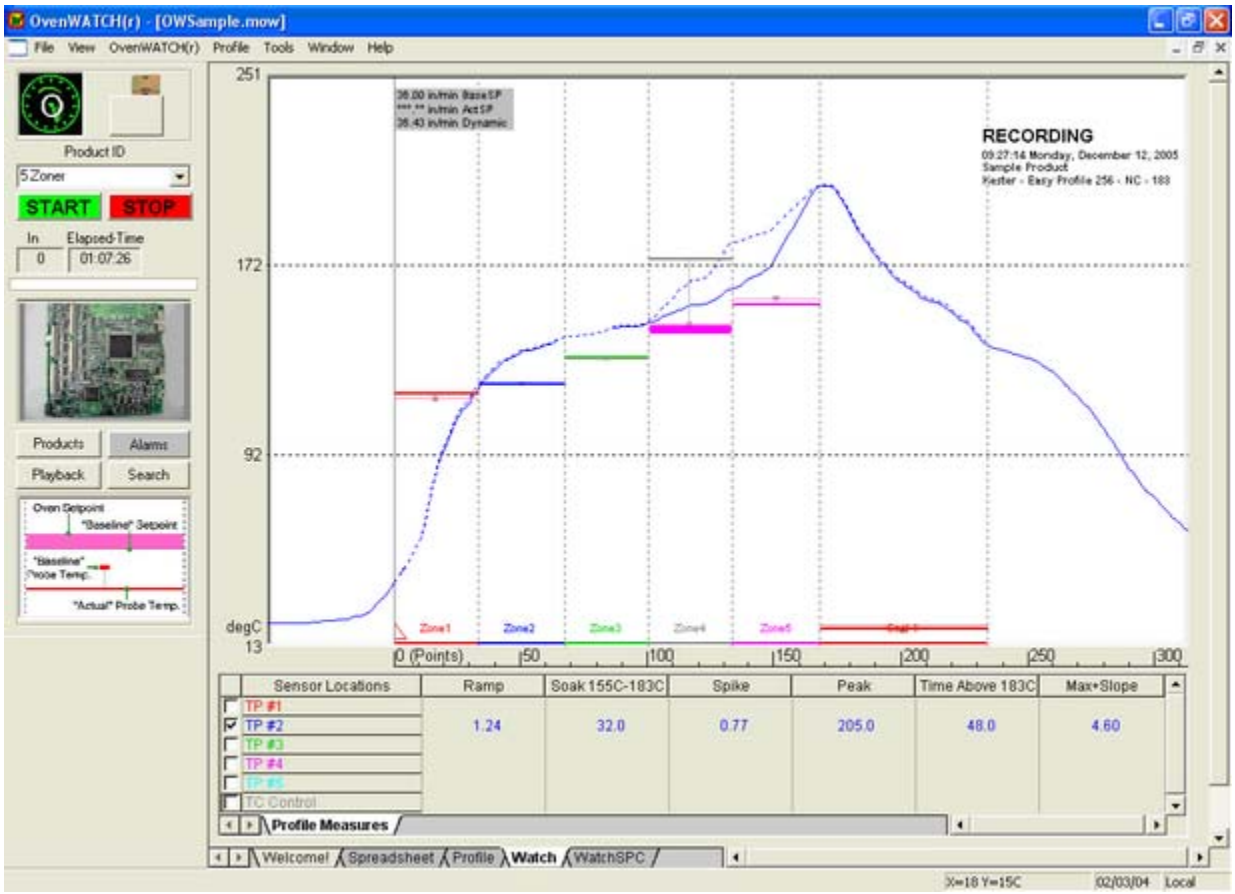
When two or more Data plots overlap the same values, the Data plots overwrite each other. For example, if the Data plot that represents the sensor connected to channel 5 and channel 1 have the same value, the channel 5 Data plot will only appear unless the user suppresses it.

When printing a Data Graph in black and white, suppressing one or more Data plots is useful for clearing a view of a Data plot that is obscured by others near it.

When printing the Data Graph in black and white, the Notes tool can be used to help identify each Data plot.

4.4.7.5 Dynamic Profile

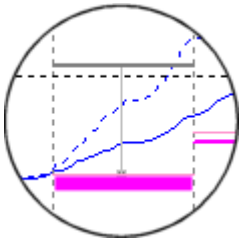
When the OvenWATCH is recording data a Dynamic Profile is displayed in the Data Graph as dashed Data plots. They represent a predicted profile based on the current temperatures of the oven and the Baseline Profile.



Dynamic Profile

Zone Temperature Compliance

The Zone Temperature Compliance compares the Baseline Zone temperatures and Setpoints with the Actual Zone temperatures and Setpoints.

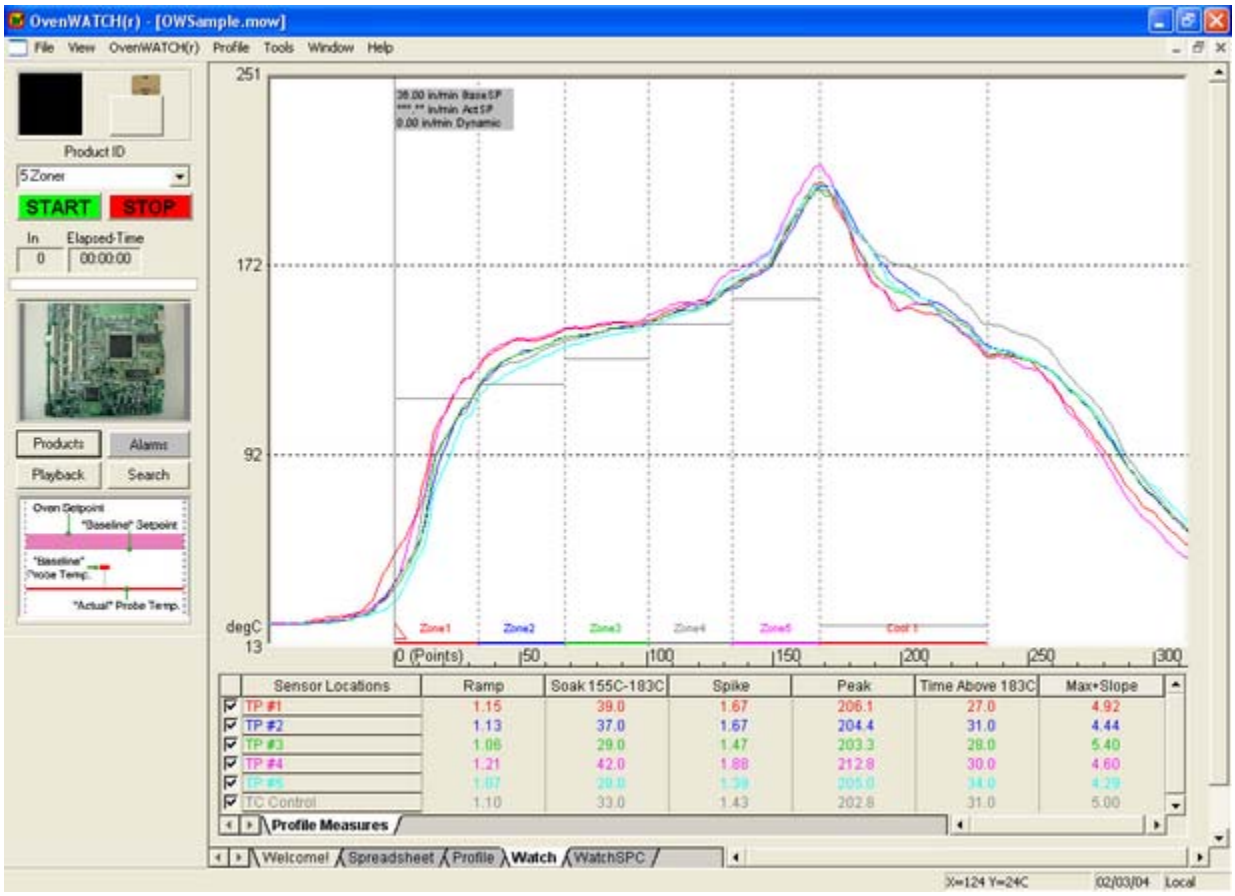


Zone Temperature Compliance

4.4.7.6 Process Origin

The Process Origin is a gray vertical line at the left edge of the Data Graph indicating where the process starts.

The Process Origin is established when the Baseline profile is created and is locked on the Watch worksheet.

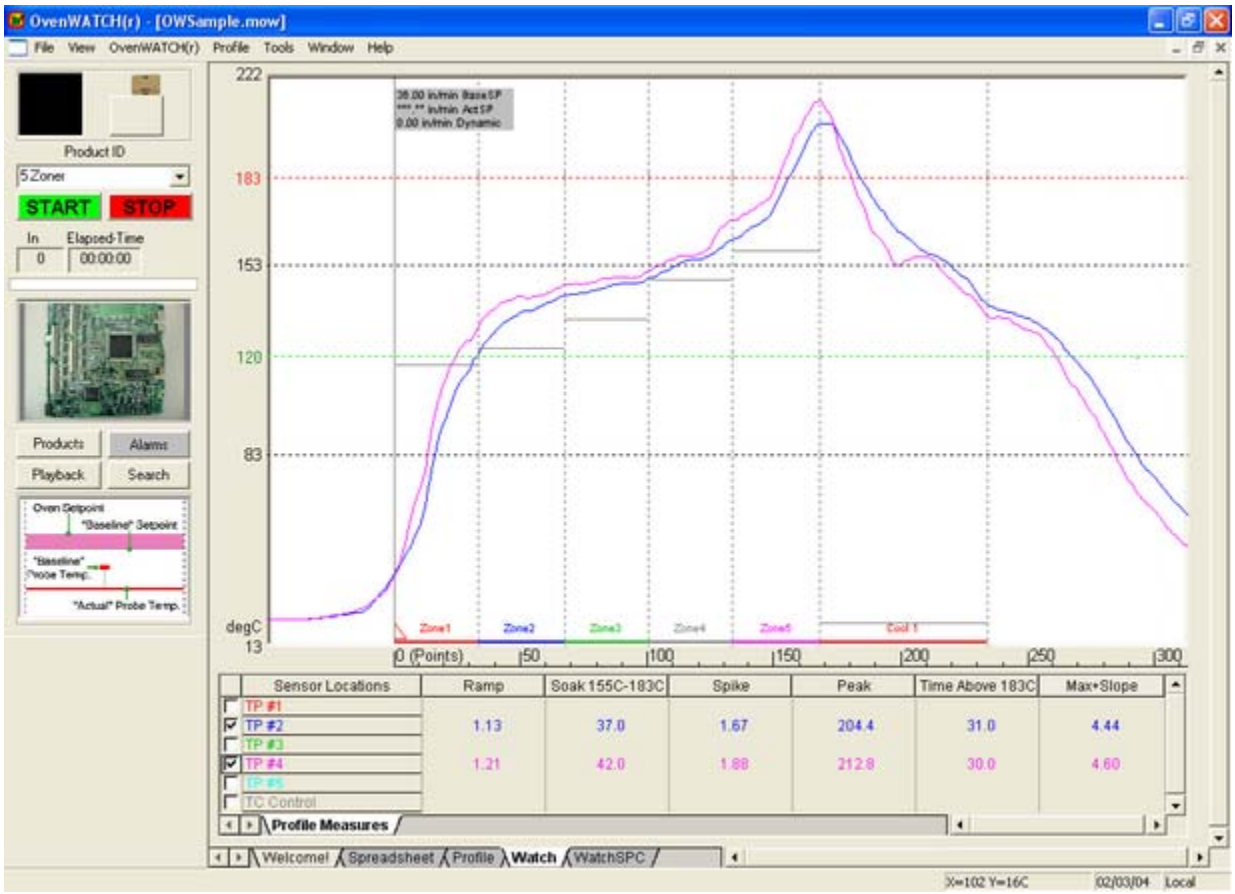


Process Origin

When Points or Distance units are being used for the X-values, the X-values to the left of the Process Origin are displayed as negative and those to the right as positive.

4.4.7.7 Temperature Reference Lines

Temperature reference lines are colored horizontal lines that are positioned within the range of Y-values in the graph. These are derived from the Paste specification of the selected product and are automatically displayed.



Temperature Reference lines

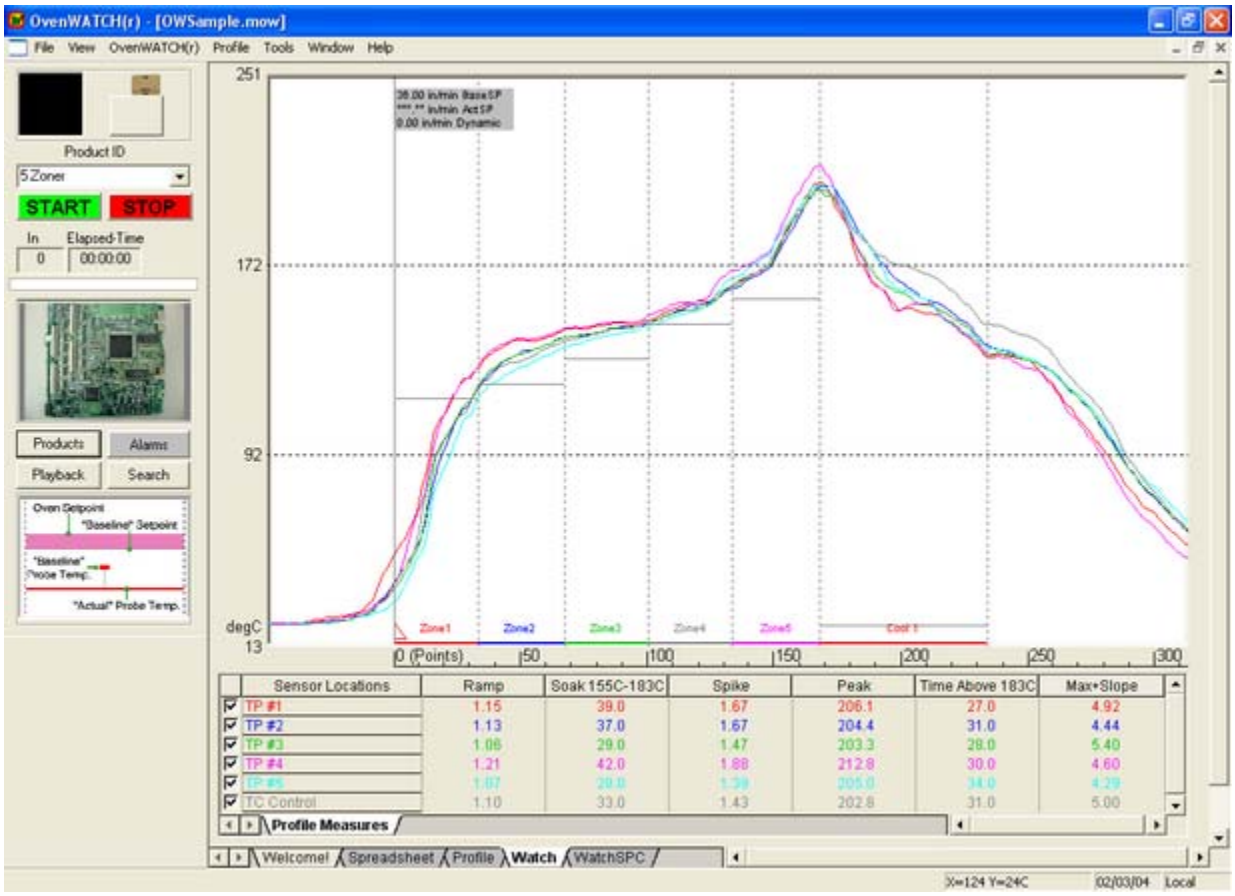
In this example, the high Temp Ref line is located at 183ºC and is in Red.

The low Temp Ref line is at 120ºC and is in Green

4.4.7.8 Zones & Zone Sizes

The X-axis is divided into zones that represent the oven zones in a process that are defined in units of length or time.

Zones are established when when the Baseline profile is created and are not configurable on the Watch worksheet.

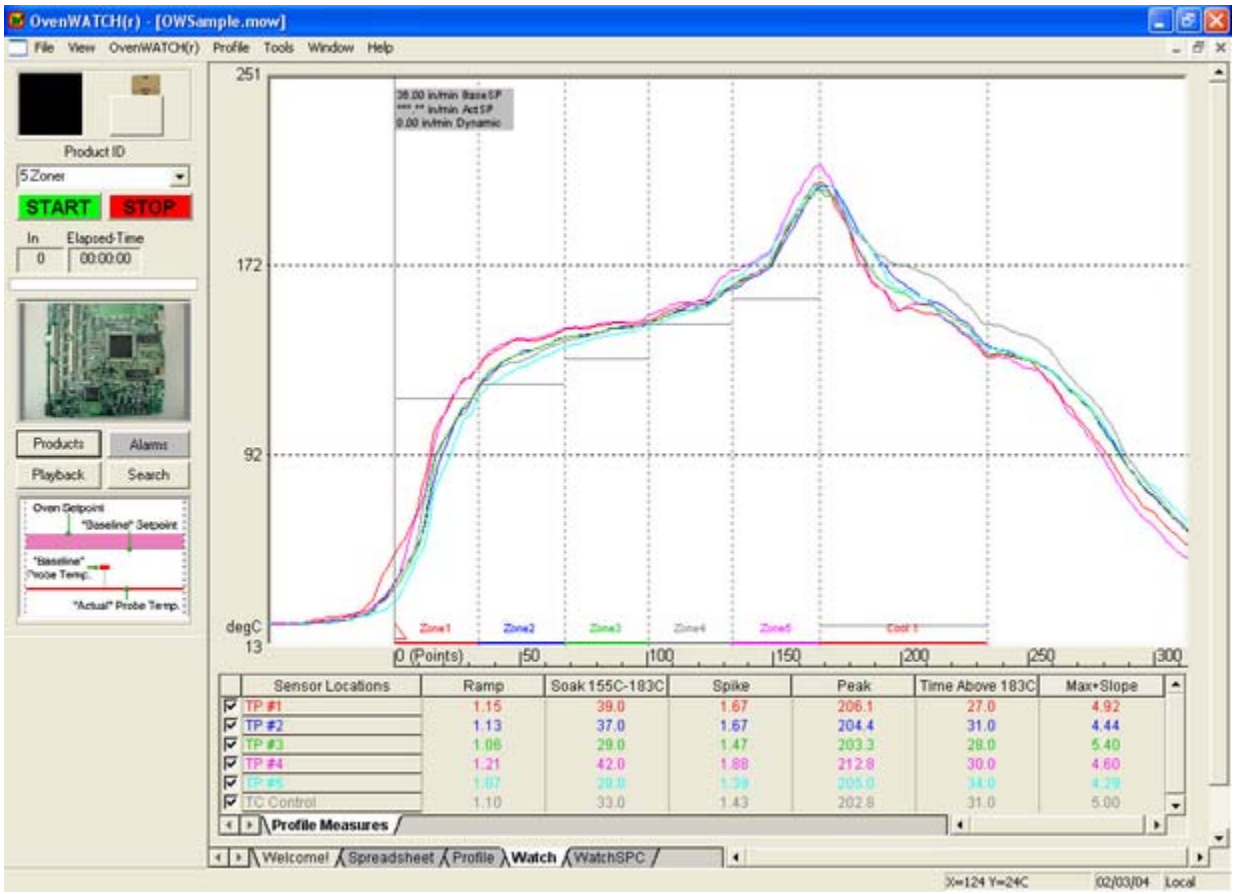


Zones

Zones are displayed as two colored lines along the bottom of the data graph and as dotted vertical lines that extend top to bottom. The first zone begins at the Process Origin.

4.4.7.9 Baseline Setpoints

Baseline Setpoints are zone temperatures established for each zone when the Baseline profile was created. These temperatures are the settings of heating elements in a process.



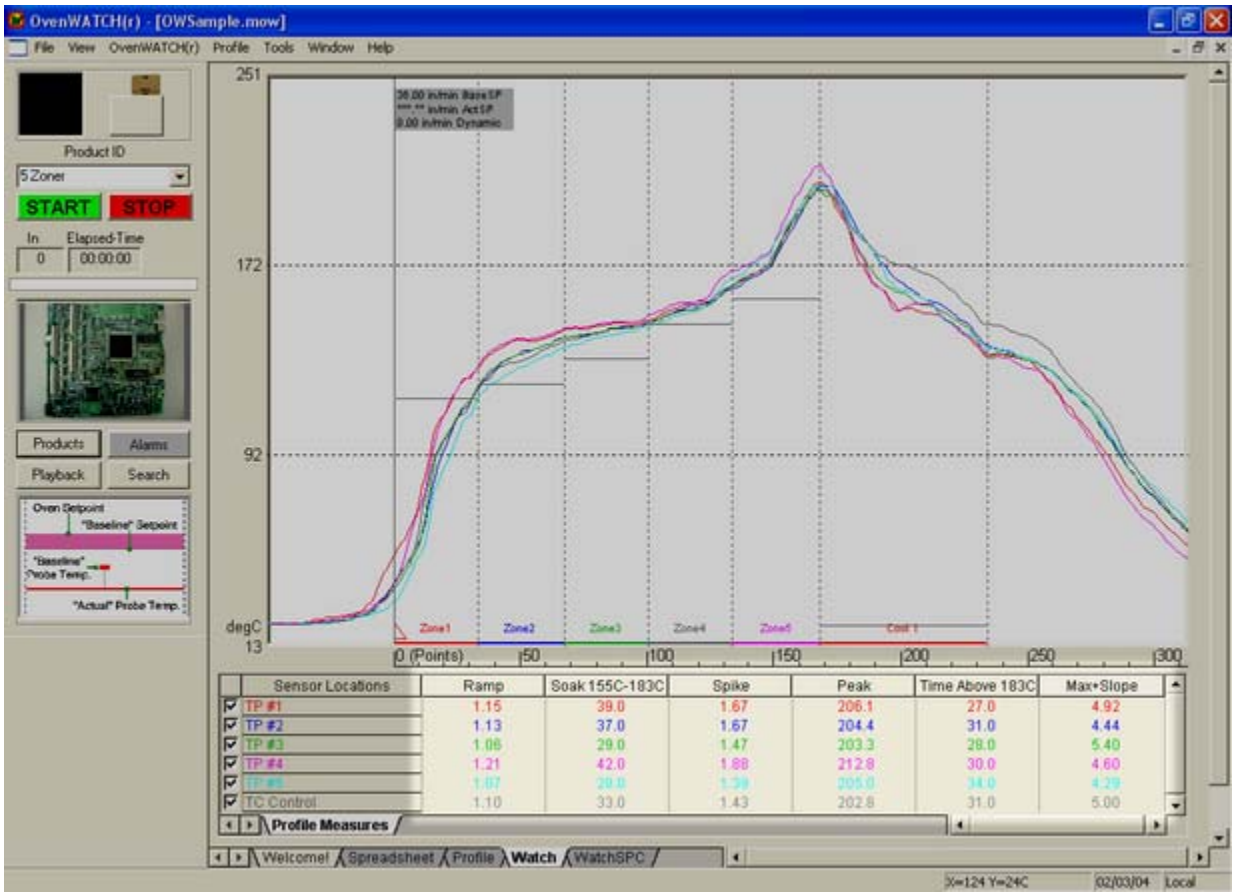
Baseline Setpoints

Baseline Setpoints appear in the Data Graph as gray bars at the temperature set for each zone.

Zone Temperatures are displayed only after zone sizes are defined in the Baseline Profile.

4.4.8 Data Table

The Data Table displays values extracted from the Data plot that can be compared to the paste specification parameters for compliance (refer to ***Appendix D: Parameter Definitions*** for Profile Measures definitions).

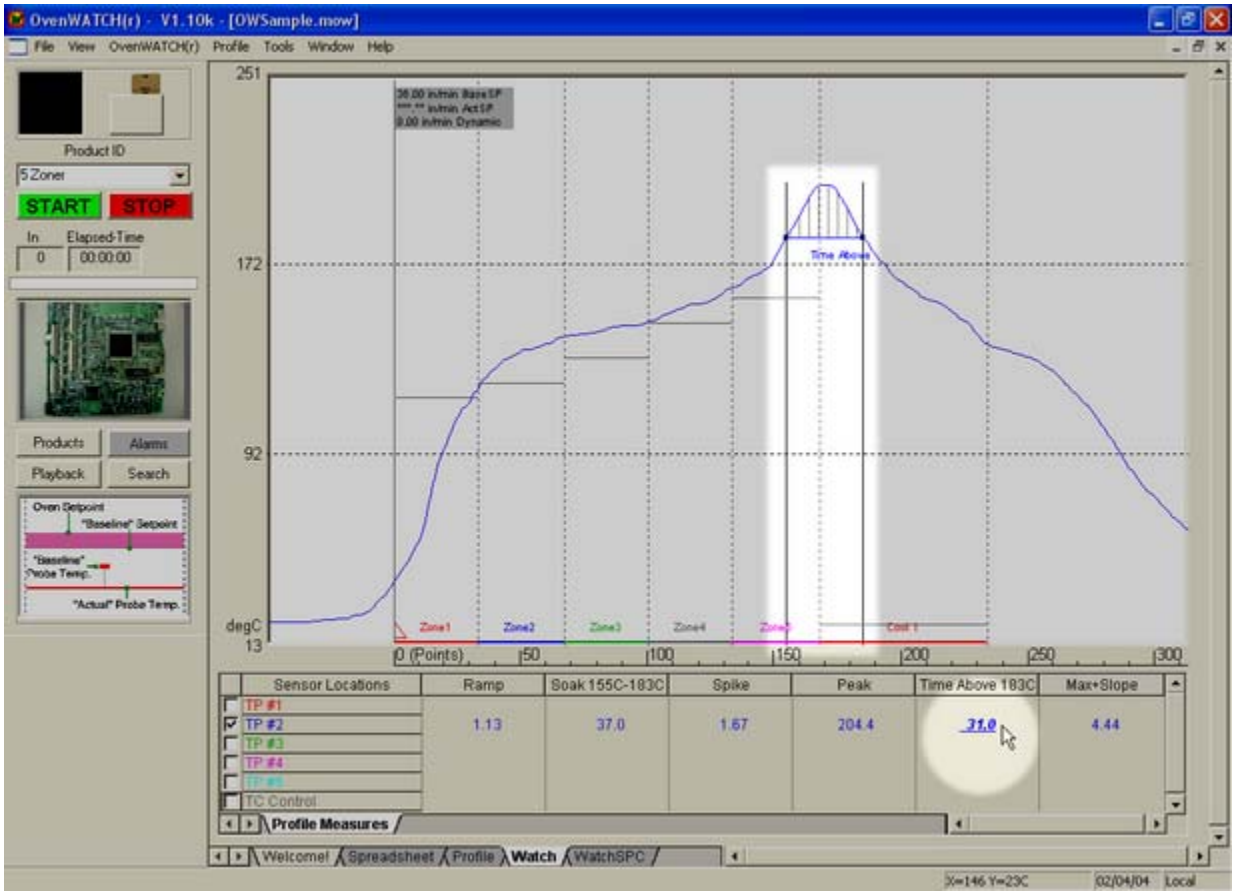


Data Table

4.4.8.1 Value Pop-Ups

Each value in the Data Table can be displayed as a Value Pop-up. A Value Pop-up is graphically illustrated on the Data Graph showing how and where that value was extracted from the profile.

Only one Value Pop-up can be displayed on the Data Graph at a time.



Value Pop-up

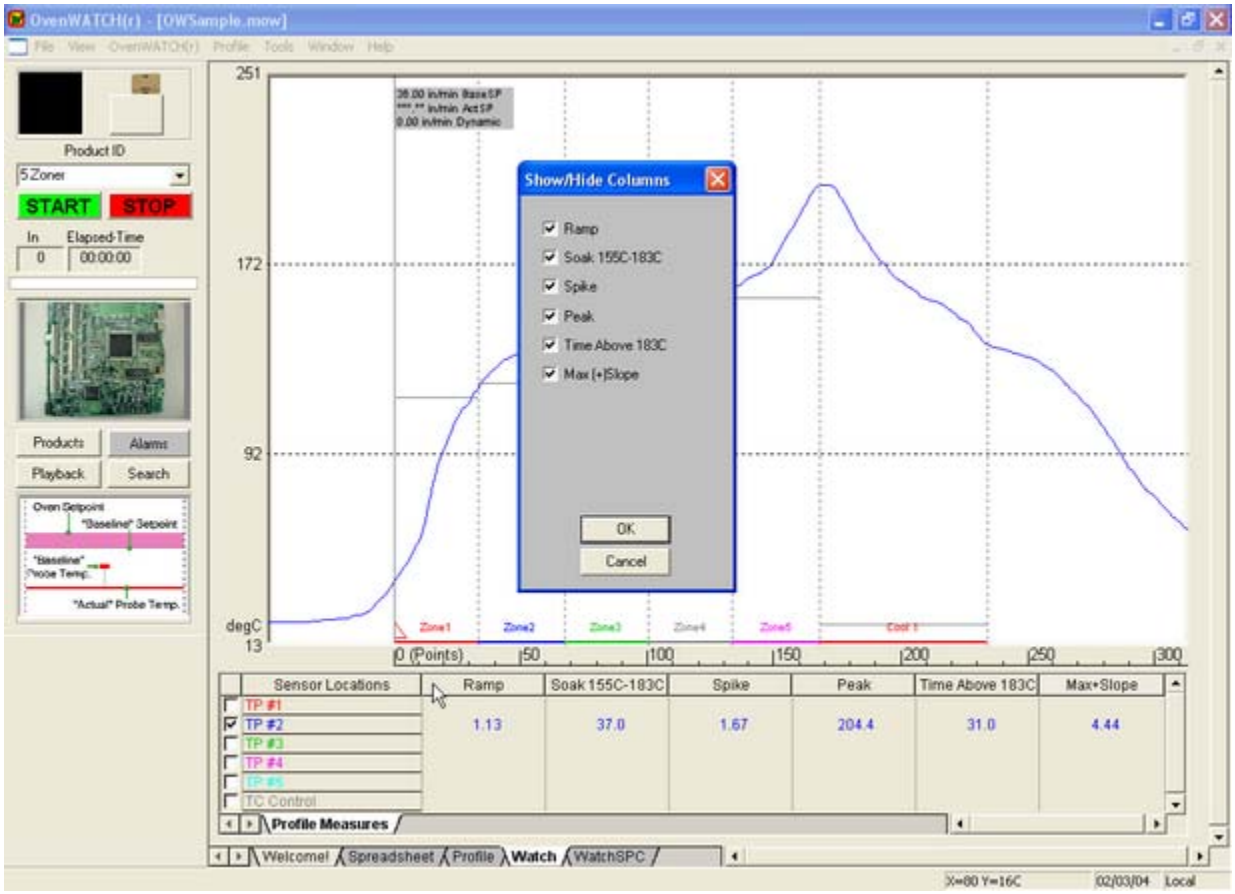
To display a Value Pop-up:

1) Select the Profile worksheet.
2) Move the mouse cursor and hover over a desired value in the Data Table. That value will automatically be displayed on the Data Graph where that value was extracted.

The last displayed Value Pop-up will remain on the Data Graph until the user selects a different worksheet.

4.4.8.2 Show/Hide Columns

Data Table parameter columns on the Profile worksheet can be hidden. This is useful when an operator wants to focus attention to the most important parameter columns.



Show/Hide Columns

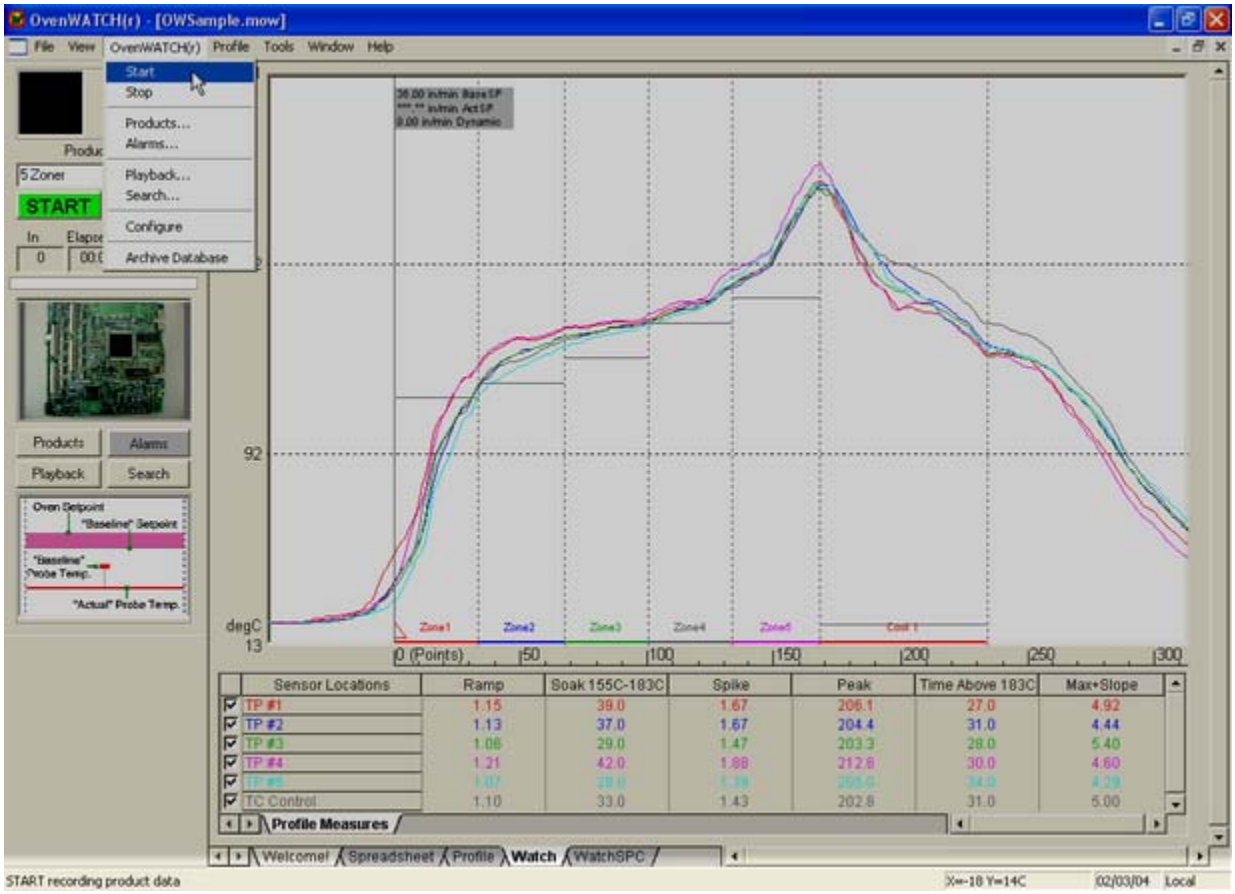
To display Show/Hide columns:

1) Select the Profile worksheet.
2) Right click a parameter column header.
3) Clear a parameter check box to hide or select to display.

Hidden Parameter columns do not affect the data being collected for that parameter. If all Parameter columns are hidden, right-click the Sensor locations column header to open the Show/Hide column dialog box.

4.4.9 Status Bar

The Status Bar displays the available Help information, X-Y position of the mouse pointer, Date and if the AutoM.O.LE.® Mailbox is Local or Remote.



Status Bar Features

Help Information:

When the mouse pointer is placed over a Toolbar button the left side of the Status bar will display the action that button performs.

X/Y Readout:

It is easy to find the exact X and Y-values of any point on the Data Graph using the mouse pointer. The X/Y Readout continuously displays the X and Y-axes values of the mouse pointer location.

The units displayed for X and Y-values are the same as those displayed on the graph. The user can select between °F and °C for the Y-value units. The X-value units can be a data point number, time, or distance. Units can be changed on the X and Y-axes at any time by selecting the ***Units*** command in the ***Profile*** menu.

While using the Magnify tool, the X/Y Readout displays the size of the selected area of interest.

Other ways to view exact X- and Y-coordinates of a data point is to select the Value Tab.

Date and Time:

This area of the Status bar displays the current time and date of the PC.

Mailbox Location:

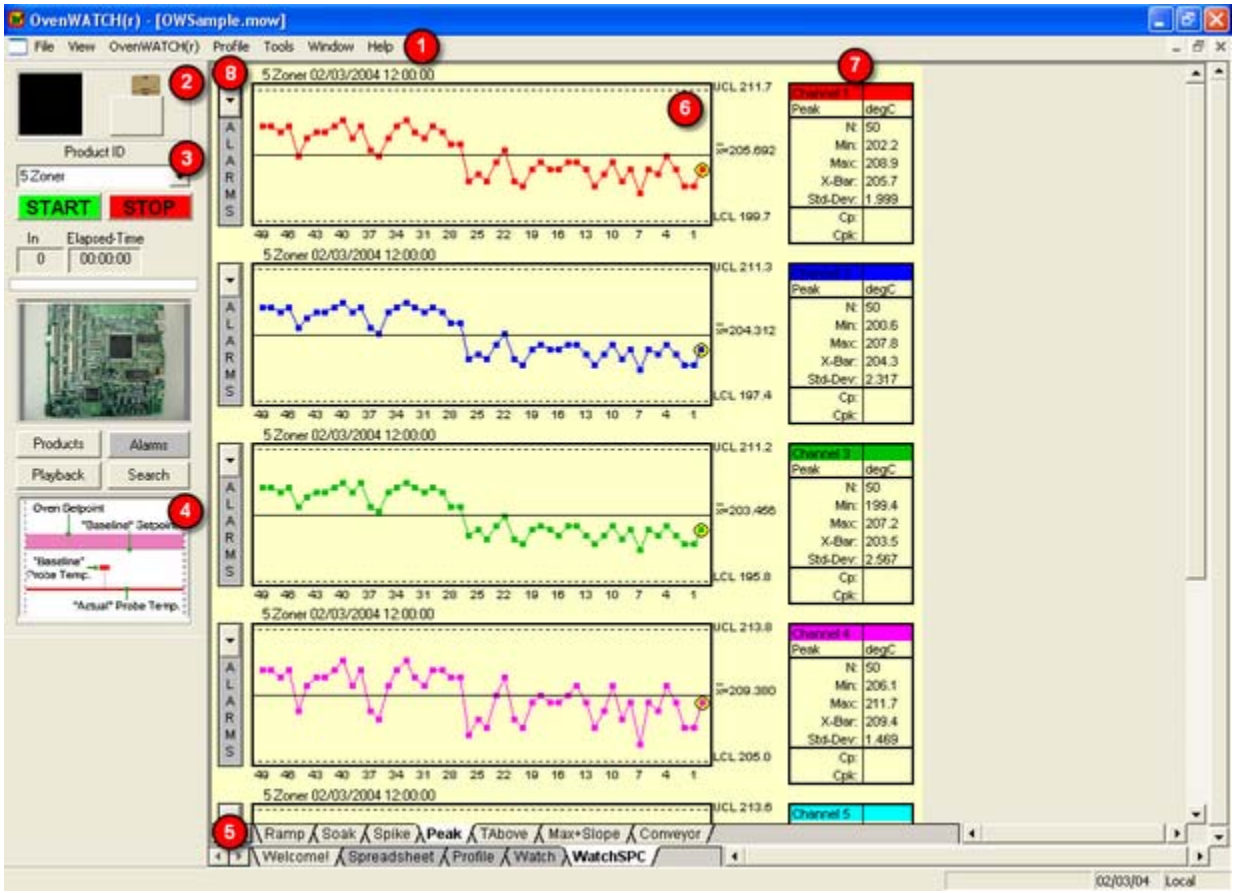
This area of the Status bar indicates if the AutoM.O.L.E.® Mailbox is located on the Local or a Remote computer (Refer to section ***Standalone Configuration*** for more information about the Mailbox).

4.5 Watch SPC Worksheet

The Watch SPC worksheet extracts the parameter data from each Dynamic Profile and displays them in SPC charts.

Watch SPC worksheet features:

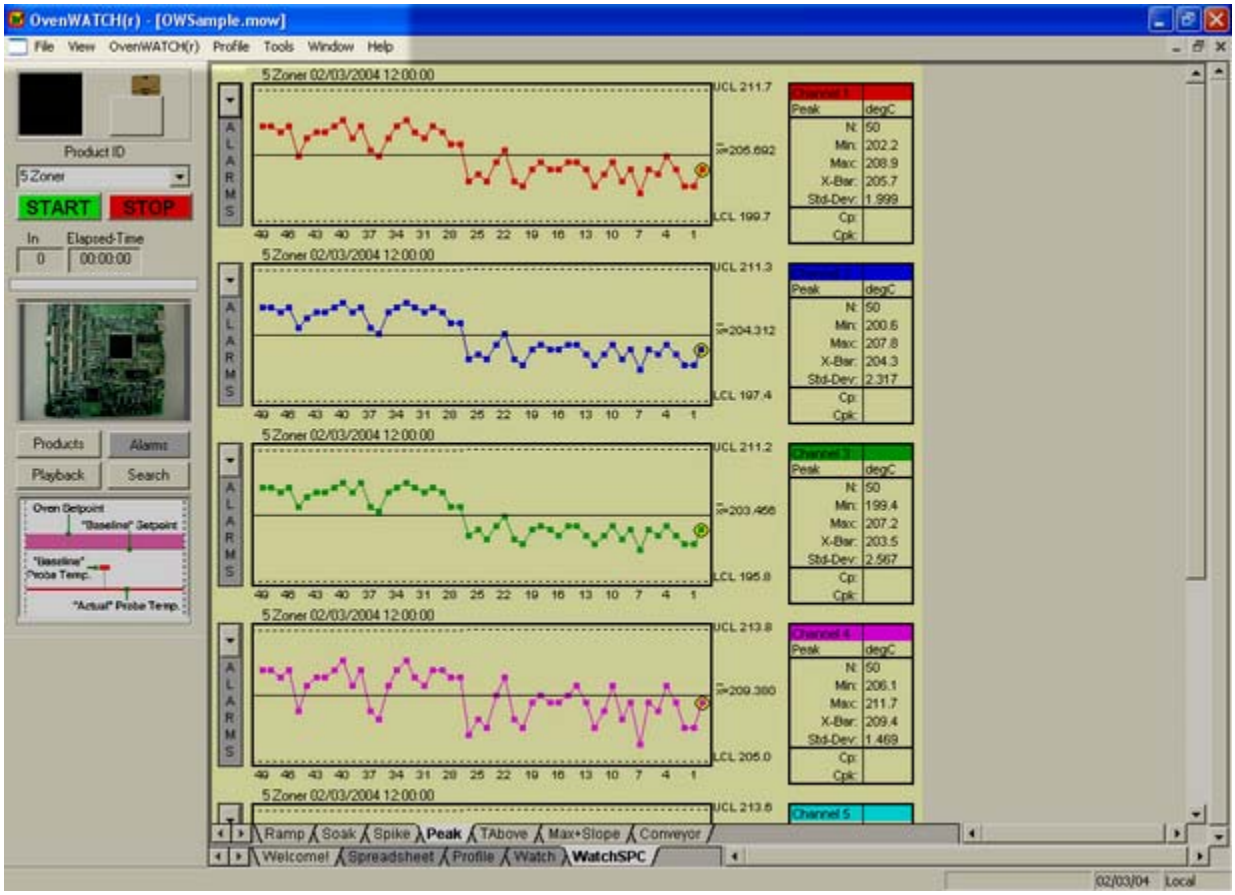
1. Menus
2. Status Indicators
3. Watch Control Panel
4. Zone Temperature Legend
5. Profile Measure Tabs
6. X Bar Chart
7. Statistics box
8. Local Alarms



Watch SPC Worksheet

4.5.1 Menus

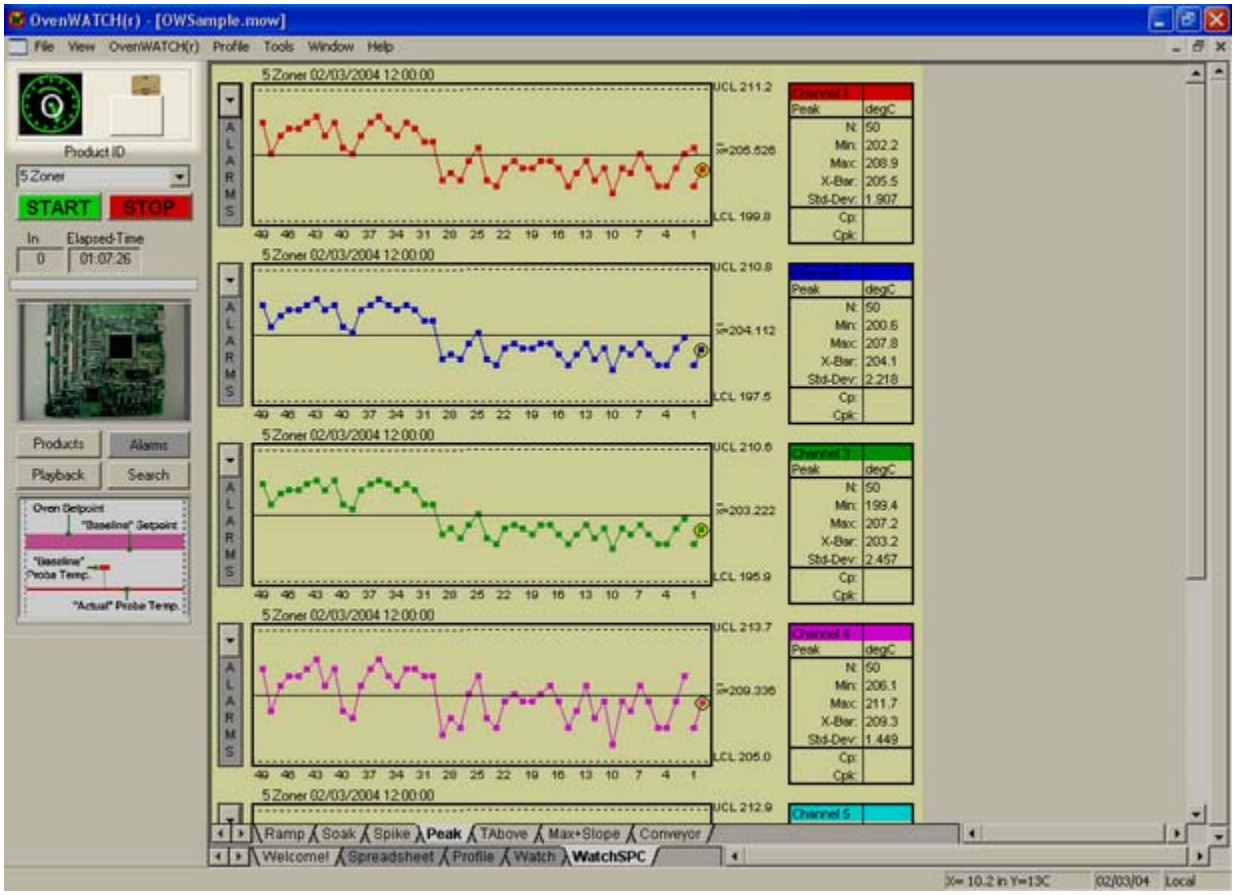
- **Menus**: File, View, OvenWATCH, Profile, Tools, Window, and Help.



SPC Worksheet Menu Bar

4.5.2 Status Indicators

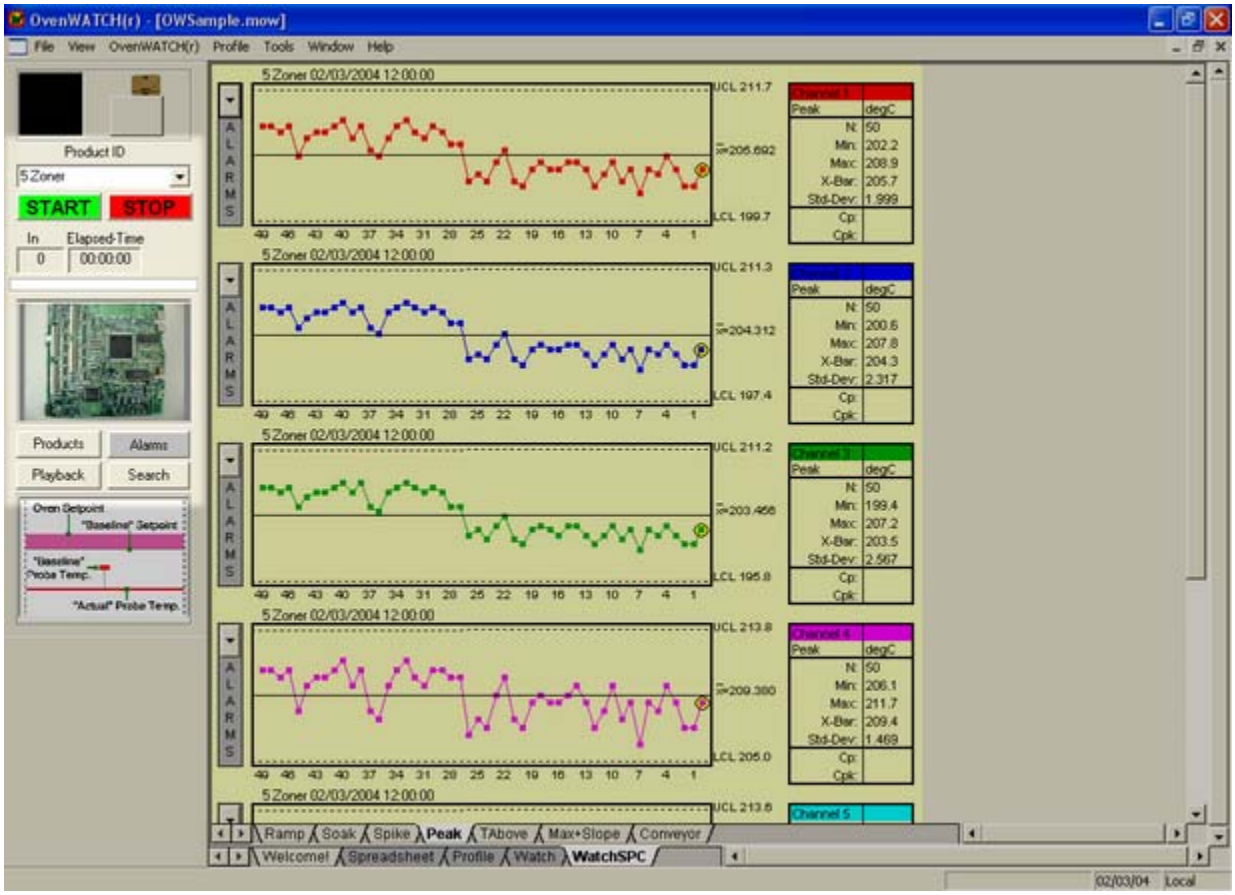
The Status Indicators are activated when the OvenWATCH is recording oven/product data and when the M.O.L.E. is inserted into the Station.



Status Indicators

4.5.3 Watch Control Panel

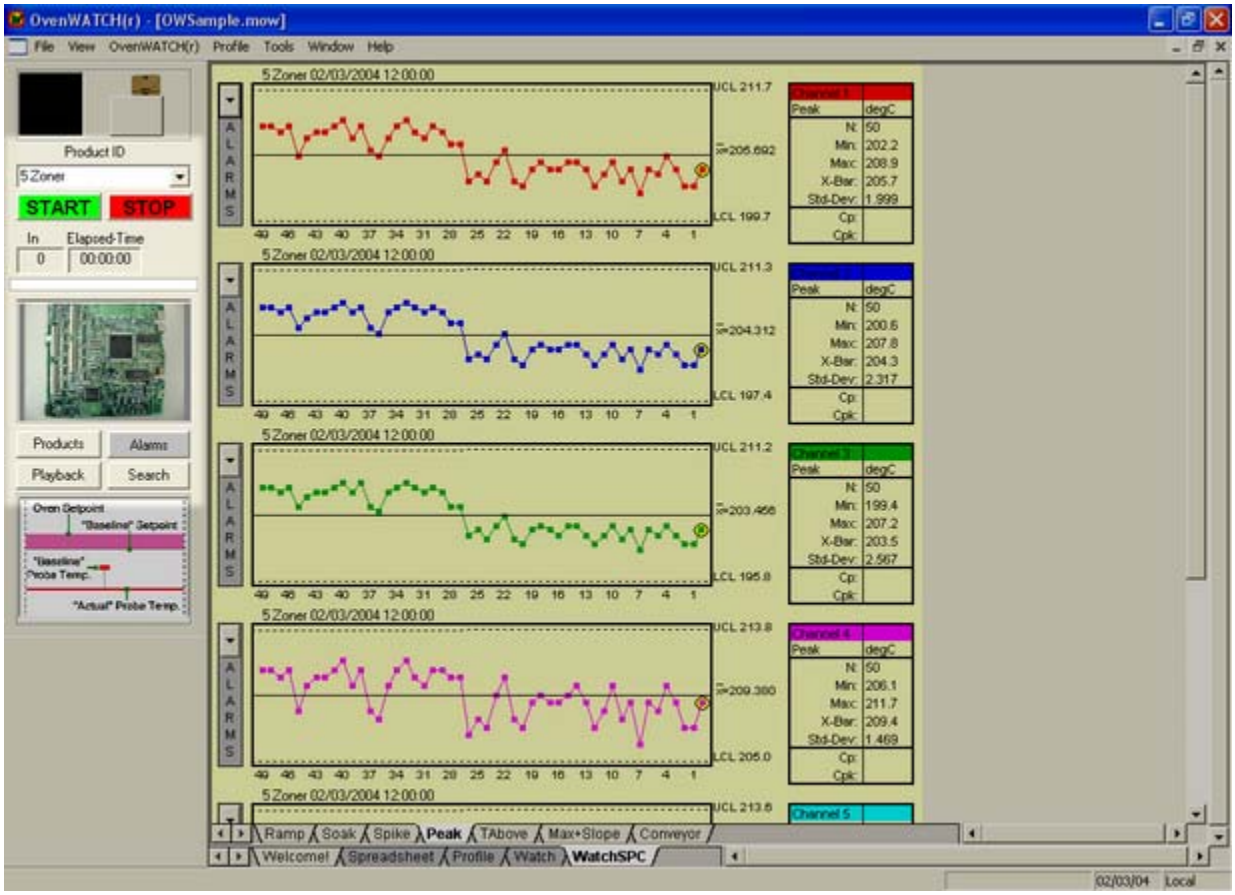
The Watch Control Panel is where product is defined and selected for quality monitoring.



Watch Control Panel

4.5.3.1 Product Selection Box

When a product is ready to run, use the Product Selection Box to select the pre-defined product.

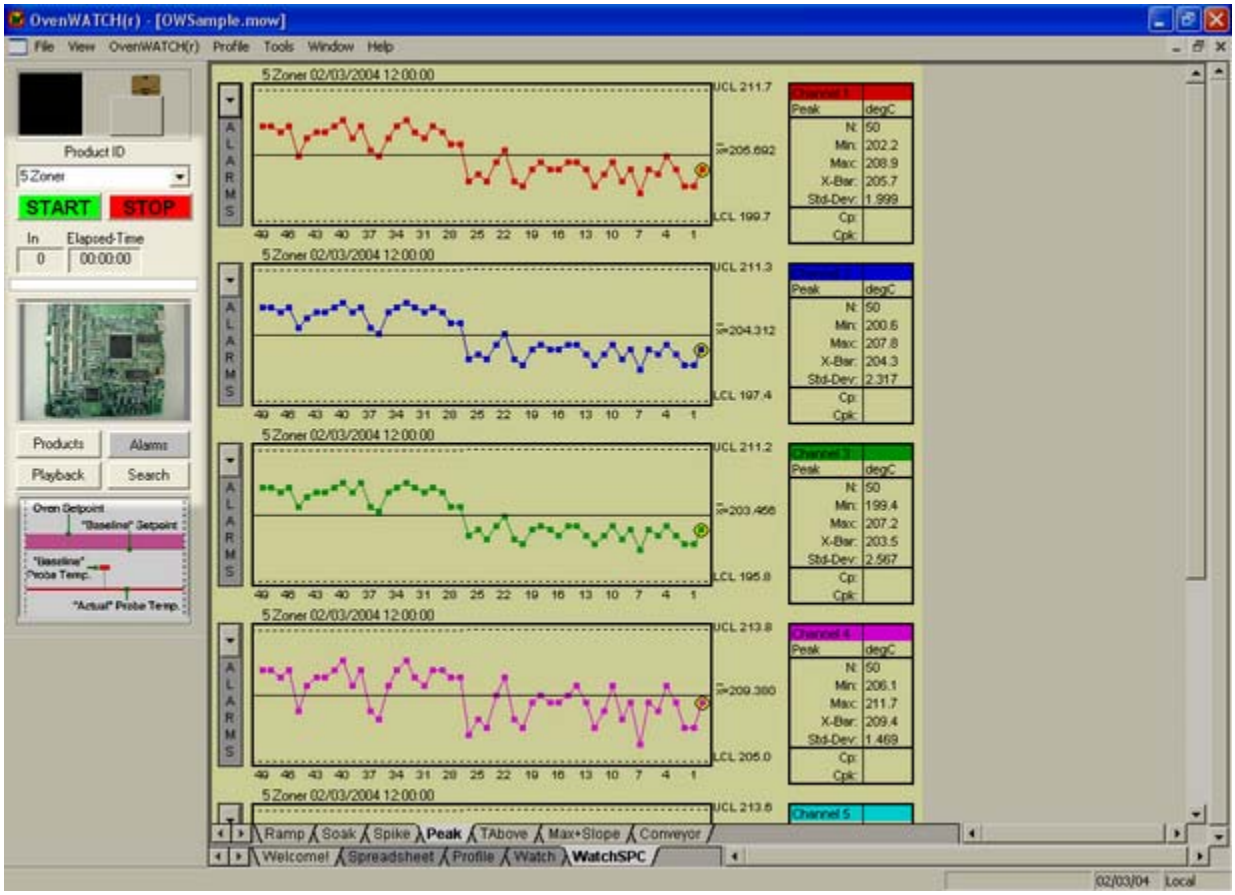


Product Selection Box

The product is defined using the ***Products*** command from the ***OvenWATCH*** menu and is listed alphabetically (refer to section ***Products*** for information on defining product).

4.5.3.2 Recording Controls

The OvenWATCH recording controls start and stop the recording process, display the elapsed recording time and product in/out information.



Recording Controls

Recording Controls:

- **Start/Stop Watch:** Starts and stops the OvenWATCH recording process.
- **Product Counter:** Displays the elapsed time since the start and the count of product that has entered and exited the oven.
- **Product Tracker:** A graphic representation of the product position in the oven.

If an board Out sensor is installed, it will be detected automatically by the software and an *Out* counter will appear after the *Elapsed* Time box.

4.5.3.3 Product Identifier

The Product Identifier is an identification photo of the selected product. This photo can be viewed at a larger scale by clicking it.

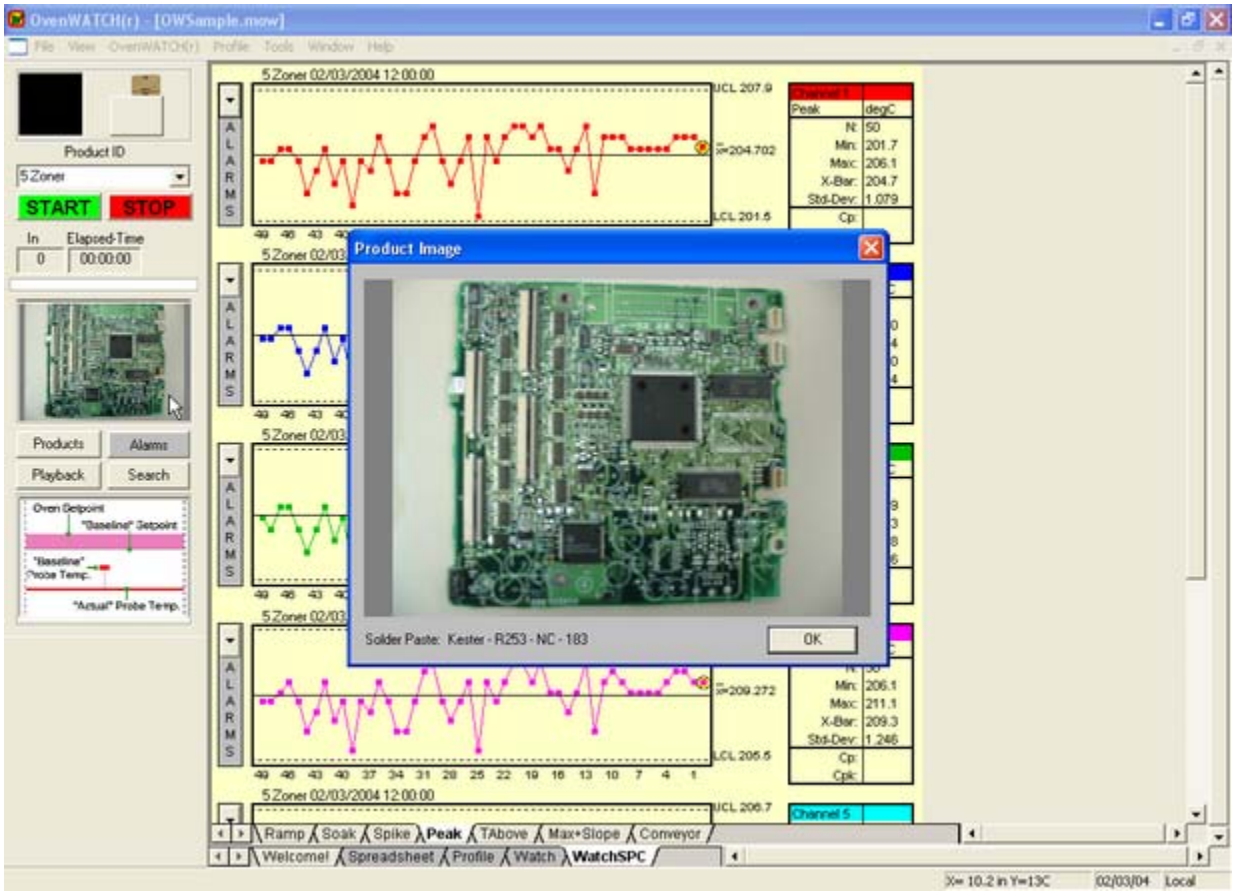
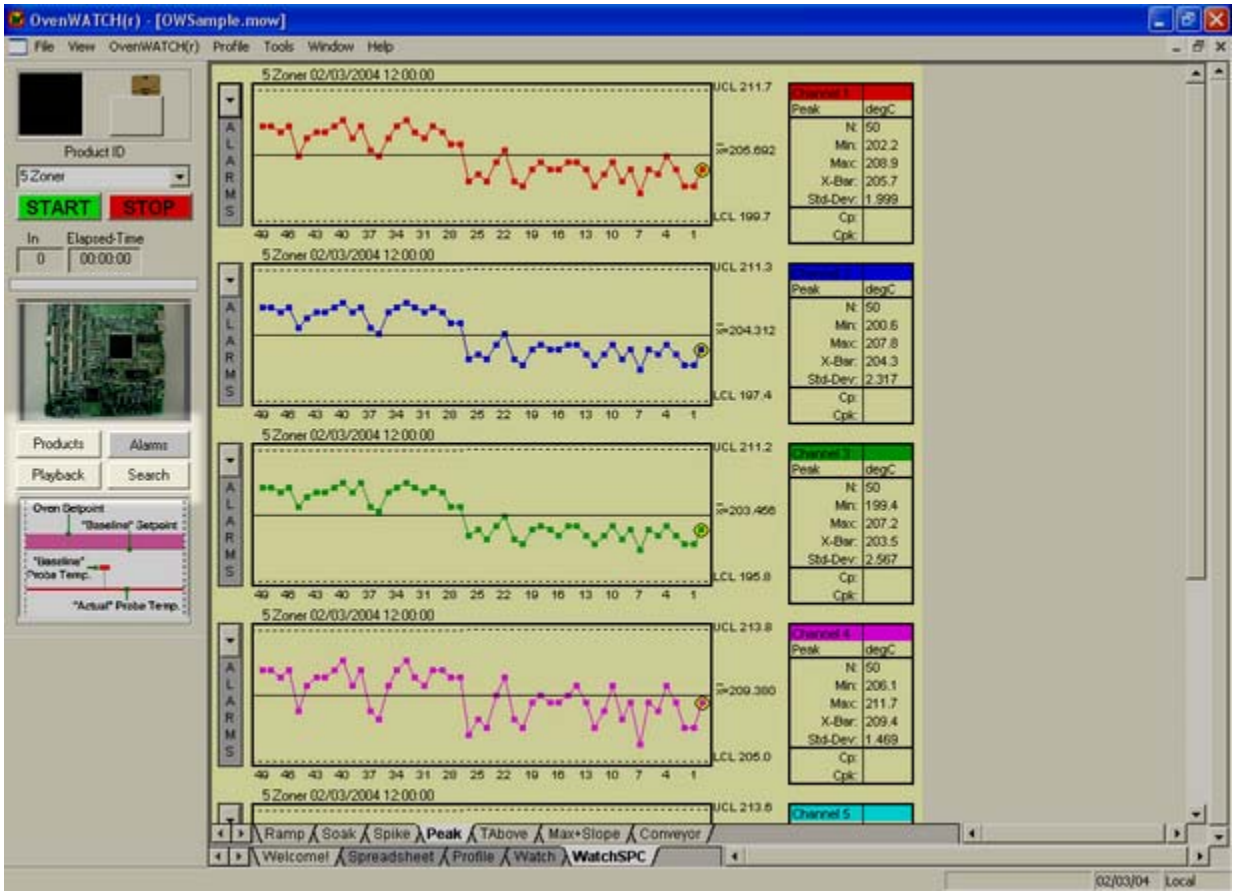


Photo Identifier

Using editing tools this photo can be enhanced with the ***Photo Shop*** command in the ***Tools*** menu (refer to section ***Photo Shop*** for detailed information).

4.5.3.4 Product Controls

The Product Controls is in essence the command center for defining and reviewing recorded product data.



Product Controls

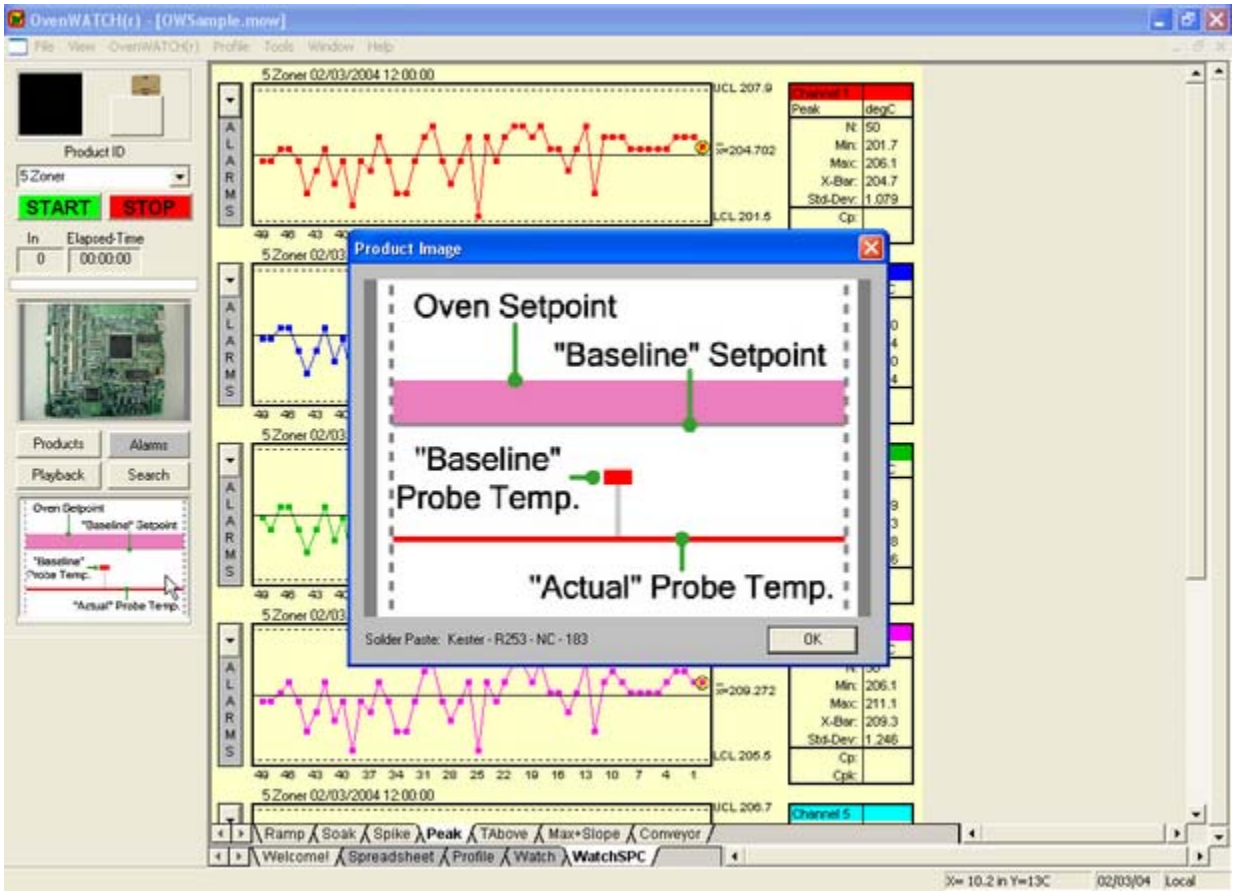
Product Controls:

- **Products:** Defines and edits new and existing product.
- **Alarms:** Defines global SPC Alarms for the currently selected product.
- **Playback:** Reviews recorded product data.
- **Search:** Searches event history for all defined products.

The Product Controls can also be accessed in the ***OvenWATCH*** menu (refer to section ***OvenWATCH Menu*** for detailed information).

4.5.4 Zone Temperature Legend

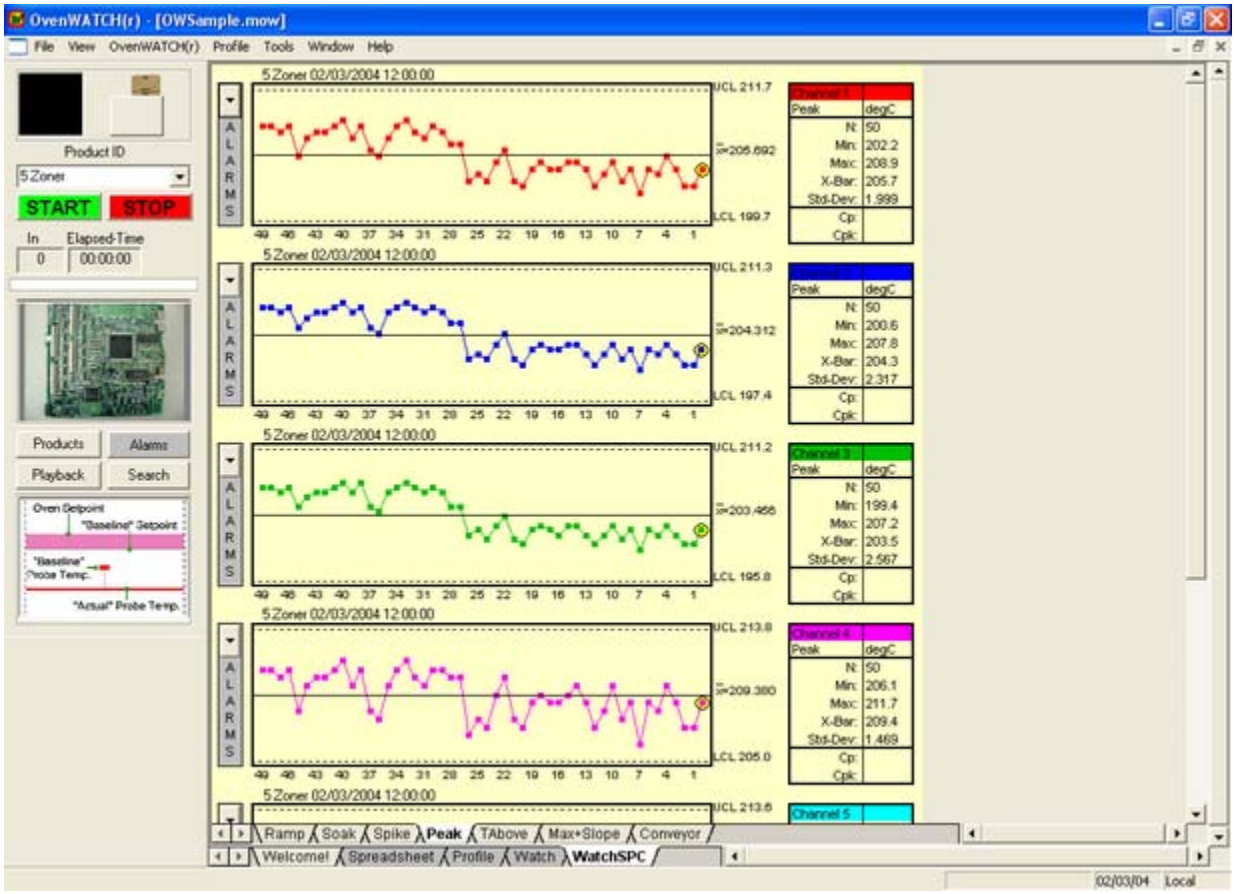
This legend describes the zone model temperatures that are displayed during the recording process. This legend can be viewed on a larger scale by clicking it.



Magnify Map

4.5.5 Profile Measures Tabs

Profile Measure Tabs display predicted parameter SPC data based on the Dynamic Profile for each channel.



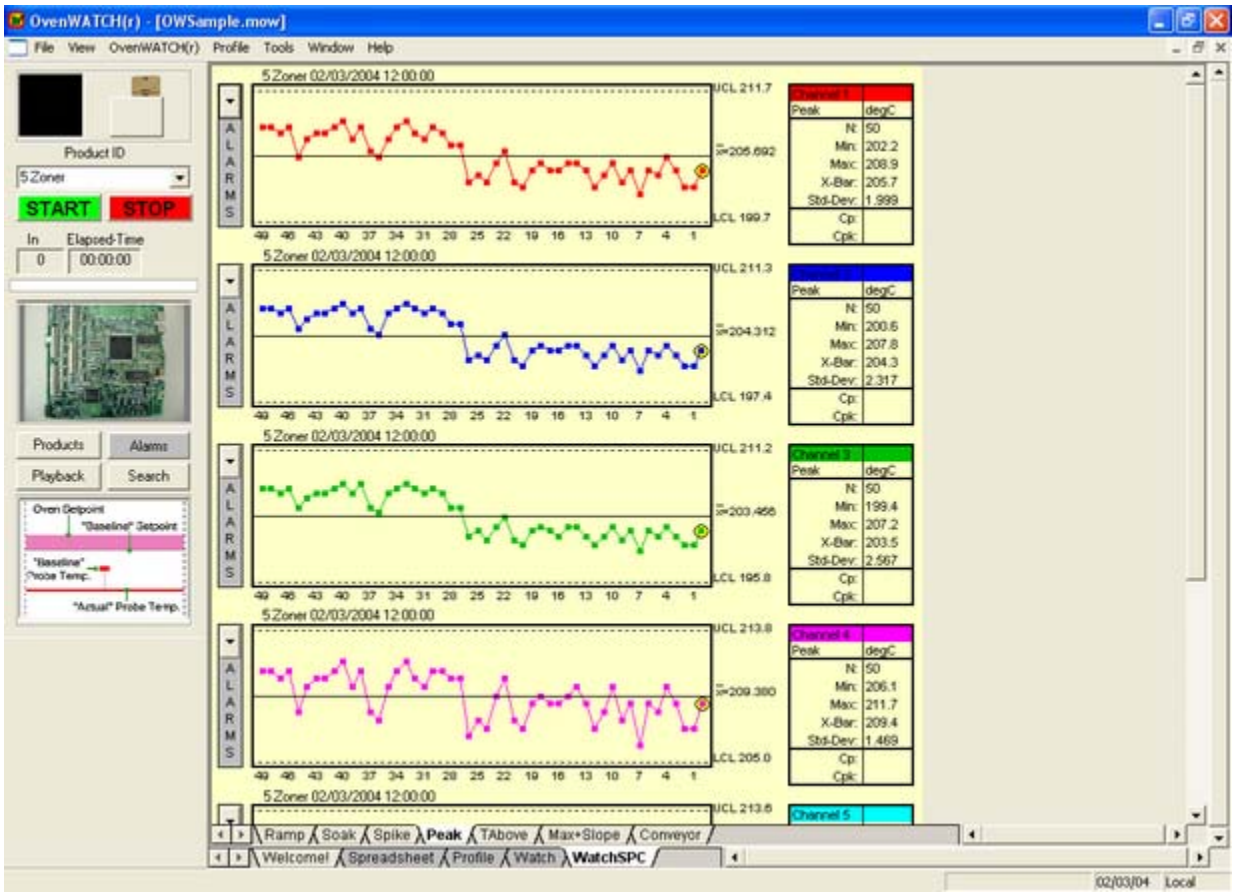
Profile Measures Tabs

To display an individual SPC worksheet, use the mouse pointer to click on a tab. The worksheet tab will then become highlighted, and the worksheet will now be visible.

The keyboard does not allow access to the worksheets. The only way to select the worksheet is by using the mouse pointer.

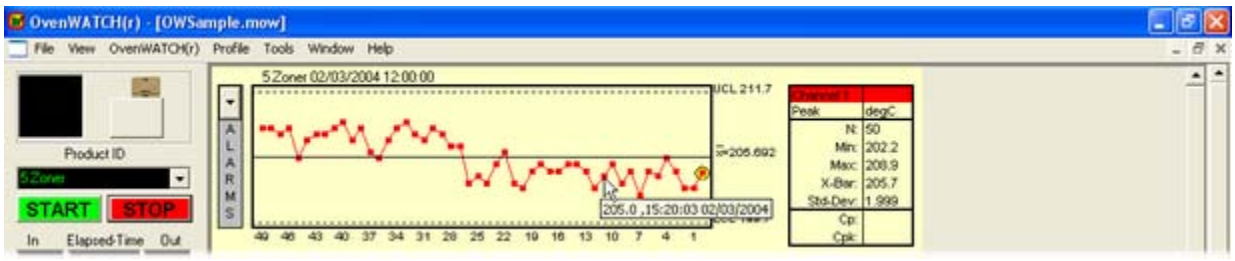
4.5.6 X-Bar Chart

The X-Bar Chart is a graphical chart produced from Parameter Measures samples. The X-bar is the average of the data samples and the UCL and LCL are calculated using a formula based on 3s standard deviation.



X-Bar Charts

The SPC data points display the value, time & date the data point was recorded when a user places the mouse arrow over it.

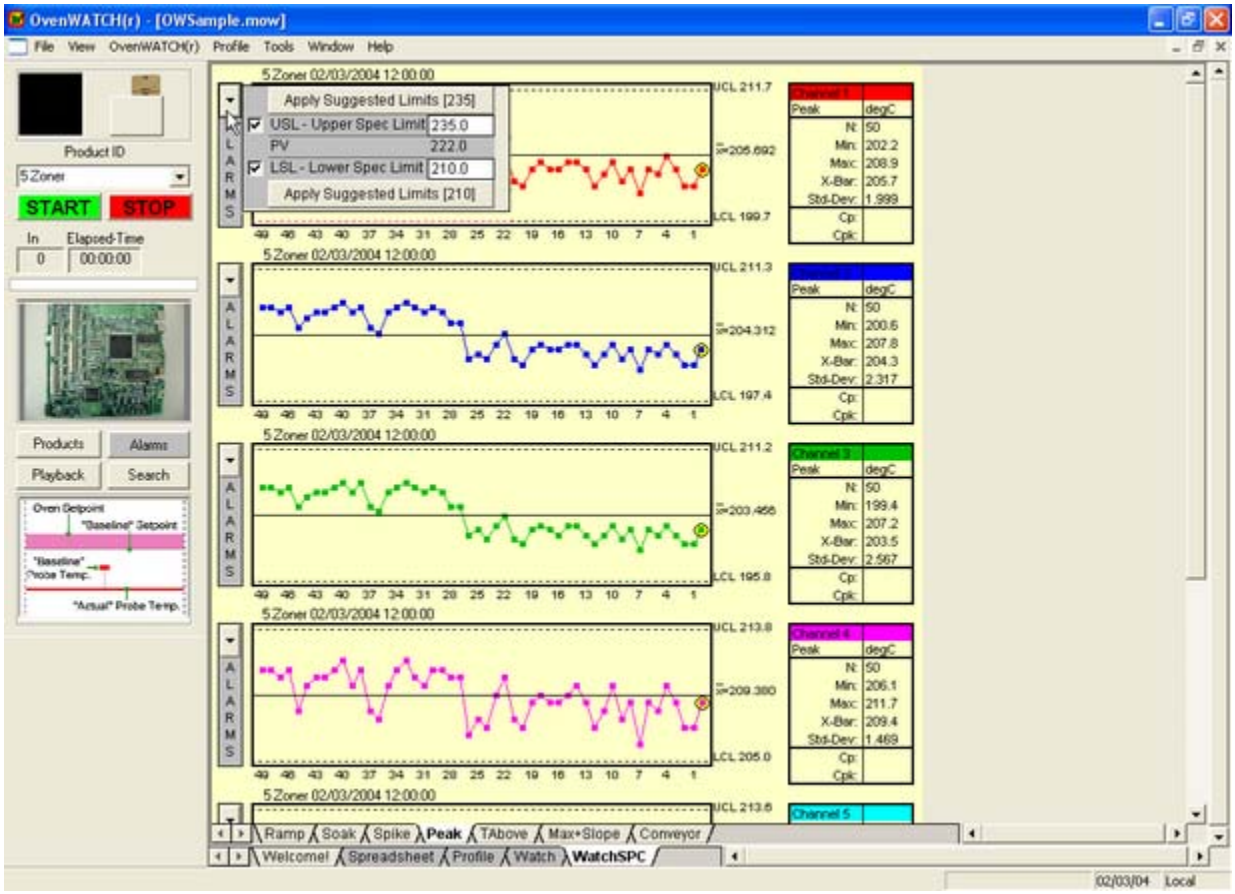


Data Point Value

Double-clicking an SPC data point will automatically envoke the Playback function from that logged point.

4.5.7 Local Alarms

Upper/Lower Specification limits can be set for each individual parameter using the Local Alarms pop-up bar. These local alarms can be applied and then activated using the ***Alarms*** command in the ***OvenWATCH*** Menu. Refer to section ***Alarms*** for more information.



Local Alarms

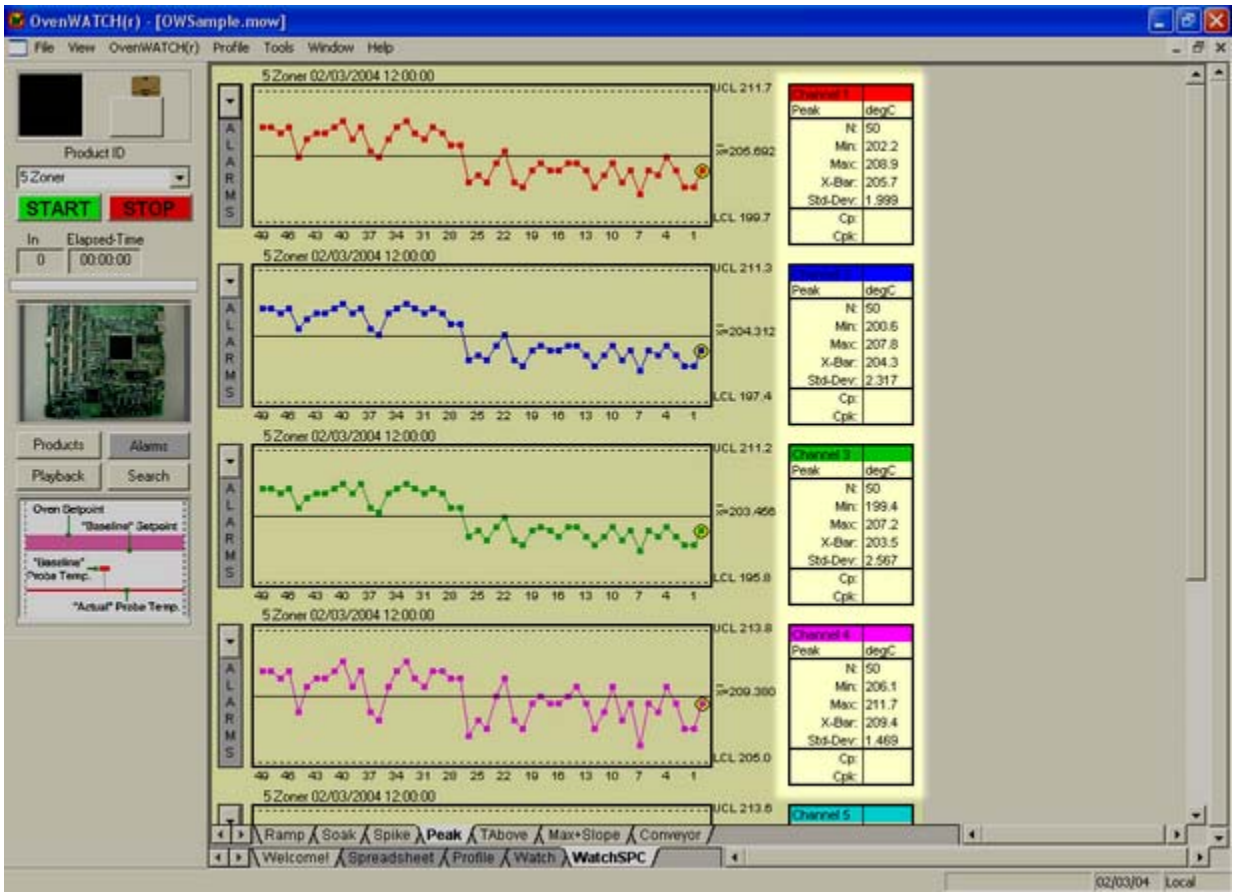
To set the alarms, click the check box adjacent to the desired control/spec limit. To use the suggested Paste Spec limit values, click the Upper and/or Lower spec command buttons. This will auto-populate and check the alarm box for the desired Spec text box.

4.5.8 Statistics Box

The Statistics Box reflects the current SPC data from a parameter.

Statistics box data:

- ***N*** = Number of individual data points (5 max.).
- ***Min.*** = The lowest data point on the graph.
- ***Max.*** = The highest data point on the graph.
- ***X-bar*** = The current X-Bar Bar calculation.
- ***Std. Dev***. = The Standard Deviation of the selected parameter.
- ***Cp; Cpk*** = Process capability indices (Refer to ***Appendix B: Statistical Process Control (SPC) Background Information***).



Statistics Box

5.0 Menu and Tool Commands

5.1 File Menu

Commands in the File menu are used to manipulate and configure workbook files.

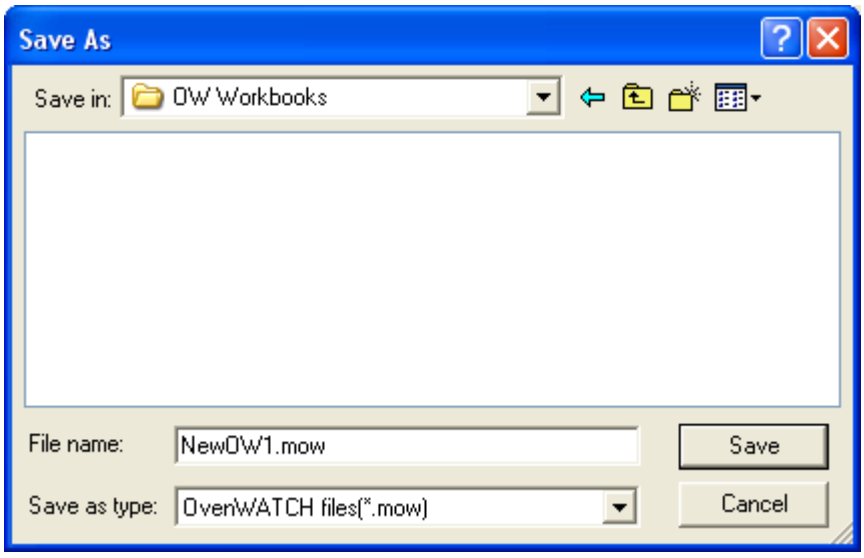
The dimmed menu commands are used in other worksheets.

5.1.1 New Workbook

To start a new workbook:

1) On the ***File*** menu, select ***New Workbook***. A message box appears requesting the user select a file folder directory to save the new workbook. The software allows only one workbook to be open at a time and if there is an existing workbook open it must be closed prior to using this command.

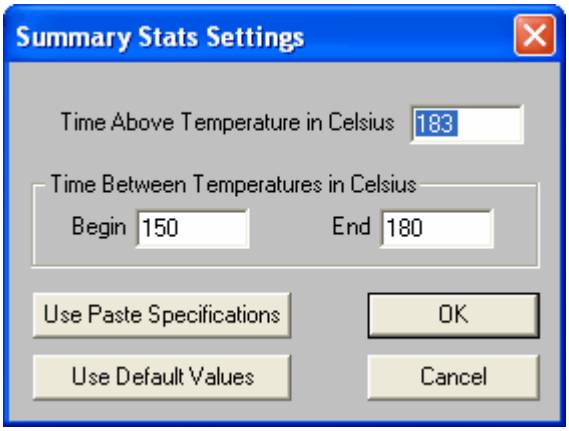
Workbook files are saved with a file extension of (.MOW), and the Profile data from the Profile worksheet are saved with an extension of (.MDM). These two file types will automatically be saved in the same file folder directory because they are inter-dependent on each other and should not be separated.



New Workbook List Box

After the file location has been determined, a dialog box appears allowing the user to specify Summary Statistics settings for the workbook based on a Paste Specification or the user selected values.

If you wish to use a Paste Specification proceed to section *Paste Specification Database* for more information.



Summary Statistics Settings

When a new workbook is created, it uses these values as thresholds for the Summary Statistics Data. A table of these values extracted from the profile can be viewed on the Summary Stats tab.

The New Workbook command can be accessed on the Toolbars of the Spreadsheet, Profile, and Admin worksheets. This command can also be used by pressing [***CTRL*** + ***N***].

New Workbook Button

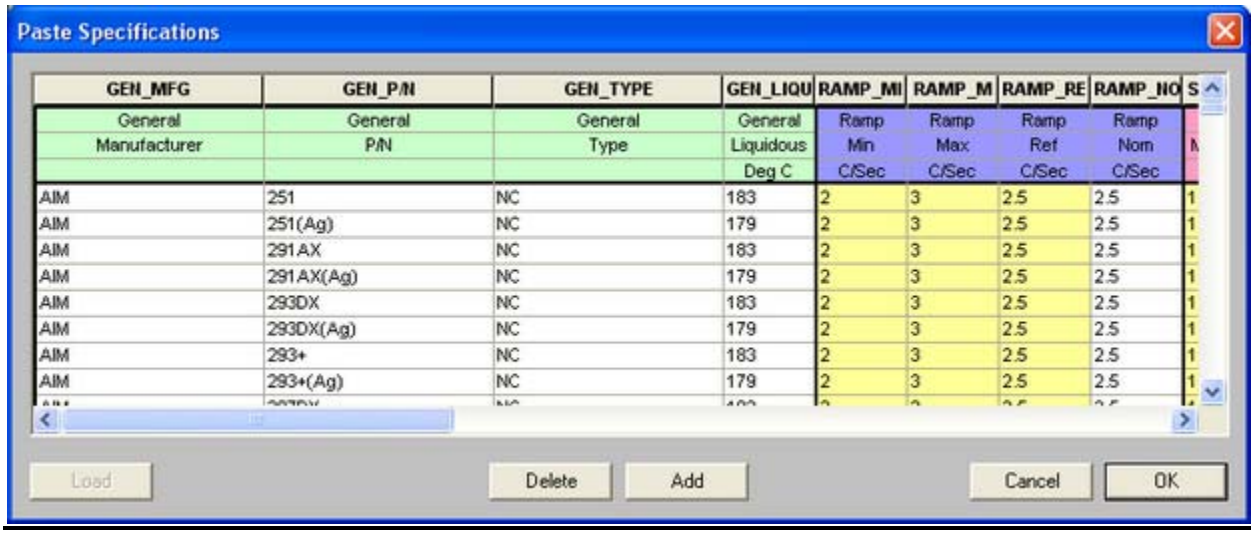
5.1.1.1 Paste Specification Database

If the user decides to use one of the Paste Specifications for the Summary Statistics use the following procedure.

The Paste database can be accessed using the Paste Selection on the Profile menu of the Profile worksheet.

To select a paste:

1) On the ***Summary Stats Settings*** dialog box, select the ***Use Paste Specifications*** command button. A dialog box displaying the paste database appears.



Paste Specification Dialog Box

2) Scroll to and select (highlight) the desired paste specification.
3) Click the ***OK*** command button to accept the selected paste specification, or ***Cancel*** to return to the Summary Stats Settings dialog box.

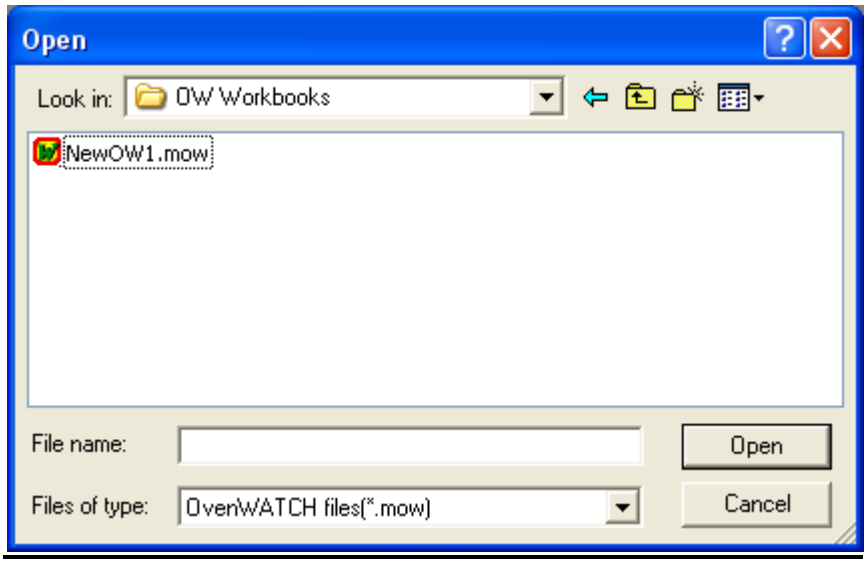
If the desired paste is not in the database, the user can add a new one using the Paste Wizard. Refer to section *Adding a Paste Specification* for more information.

5.1.2 Open Workbook

The Open Workbook command opens existing workbook files. The software allows only one workbook to be open at a time and if there is an existing workbook open it must be closed prior to using this command.

To open a workbook file:

1) On the ***File*** menu, select ***Open Workbook***. A list box of workbook files with an extension of (**.MOW**) files appears.



Open Workbook List Box

2) Highlight the desired workbook file to open by clicking.
3) Click the ***Open*** command button to open, or ***Cancel*** to return to the current worksheet.

The Open Workbook command can be accessed on the Toolbars of the Spreadsheet and Profile worksheets. This command can also be used by pressing [***CTRL*** + ***O***].

Open Workbook Button

5.1.3 Close Workbook

To close a workbook file:

1) On the ***File*** menu, select ***Close Workbook***. If there is a second workbook open, closing a workbook will return to the previous workbook.

5.1.4 Import

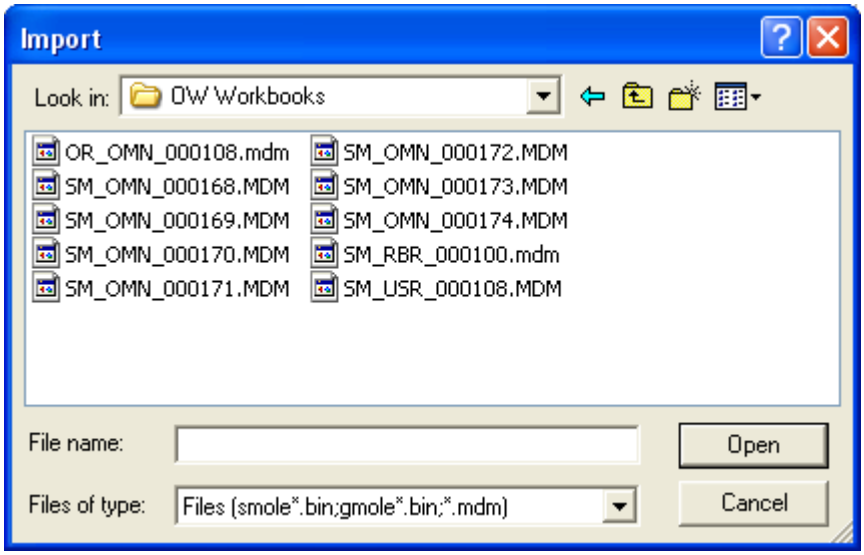
The Import command imports existing SM.O.L.E. (.bin) GM.O.L.E. (.bin) and SMFW (.mdm), files into the Spreadsheet worksheet. This process will copy all documentation information (i.e. part, process) from the file being imported, into the user definable cells on the Spreadsheet worksheet.

When importing (.MDM) files, they are automatically copied into the directory of the current workbook file.

When importing (*.bin) files they are accompanied by a corresponding hidden *.doc file. The file pairs MUST remain together in the same directory while you are importing them. If you wish to move some of these files to a new directory before importing, be sure to find the matching (*.bin) and (*.doc) files and keep them together.

To import:

1) On the ***File*** menu, select ***Import*** and the Import list box appears.



Import List Box

2) Navigate to the file folder where the file(s) to import are located. (The path and file name can also be typed in the ***File of type*** text box).
3) Select the file(s) to import by clicking it once.
4) Click the ***Open*** command button and the data run will automatically be inserted into a data run row on Spreadsheet worksheet..

5.1.5 Save Workbook

To save a workbook file:

1) On the ***File*** menu, select ***Save Workbook*** to save the current workbook file after changes have been made. When the user saves the file, all of the current data runs and options in the workbook are saved.

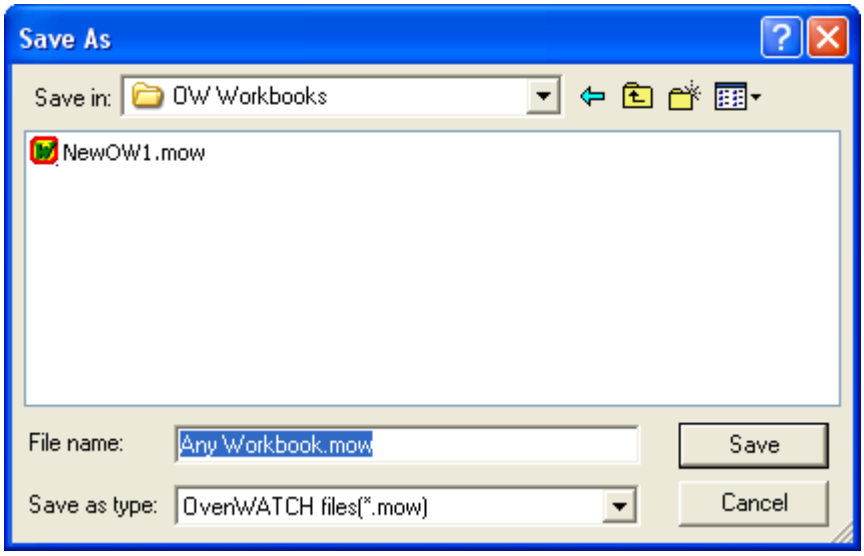
The Save Workbook command can be accessed on the Toolbars of the Spreadsheet and Admin worksheets. This command can also be used by pressing [***CTRL*** + ***S***].

Save Button

5.1.6 Save Workbook As

To save a workbook file as a different name:

1) On the ***File*** menu, select ***Save Workbook As*** to save the current workbook with a different file name. When the user saves the file, the current appearance of the workbook and the options that have been set are saved.



Save Workbook As List Box

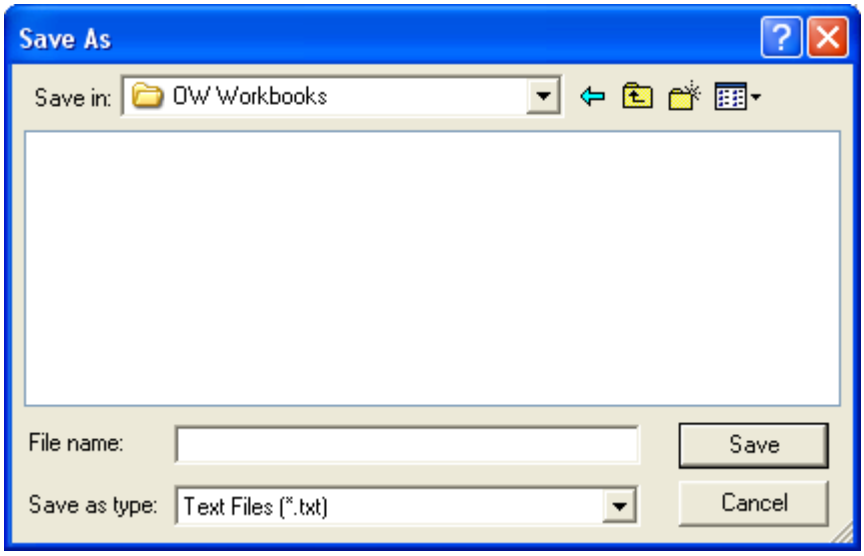
The Save Workbook As command can also be used to save selected data runs out of a worksheet that includes a large data set. When unwanted data runs are filtered out of a large data set and then the Save Workbook As command is used, the selected data runs are saved in a new workbook file along with the profile data.

This command is also useful when the user wants to transfer selected MDM data run(s) to a floppy disk.

5.1.7 Save As Text

To save as text:

1) On the ***File*** menu, select ***Save As Text*** to save the Spreadsheet information as a text file in the current language, unit of temperature and distance configurations. The saved text files have a file extension of **(.TXT)**. This command will save the data so it can be opened with software programs that open standard text files.

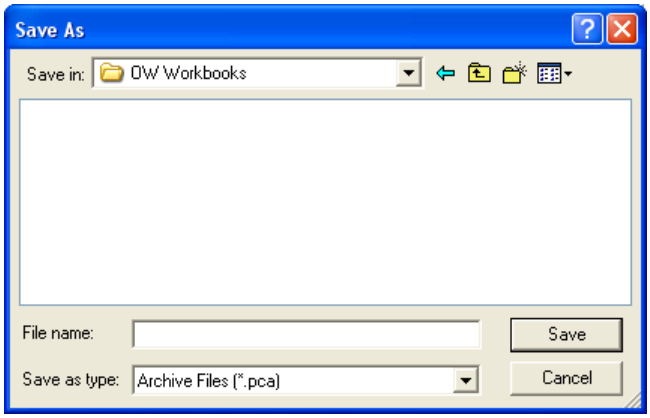


Save As Text Dialog Box

5.1.8 Save as Text Archive

To save as a text archive:

1) On the ***File*** menu, select ***Save As Text Archive*** to save all of the data sets in the workbook file as a text archive with a file extension of **(.PCA)**. This is a useful way to save large worksheets because text archive files are much smaller than saving in workbook file format. This allows saving large workbook spreadsheet data in a compressed format. They can be restored using the ***Load Text Archive*** command.

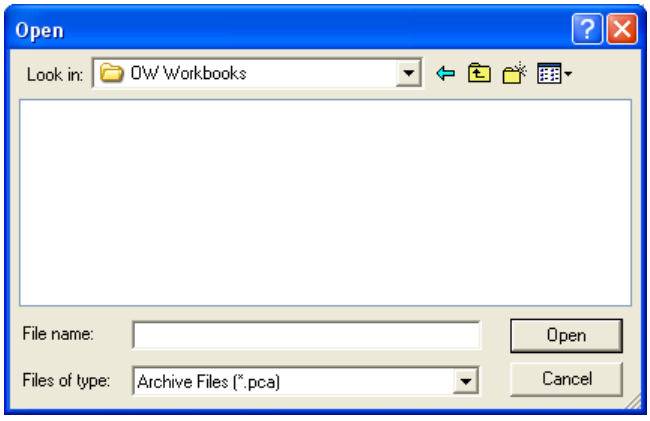


Save As Text Archive List Box

5.1.9 Load Text Archive

To load a text archive:

1) On the ***File*** menu, select ***Load Text Archive*** to load a previously saved text archive file. This command will clear the currently loaded data and load the selected text archive file in its place.

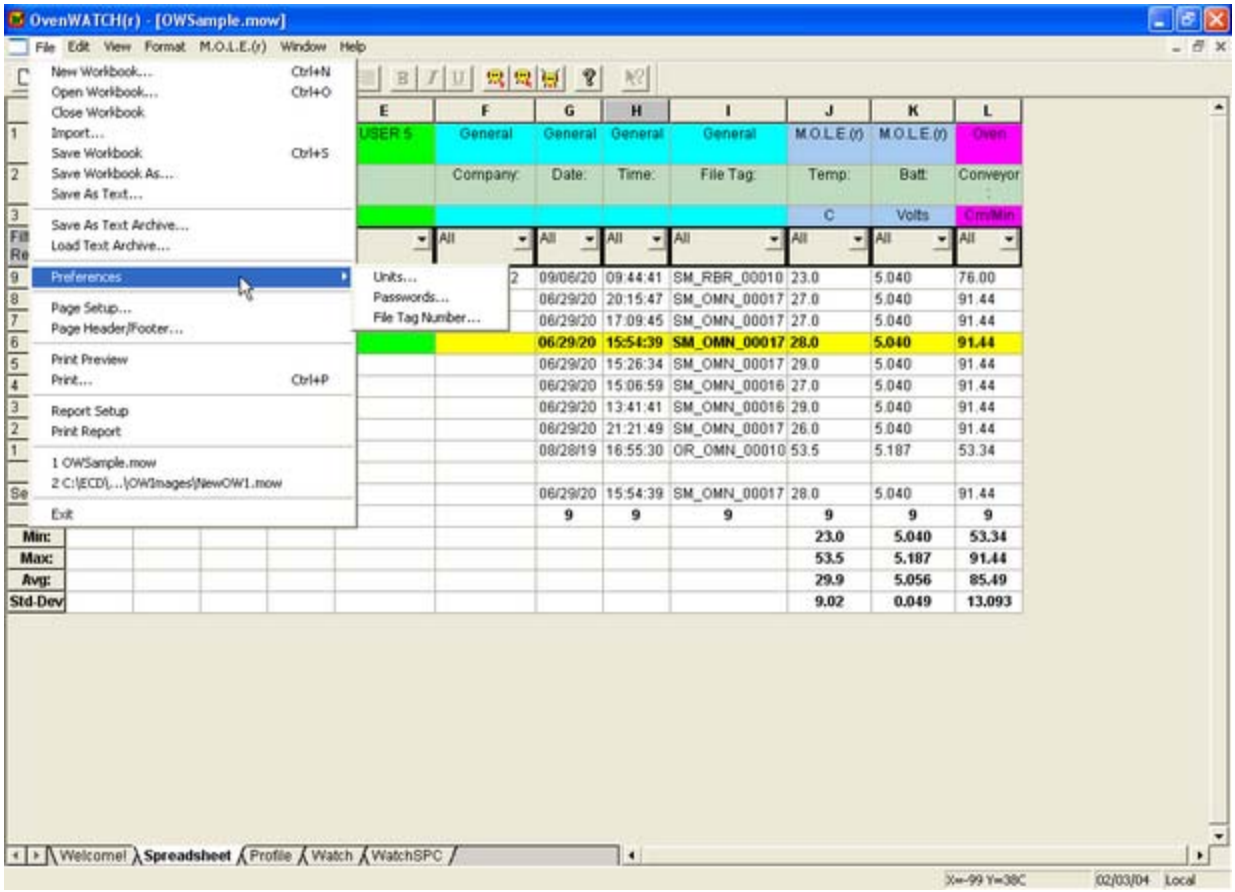


Load Text Archive List Box

To avoid loosing valuable data, it is recommended to load text archive files into a new workbook file because as previously stated, this command clears all currently loaded data.

5.1.10 Preferences

The Preferences sub-menu lets the user perform custom setup tasks for the software.



Preferences Menu

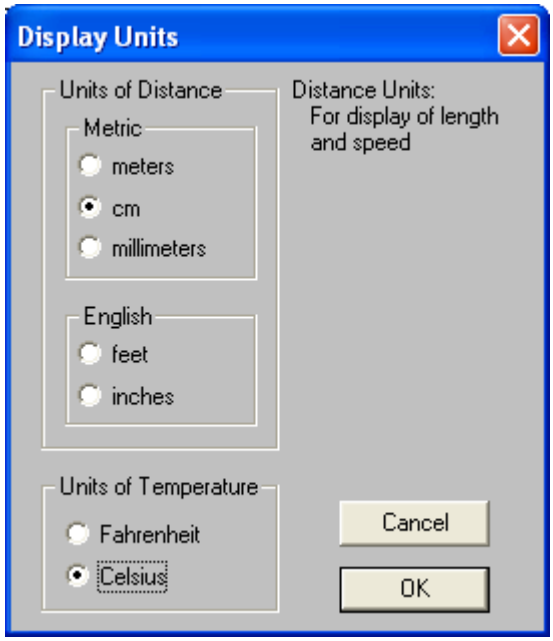
5.1.10.1 Units

The software can be configured to operate with different units of distance and temperature.

This command does not set the units reported by the M.O.L.E., it applies only to the software.

To change Units of Temperature or Distance Units:

1) Select the ***Spreadsheet*** worksheet.
2) On the ***File*** menu, point to ***Preferences***, and then click ***Units***.
3) Click the option button beside a unit of distance and/or unit of temperature.
4) Click the ***OK*** command button to use the choices as defaults whenever the software is started or ***Cancel*** to return to the worksheet without making any changes.



Units Configuration Window

5.1.10.2 Passwords

Some software commands are password protected for securing access. When a command is password protected, the user will not be able to access the command without proper password privileges.

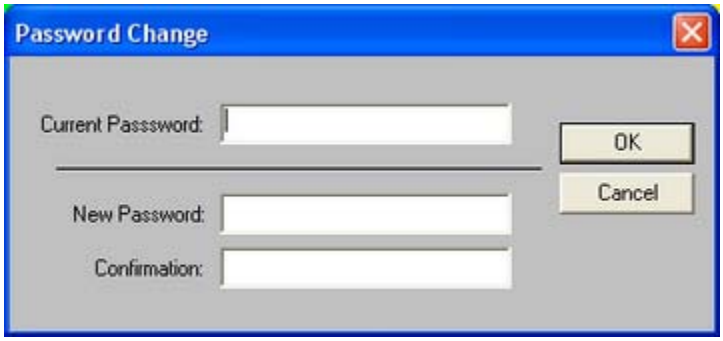
The password command works on a global basis. The password currently assigned applies to all existing or new workbook files.

To change a password:

1) Select the ***Spreadsheet*** worksheet.
2) On the ***File*** menu, point to ***Preferences*** and then click ***Passwords***. The Password protection dialog box appears.

Password Protection Dialog Box

3) Click the ***Change Password*** command button and the Password Change dialog box appears.



Change Password Dialog Box.

The software has a default password Admin. When the password is changed for the first time, Admin will need to be entered in the "Current Password" text box.

4) Enter current password in the ***Current*** Password text box.

5) Enter a new password in the ***New*** Password text box.

The software only accepts passwords with a minimum of 4 characters.

- Enter the new password again in the ***Confirmation*** text box and then click the ***OK*** command button to accept or ***Cancel*** to not change the password.

5.1.10.3 File Tag Number

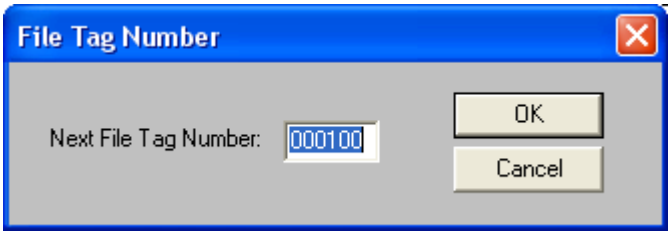
When data is uploaded from the M.O.L.E., the (***.MDM**) portion of the data run is automatically assigned a special File Tag number. The first two characters are automatically assigned **OW**. The next nine characters are the first nine characters from the User/Computer login name and the remaining six characters are in numerical sequence that can be specified by the user.

For example, if the User login name is "**JSMITH**", a File Tag number would be "**OW_JSMITH_000100.mdm**".

If there is no User login name available, the software will automatically assign the first nine characters from the Computer name (i.e. Production, Engineering). If both the User name and Computer name are not available "USER" will be assigned to the File Tag number (i.e. OW_USER_000100.mdm).

To change the File Tag number sequence:

1) Select the ***Admin*** worksheet.
2) On the ***File*** menu, point to ***Preferences***, and then click ***File Tag Number***.
3) A dialog box appears so a tag file number can be entered in the text box, or the number automatically assigned by the software can be used.



File Tag Number Dialog Box

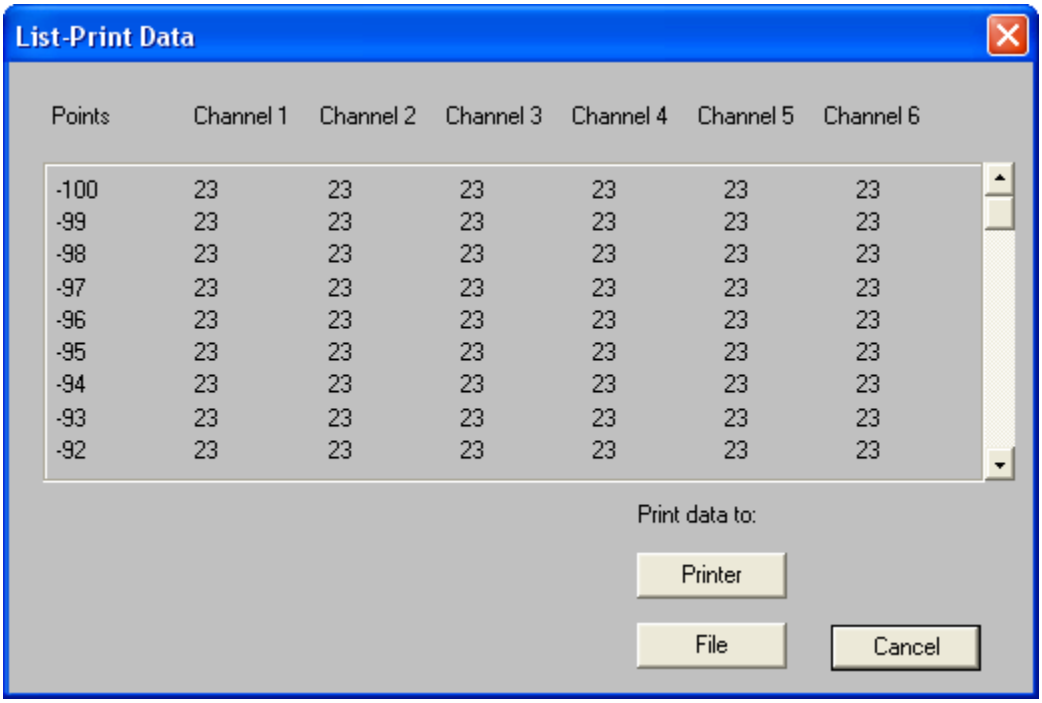
4) Click the ***OK*** command button to set the File Tag Number or click ***Cancel*** to close the window without changing the number.

If a file tag number is entered that currently exists, the (.MDM) file will be incremented automatically to avoid that file from being overwritten.

5.1.11 List-Print Data

The List-Print Data command is used to display the raw data used to graph the Data Plots and calculate the statistics. Use this command to display data on the screen or create a new file with a file extension of (**.PRN**) that can be opened with word processor, spreadsheet, or database programs.

The table of values that is displayed shows the X-value in the units currently set. The Negative X-values in the table indicate those that are to the left of the Process Origin in the Data Graph. The next six columns include the Y-value for the channels of data collected by the M.O.L.E. in °F or °C, depending on the currently set units.



List Print Data Dialog Box

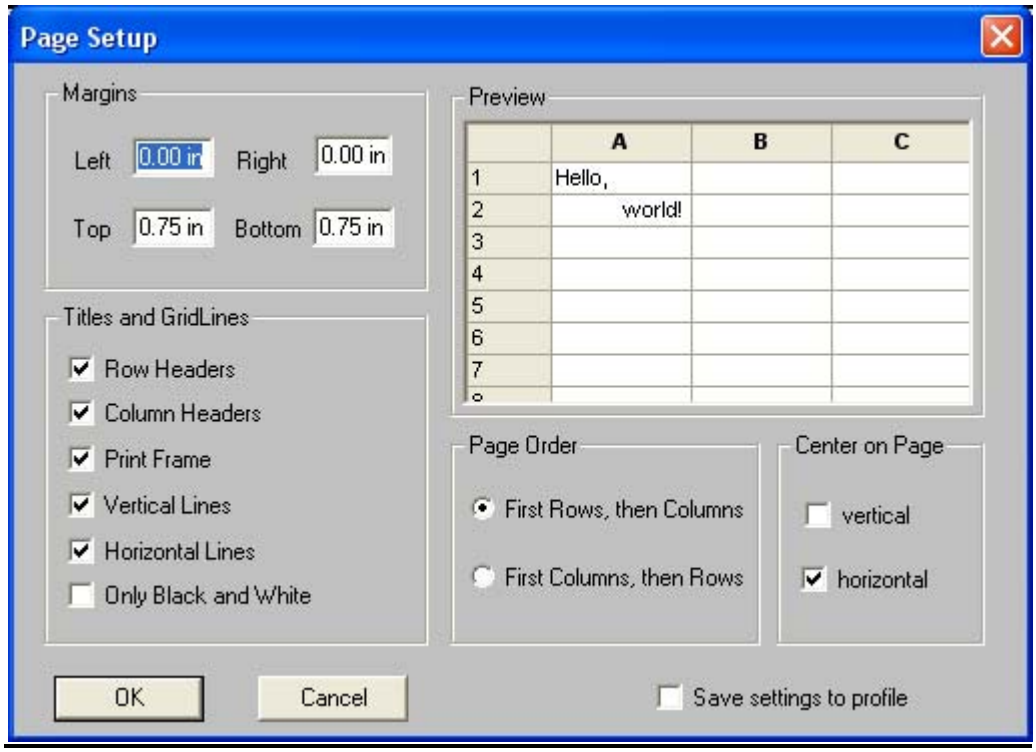
All or parts of the data can be List Printed by selecting a limited range of data to print. To do this, use the Magnify command from the Tools menu along with the List-Print command. Refer to ***Magnify Tool*** for details.

5.1.12 Page Setup

The Page Setup command sets page parameters for the Spreadsheet worksheet.

To set page parameters:

1) On the ***File*** menu, select ***Page Setup*** and the following dialog box appears.



Page Setup Dialog Box

2) Select desired parameters to apply to the worksheet.
3) Click the ***OK*** command button to use the current page setup selections.
4) Click the ***Cancel*** command button to leave the page setup command without changing anything.

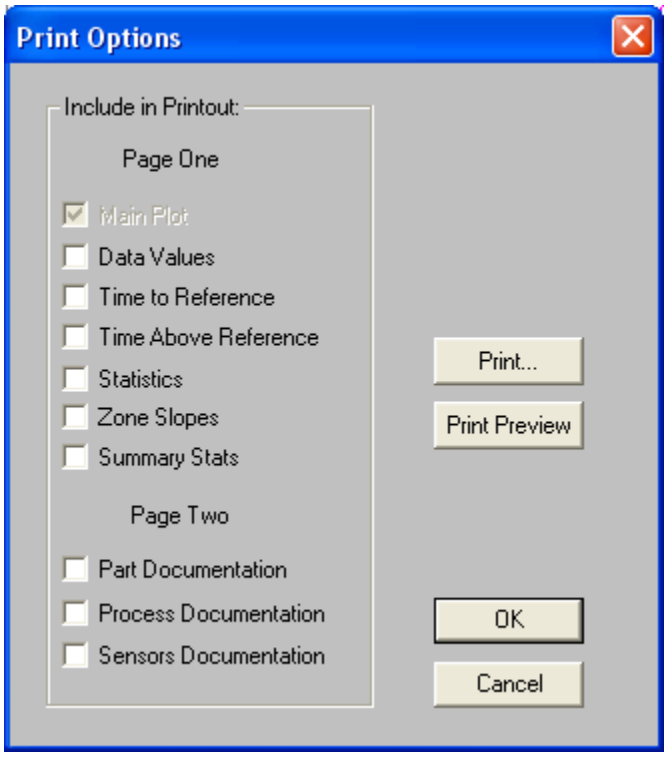
Selections made using the *Page Setup* command will not be visible on the worksheet it is only used for print formatting. To view the selections, use the *Print Preview* command described in *Print Preview*.

5.1.13 Print Options

The Print Options command is where additional Data Table statistics can be selected to be printed along with the Data Graph. Additional documentation can also be selected that will be printed on a second page.

To select print options:

1) On the ***File*** menu, select ***Print Options*** and the following dialog box appears.



Print Options Dialog Box

2) Click the check box beside desired Statistic(s) to be printed along with the Main Plot.
3) Click the check box beside desired documentation to be printed on a second page.

- Click the ***Print*** command button to close the print options process and initiate printing.
- Click the ***Print Preview*** command button to view the report appearance.

4) Click the ***OK*** command button to accept or ***Cancel*** command button to leave the print options command without making any changes.

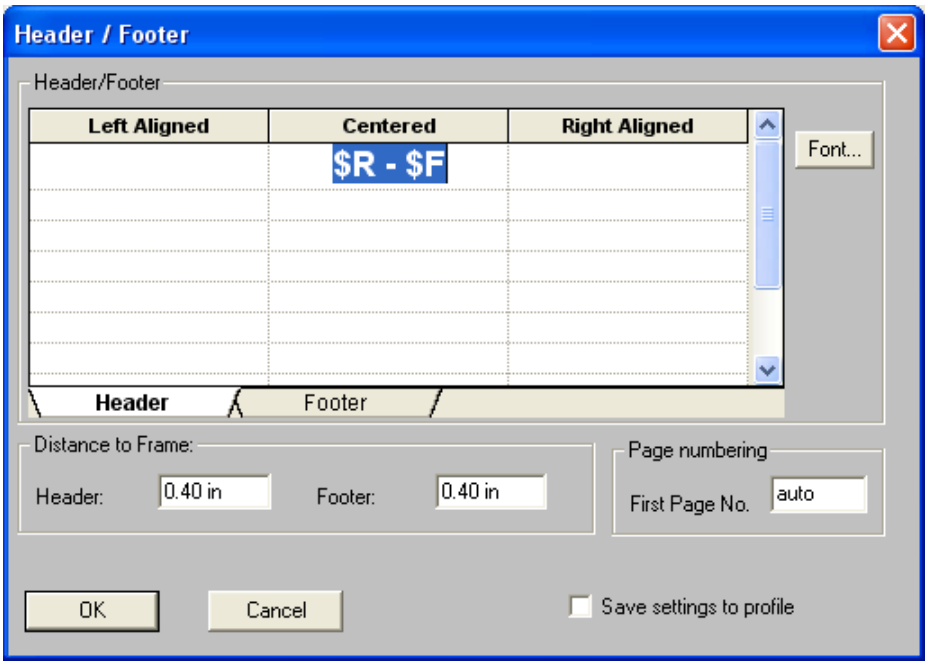
5.1.14 Page Header / Footer

The Page Header / Footer command places text on the top and bottom of the printed worksheet.

Some of the worksheets contain default information in the Header and Footer fields, to view use the Print Preview command. Refer to *Print Preview* for more information.

To add a Header and/or Footer

1) On the ***File*** menu, select ***Page Header/Footer*** and the following dialog box appears.



Header / Footer Dialog Box

2) Click the Header tab or the Footer tab.
3) Determine where to locate the text: left, center or right side of the worksheet. Click a text field and type the desired text.

- The user can also change the text font, distance the note is from the frame edges and type of page numbering.

4) Click the ***OK*** command button to accept the ***Header / Footer*** or click Cancel to return to the worksheet without changes.

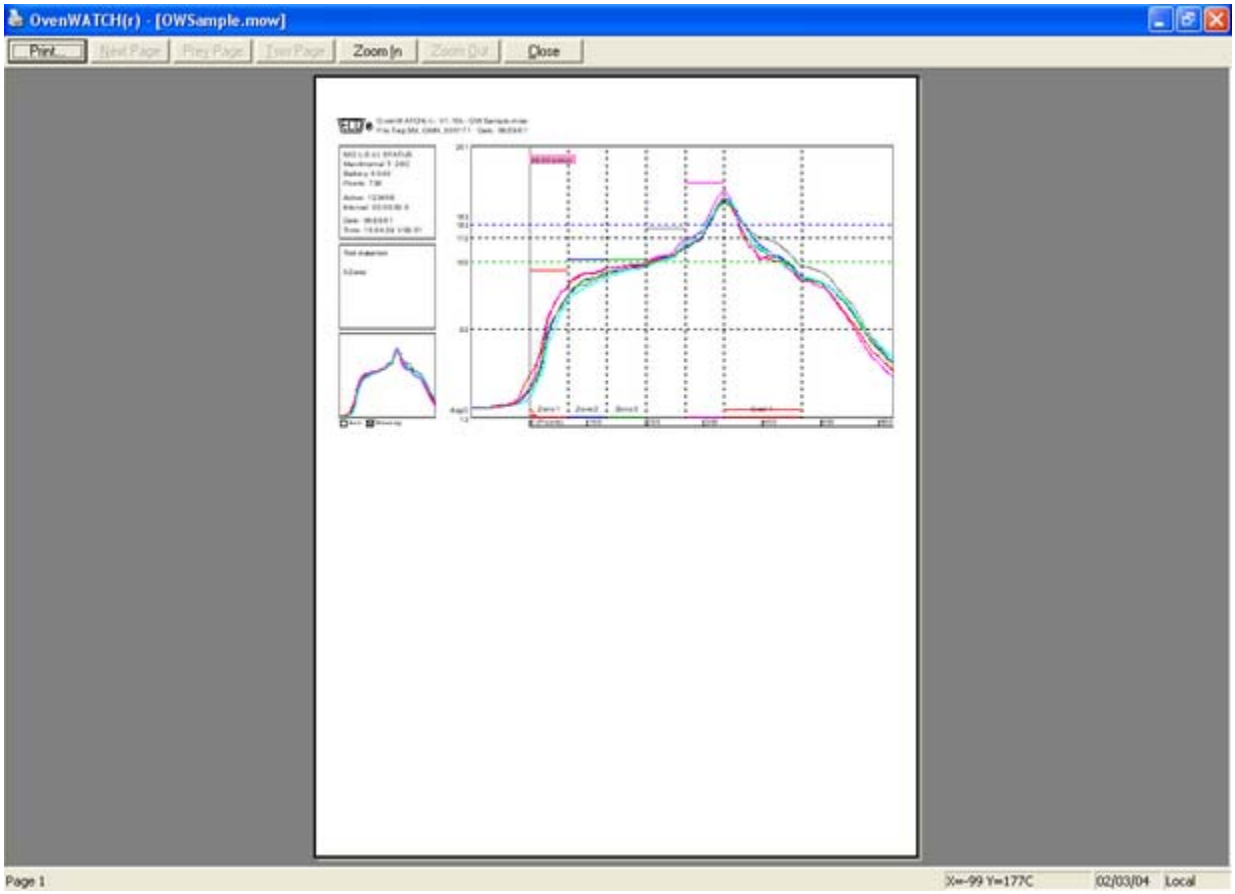
The Header / Footer information will not be visible on the worksheet. It is only used for printing. To view the Header / Footer information, use the Print Preview command. Refer to *Print Preview* for more information.

5.1.15 Print Preview

The Print Preview command shows a preview of the page(s) to be printed. This command is useful when confirming print options.

To view a print preview:

1) On the ***File*** menu, select ***Print Preview*** and the Print Preview window appears.



Print Preview Window

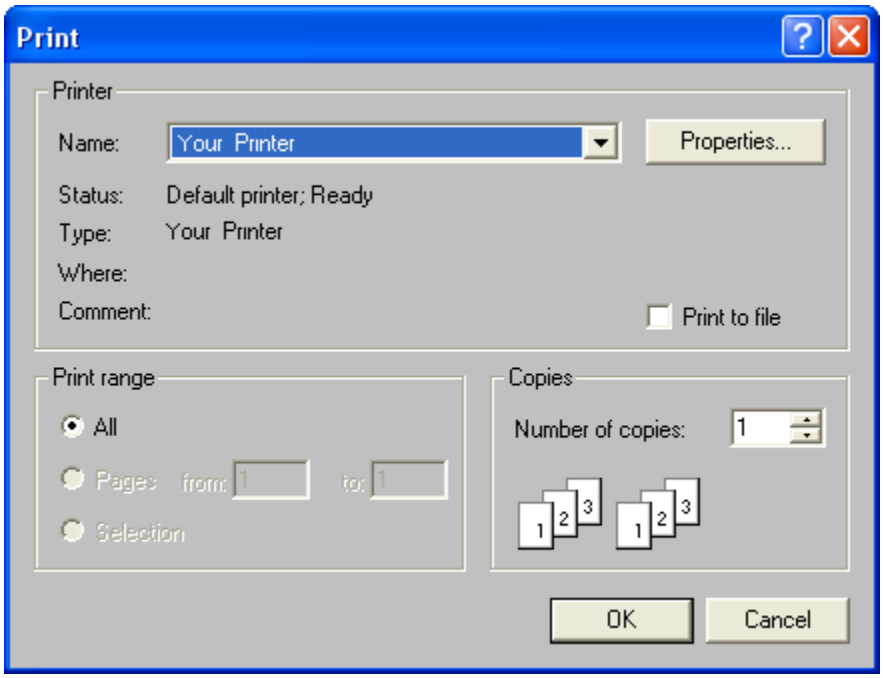
2) Click the ***Print*** command button to proceed with printing.
3) Click the ***Two-Page*** command button when there is more than one page in the report to view them side by side.
4) Click the ***Next Page*** or ***Prev Page*** command button to view other pages of a multiple page report.
5) Click the ***Zoom In*** command button to observe small details, and ***Zoom Out*** to restore.
6) Click the ***Close*** command button to close the Print Preview window.

5.1.16 Print

The Print command prints worksheet information from the workbook. The options that appear on the Print dialog box will depend on the type of printer and the installed printer driver.

To print a worksheet:

1) On the ***File*** menu, select ***Print*** and standard Windows or driver-dependent print dialog box appears.
2) Select desired print options.



Print Dialog Box

3) Click the ***OK*** command button to close the Print dialog box and initiate printing the worksheet.
4) Click the ***Cancel*** command button to close the print window without printing.

The Print command can be accessed on all worksheet Toolbars This command can also be used by pressing [***CTRL*** + ***P***].

Print Button

5.1.17 File Viewer

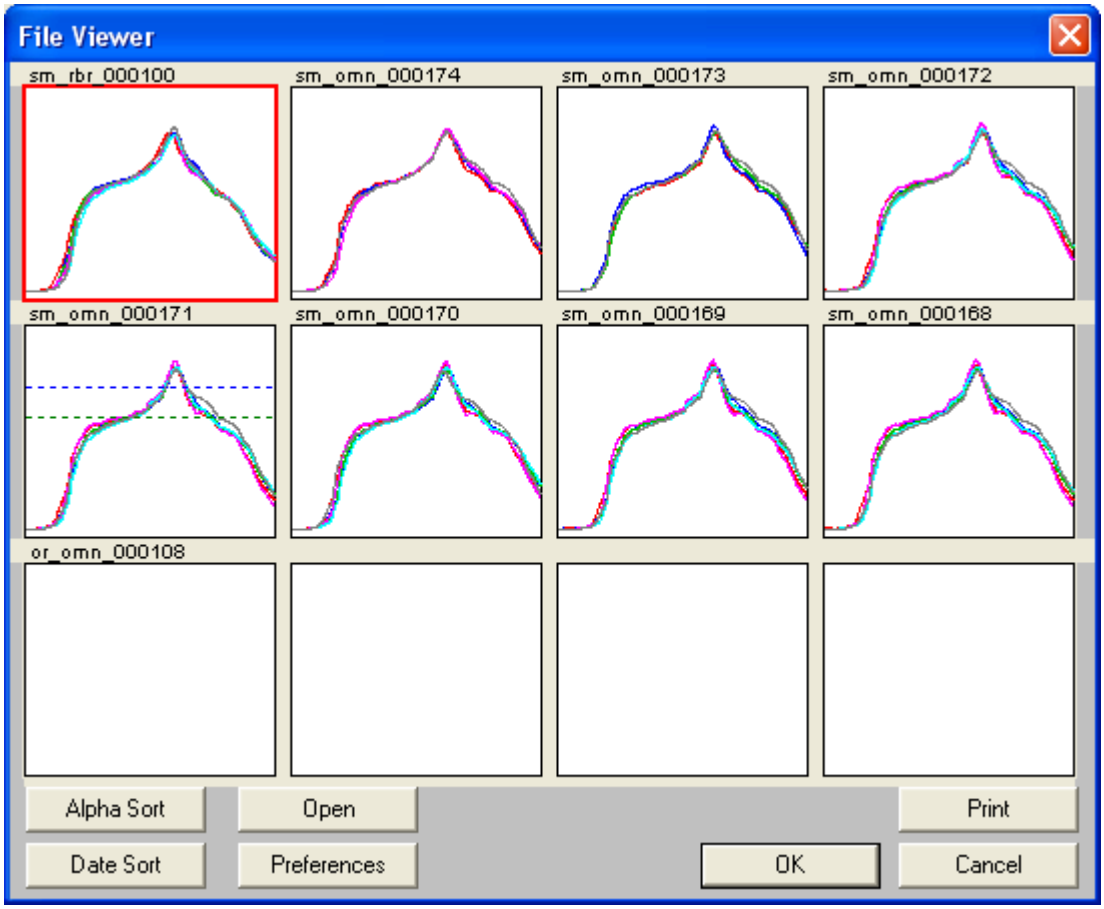
The File Viewer dialog box displays small thumbnail views of the graphical contents of up to 120 (***.MDM**) Profiles at one time.

To select a data run:

1) On the ***File*** menu, select ***File Viewer***.
2) Double click the desired thumbnail graph box and the data run will automatically be loaded into the Data graph on the Profile worksheet.

or

- Click a desired thumbnail graph box once then select the ***Open*** command button. This will load the data run into the Data graph on the Profile worksheet.



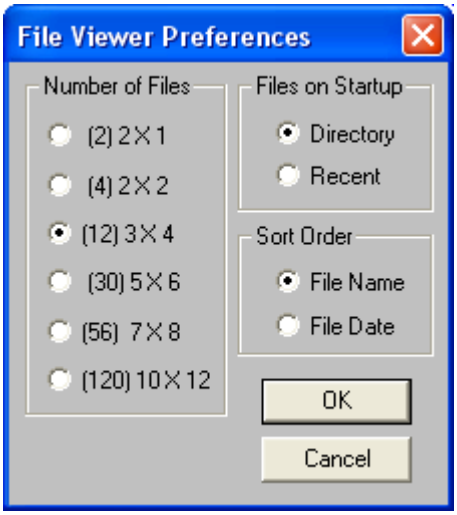
File Viewer Window

How the data runs are displayed can be selected by pressing the command buttons on the lower end of the dialog box. The user may select command buttons to ***Alpha Sort*** (by name) or ***Date Sort*** (by date profiled).

Clicking on a selected graph and then dragging it to another location within the selected grid may also arrange the thumbnail graphs. When it is being moved to a new location, a dashed box appears around the graph. Changing the arrangement in this manner is temporary and the thumbnail graphs will return to the default locations when the dialog box is closed.

To change the thumbnail display:

1) Click the ***Preferences*** command button to set the grid arrangement to display from 2 to 120 graphical files.
2) Click the appropriate ***Number of Files*** option button to make a selection.



File View Dialog Box

There are two choices to display data runs on Startup. Select the ***Directory*** option button and all of the profiles in the current workbook file will be displayed. If the ***Recent*** option button is selected, the last four files saved since the last time the program was exited, will be displayed.

There are also two choices on the Sort Order. If the ***File Name*** option button is selected, all of the files will be sorted by alpha name. If the ***File Date*** option button is selected, all of the files will be sorted by the date of the data run.

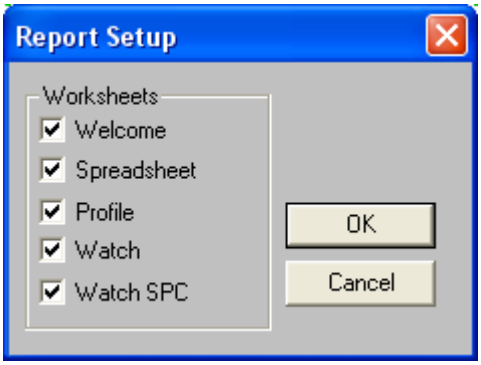
When new selections have been made, use the ***Set*** command button to save the preferences as default before pressing the ***OK*** command button.

5.1.18 Report Setup

The workbook file can be printed in a Report style. Use this command to configure which worksheets are to be included.

To setup a report:

1) On the ***File*** menu, select ***Report Setup*** and the Report Setup dialog box appears.



Report Setup Dialog Box

2) Click the check box(es) to enable the worksheet(s) to be printed.
3) Click the ***OK*** command button to accept the selection(s) and return to the worksheet, or click ***Cancel*** to return to the worksheet without any changes.

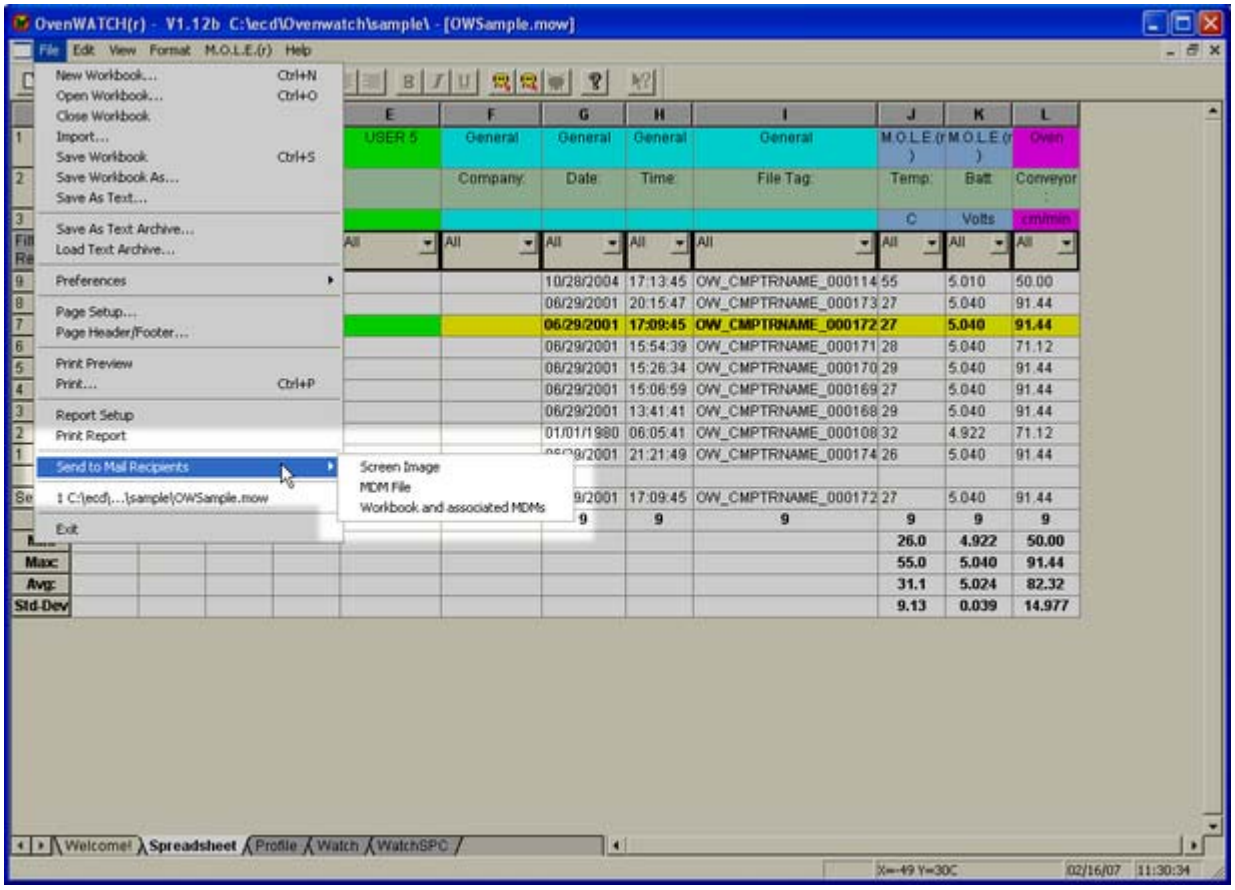
5.1.19 Print Report

To print a report:

1) On the ***File*** menu, select ***Print Report*** to print the selected worksheets from the Report Setup dialog box as discussed in ***Report Setup***.

5.1.20 Send to Mail Recipients

The Send to Mail Recipients sub-menu commands let the user send a Screen image, MDM, or Workbook and associated MDM's to an email recipient. This command is useful when the user would like to share profiles and/or workbooks with other locations or when troubleshooting problems.



Preferences Menu

To send:

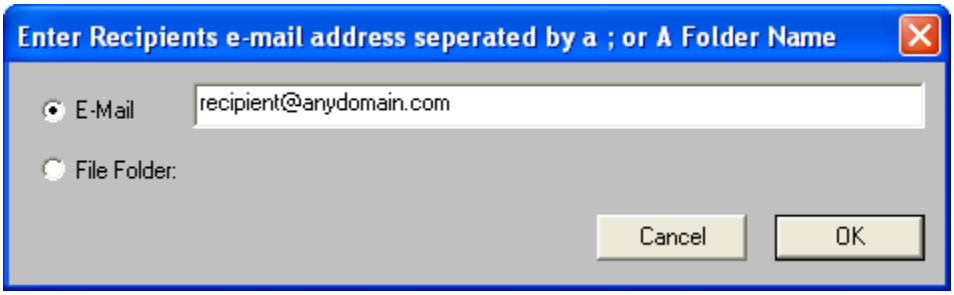
1) Launch an email program (i.e. Outlook, Firefox, Endora).
2) Select the desired email command described below:

- On the ***File*** menu, point to ***Send to Mail Recipients*** and then select ***Screen Image*** to capture the current displayed worksheet screen.

When selecting the Screen Image command, the software captures the current screen image where the command is activated and converts it into a Bitmap (filetag.bmp) file.

- On the ***File*** menu, point to ***Send to Mail Recipients*** and then select ***MDM*** File to send the MDM file from the currently selected data run.
- On the ***File*** menu, point to ***Send to Mail Recipients*** and then select ***Workbook and associated MDM's*** to send the current Workbook and associated MDM files.

3) Enter an email address in the email text box and select the ***OK*** command button to send the file and return to the worksheet where the command was activated.



Enter Recipients

When sending files the email program may display an message dialog that informs the user that it is sending the email.

5.1.21 Recent Files 1, 2, 3, etc...

The most recently loaded workbook file names are displayed at the bottom of the File menu. To open one of these files, click the name of the desired workbook file or press the appropriate number beside it.

5.1.22 Exit

To exit the program:

1) On the ***File*** menu, select ***Exit*** to quit the program. A message box will prompt the user to save changes. If the user decides to save the changes, all data and configuration changes will be saved with the workbook file.

5.2 Edit Menu

The Edit menu commands enable the user to modify the data set on the Spreadsheet and Admin worksheets so the most beneficial data is assembled in the workbook file.

5.2.1 Undo

To undo a command:

1) On the ***Edit*** menu, select ***Undo*** to undo any previous action. For example if the filter command is used and then the user decides that command was not necessary, the Undo command will restore it back to its original format.

The Undo command can be accessed on the Toolbars of the Spreadsheet and Admin worksheets. This command can also be used by pressing [***CTRL*** + ***Z***].

Undo Button

5.2.2 Redo

To redo a command:

1) On the ***Edit*** menu, select ***Redo*** to restore the action made by using the Undo command. Like Undo, the user can use Redo to restore all of the Undo actions.

The Redo command can be accessed on the Toolbars of the Spreadsheet and Admin worksheets. This command can also be used by pressing [***CTRL*** + ***R***].

Redo Button

5.2.3 Copy

To copy data:

1) Highlight data in a Spreadsheet cell(s)
2) On the ***Edit*** menu, select ***Copy*** to copy the data in the selected Spreadsheet cells for pasting into other user definable cells or different programs.

This command can also be used by pressing [***CTRL*** +***C***].

5.2.4 Paste

To paste data:

1) Select a user definable cell.
2) On the ***Edit*** menu, select ***Paste*** to insert collected data.

This command can also be used by pressing [***CTRL*** +***V***].

5.2.5 Remove Row

To remove a row:

1) On the ***Edit*** menu, select ***Remove Row*** to remove a data run row that is not wanted. This command is helpful when data has been collected and the user feels it is not beneficial to the workbook data set or has a corrupted (***.MDM**) file.

This command permanently removes the user configurable data. However, the associated (.MDM) file will not be deleted and can be retrieved using the Import command. Refer to *Import* for more information.

5.2.6 Hide Row

To hide a row:

1) On the ***Edit*** menu, select ***Hide Row*** to exclude a row without eliminating it completely from the workbook file. This command is similar to the filter function, and is helpful when data has been collected and it may not be beneficial to the data set. To restore hidden data set row(s) click the Red ***Filter Reset*** button located on the Spreadsheet worksheet. Refer to ***Filters*** for more information.

5.3 View Menu

The View menu commands enable the user to manipulate which areas are viewed on the worksheet display.

The dimmed menu commands are used in other worksheets.

5.3.1 Toolbar

To display or hide the toolbar:

1) On the ***View*** menu, select ***Toolbar*** to activate or deactivate the toolbar. When the Toolbar is deactivated, more of the worksheet area appears on the PC display. When there is a checkmark beside the Toolbar command it is activated and when the checkmark is not there it is deactivated.

5.3.2 Status Bar

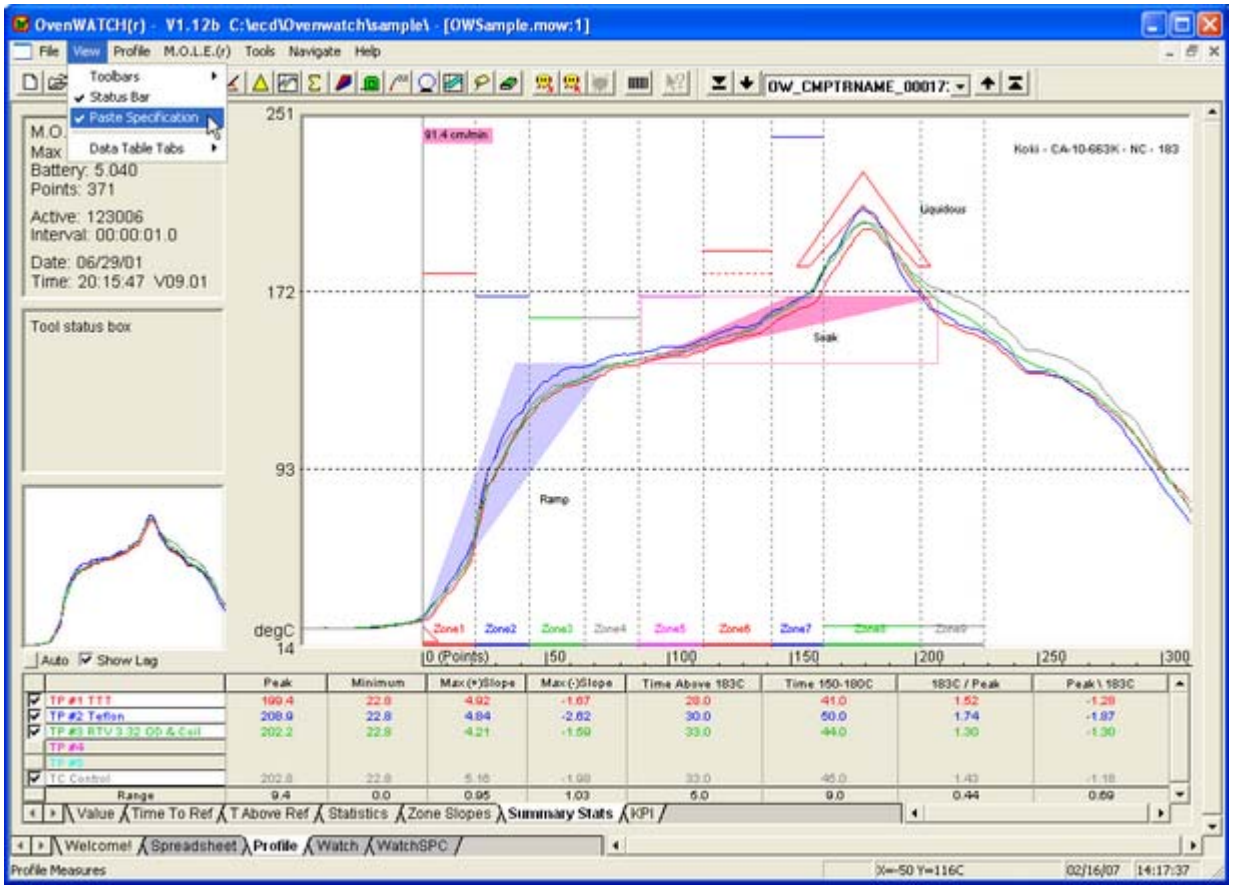
To display or hide the status bar:

1) On the ***View*** menu, select ***Status bar*** to activate or deactivate the Status bar on the bottom of the worksheets. When the Status Bar is deactivated, more of the worksheet area appears on the PC display. When there is a checkmark beside the Status bar command it is activated and when the checkmark is not there it is deactivated.

5.3.3 Paste Specification

To view the paste specification:

1) On the ***View*** menu, select ***Paste Specification*** to display the paste specification on the Data Graph of the Profile worksheet. When the paste specification is displayed a check mark appears beside the command on the menu.



Paste Specification

5.3.4 Data Table Tabs

To display or hide data table tabs:

1) On the ***View*** menu, point to ***Data Table Tabs*** select a tab name to display or hide the Data Table tabs on the Profile worksheet. When a Data Table tab is displayed a check mark appears beside the command on the menu.

5.3.5 Zoom In

To zoom in:

1) On the ***View*** menu, select ***Zoom In*** to make the current worksheet view larger. The Zoom In command has the capability to zoom in multiple times. When the maximum zoom level has been reached the Zoom In command will be dimmed.

The Zoom In command can be accessed on all worksheet Toolbars excluding the Profile worksheet. This button will speed up the Zoom In process if multiple zooms are desired.

Zoom In Button

5.3.6 Zoom Out

To zoom out:

1) On the ***View*** menu, select ***Zoom Out*** to make the current worksheet view smaller. The Zoom Out command has the capability to zoom out multiple times. When the minimum zoom has been reached the Zoom Out command will be dimmed.

The Zoom Out command can be accessed on all worksheet Toolbars excluding the Profile worksheet. This button will speed up the Zoom Out process if multiple zooms are desired.

Zoom Out Button

5.3.7 100%

To zoom to 100%:

1) On the ***View*** menu, select ***100%*** to return the worksheet to its default display size.

The 100% command can be accessed on all worksheet Toolbars excluding the Profile worksheet.

100% Button

5.4 Format Menu

The Format menu includes commands that change the layout or pattern of the text in user configurable cells.

5.4.1 Bold

To make text bold:

1) On the ***Format*** menu, select ***Bold*** to turn data in a user configurable cell **bold**. Select the Bold command again to return to standard format.

The Bold command can be accessed on the Toolbar of the Spreadsheet and Admin worksheets.

5.4.2 Italic

To make text italic:

1) On the ***Format*** menu, select ***Italic*** to turn data in a user configurable cell *italic*. Select the Italic command again to return to standard format.

The Italic command can be accessed on the Toolbar of the Spreadsheet and Admin worksheets.

5.4.3 Underline

To underline text:

1) On the ***Format*** menu, select ***Underline*** to underline data in a user configurable cell. Select the underline command again to return to standard format.

The Underline command can be accessed on the Toolbar of the Spreadsheet and Admin worksheets.

Underline Button

5.4.4 Alignment (Left, Center, Right)

To align text:

1) On the ***Format*** menu, select ***Left***, ***Center*** or ***Right*** to align data in a user configurable cell.

The alignment commands can be accessed on the Toolbar of the Spreadsheet worksheet.

Alignment Buttons (*Align Left, Center, and Align Right*)

5.5 Profile Menu

The Profile menu includes special commands specifically used on the Profile worksheet. Commands in this menu enable the user to view and edit experimental documentation, change the appearance of the display and design experiments.

The dimmed menu commands are used in other worksheets.

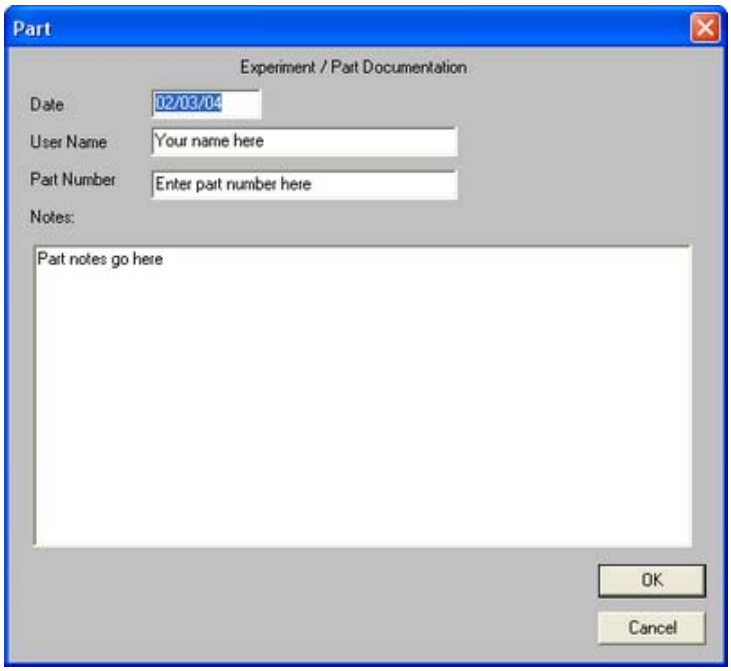
5.5.1 Part

Part documentation is information about the part being profiled. There are also fields for entering the date the data was recorded, a user name, part number or identification of the component being profiled.

To enter Part documentation:

1) On the ***Profile*** menu, select ***Part***.
2) Enter part documentation.
3) Click the ***OK*** command button accept or ***Cancel*** to exit without adding any information.

The part date field automatically updates when reading data from the M.O.L.E.

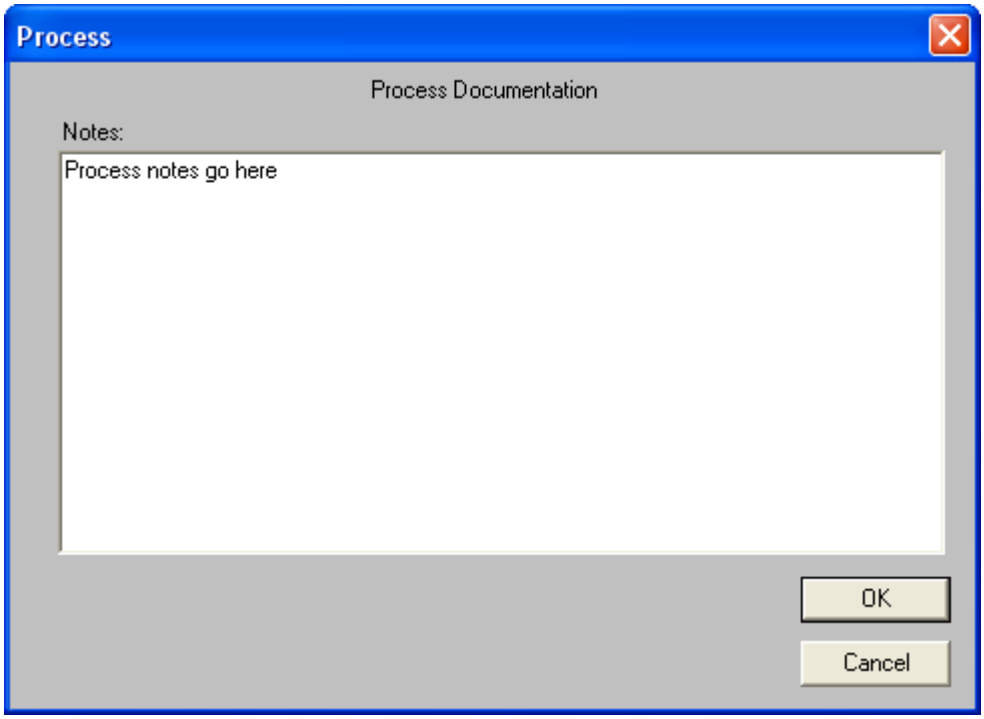


Part Dialog Box

5.5.2 Process

To enter process information:

1) On the ***Profile*** menu, select ***Process*** to enter and edit information about the process that generated the profile data.
2) Click the ***OK*** command button accept or ***Cancel*** to exit without adding any information.

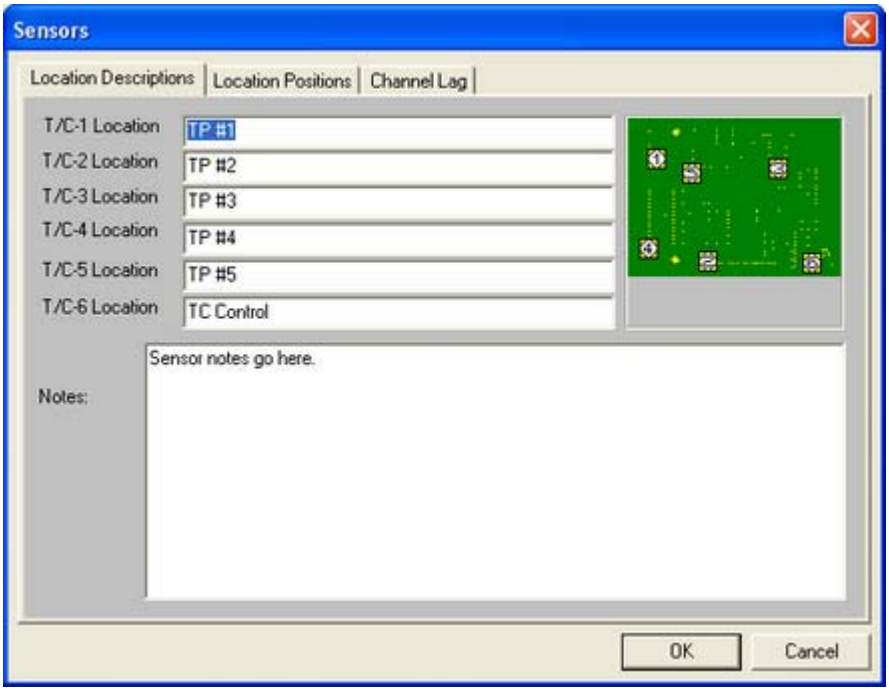


Process Dialog Box

5.5.3 Sensors

To enter sensor information:

1) On the ***Profile*** menu, select ***Sensors*** to enter and edit information about the sensor locations that are used to generate the profile data. The Thermocouple placement information entered in the ***T/C-Location*** cells are also displayed as the ***Sensor Locations*** in the Data Table.



Sensor Location Descriptions

2) Select the ***Location Positions*** tab to enter sensor location options. The sensor location options record the actual physical locations of the sensors, board size and appearance information.

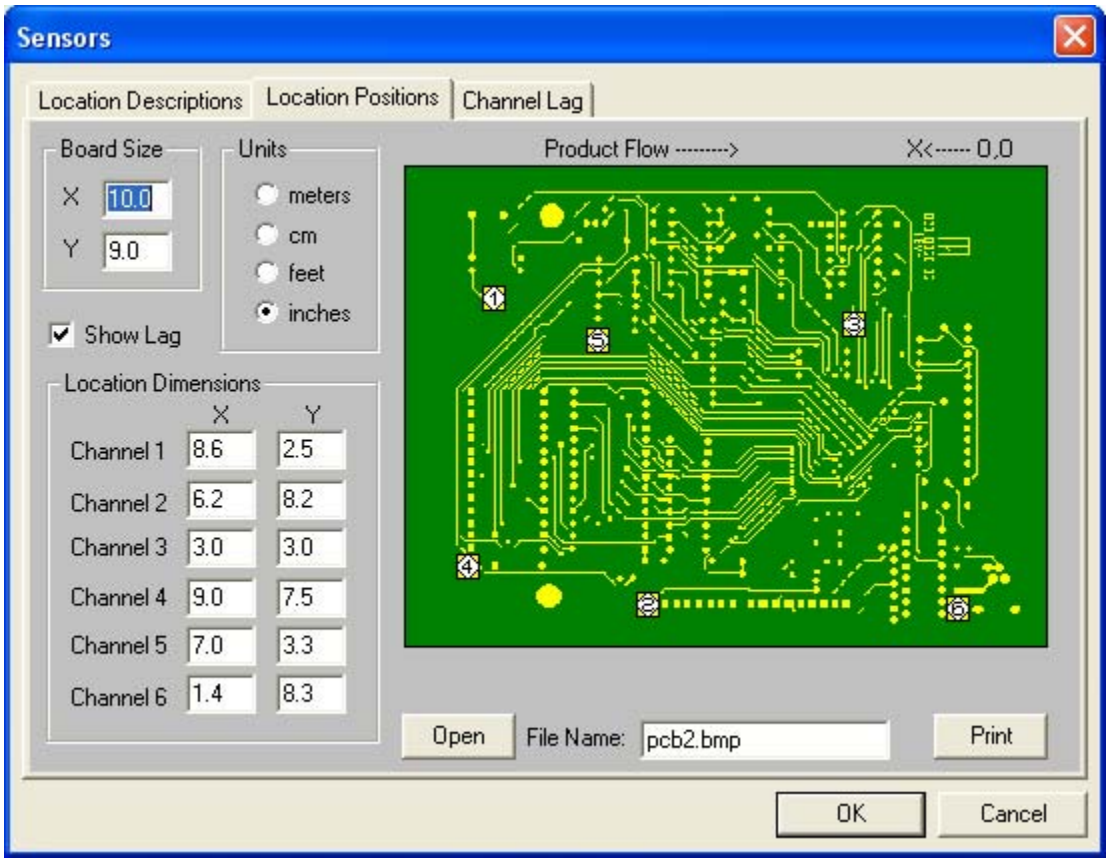
   Location dimensions can also be entered in a number of unit types. Locations can be entered by typing in dimensions, or by dragging the sensor locations around on the image. Note that X-dimensions are measured from the leading (right) edge or the first edge to enter the process, and Y dimensions are from the top down.

3) Click the ***OK*** command button accept or ***Cancel*** to exit without adding any information.

X-dimensions, are also the same dimensions that are used by the Channel Lag command to re-align the profile lines if Lag is enabled. Refer to *Scaling* for more information.

To select an image:

1) On the ***Sensors*** dialog box, select the ***Open*** command button to add or change the image file. When this field is activated, a list box appears prompting the user to select an image file. The image files supported by the software are Dib-(.dib), Gif (.gif), Pcx (.pcx), Tiff (.tif), Targa (.tga), Bitmap (.bmp) and Jpeg (.jpg).



Sensor Location Positions

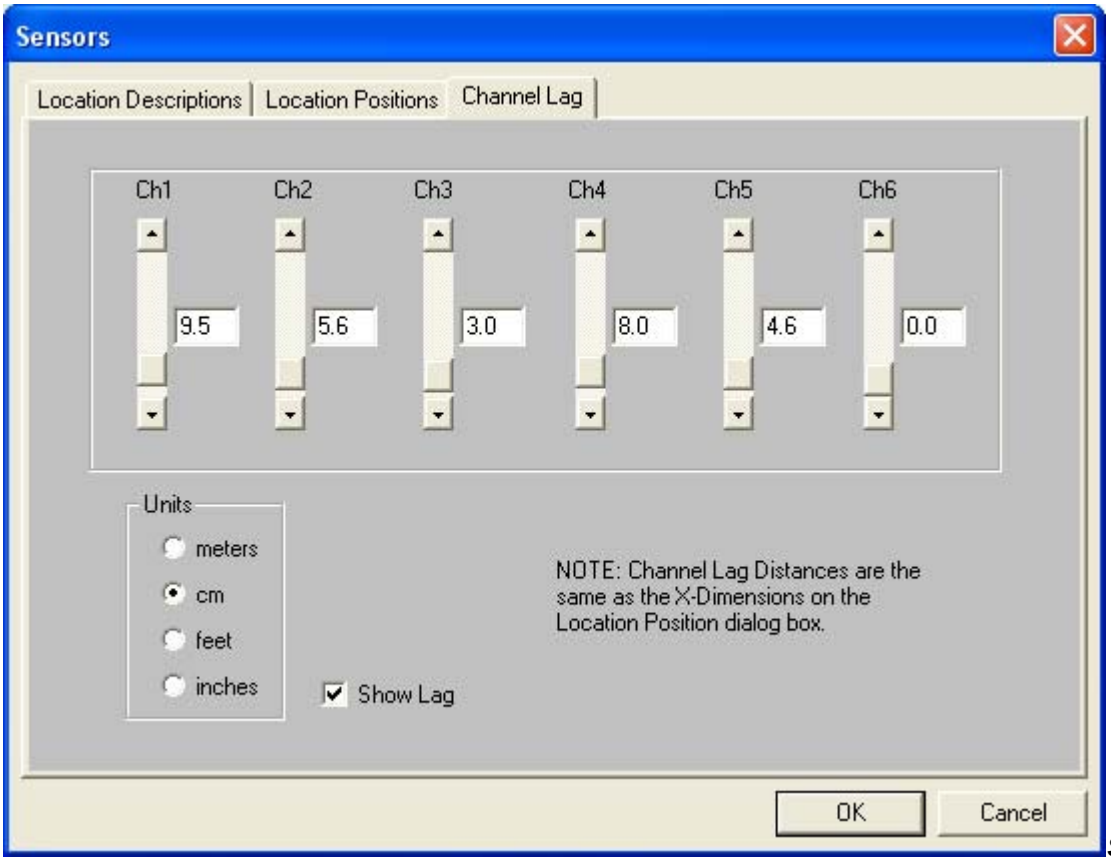
2) Click the ***OK*** command button to accept the additions/changes or click ***Cancel*** to return to the Profile worksheet without making any additions/changes.

Once an image (picture) is selected, copy of that image is added to the "Images" folder. This enables the user to easily locate any image or logo files.

To enter a channel lag:

1) On the ***Sensors*** dialog box, select the ***Channel Lag*** tab to enter the difference between the distance from one sensor to another along a conveyorized system.

Channel Lag dimensions, are also the same dimensions that are used by the Location Positions options as X-Dimensions.

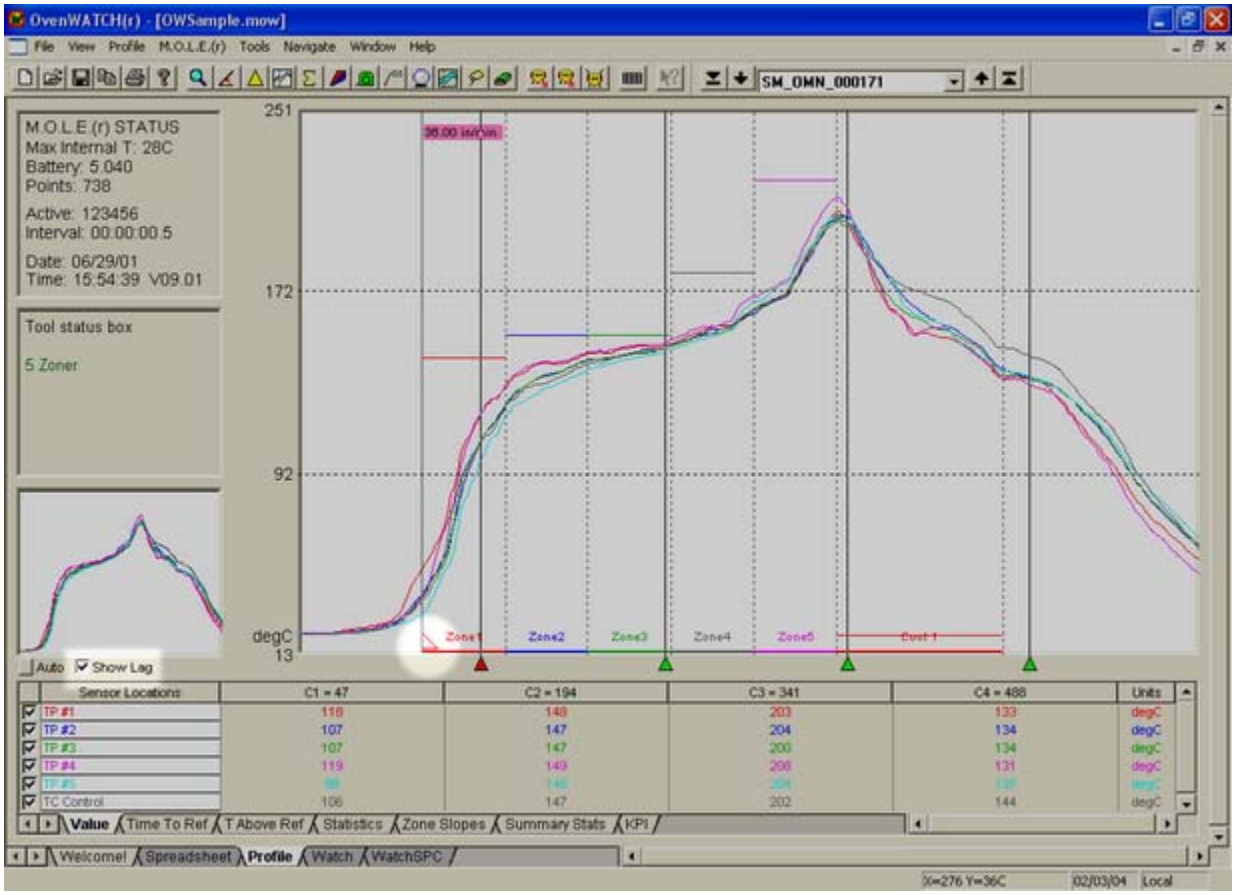


Sensor Channel Lag

2) On the dialog box, ***CH1*** through ***CH6*** represent each channel attached to the M.O.L.E. Click an option button beside an unit of measure and then enter the distance between sensors.

   If sensors are placed along a line in a process so they enter and exit oven zones at different times, the resulting Data Plots lag behind one another. The software uses channel lag information entered here to align the Data Plots so the results can be easily compared during analysis.

3) To enable the ***Channel Lag*** command, click the ***Show Lag*** check box. When the ***Channel Lag*** command is enabled, a small triangle appears on the lower end of the process origin line.



Channel Lag Indicator

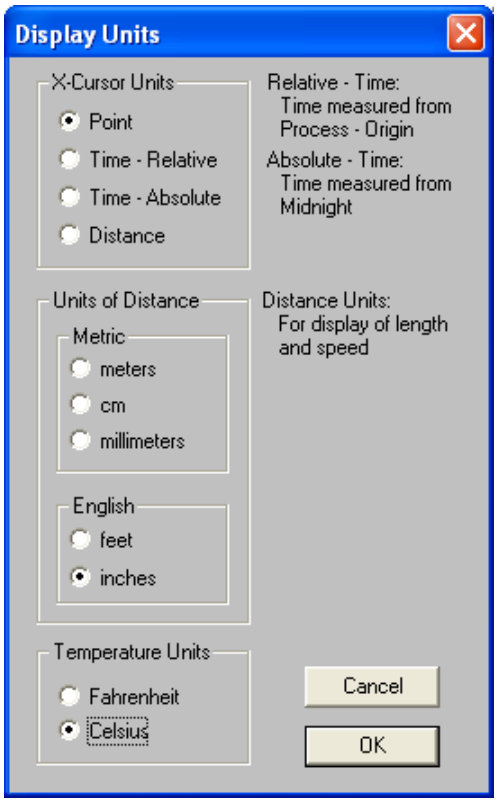
4) Click the ***OK*** command button to return to the Profile worksheet using the new settings or ***Cancel*** to return making no changes.

5.5.4 Units (X-Axis)

The Units command is where the unit type for the X-axis is selected.

To select a X axis unit:

1) On the ***Profile*** menu, select ***Units*** and the Display Units dialog box appears.



Units Dialog Box

2) Click the option button beside ***Point***, ***Time-Relative***, ***Time-Absolute*** or ***Distance*** to select the units for the X-axis.

- **Point:** the data points collected from the Process-Origin.
- **Time-Relative:** Time measured from the Process-Origin
- **Time-Absolute:** Time of day
- **Distance:** Distance from the Process Origin (Meters, Centimeters, Feet or Inches).

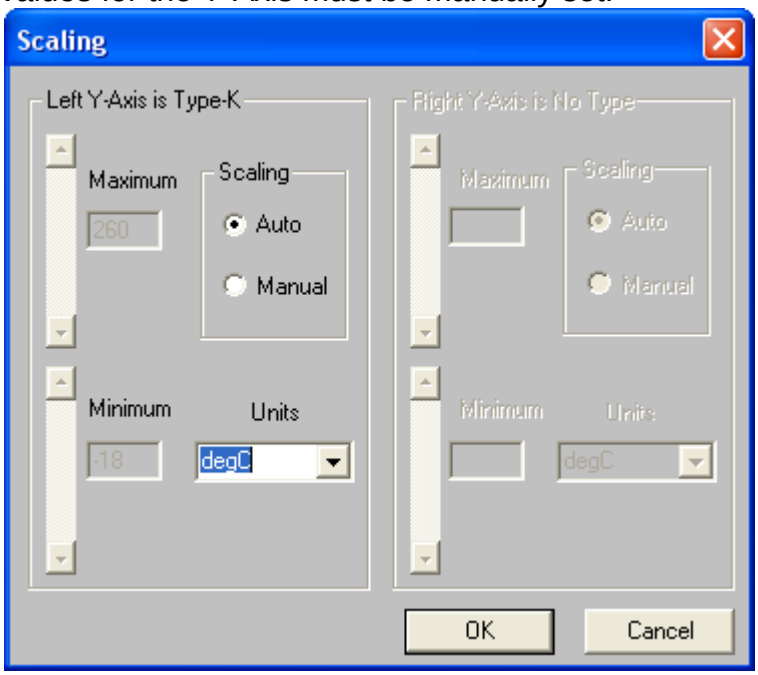
3) Click the option button beside a unit of distance.
4) Click the ***Celsius*** or ***Fahrenheit*** option button to represent the degrees for the Y-axis.
5) Click the ***OK*** command button to return to the Profile worksheet using the new settings or ***Cancel*** to make no new changes.

5.5.5 Scaling

The Scaling command controls the scale of the X and Y axis units of the Data Graph on the Profile worksheet.

To use the scaling command:

1) On the ***Profile*** menu, select ***Scaling*** and the scaling dialog box appears. This dialog box identifies the current settings of the displayed Y-axis units and the maximum and minimum values of the Y-axis.
2) Select between ***Auto*** or ***Manual*** mode. In Auto mode, the software selects the scale of the Y-Axis to ensure all Data Point values and the highest Zone temperature settings are visible in the Data Graph. In Manual mode, the range of values for the Y-Axis must be manually set.



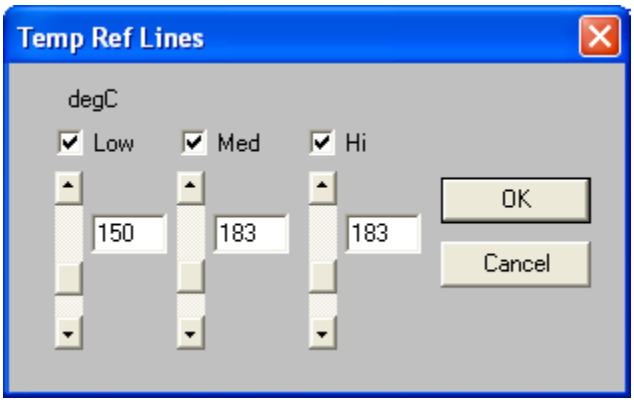
Scaling Dialog Box

3) Click the ***OK*** command button to use the new settings or ***Cancel*** to return to the Profile worksheet with no changes.

The Scaling command is not available if the Data Graph has been magnified.

5.5.6 Temp Ref Lines (Temperature reference lines)

Temperature reference lines are colored horizontal lines and can be positioned anywhere within the range of Y-values in the Data graph on the Profile Worksheet using the ***Temp Ref Lines*** command in the ***Profile*** menu.



Temp Ref Lines Dialog Box

The Temp Ref Lines dialog box identifies the units of the Y-axis and the current values of any Temperature reference lines in the Data graph. Temperature reference lines can be added or changed at any time and must be created before the T Above Ref statistic will produce valid data in the Data table.

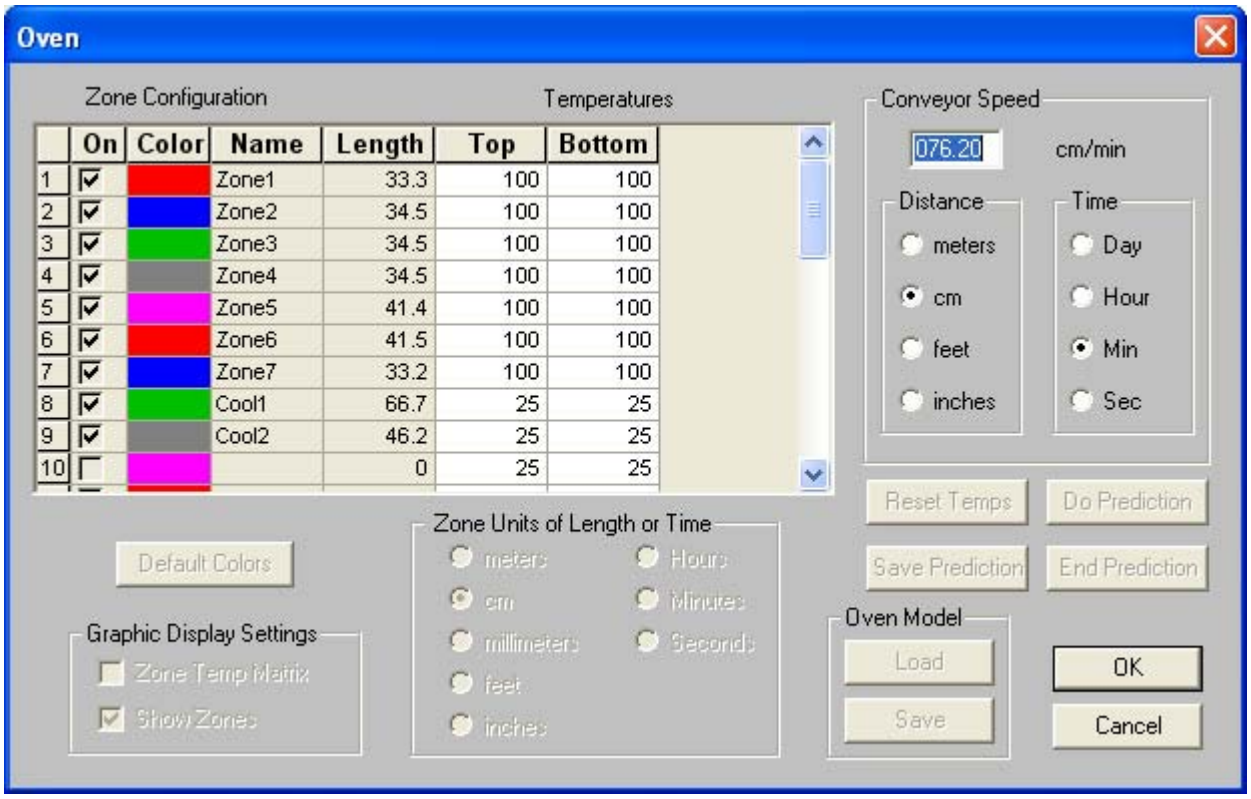
The Temperature reference lines on the Watch worksheet are derived from the Paste specification of the selected product and are automatically displayed on the Data graph.

To add Temperature Reference Lines to the Data Graph:

1) On the ***Profile*** menu, select ***Temp Ref Lines***.
2) Click the check box above ***Low***, ***Med***, or ***Hi*** to draw that line in the graph.
3) Enter Y-axis value(s) by adjusting the slider position or typing it in the text box.
4) Click the ***OK*** command to return to the Profile worksheet using the new settings or ***Cancel*** to not make any changes.

5.5.7 Oven Configure

The Oven Configure command includes options that display details of the experiment and establish analysis criteria. These options also enable the user to create a model of an ideal process that the software uses to create baseline profiles.



Oven Configure Dialog Box

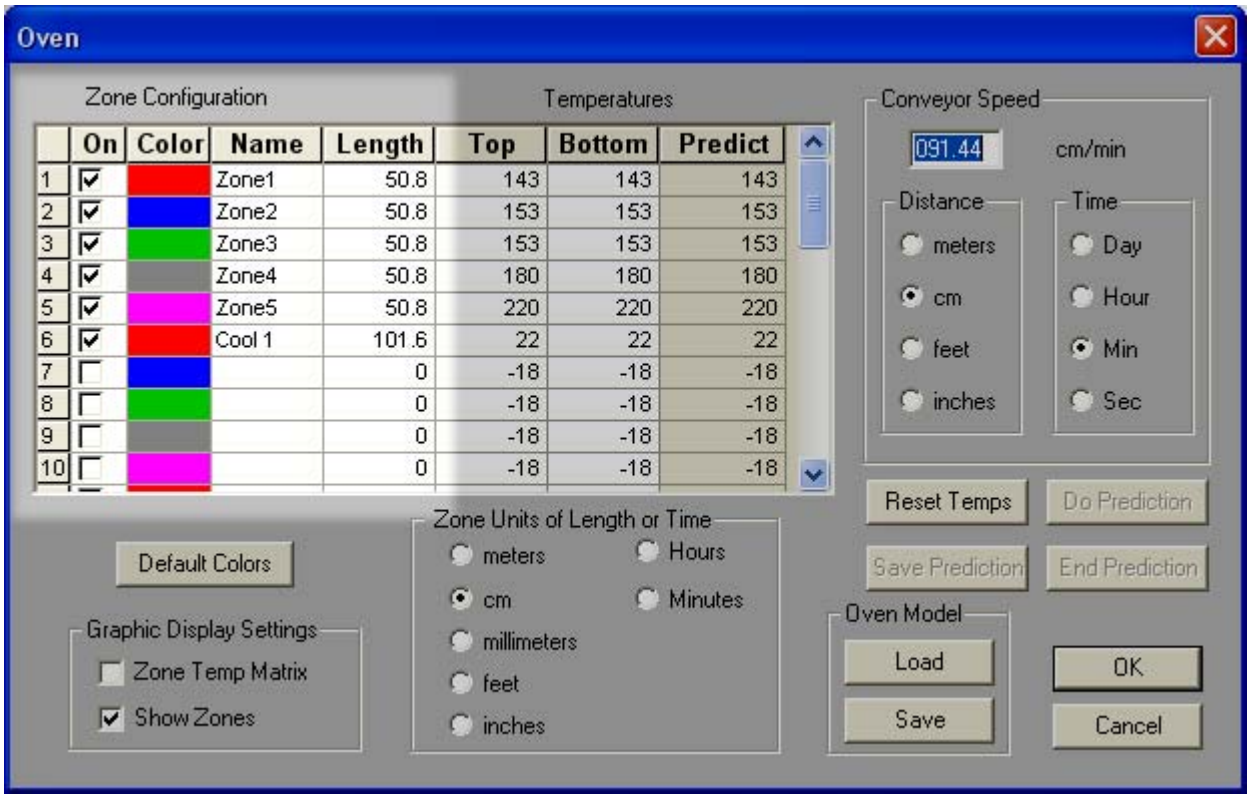
The following information describes the options on the Oven Configure dialog box to assist the user when configuring an oven.

The software automatically populates the amount of Zones, names and lengths.

5.5.7.1 Zone Configuration

The Zone Configuration portion of the Oven Configuration dialog box defines the number of zones activated; color, name and length for each desired Zone.

The software automatically populates the the oven settings discussed in this section. To enable the ability to configure these settings, refer to section *General Configuration - Oven Type* for more information.

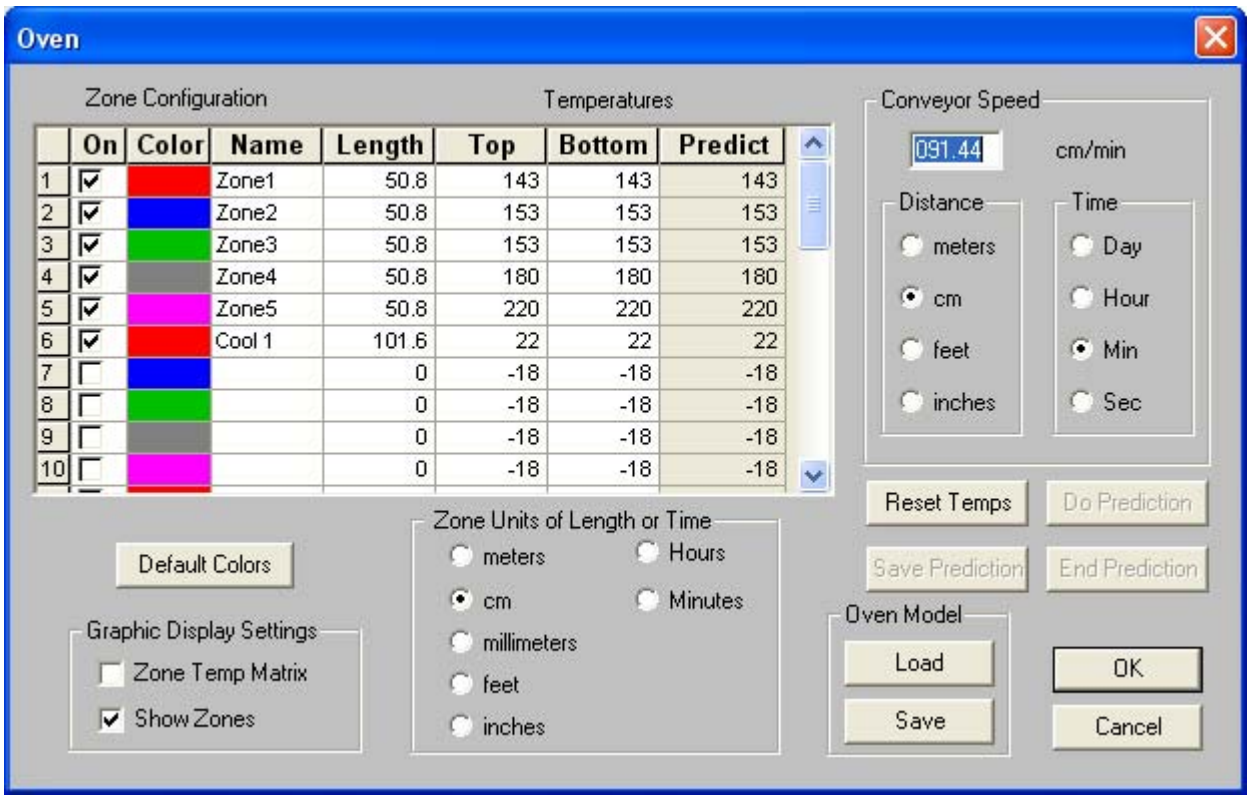


Zone Configuration Options

When the zones are displayed in the Data Graph, the ***Zone Slope*** statistic can be used based on the zones defined with this dialog box. The zones can be changed at any time by using the cells in this dialog box or changing them in the Zone Matrix. Refer to ***Zone Matrix*** for more information.

To define zones:

1) On the ***Profile*** menu, select ***Oven Configure***.

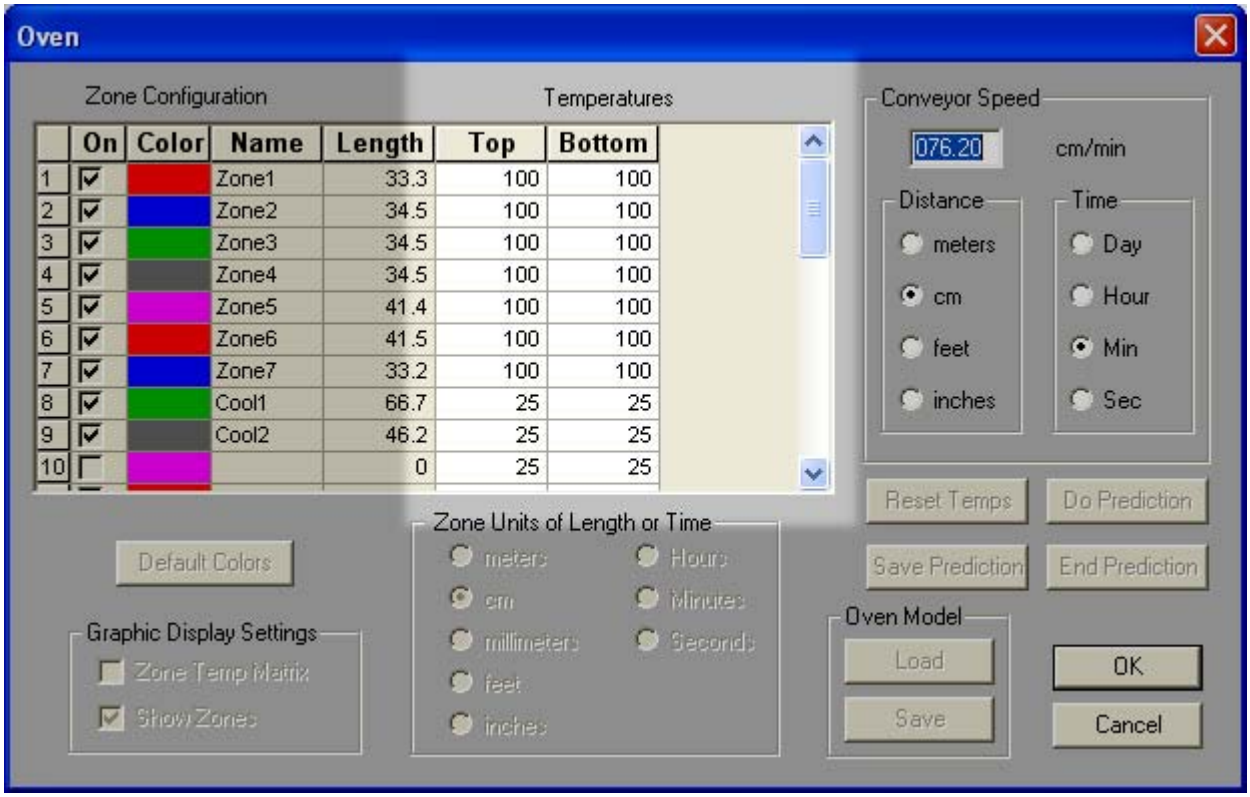


Oven Configure Dialog Box

2) Click the corresponding check box beside a zone to activate or deactivate it.
3) Click the corresponding ***Color*** cell to select a custom color for that zone. To restore to the default colors click the ***Default Colors*** command button.
4) Click the corresponding ***Name*** cell to enter a custom zone name if desired.
5) Click the option button beside the appropriate units of length or time for the process.
6) Click the corresponding ***Length*** cell to enter a specific zone length for each zone.
7) Click the ***Show Zones*** command button to display the zones as colored bars along the X-axis.
8) Click the ***Zone Temp Matrix*** check box to activate the Zone Matrix.
9) Click the ***OK*** command button to create the zone(s) and close the ***Oven Configure*** dialog box or ***Cancel*** to quit without making any changes.

5.5.7.2 Temperatures

After zone sizes are defined, the zone temperatures can be set. These temperatures could be the upper and lower thresholds of acceptable temperatures to meet process standards, temperature settings of upper and lower heat sources, or they could have any meaning desired.



Zone Temperature Section

To set zone temperatures:

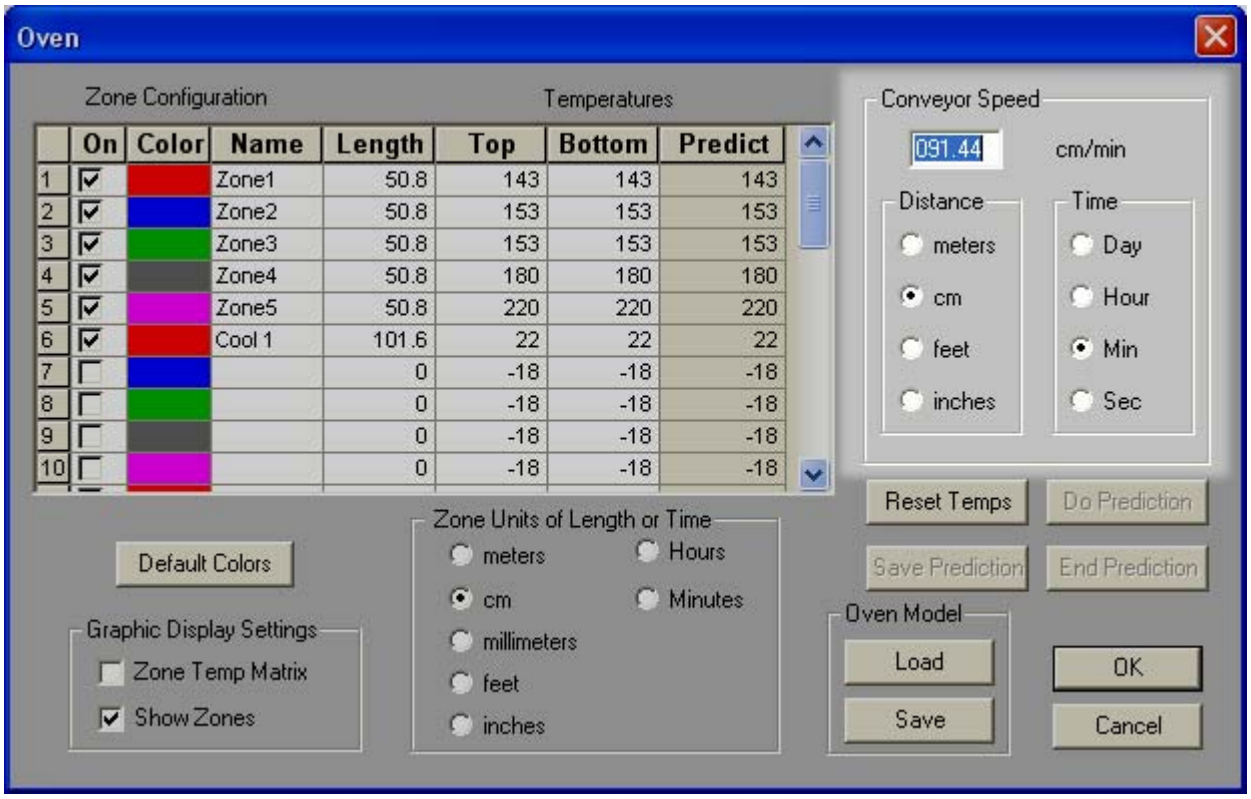
1) On the ***Profile*** menu, select ***Oven Configure***.
2) Click the top and bottom text field(s) to enter upper and lower zone temperatures as a colored line for each zone of the Data Graph. The upper zone temperatures appear as solid lines and the lower zones appear as dotted lines.

This matrix can be used to plot predicted data lines based on different zone temperatures or conveyor rates. Refer to *Prediction Tool* for a description of this process.

3). Click the ***OK*** command button to create the zone temperatures and close the ***Oven Configure*** dialog box or click ***Cancel*** to quit without making any changes.

5.5.7.3 Conveyor speed

Actual speed of the conveyor can be set using the Conveyor speed portion of the Oven Configure dialog box. The software uses this value to calculate the X-axis values when a ***Distance*** option button has been selected. This number is also used as the actual conveyor speed that the software uses when prediction data lines are added. Refer to ***Prediction Tool*** for more information.



Conveyor Speed Options

Conveyor Speed can not be set or viewed after the Data Graph has been magnified.

To set the conveyor speed:

1) On the ***Profile*** menu, select ***Oven Configure***.
2) Enter the ***Conveyor Speed*** in the text box. This value appears in the Zone Matrix.
3) Select the option button beside the desired units such as: ***Distance*** (inches) per ***Time*** (Minutes).
4) Click the ***OK*** command button to return to the Data Graph using the new settings or ***Cancel*** to return to the Data Graph with no changes.

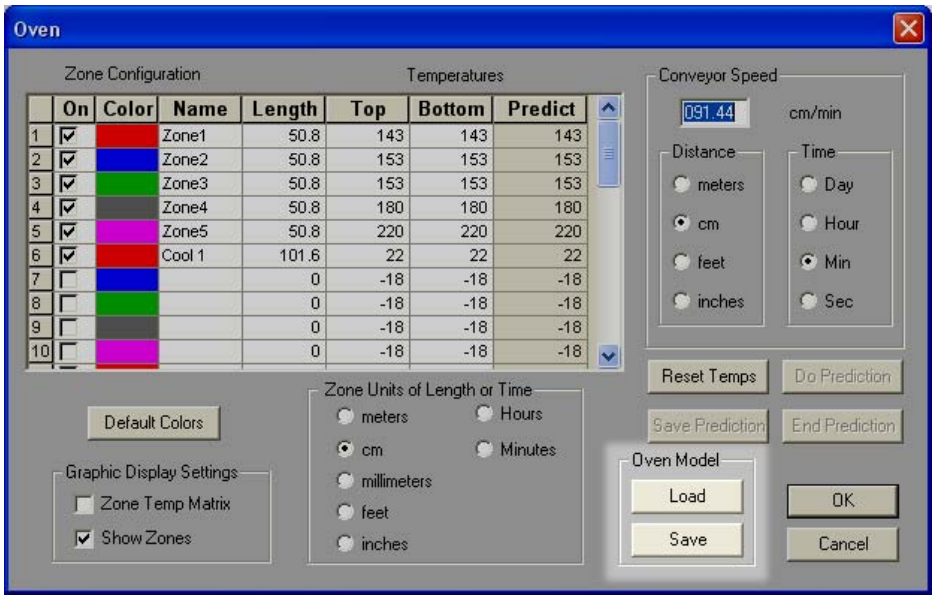
5.5.7.4 Oven Models

The ***Oven Configuration*** dialog box includes an option to select oven model files. This command provides a quick way to load oven size and zone temperature information.

The software automatically loads oven configurations. To enable the ability to Load & Save oven models, refer to section *General Configuration - Oven Type* for more information.

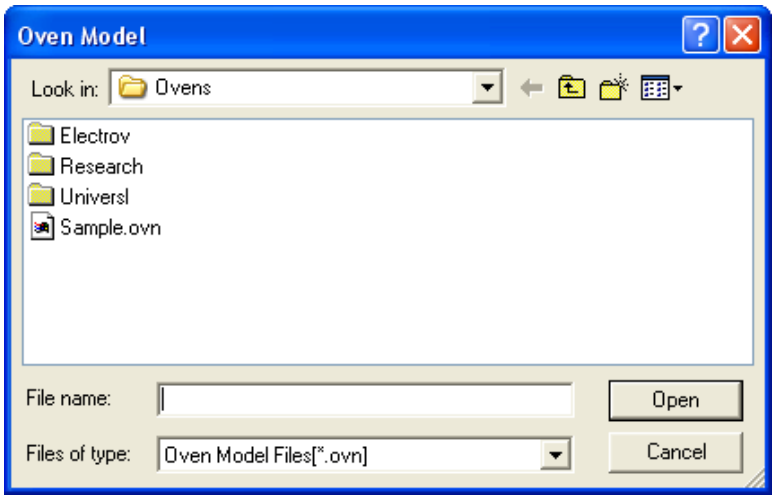
To load an Oven Model:

1) On the ***Profile*** menu, select ***Oven Configure***.



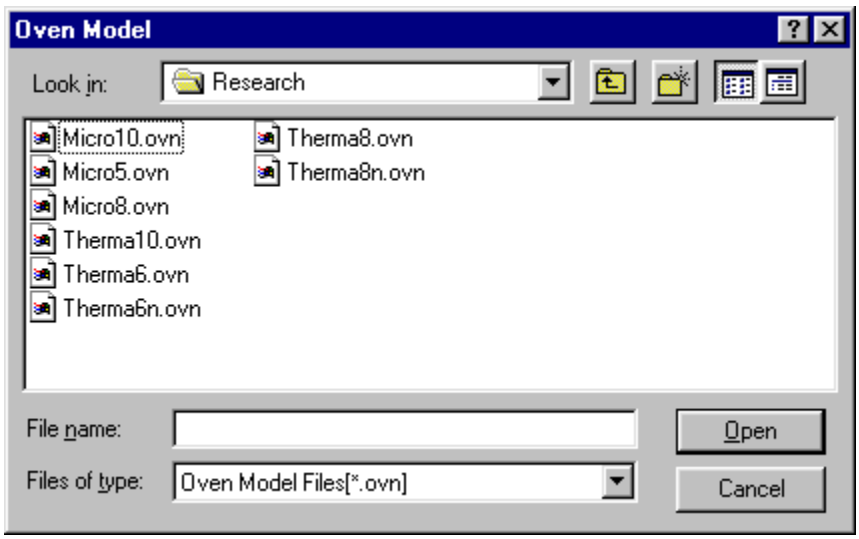
Oven Model Commands

2) Click the ***Load*** command button in the Oven Model section and navigate to the oven file folder.



Load Oven Model List Box

3) Select the desired oven manufacturer file folder.



Oven Model List Box

4) Select the desired oven model by clicking it once.

5) Click the ***Open*** command button.

Loading an oven model will overlay the current data set with the following information from the Oven Model File:

- Zone Size Information
- Zone Temperature Information
- Conveyor Speed Information
- Process notes if the existing file has process information.

Creating and Saving an Oven Model:

1) Make sure current data is saved.
2) Edit the following information to fit the desired requirements. Zone Sizes, Zone Temperatures, Conveyor Speed (from the Oven Configuration Dialog Box) and Part, Process, Sensor Documentation (from the Profile menu).
3) Select the ***Oven Configuration*** command from the ***Profile*** menu.
4) Click the ***Save*** command button from the Oven Model section and navigate to the Ovens file folder.
5) Select the file folder of an oven manufacturer. (Additional file folders may be created if needed).
6) Enter the file name in the ***File*** name text box. The extension assigned to this file is **(.OVN)**.
7) Click the ***Save*** command button.

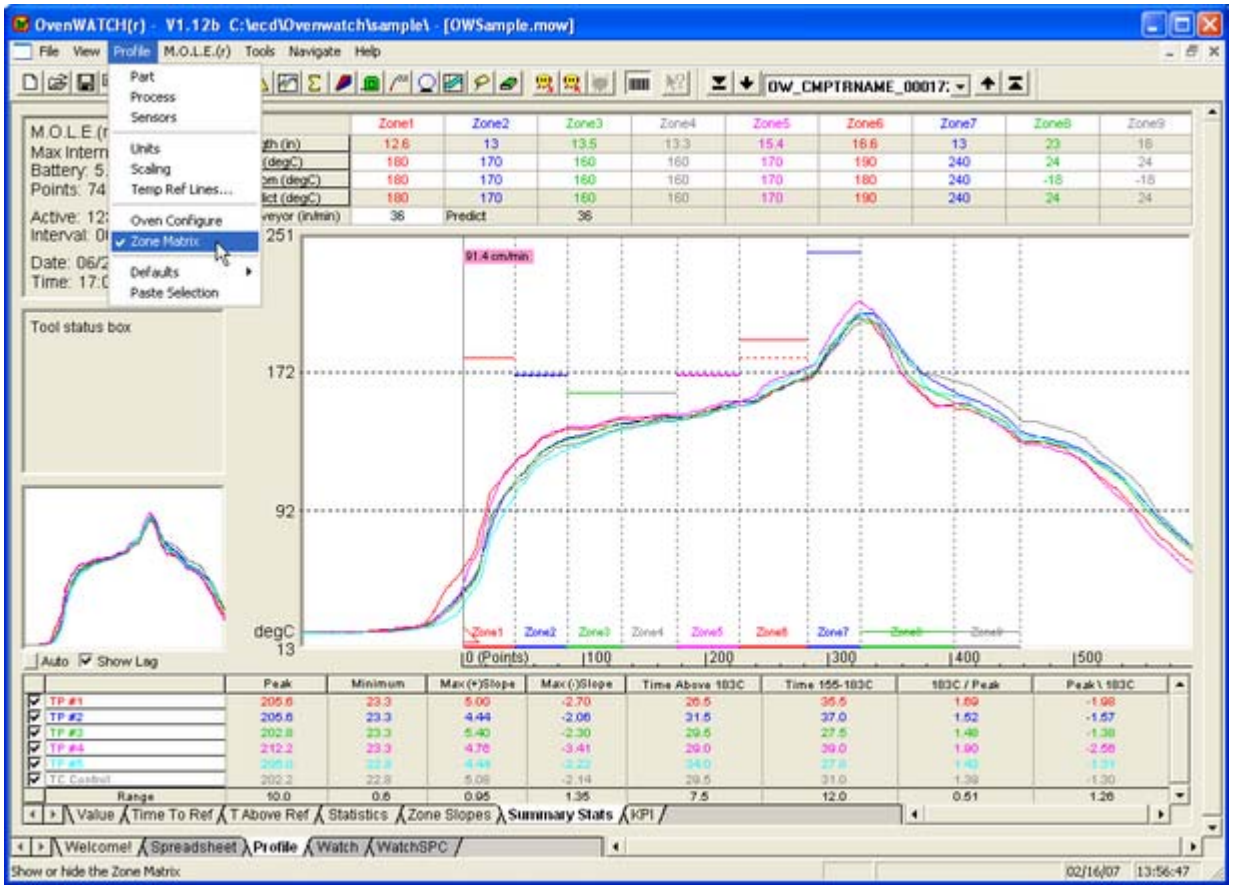
The new Oven Model is now ready to use

Process information will only be used if there is no process information in the data set that exists when a Oven Model is loaded.

5.5.8 Zone Matrix

To view the Zone Matrix:

1) On the ***Profile*** menu, select ***Zone Matrix***. A check mark appears beside it which indicates that the Zone Matrix is activated. When the Zone Matrix is turned "ON", it is located above the Data Graph.



Zone Matrix

The Zone Matrix command can be accessed on the Profile worksheet Toolbar.

	Zone Matrix Button

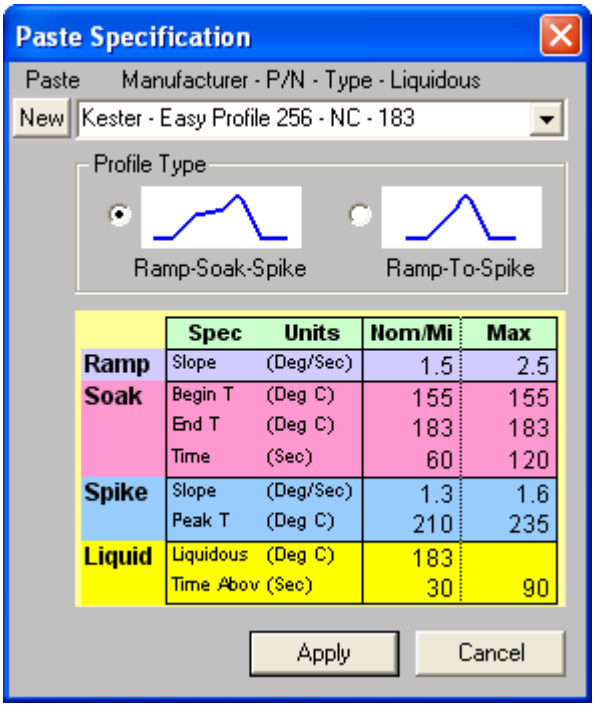
5.5.9 Paste Selection

The Paste Selection command displays a selected paste from the database on the Data Graph of the ***Profile*** worksheet.

To Select a Paste:

1) On the ***Profile*** menu, select ***Paste Selection***.
2) Select a desired paste from the paste database drop-down list box.

If your paste does not exist in the database, you can create a new one by selecting the *New* command button. Refer to *Adding a Paste Wizard* for more information.



Paste Specification Dialog Box

3) Select a Profile Type (***Ramp-Soak-Spike*** or ***Ramp-To-Spike***).
4) Click the ***Apply*** command button to display the paste specification reference on the Data Graph, or ***Cancel*** to return to the Profile worksheet without making any changes.

To hide the paste spec, you can clear the *Paste Spec* check mark on the *View* Menu.

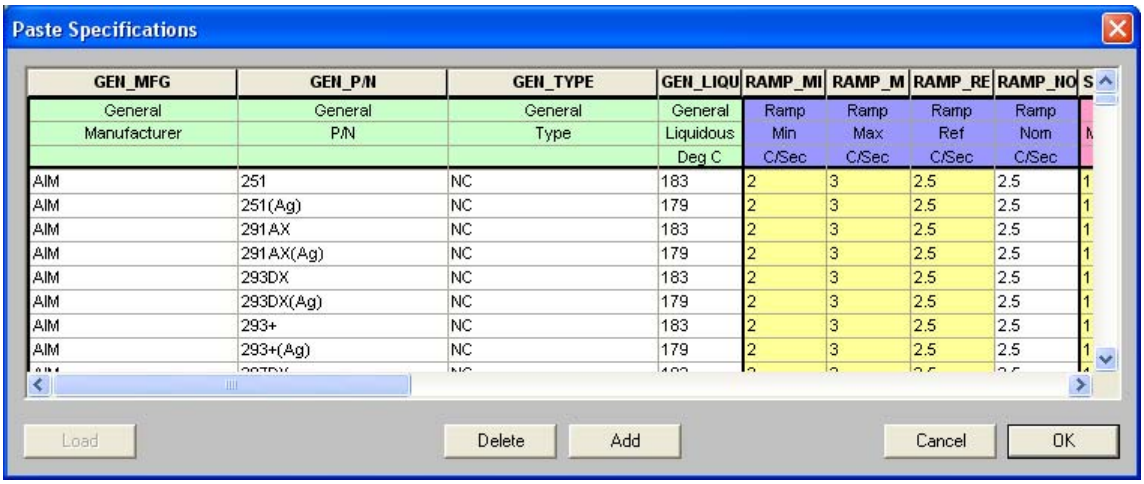
5.5.9.1 Adding a Paste Specification

The following section displays the required Paste Wizard Steps to help prepare the user prior to creating a new paste.

To add a paste:

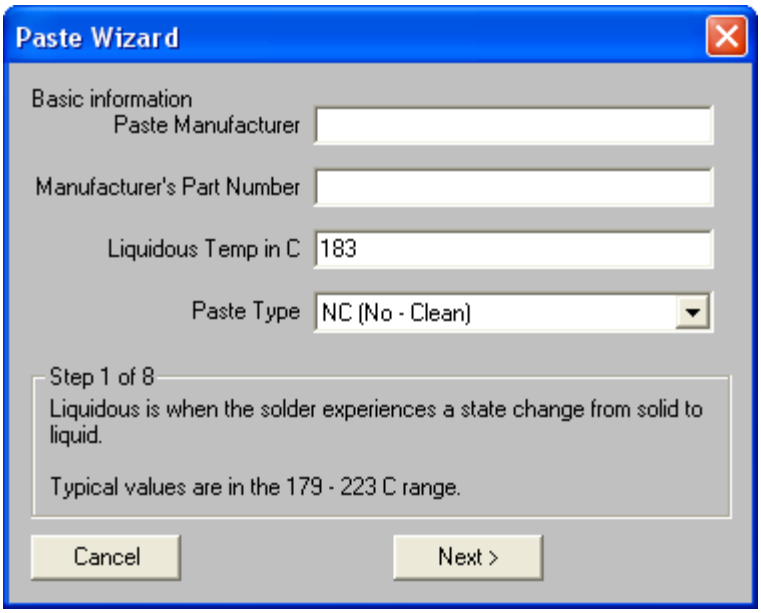
Included on the bottom of each Step is a brief guideline of industry values related to each specification.

1) On the ***Paste Specification database*** dialog box, select the ***Add*** command button.



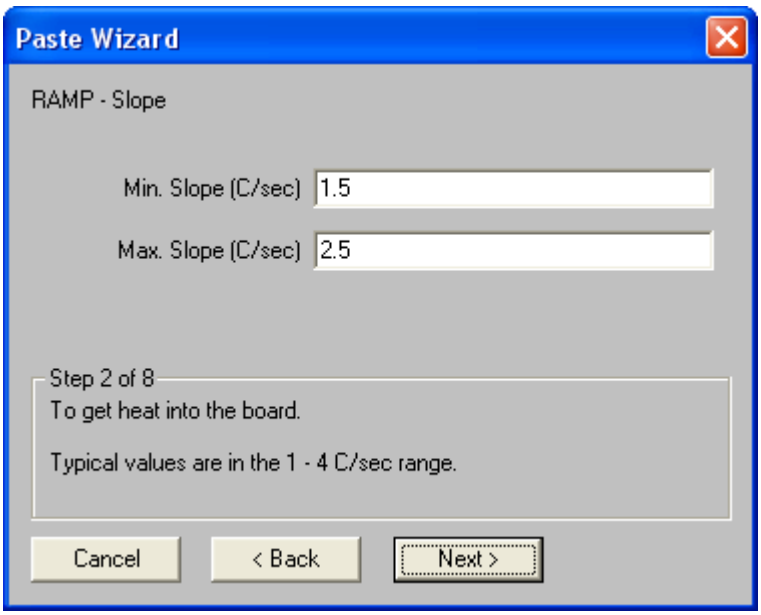
Paste Specification Dialog Box

2) Enter the required information and select the ***Next*** button.



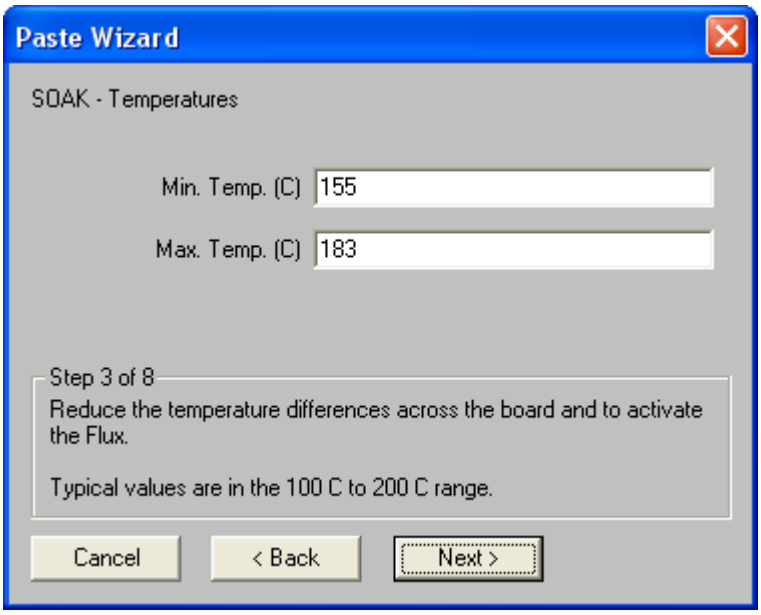
Paste Wizard Step 1

3) Enter the RAMP – Slope information and select the ***Next*** button.



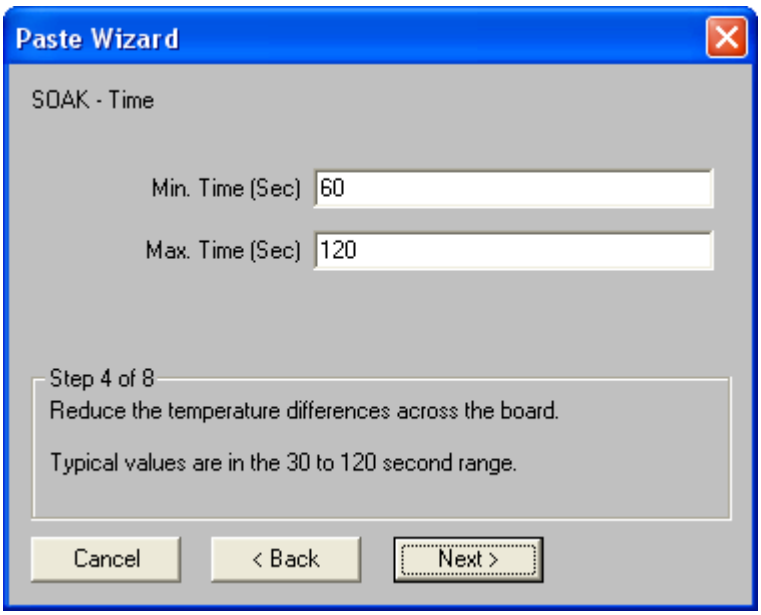
Profile Wizard Step 2

4) Enter the SOAK –Temperatures information and select the ***Next*** button.



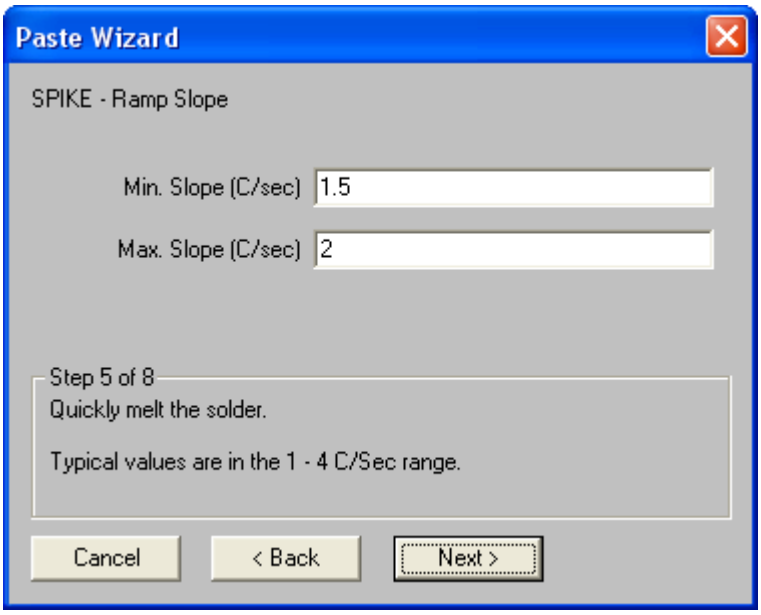
Profile Wizard Step 3

5) Enter the SOAK –Time information and select the ***Next*** button.



Profile Wizard Step 4

6) Enter the SPIKE – Ramp Slope information and select the ***Next*** button.

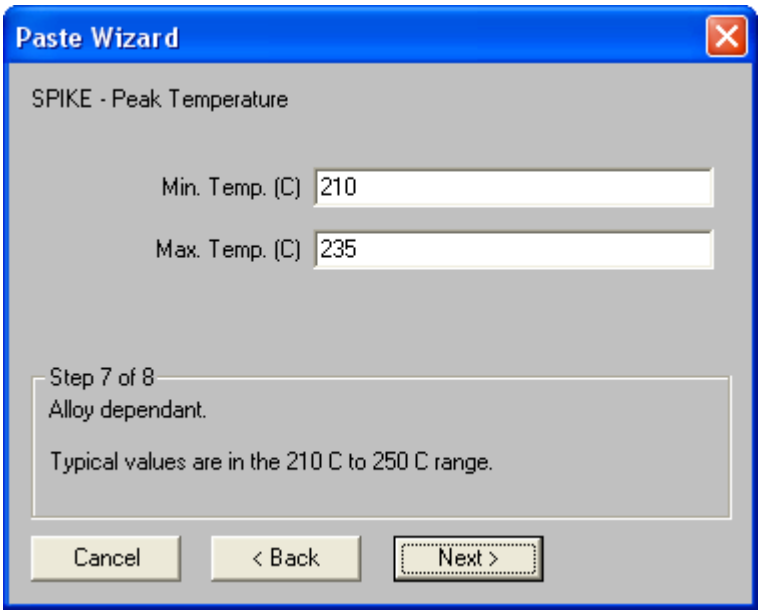


Profile Wizard Step 5

7) Enter the SPIKE – Time Above information and select the ***Next*** button.

Profile Wizard Step 6

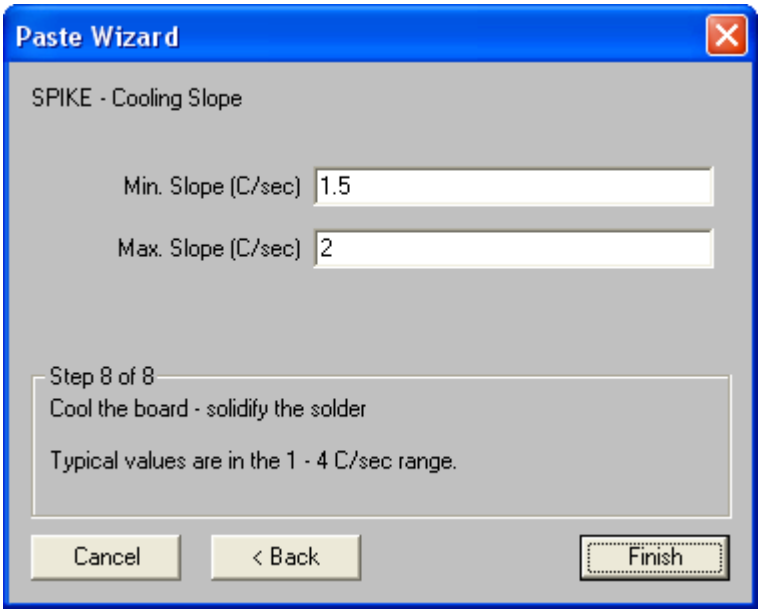
8) Enter the SPIKE – Peak Temperature information and select the ***Next*** button.



Profile Wizard Step 7

9) Enter the SPIKE – Cooling Slope information and select the ***Finish*** button to create the new paste and return to the Paste Specification database dialog box.

Once the user proceeds to each Step, the Back button can be selected to confirm or modify previously entered information.



Profile Wizard Step 8

10) Scroll down to the bottom of the database and select the new paste specification. (Note: all user created paste specifications will always appear on the bottom of the database).

Created Paste Selection

11) Click the ***OK*** command button to accept, or ***Cancel*** to return to the Summary Stats dialog box.

5.5.10 Profile Defaults Sub-Menu

The Profile ***Defaults*** sub-menu commands sets Profile menu commands with standard defaults. When an option in the ***Defaults*** sub-menu is selected and a value is changed, the new value becomes the default that is used when a new workbook file is created. Default values are applied when importing old data files because they may not contain all the information needed by the software.

To create new defaults:

1) On the ***Profile*** menu, point to ***Defaults***, and then select a command.
2) Change the default setting(s).
3) Click the ***SET*** command button on the specific dialog box to save the new default setting(s).

Typically the defaults are set once for specific requirements and cloned afterwards. Profile defaults are then changed only when requirements change.

5.6 M.O.L.E. Menu

The M.O.L.E. menu commands configure the M.O.L.E. for collecting experiment data.

The dimmed menu commands are used in other worksheets.

The M.O.L.E. must be inserted in the Station and the proper communication port must be configured to properly use the *M.O.L.E.* menu commands.

All *M.O.L.E.* menu commands cannot be used if the software is currently logging oven data.

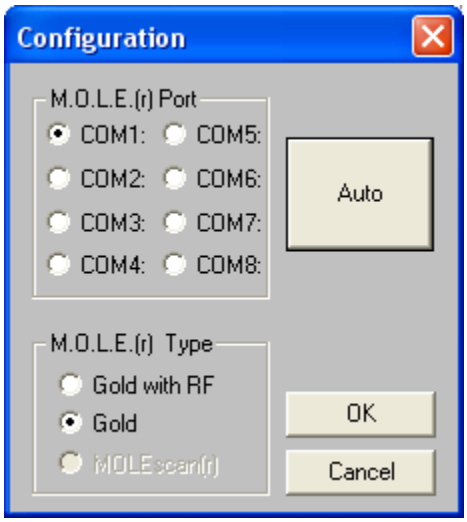
5.6.1 Configuration Wizard

This wizard guides a user through the communications setup process so the software and M.O.L.E. can communicate. Communications configuration needs to be done when the software is first installed or PC hardware configurations have changed.

The wizard steps can be accessed individually on the File and M.O.L.E. menus.

To configure communications:

1) Insert the M.O.L.E. into the OvenWATCH Station.
2) On the ***M.O.L.E.*** menu, select ***Configuration Wizard*** and the Configuration dialog box appears.



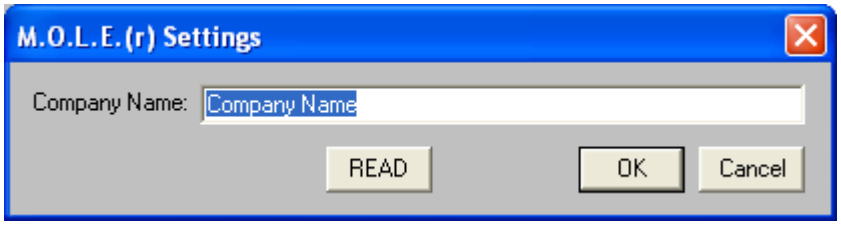
Wizard Step 1 – Configuration

3) Click the option button next to a COM port which the PC is set up for RS-232 communications or the Auto command button to have the software automatically find the COM port the M.O.L.E. is connected.
4) Click the option button beside the appropriate M.O.L.E. type that will be used to collect data, Gold with RF, or Gold. The M.O.L.E. type selection will affect access to the RF M.O.L.E. Data command and Receive RF button. It also affects the M.O.L.E. configuration parameters, such as number of channels, battery life estimate and minimum logging interval.

5) Click the ***OK*** command button to use the selection and continue to the M.O.L.E. Settings dialog box.

The user can exit the Configuration Wizard any time by selecting the Cancel button.

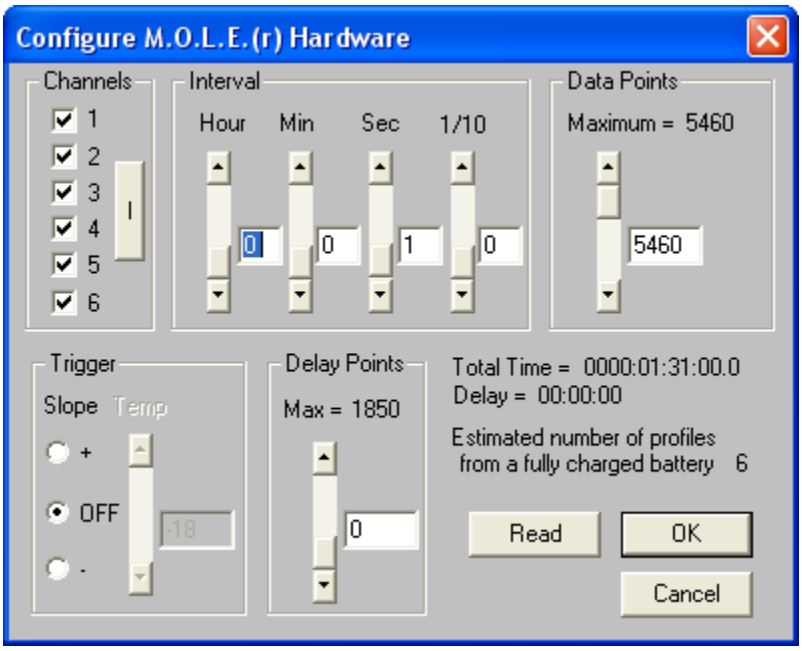
6) Type a company, operator, or machine name in the text box.



Wizard Step 2 – M.O.L.E. Settings

7) Click the ***OK*** command button to store the information in the M.O.L.E. and continue to the Configure M.O.L.E. Hardware dialog box.

8) Click the check box beside a corresponding channel to turn it “ON” or “OFF”. If a channel is “OFF”, it does not collect data for that channel, increasing battery life.



Step 3 – Configure M.O.L.E. Hardware

9) Enter an interval at which the M.O.L.E. records data points by using the slider(s) or manually typing in the corresponding text box. The maximum interval for the M.O.L.E. is 23:59:59 hours (one data point per day) and the minimum interval is 0.2 second (one data point every two-tenths of a second). When using the M.O.L.E. with RF Option the minimum interval is 0.5 (one data point every five-tenths of a second) and when one channel is active, the minimum interval is 0.1 second (one data point every tenth of a second).

10) Enter the number of data points the M.O.L.E. will record during the data run. The maximum number is dependent on the number of channels turned on. The maximum data points the M.O.L.E. can collect are displayed above the text box. When the number of data points collected and the recording interval have been selected, the software displays the corresponding time the experiment will take beside Total Time = text in the lower right corner of the dialog box.

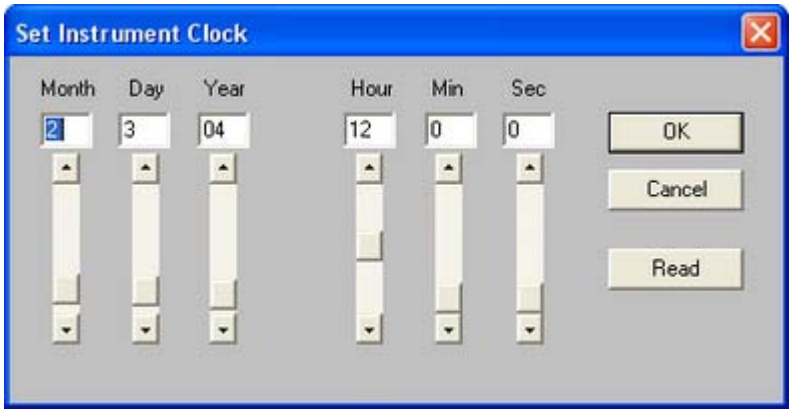
When M.O.L.E. configure options are modified, the data is calculated and then amount of profiles the user can expect from the power pack battery (based on a fully-charged power pack battery) is displayed in the lower right corner next to the Profiles Per Battery line.

Optional configurations:

- Enter a threshold temperature to “trigger” the M.O.L.E. to start recording data by using the slider or by entering it in the text box. When any active channel reaches that temperature, the M.O.L.E. will begin to record data. This option can trigger the profiler when the temperature cools down to the threshold temperature by selecting the (-) option button, or heating up to the threshold temperature by selecting the (+) option button. If this option is not used for temperature triggering, select the Off option button.
- Enter how many data points to delay “trigger” the M.O.L.E. to start recording data by using the slider or by entering it in the text box. The data point entered will “trigger” the start of data collection when the specified data point is reached in the process. The actual delay is equal to the Interval times the Pts Dly.

11) Click the ***OK*** command button to save the configuration and continue to the Set Instruments Clock dialog box.

12) Enter the correct month, day, year, hour, minute, and second by adjusting the slider(s) or manually typing in the corresponding text box.



Wizard Step 4 -Set Instrument Clock

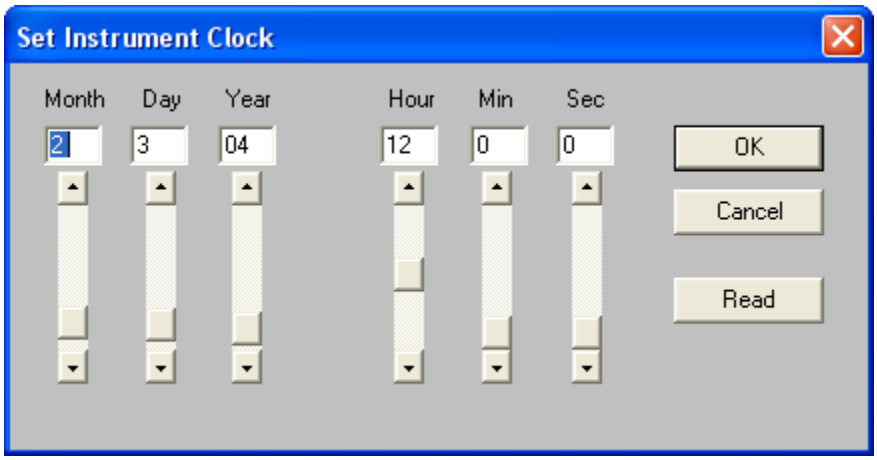
When the Set Instrument Clock dialog box appears the current computer clock setting is automatically entered in the text boxes.

13) Click the ***OK*** button to reset the clock.

Configuration is now complete and the M.O.L.E. is ready to collect data.

5.6.2 Set M.O.L.E. Clock

The M.O.L.E. has an internal clock it uses to identify the time and date of each data run and to control when each measurement is recorded. The M.O.L.E. clock should be set prior to data collection to ensure that the proper time was recorded.



Set M.O.L.E. Clock Dialog Box

To set the M.O.L.E. clock:

1) Insert the M.O.L.E. into the OvenWATCH Station.
2) On the ***M.O.L.E.*** menu, select ***Set M.O.L.E. Clock***.
3) Enter the correct month, day, year, hour, minute, and second by adjusting the slider(s) or manually typing in the corresponding text box.

When the Set Instrument Clock dialog box appears the current computer clock setting is automatically entered in the text boxes.

4) Click the ***Send*** button to reset the clock.

When the setting of the clock is completed, a dialog box with the configuration data appears.

To read the M.O.L.E. clock:

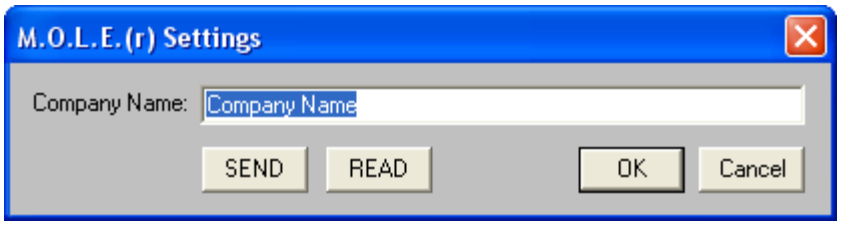
1) Insert the M.O.L.E. into the OvenWATCH Station.
2) On the ***M.O.L.E.*** menu, select ***Set M.O.L.E. Clock***.
3) Click the ***Read*** command button to display the current date and time from the M.O.L.E.. If the clock is set wrong, the date or time will be incorrect.

5.6.3 M.O.L.E. Settings

The M.O.L.E. can be configured to store the name of your company, operator or machine name.

To select M.O.L.E. settings:

1) Insert the M.O.L.E. into the OvenWATCH Station.
2) On the ***M.O.L.E.*** menu, select ***M.O.L.E. Settings***.
3) Type a company, operator, or machine name in the text box.



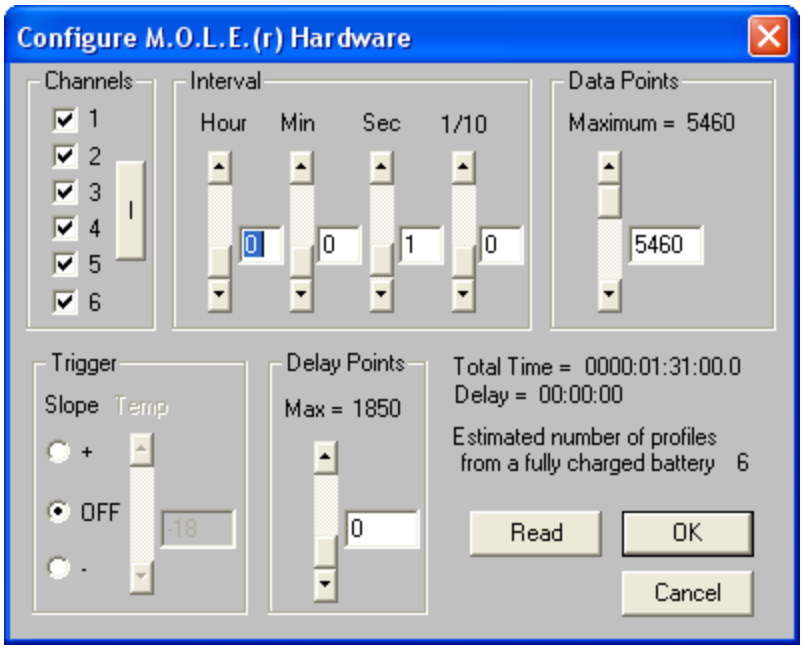
M.O.L.E. Settings

4) Click the ***Send*** command button to store the information in the M.O.L.E.
5) When the process is complete, a dialog box appears confirming the information sent. Click the ***OK*** command button and the Set M.O.L.E. Clock dialog box appears for verification of the clock settings. Click the ***OK*** command button and the software will return to the worksheet.

Using this command may cause the M.O.L.E. to lose any previous data collected.

5.6.4 M.O.L.E. Configure

The ***M.O.L.E. Configure*** command configures how the M.O.L.E. records data during a data run.



M.O.L.E. Configure Dialog Box

To configure the M.O.L.E.:

1) Insert the M.O.L.E. into the OvenWATCH Station.
2) On the ***M.O.L.E.*** menu, select ***M.O.L.E. Configure***.
3) Click the check box beside a corresponding channel to turn it "ON" or "OFF". If a channel is "OFF", it does not collect data for that channel, increasing battery life.
4) Enter an interval at which the M.O.L.E. records data points by using the slider(s) or manually typing in the corresponding text box. The maximum interval for the M.O.L.E. is 23:59:59 hours (one data point per day) and the minimum interval is 0.2 second (one data point every two-tenths of a second). When using the M.O.L.E. with RF Option the minimum interval is 0.5 (one data point every five-tenths of a second) and when one channel is active, the minimum interval is 0.1 second (one data point every tenth of a second).

If more than 1 channel enabled, the M.O.L.E. cannot be configured to less than a 0.3 second interval.

5) Enter the number of data points the M.O.L.E. will record during the data run. The maximum number is dependent on the number of channels turned on. The maximum data points the M.O.L.E. can collect are displayed above the text box. When the number of data points collected and the recording interval have been selected, the software displays the corresponding time the experiment will take beside ***Total Time*** = text in the lower right corner of the dialog box.

When M.O.L.E. configure options are modified, the data is calculated and then amount of profiles the user can expect from the power pack battery (based on a fully-charged power pack battery) is displayed in the lower right corner next to the Profiles Per Battery line.

Optional configurations:

- Enter a threshold temperature to "trigger" the M.O.L.E. to start recording data by using the slider or by entering it in the text box. When any active channel reaches that temperature, the M.O.L.E. will begin to record data. This option can trigger the profiler when the temperature cools down to the threshold temperature by selecting the ***(-)*** option button, or heating up to the threshold temperature by selecting the ***(+)*** option button. If this option is not used for temperature triggering, select the ***Off*** option button.
- Enter how many data points to delay "trigger" the M.O.L.E. to start recording data by using the slider or by entering it in the text box. The data point entered will "trigger" the start of data collection when the specified data point is reached in the process. The actual delay is equal to the ***Interval*** times the ***Pts Dly***.

6) Click the ***Send*** command button to send the new configurations to the M.O.L.E.
7) Click the ***Read*** command button to confirm the active configuration.
8) Click the ***OK*** command button to return to the Data Graph, retaining any changes made to the configuration or ***Cancel*** to return to the Data Graph without recording any changes.

The M.O.L.E. configure command can be accessed on the Toolbars of the Spreadsheet and Profile worksheets.

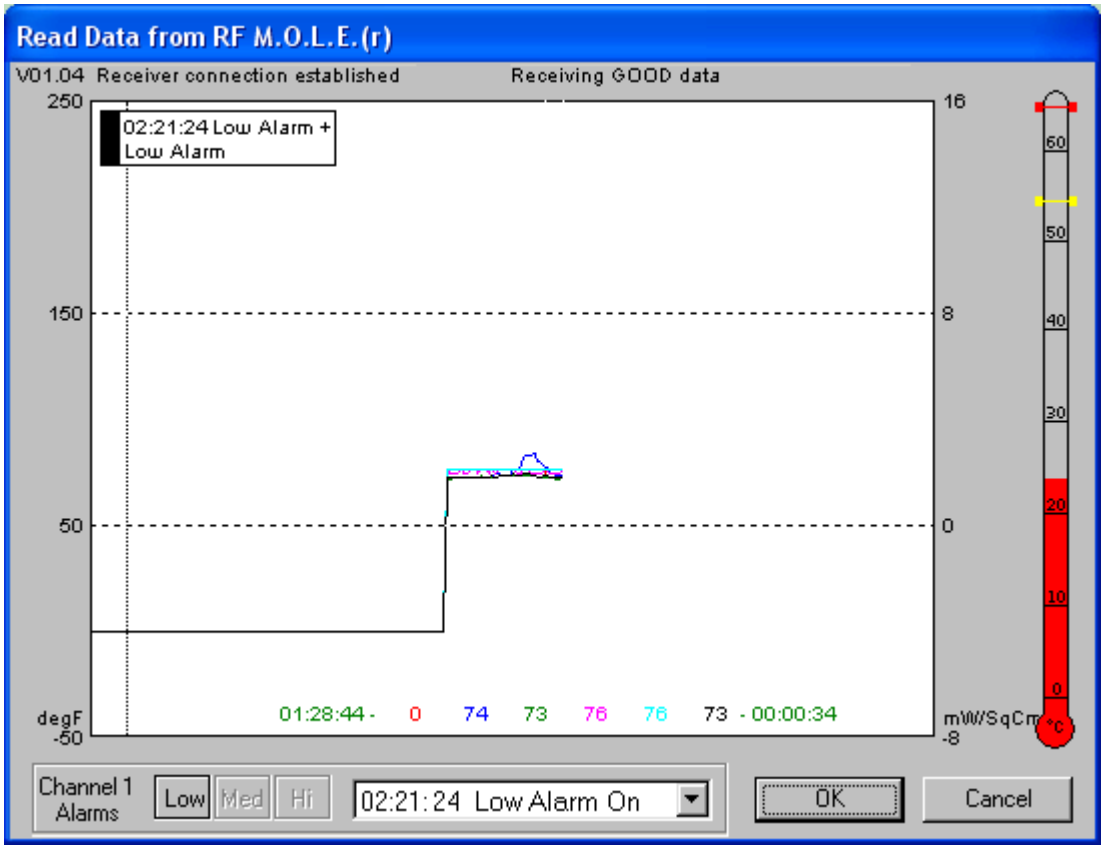
Configure M.O.L.E. Button

5.6.5 RF M.O.L.E. Data

This command activates the software to receive “Real-time” data from the M.O.L.E. when using it with the RF option.

To Read RF M.O.L.E. Data:

1) Connect the RF Receiver to the PC using the PC interface cable supplied.
2) Using the ***Configuration Wizard***, set the COM port and configure the software to accept RF M.O.L.E. Data. Refer to ***Configuration Wizard*** for more information.
3) Once the ***Yes*** or ***No*** command button has been selected, the ***Read Data from RF M.O.L.E***. dialog box appears and “Real-time” data is displayed on the lower edge of the dialog box. Refer to ***RF M.O.L.E. dialog box features*** for more information.

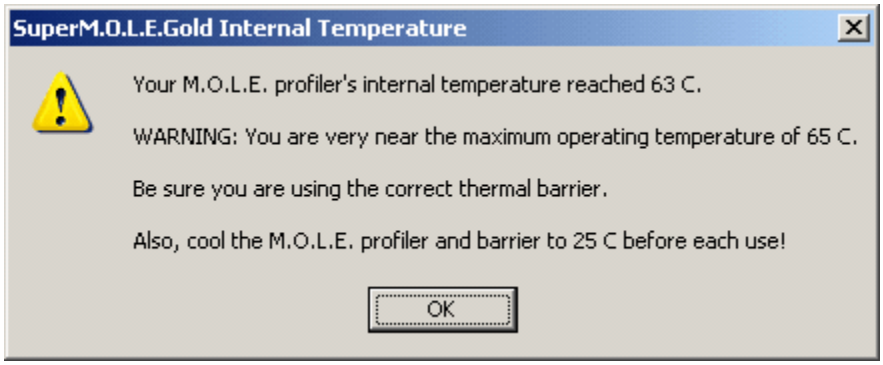


RF Dialog Box

If the computer is not communicating with the receiver, a message box appears informing the user of a cable or port configuration problem and not the transmitter. If the message does not appear and data is not received, refer to the *RF Trouble Shooting* section in the RF Option hardware manual for radio link trouble shooting tips.

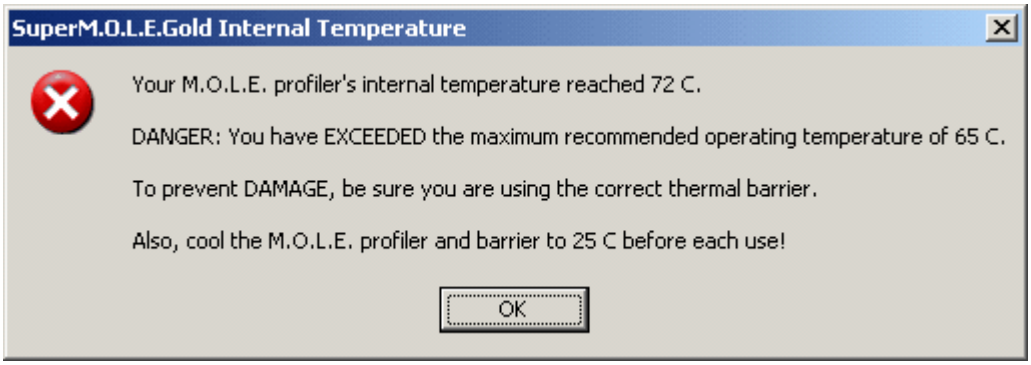
4) When finished collecting transmitted data, click the ***OK*** command button. The data run is automatically uploaded into a data run row on ***Spreadsheet*** worksheet and the ***Oven*** dialog box appears.

After the M.O.L.E. has finished sending the profile data, it then reports the highest internal temperature logged during the profile. If the highest temperature logged is in the range of is 55.0°C-64.9°C the Internal Temperature dialog box appears. This indicates the internal temperature of the M.O.L.E. has reached the operating temperature warning zone.



Operating Temperature Warning

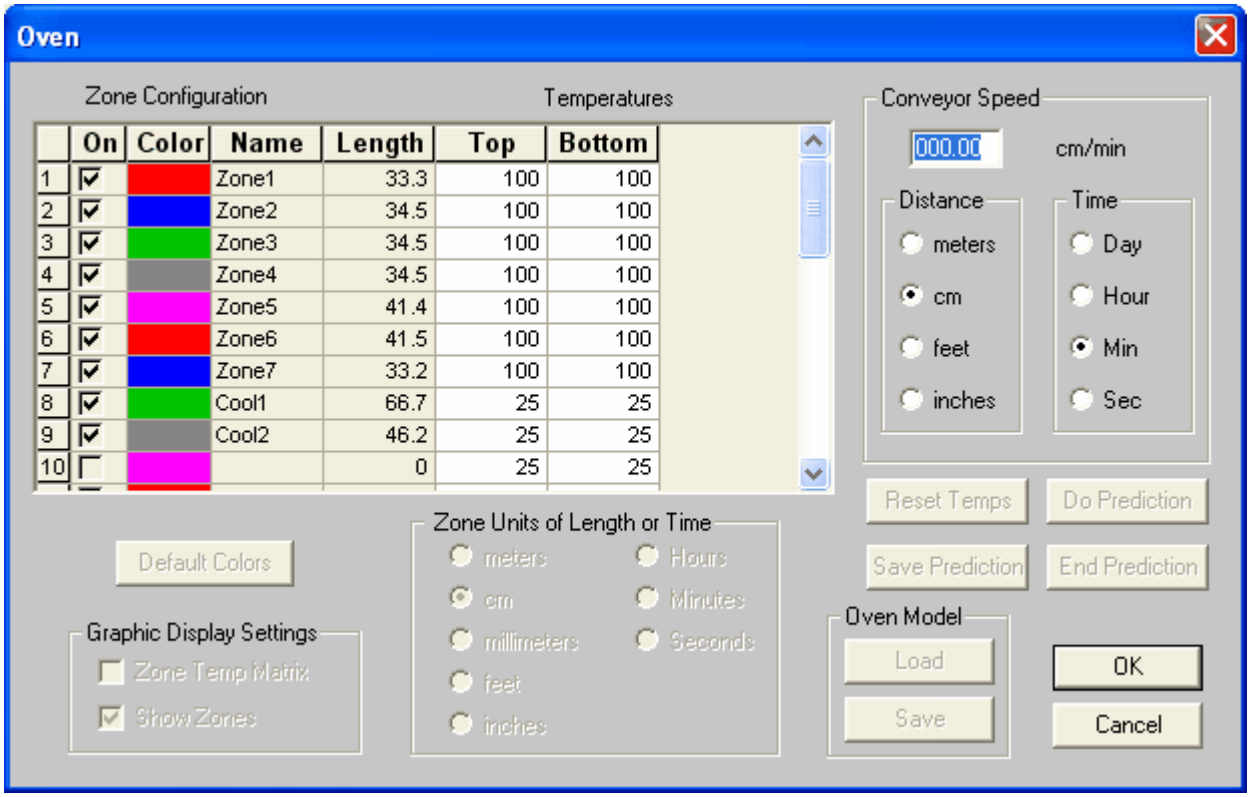
If the internal temp of the M.O.L.E. is 65.0 C or more the Internal Temperature dialog box appears. This indicates the internal temperature of the M.O.L.E. has exceeded the maximum recommended operating temperature.



Maximum Recommended Operating Temperature Warning

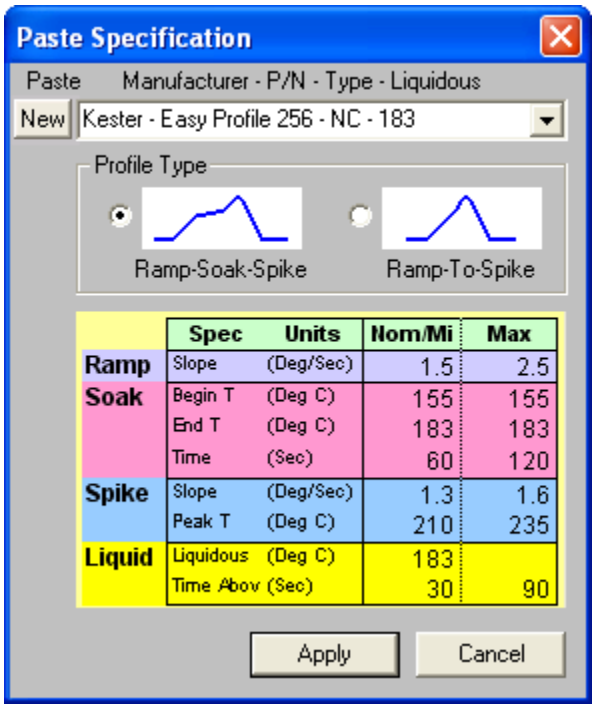
The software automatically populates the amount of Zones, names and lengths.

5) Enter the oven conveyor speed and zone temperatures into the oven dialog box.



Oven Settings

6) Select a solder paste from the list box and a Profile Type (Ramp-Soak-Spike or Ramp-To-Spike).



Select Paste

7) To complete the download process, select the ***Apply*** button to display the data run and oven information on the ***Profile*** worksheet Data Graph.

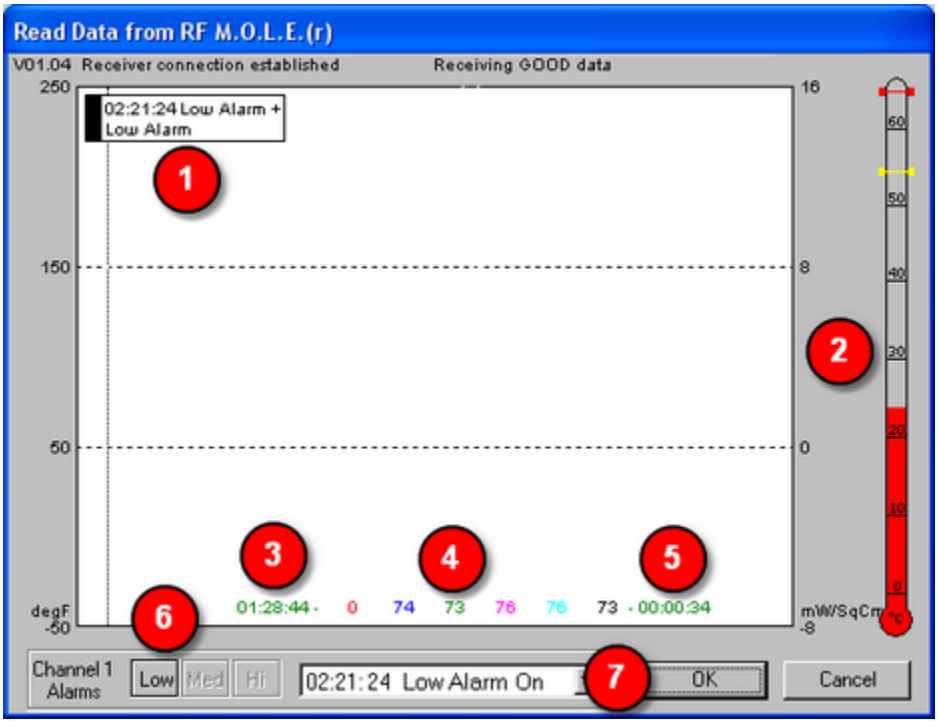
When the Data Graph is populated with a new profile, the software automatically aligns the X-axis maximum peak values for each Data Plot and the oven model so the results can be easily compared during analysis.

The RF M.O.L.E. Data command can be accessed on all of the worksheet Toolbars.

RF M.O.L.E. Data Button

5.6.5.1 RF M.O.L.E. dialog box features

The RF M.O.L.E. Data dialog box has many features. Use the illustration shown and the following definitions to interpret.



RF Dialog Box Features

❶ **Alarm Message Box:** This indicates the last alarm point breached.

❷ **Internal Temperature Thermometer:** This is an indicator displaying the current internal temperature of the M.O.L.E..

❸ **Remaining Profile Time:** This is the amount of data collection time preset by the user.

❹ **Channel Temperatures:** This displays the current temperature that the sensors are reporting.

❺ **Elapsed Time:** This displays the elapsed time from when the data run has begun.

❻ **Alarm Visual Indicators:** When a user-preset temperature has been reached, the box of that alarm that has been reached will flash. This feature will be dimmed until it has been configured by the user. Refer to ***RF Alarm Points*** for more information.

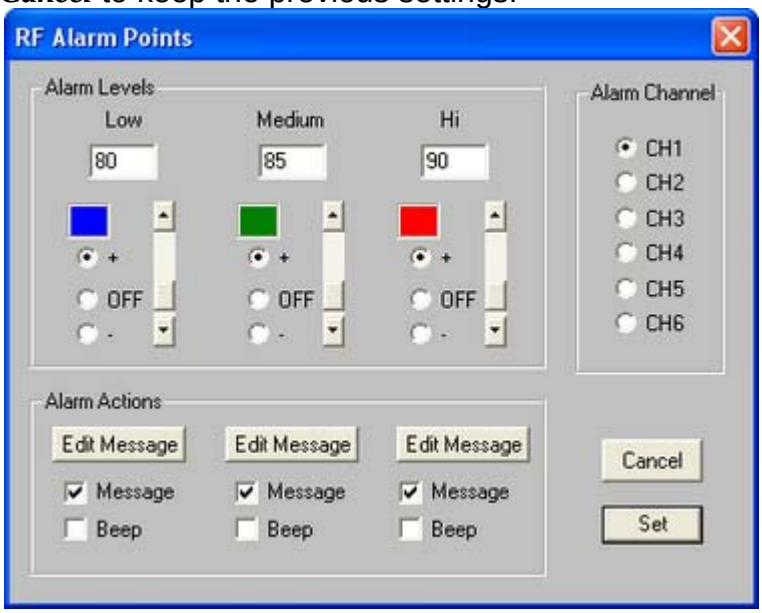
❼ **Alarm Log:** This is a drop down list box that logs the time and channel that has been breached during the current profile.

5.6.5.2 RF Alarm Points

While transmitting data with the M.O.L.E. RF Option, the RF Alarm Points command displays a customized alert message informing the user that a preset temperature has been met.

To use RF Alarm Points:

1) On the ***M.O.L.E.*** menu, point to ***M.O.L.E. "Defaults"***, and then select ***RF Alarm Points***.
2) Select alarm(s) to activate, ***Low***, ***Medium*** and/or ***High***, by selecting the (+) = Rising temperature or (-) = Falling temperature option buttons.
3) Determine alarm point temperature(s) for the alarm points by adjusting the slider or typing in the corresponding text box.
4) Select which channel to apply the alarm(s) to.
5) Select a Message box and or an audio indication to alert the user when an alarm temperature has been met.
6) Click the ***Set*** command button to set the current configuration as defaults or ***Cancel*** to keep the previous settings.

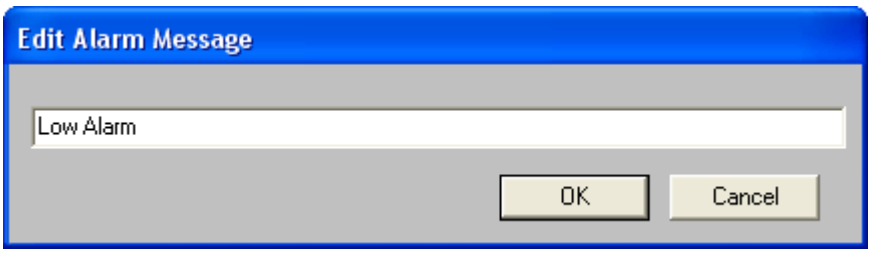


RF Alarm Dialog Box

Alarm messages can be changed to indicate what the alarm message is describing. The default messages are Low Alarm, Medium Alarm and Hi Alarm.

To edit an alarm message:

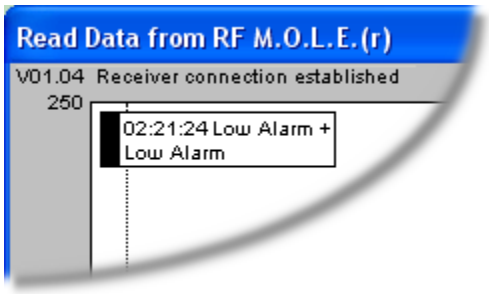
1) Click an ***Edit Message*** command button.



RF Alarm Message Text Box

2) Enter custom message in the text box and click the ***OK*** command button to accept or ***Cancel*** to not make any changes.

The results of programming RF Alarm points are used with the RF Option, and appear in the Read Data from RF M.O.L.E. dialog box while receiving data.



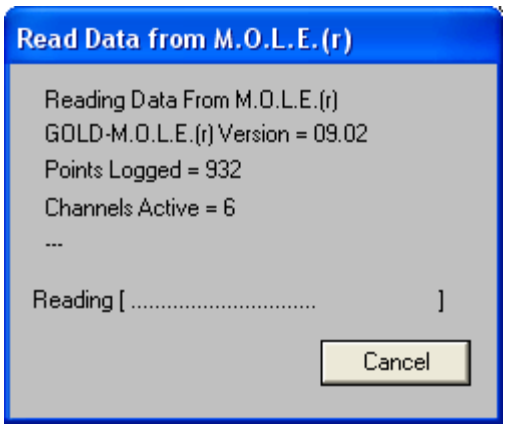
Alarm Message Box

5.6.6 Read M.O.L.E. Data

This command transfers experiment data from the M.O.L.E. into the software.

To Read M.O.L.E. Data:

1) Insert the M.O.L.E. into the OvenWATCH Station.
2) Once uploading has started, the ***Read Data from M.O.L.E.*** status box appears showing the status of the uploading process. To discontinue click the ***Cancel*** command button at any time.

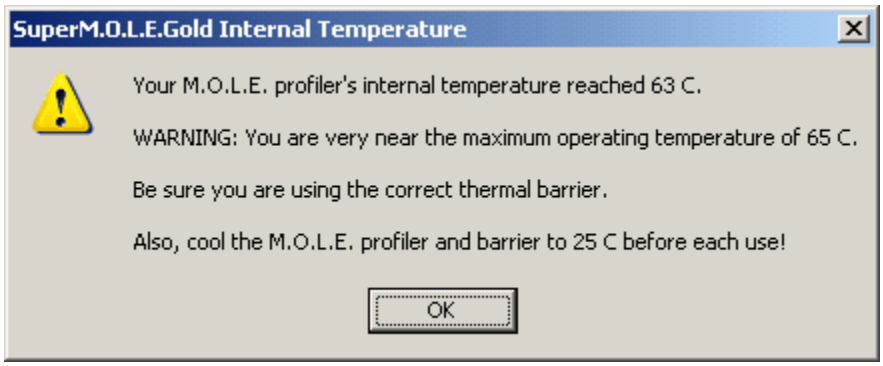


Read M.O.L.E. Data Status Box

If a message box appears stating that the M.O.L.E. is not responding, check the COM port configuration, cable connections, and/or the M.O.L.E. itself (i.e. battery).

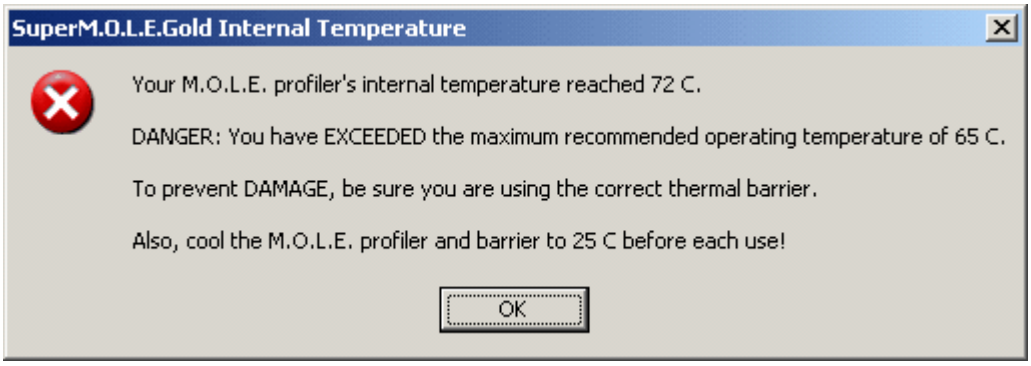
3) When finished collecting transmitted data, click the ***OK*** command button. The data run is automatically uploaded into a data run row on ***Spreadsheet*** worksheet and the ***Oven*** dialog box appears.

After the M.O.L.E. has finished sending the profile data, it then reports the highest internal temperature logged during the profile. If the highest temperature logged is in the range of is 55.0°C-64.9°C the Internal Temperature dialog box appears. This indicates the internal temperature of the M.O.L.E. has reached the operating temperature warning zone.



Operating Temperature Warning

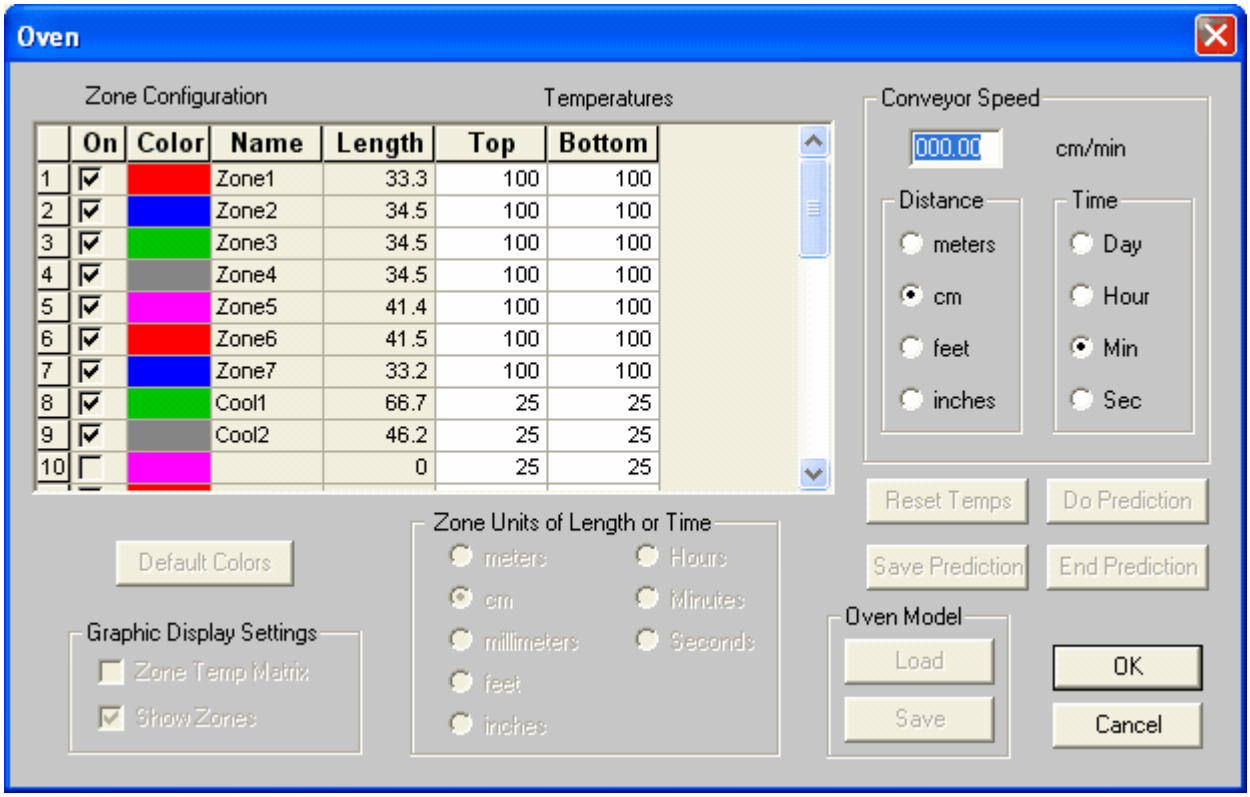
If the internal temp of the M.O.L.E. is 65.0 C or more the Internal Temperature dialog box appears. This indicates the internal temperature of the M.O.L.E. has exceeded the maximum recommended operating temperature.



Maximum Recommended Operating Temperature Warning

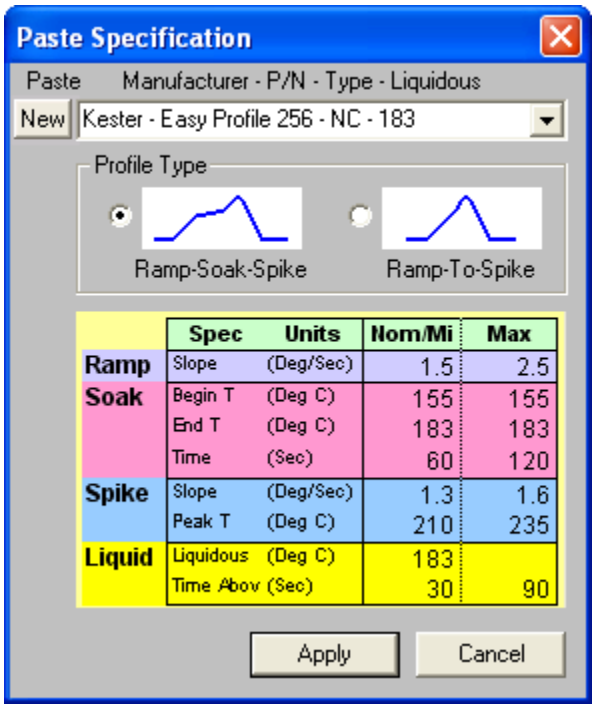
The software automatically populates the amount of Zones, names and lengths.

4) Enter the oven conveyor speed and zone temperatures into the oven dialog box.



Oven Settings

5) Select a solder paste from the list box and a Profile Type (Ramp-Soak-Spike or Ramp-To-Spike).



Select Paste

6) To complete the download process, select the ***Apply*** button to display the data run and oven information on the ***Profile*** worksheet Data Graph.

When the Data Graph is populated with a new profile, the software automatically aligns the X-axis maximum peak values for each Data Plot and the oven model so the results can be easily compared during analysis.

The Read M.O.L.E. Data command can be accessed on the Toolbars of the Welcome, Spreadsheet and Profile worksheets.

Read M.O.L.E. Data Button

5.6.7 M.O.L.E. Defaults Sub-Menu

The M.O.L.E. ***Defaults*** sub-menu is designed to set M.O.L.E. menu commands with standard defaults. When a command in the ***Defaults*** sub-menu is selected and a value is changed, the new value becomes the default that is used when a new workbook file is created. Default values are also used when importing old data files because they may not contain all the information needed by the software.

5.7 OvenWATCH Menu

The OvenWATCH menu commands control the product recording process.

The *OvenWATCH* menu commands are only used on the *Watch* & *Watch SPC* Worksheets

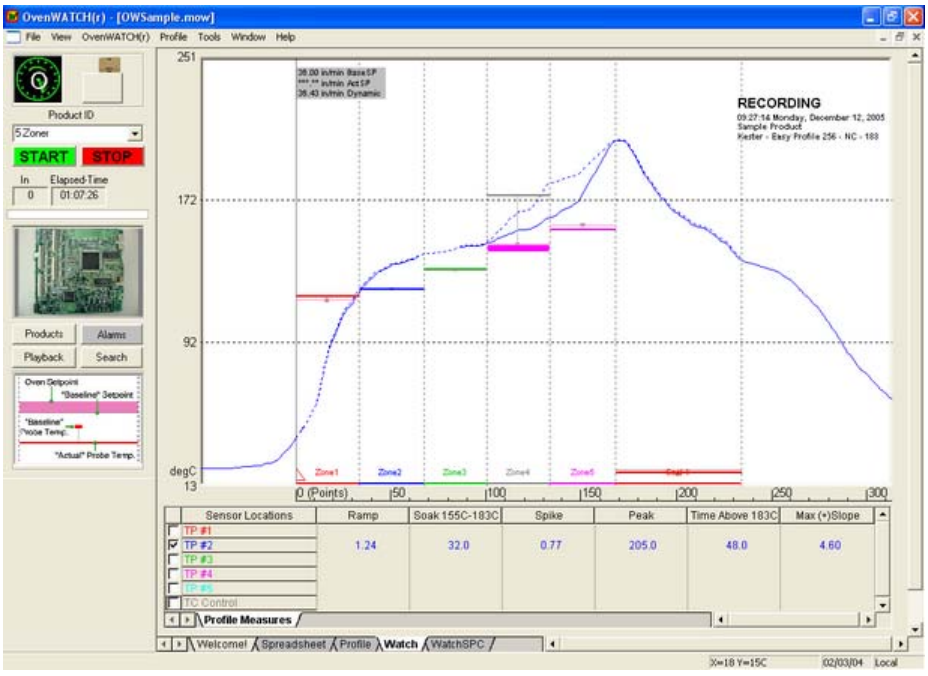
5.7.1 Start

The Start command activates the OvenWATCH to start recording oven data.

To Start recording OvenWATCH data:

1) Insert the M.O.L.E. into the Station.
2) Select the ***Start*** command from the ***OvenWATCH*** Menu to start the OvenWATCH recording process If either the ***Yes*** or ***No*** command button was selected the recording process will start.

When the OvenWATCH is recording data a Dynamic Profile is displayed in the Data graph as dashed Data plots that represents a predicted profile based on the current temperatures and the Baseline Profile. (Refer to section ***Step 1 – Create a Baseline Profile*** for more information).



Recording Data

The ***Start*** command can also be accessed on the Control panel of the Watch and Watch SPC worksheets.

5.7.2 Stop

Selecting the Stop command on the OvenWATCH Menu stops the recording process.

The ***Stop*** command can also be accessed on the Control panel of the Watch and Watch SPC worksheets.

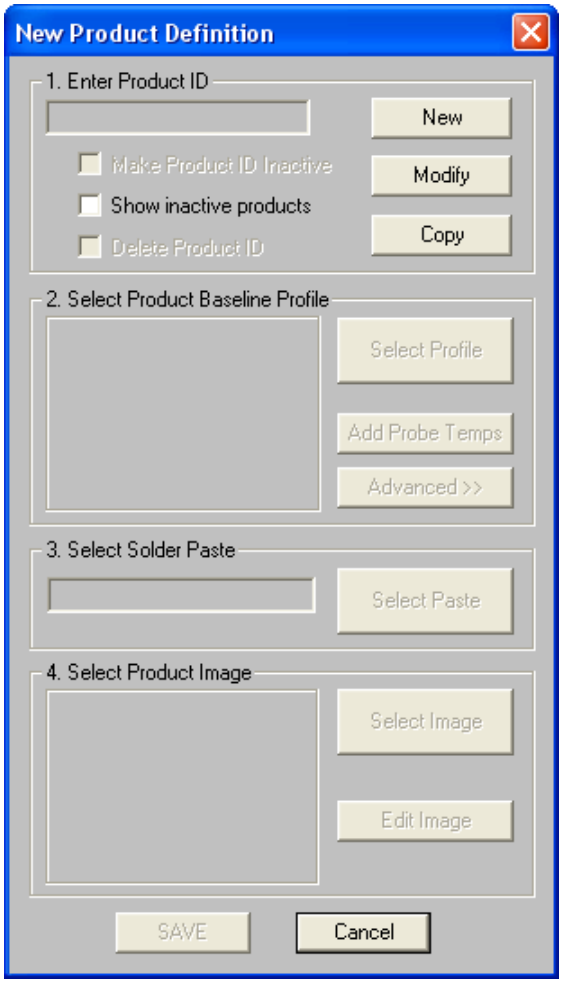
5.7.3 Products

The Products command is used to define a new or edit an existing product.

To create a Product:

1) On the ***OvenWATCH*** Menu, select the ***Products*** command.

The Product commands are password protected and the default software password Admin will be needed to gain access to them. If the password has been changed, the new password will then be needed. Refer to the section *Passwords for more information*.

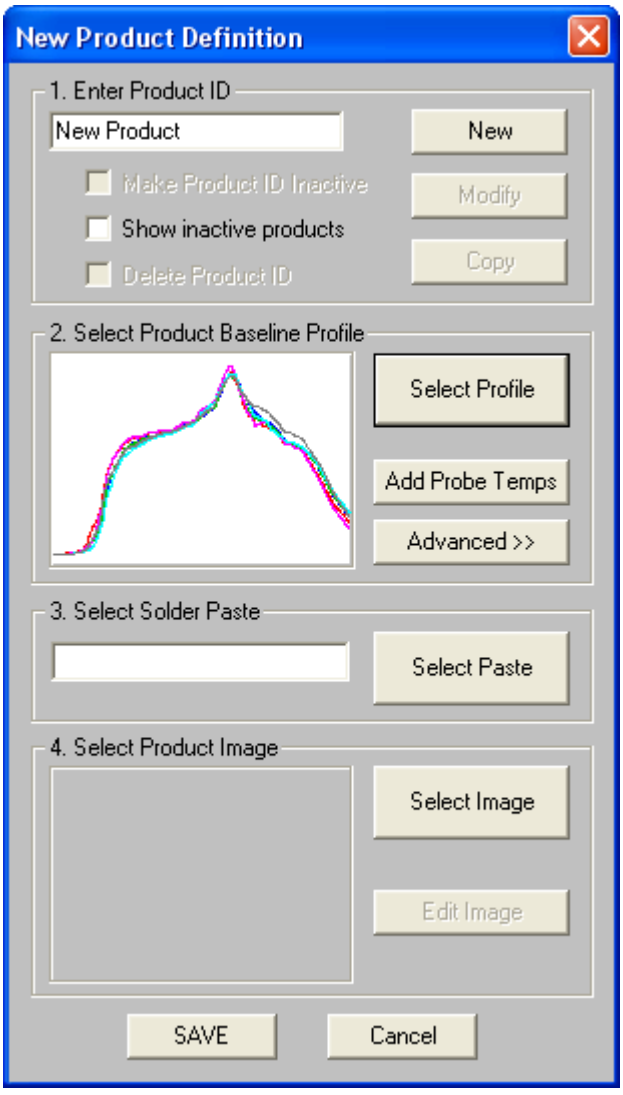


Product Definition Palette

2) On the the ***Product Definition*** palette, select the ***New*** command button. Enter a product ID, or select the ***Copy*** command button to create a new product by copying an existing product.

When copying an existing product, the user can select the Show inactive Products check box to display all inactive products in the database. These products are made inactive using the Modify command. Refer to section *Modify Product Definition* for more information.

3) Select the ***Select Profile*** command button on the Product Definition pallet and the software will automatically display the Spreadsheet worksheet where the user selects the desired Baseline Profile for the product.

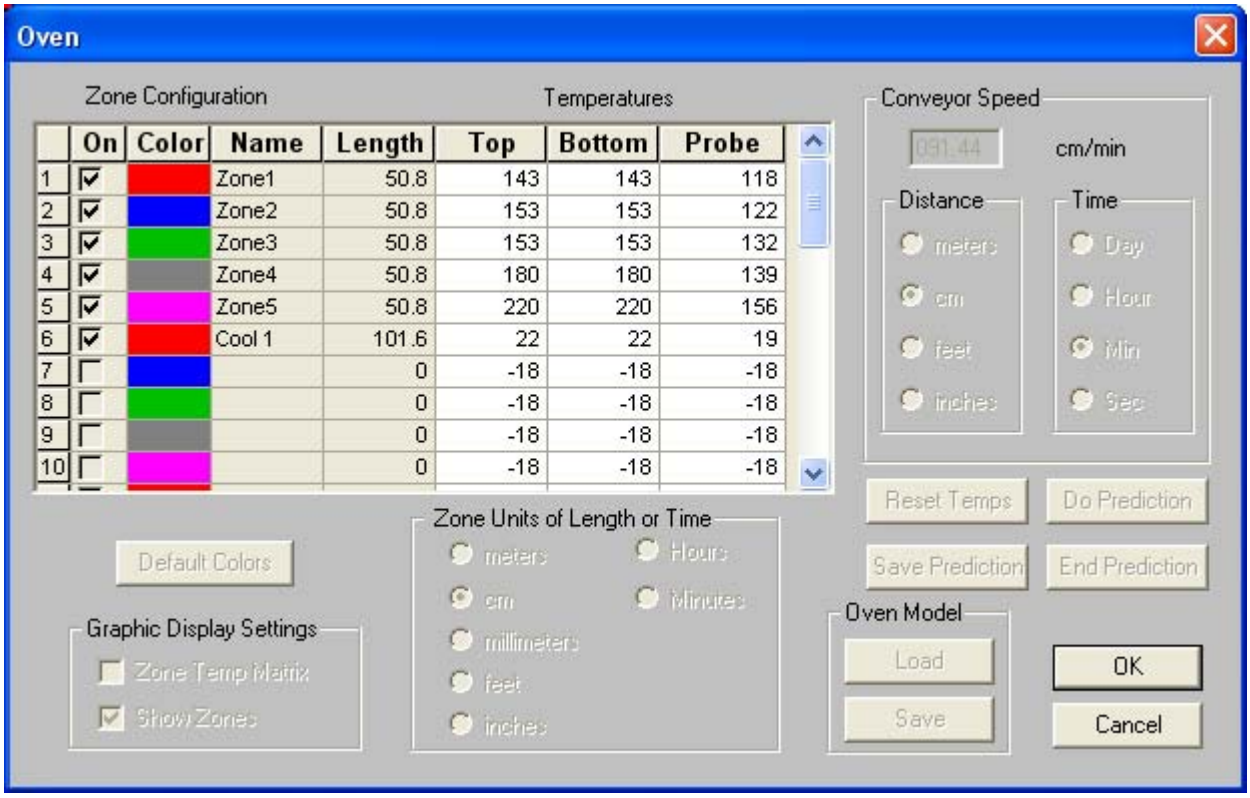


Select Profile

4) If the oven is stabilized at the set temperatures, select the ***Add Probe Temps*** command button to add the current probe temperatures from the oven.

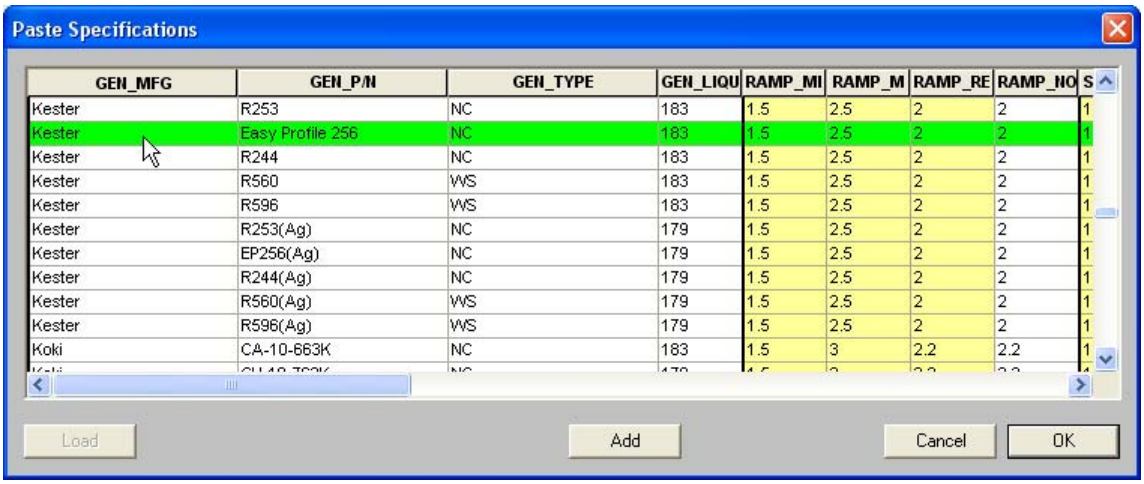
If the oven is not stabilized, you can modify the product ID to add the current probe temperatures from the oven once it has stabilized.

If the oven is not stabilized, the user can select the *Advanced* command button on the Product pallet to manually edit the Oven zone temperatures from the Baseline Profile.



Advanced Oven Temperature Settings

5) Select the ***Select Paste*** command button on the Product Definition pallet and the Paste Specifications list box appears.



Paste Database Dialog Box

6) Navigate to the desired paste highlight it, and select the ***OK*** command button to assign paste specification.

If the user wants to add a new Paste Specification, select the *Add* command button and follow the steps in section *Adding a Paste Specification* for more information.

7) Select the ***Select Photo*** command button from the Product Definition pallet and the Photo list box appears.

8) Navigate to the product photo highlight it, and select the ***Open*** command button to assign an identification photo.

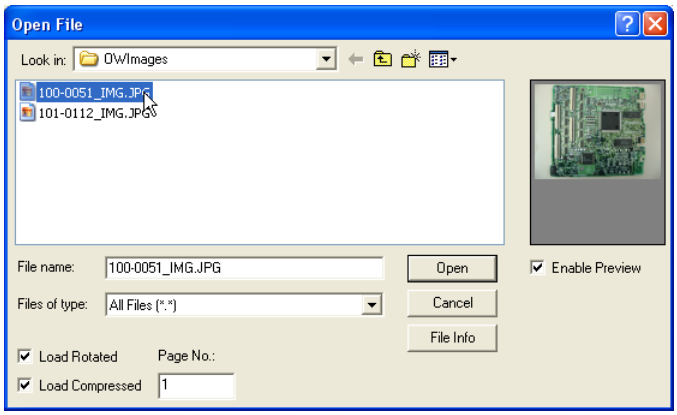
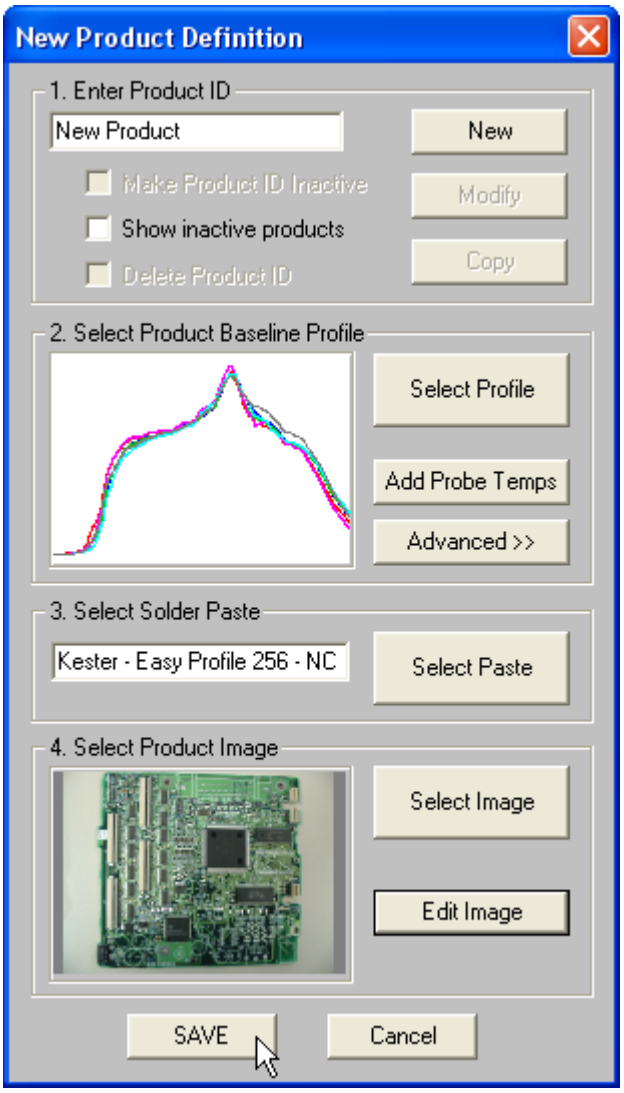


Image Dialog Box

Once a photo is assigned, the user can use the Photo Shop tools to enhance the photo by selecting the *Edit Image* command button on the Product Definition pallet.

9) Select the ***Save*** command button to save the product definition or ***Cancel*** to return to the worksheet without creating a product.



Defined Product

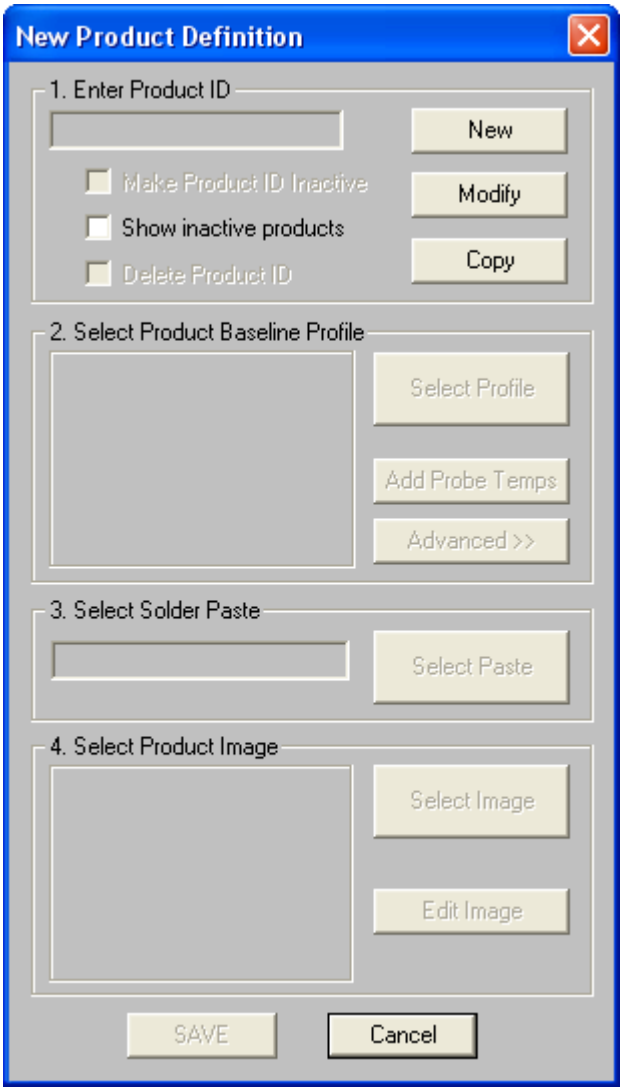
The Product command can also be accessed on the Watch Control panel of the Watch and Watch SPC worksheets.

To modify a Product definition:

Once products have been added to the database, the user can modify existing product definitions to keep up with process improvements.

Once a product is created, some definitions are locked and cannot be modified.

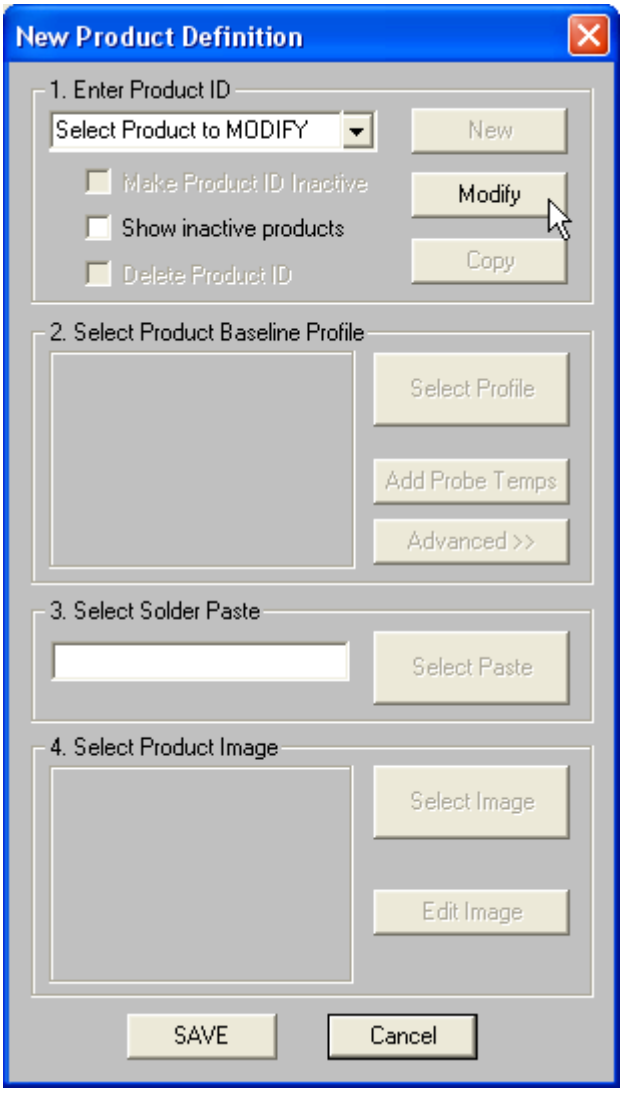
1) Select the ***Products*** command from the ***OvenWATCH*** Menu and the ***Product Definition*** palette appears.



Product Definition Palette

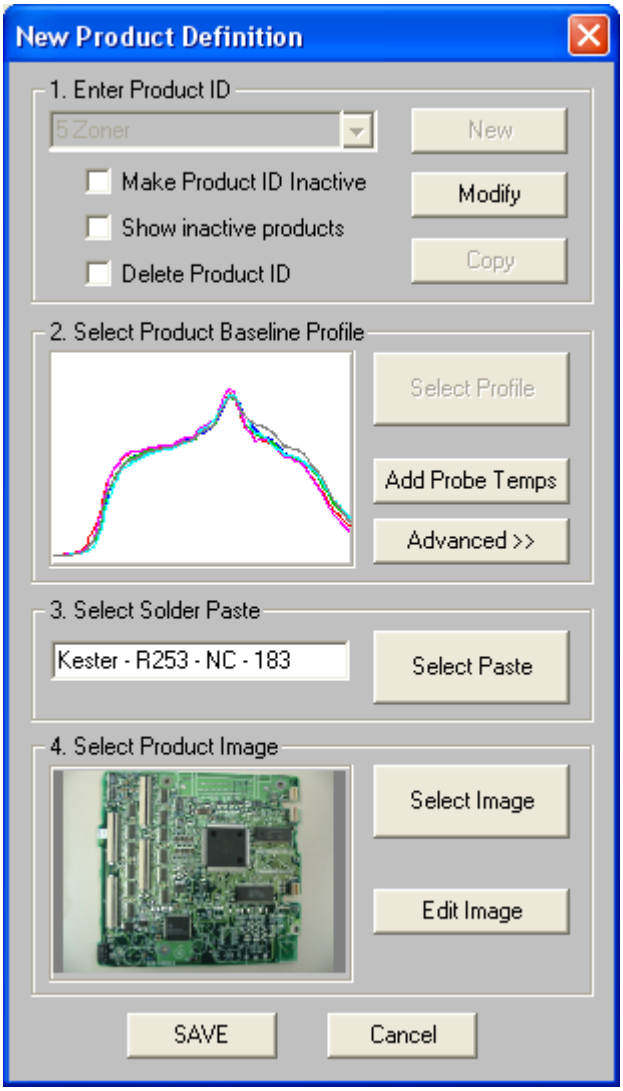
The Product commands are password protected and have a preset password Admin. This password will be needed unless it has been changed. Refer to the section *Passwords* for more information.

2) Select the ***Modify*** command button to select an existing product.



Modify Product Definition command

3) Select a product from the Product ID drop-down list.



Modify Product Definition

- Select the ***Make Product ID Inactive*** checkbox to make the selected product inactive.

When products are inactive, they will not appear in the Product ID drop-down list.

- Select the ***Show inactive Products*** check box to display all inactive products in the database.
- Select the ***Delete Product ID*** to delete the selected product from the database.

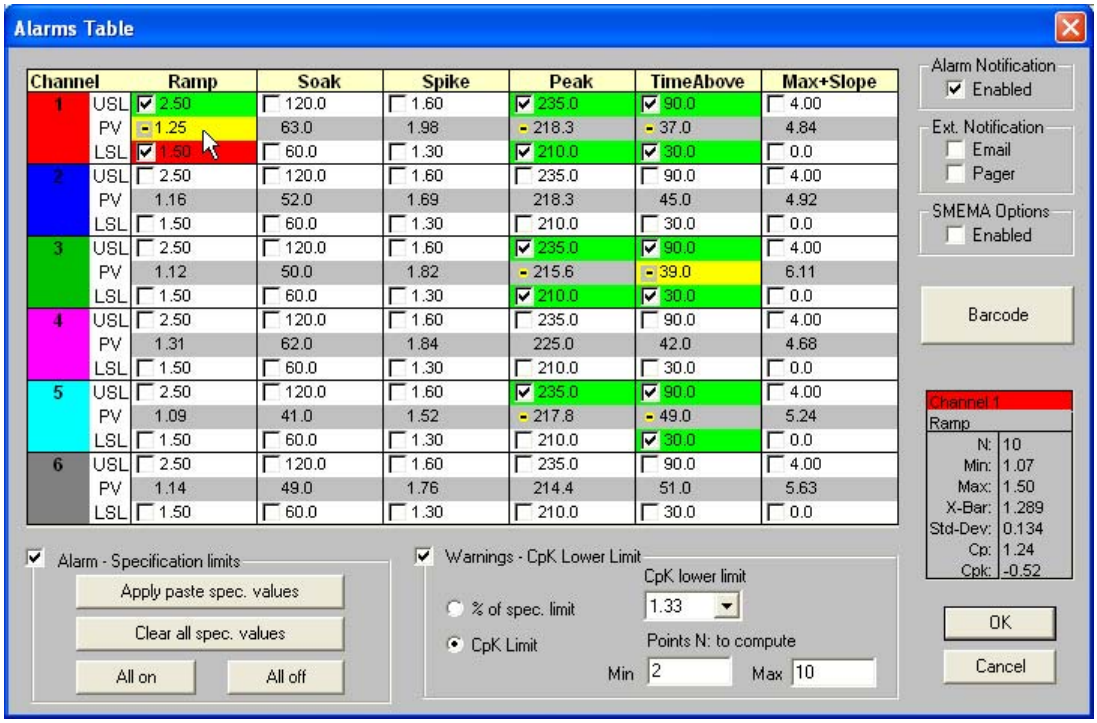
4) Modify the product definitions to reflect process improvements.

5) Select the ***Save*** command button to save the product definition modifications or ***Cancel*** to return to the worksheet without changing the product.

5.7.4 Alarms

The Alarms command defines global Alarms for the currently selected product.

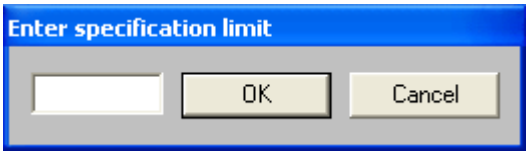
The Alarms Table has many features. Use the illustration shown and the following definitions to interpret.



Alarms Table Features

USL/LSL

These cells contain an Upper or Lower specification limit value. The user can choose to populate these with the Paste Specification values or configure them individually by double clicking the cell.



Enter Specification limit

These USL/LSL values are linked to the local Alarms set on the Watch SPC worksheet. When set from the Alarms Table they will automatically update the values on the Watch SPC worksheet.

PV (Present Values)

These cells contain the PV (Present Value) of parameter.

Alarms Specification Limits

When selected, this enables the USL/LSL Alarms. When USL or LSL cells are populated with a spec limit value, the cells are **GREEN** when the spec limits are not violated. If the cells are **RED** the spec limits have been violated. If a USL or LSL does not have a spec limit, they will remain white.

When USL or LSL cells are checked they enable ability to have an Alarm.

The user also has the ability to globally set all of the USL/LSL limits based on the paste specification currently selected for the product by pressing the ***Apply paste spec.*** values command button.

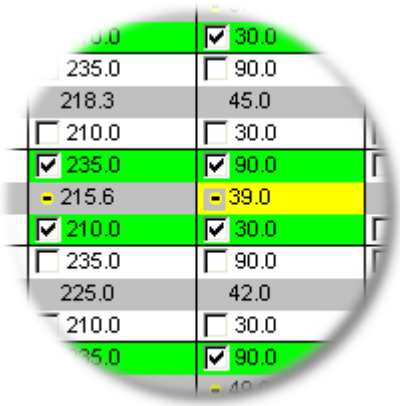
All of the USL/LSL limits can be enabled or disabled at one time by selecting the ***All On*** or ***All Off*** command buttons.

Warnings

When selected, the software monitors the enabled parameters and warns the operator when the parameters are approaching the specification limits.

Warnings can only occur when <u>both</u> the USL and LSL limits have values and at least one of the check boxes are enabled.

If the CpK Lower Limit or % spec Warning Limits are active, a small yellow circle



appears at the left end of the PV box.

Warning Indicators

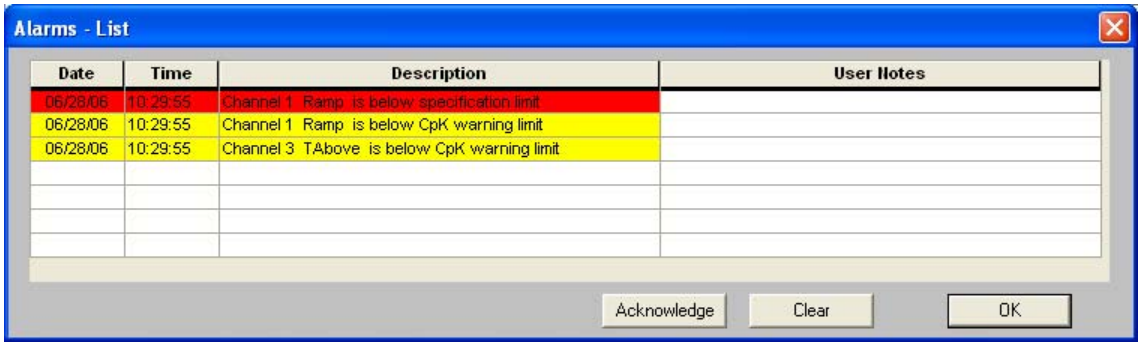
If CpK Lower Limit or % spec warnings are enabled and the limit(s) are violated, the PV cell will be highlighted **YELLOW**.

Alarms Notification

When selected, the ***Alarms – List*** dialog box and OvenWATCH station will alarm when either the USL/LSL and/or Warning values are violated.

If the optional Light tower or SMEMA Interface is installed with the system, activating the Alarm Notification will also signal these options.

If an alarm or warning is triggered during the recording process, the ***Alarms - List*** dialog box appears.



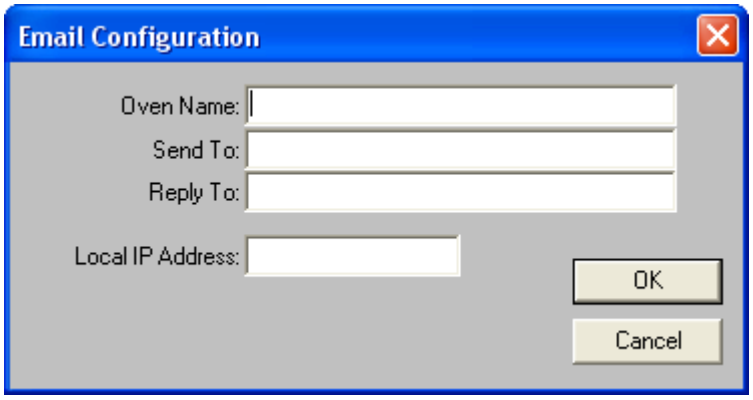
Alarms-List

Once the Alarms-List appears selecting the ***Acknowledge*** command button stops the alarm. Once it has been acknowledged, the operator can then proceed to troubleshoot the problem. After the problem has been resolved selecting the ***Clear*** command button will remove the alarm from the Alarms List.

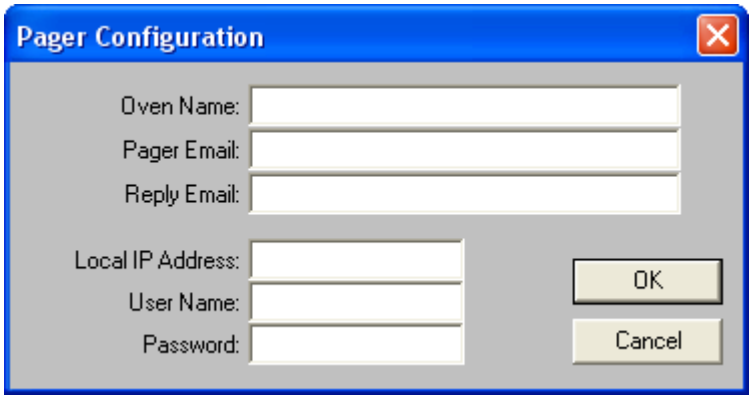
Acknowledged Alarms will not sound again even if the alarm condition persists. Once the alarm condition is cleared, and the same alarm condition remains or returns the alarm will be displayed in the Alarm List again.

External Notification

Select the check box adjacent to Email and/or Pager options to activate external Alarm notification. When either of these options are selected, the associated configuration dialog boxes appears.



E-mail Notification Configuration



Pager Notification Configuration

Enter the appropriate configuration information. You may have to contact your internal Information System Manager and your Pager service to get the correct settings.

SMEMA Options

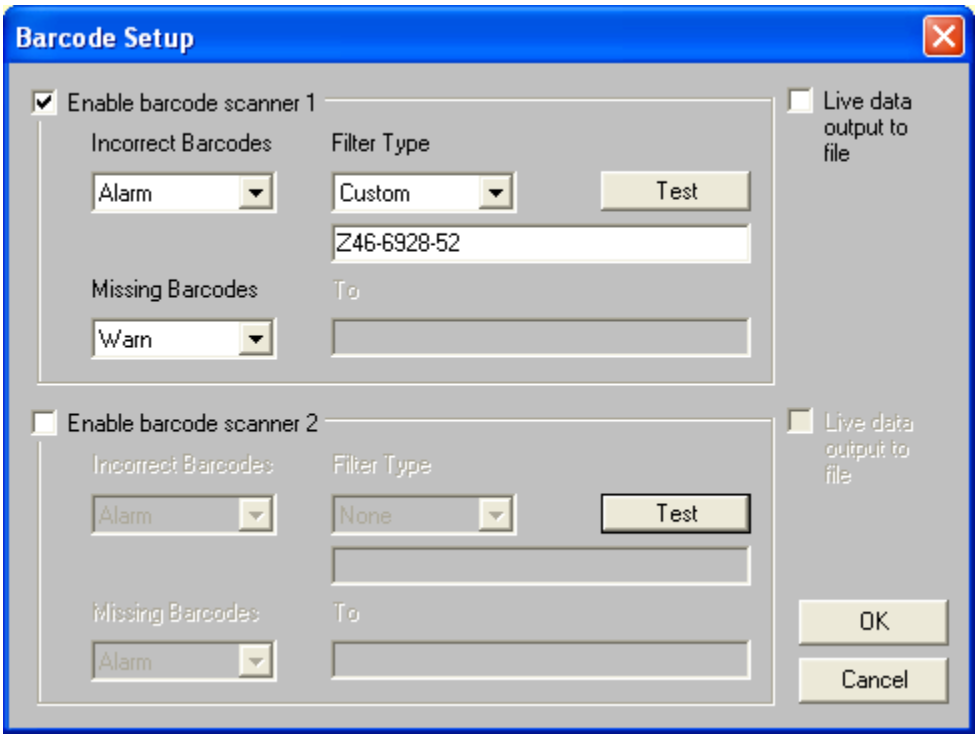
If your system includes the optional SMEMA interface, select this check box to enable the Machine not ready signal. This signal opens whenever there is an Alarm. It closes when you either acknowledge or clear an alarm(s).

If a PV parameter is set up to warn the user, the software does not send a siginal to the SMEMA option.

Barcode

This is the optional Barcode scanner Alarm setup dialog box.

If the *Barcode* alarm setup command button is dimmed, it must be authorized to prior to use. (Refer to Section *Software Authorization* for additional information)



Barcode Scanner Setup

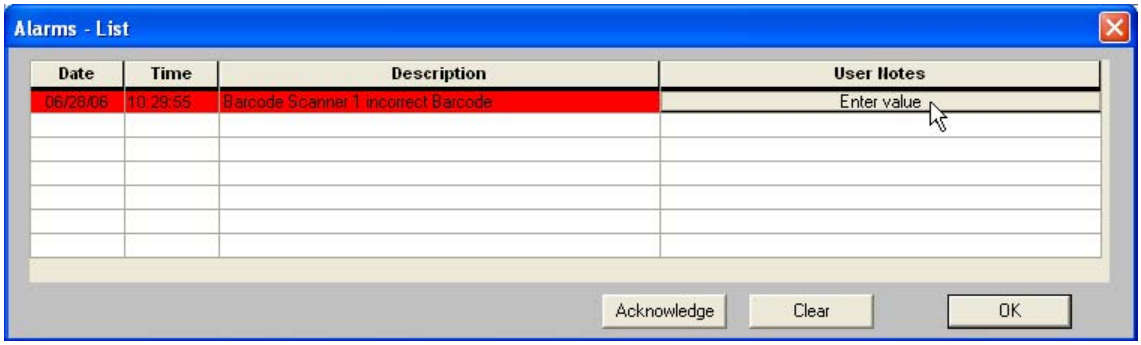
Each Barcode scanner must be configured using the Barcode Configuration dialog box. Refer to section *Barcode Configuration* for more information.

Enable barcode scanner 1 and/or 2 by selecting the associated check box.

Incorrect Barcodes:

Once a barcode is enabled, the user can set the software to alarm, warn, or take no action when an incorrect barcode is read and compared to the filter.

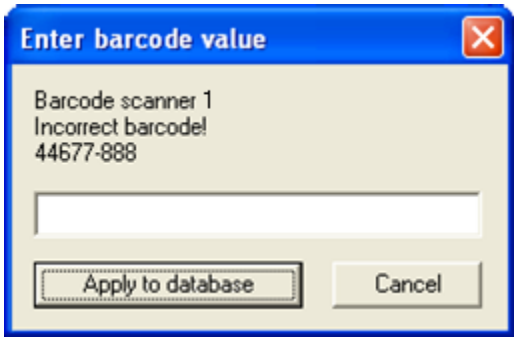
If an alarm or warning is triggered during the recording process, the ***Alarms - List*** appears.



Alarms-List

If the Alarms-List appears select the ***Acknowledge*** command button to stop the alarm. Once it has been acknowledged, the operator can then proceed to troubleshoot the problem. If an incorrect barcode is set to alarm, the user can select the ***Enter value*** command button in the User Notes field to manually add the barcode to the database.

If the incorrect barcode feature is set up to warn the user, the software does not allow the ability to update the database with the correct barcode.



Enter barcode value

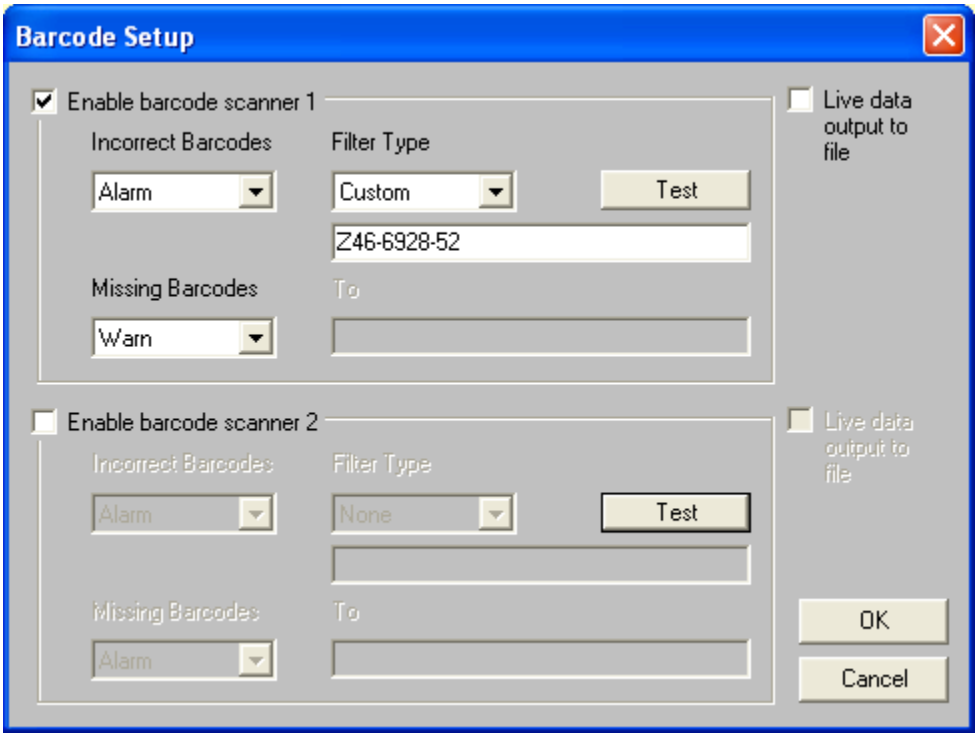
Once the problem has been resolved selecting the ***Clear*** command button will remove the alarm from the Alarms List.

Acknowledged Alarms will not sound again even if the alarm condition persists. Once the alarm condition is cleared, and the same alarm condition remains or returns the alarm will be displayed in the Alarm List again.

Filter Type:

A filter can be based on the currently selected product, called the ProductID, a barcode range, custom, or none.

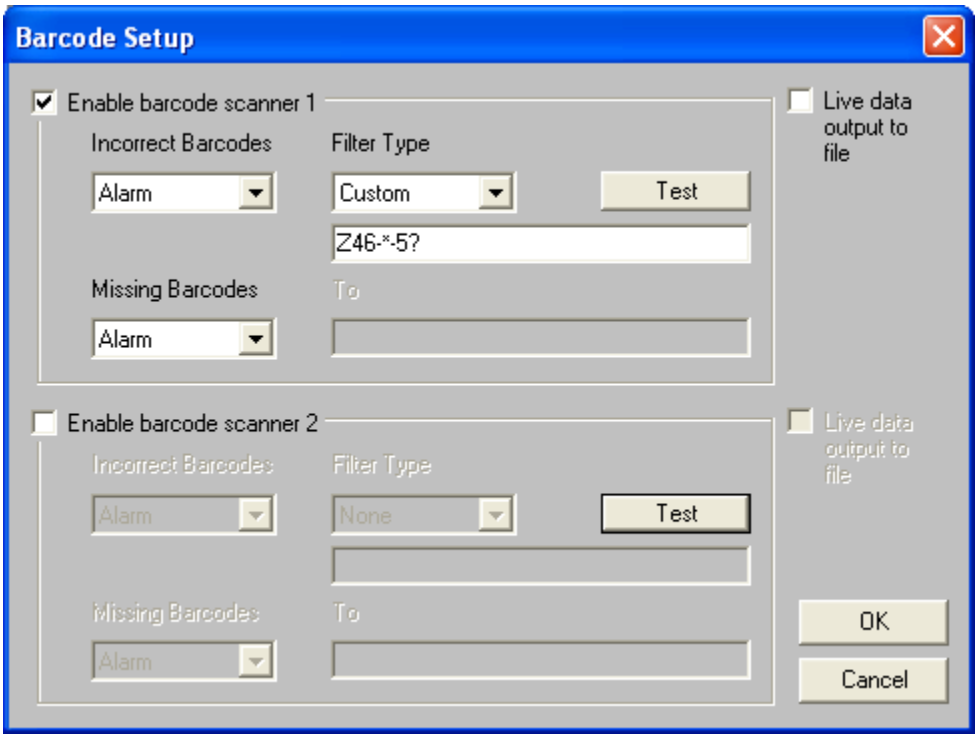
For example, the user can select Custom from the Filter Type drop down box and then enter a specific Part Number for the software to accept. If the barcode scanner reports anything other than that specified part number, the software will take the action specified by the user.



Barcode Filter Type

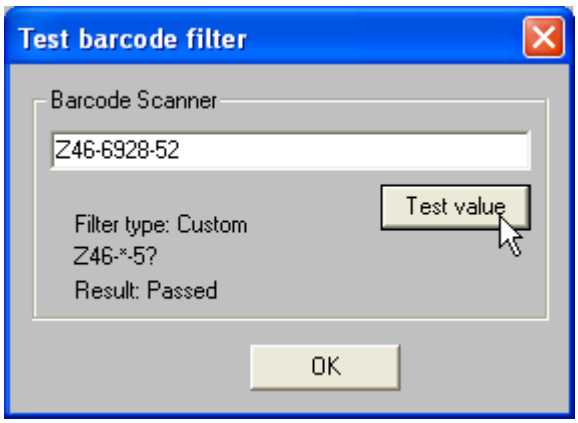
Filter Type also allows the user to use special characters to enhance the filter capabilities.

***** = Any single or set of characters at that location in the text.
? = Any single character at that location in the text.



Barcode Filter Type Special Characters

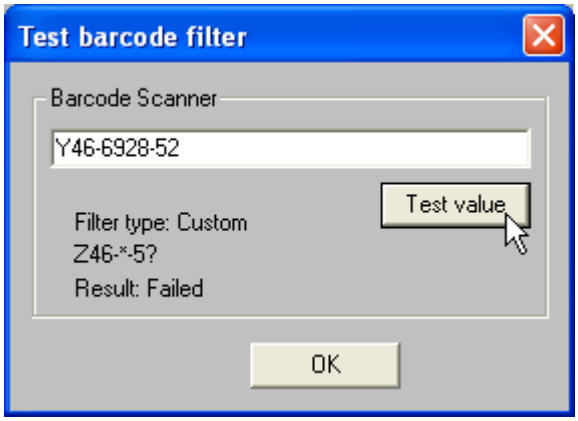
Once a filter type is specified, the user can test the filter type by selecting the ***Test*** command button on the Barcode Setup dialog box.



Filter Type Test

As shown in the Figure above the custom filter is specifying a part number that must start with **Z46-**, will accept any value or set of values, then must have **-5** and end with any single character.

The Figure below shows part number that failed the custom filter due to the fact it stared with **Y46-** which did not match the custom filter that specified the part number must start with **Z46-**.



Failed Custom Filter Type

Missing barcodes:

When selected, the software has the ability to alarm, warn, or take no action when a missing barcode is reported by the barcode scanner.

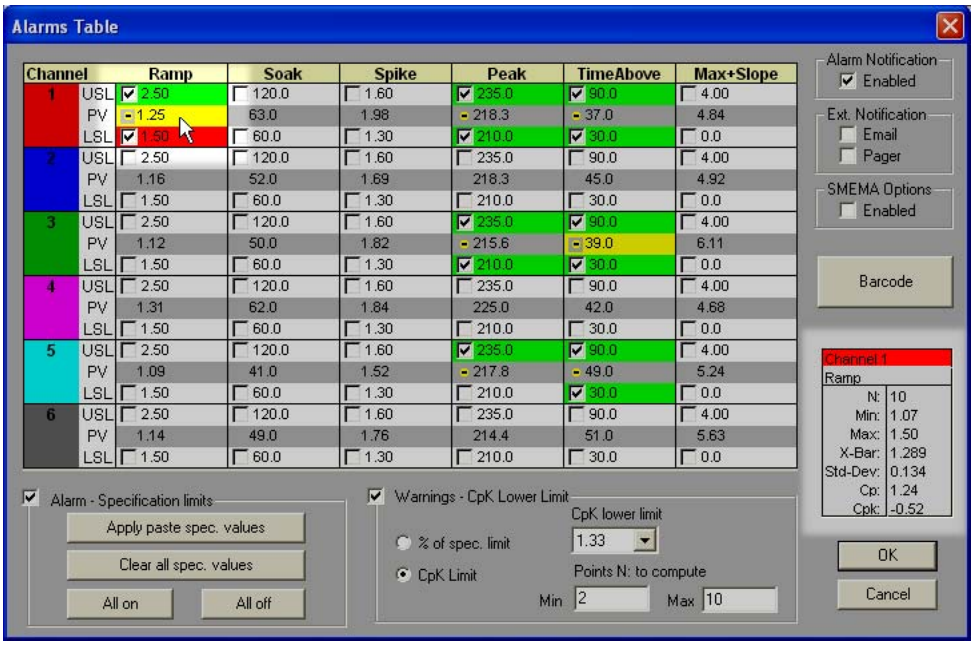
The optional Missing barcode detection must be configured using the Barcode Configuration command. Refer to section *Barcode Configuration* for more information.

Live data output to file

When selected, it will cause a .txt text file to be outputted with the same name as the barcode. The software will output the text file in the **ECD\Ovenwatch\liveoutput\directory**.

Channel Parameter Display

Mouse over any parameter on the Alarms table and the Statistics box is displayed on the Alarms table. Refer to section ***Statistics Box*** for more information.



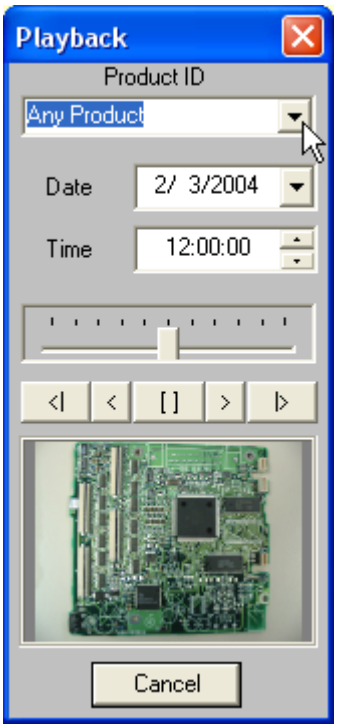
Channel Parameter Display

5.7.5 Playback

The Playback command reviews previously recorded product data.

To review product data:

1) On the ***OvenWATCH*** Menu, select the ***Playback*** command.



Playback

2) Select a product from the Product ID drop-down box.
3) Select a playback start date and time.

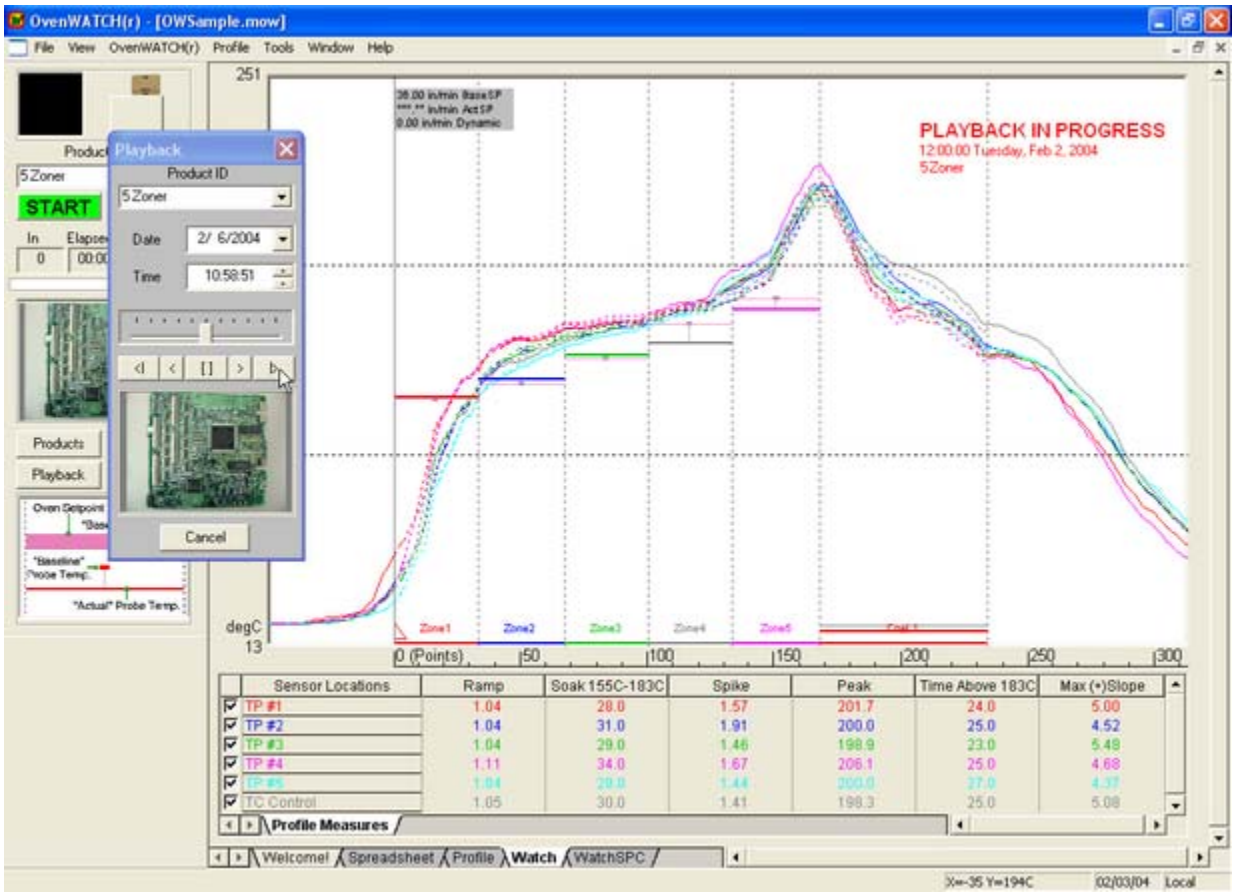
After selecting a Product the user can start the playback process without specifying a start date or time. If a start data or time is not specified the software wil automatically rewind 24 hours from the displayed date and time.

4) Select the Play forward or Play back button to start the Playback process. The software will search the database for the closest logged data points that match the selected product and time.

To locate a specific sample point, the user can single-step forward or backward sample points using the single step buttons.

When playing back data, if the specified date and time criteria is before the first logged data point for the selected product, the software will automatically forward to the first data point logged. If the date and time critera is after the last point logged the playback will remain idle.

5) When the playback process has started a playback label appears in the upper right corner of the Data graph.



Playback

6) To stop the playback process press the stop button ([ ]) between the play forward and play back buttons.

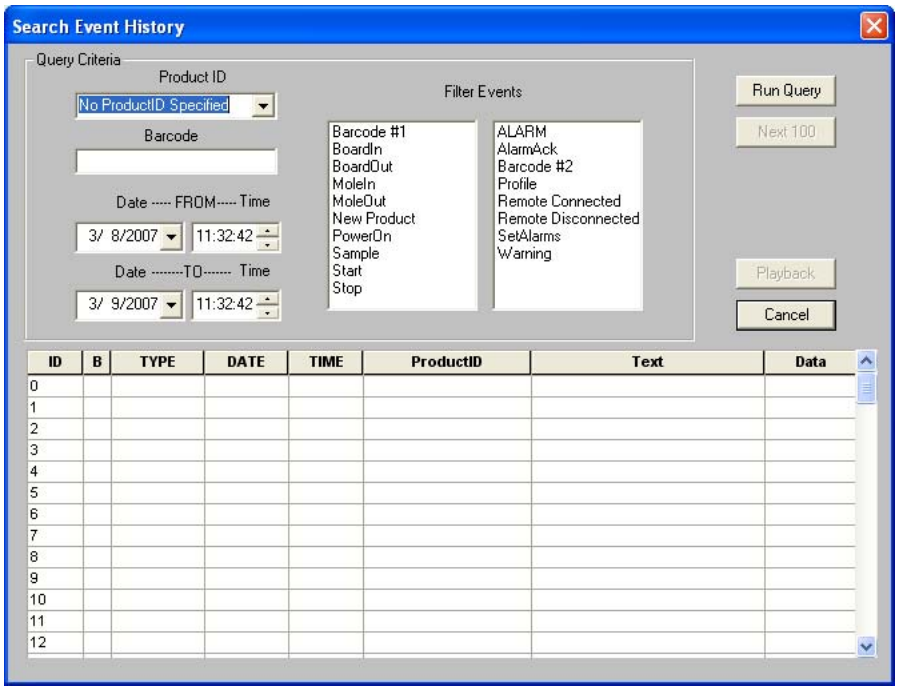
The Playback command can also be accessed on the Control panel of the Watch and Watch SPC worksheets.

5.7.6 Search

The Search command searches for event history for all previously defined products.

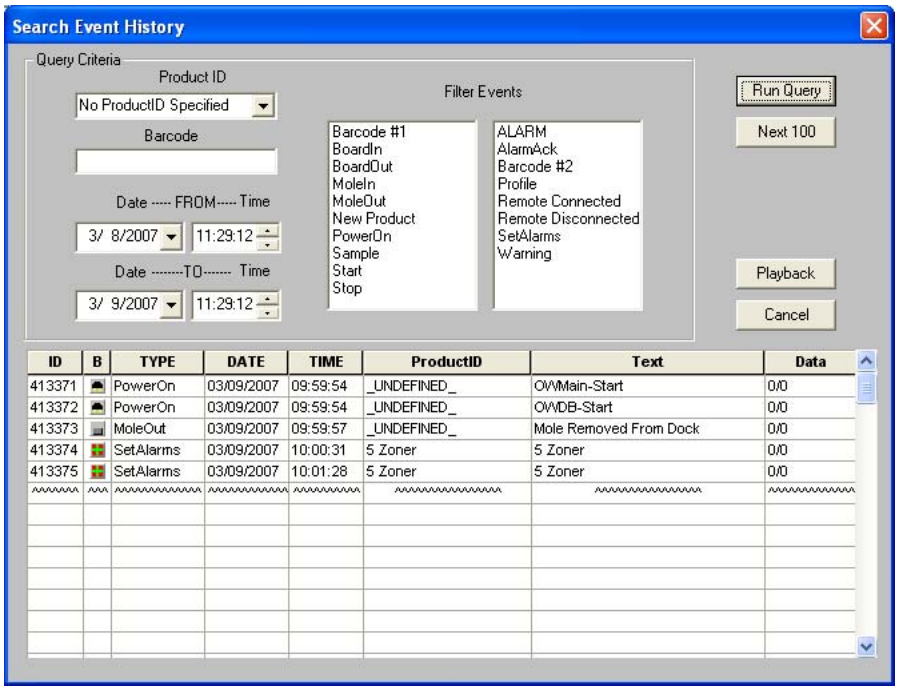
To search events:

1) On the ***OvenWATCH*** Menu, select the ***Search*** command.



Search Dialog Box

2) Select any criteria and search will find event to match a product. The user can also select a product from the Product ID drop-down list and select desired date and time criteria. To search for specific events select a desired event(s) in the Filter Events list box and select the ***Run Query*** command button.



Search Results

Once the search is complete the user can select an event and then use the Playback command to display it on the Data graph.

To search events for all products select the *Run Query* command button without selecting any search criteria.

The Search command can also be accessed on the Control panel of the Watch and Watch SPC worksheets.

5.7.7 Configure

The Configure sub-menu commands contain settings that are used to configure the optional Barcode and General Software settings during installation and fine-tuning for proper operation.

Because of the sensitive nature of the setting on the Configuration commands, they should be used by the Administrator or qualified operators only.

The Configuration commands are password protected and has a preset password Admin. This password will be needed unless it is changed using the Passwords command (for more information refer to section *Passwords*).

5.7.7.1 Barcode Configuration

The OvenWATCH software allows Barcode scanners and a Missing barcode option to be added to the system. The software settings are located in the Barcode configuration dialog box. These settings are configured when the software and Barcode scanner(s) is installed or the computer COM port configurations have changed.

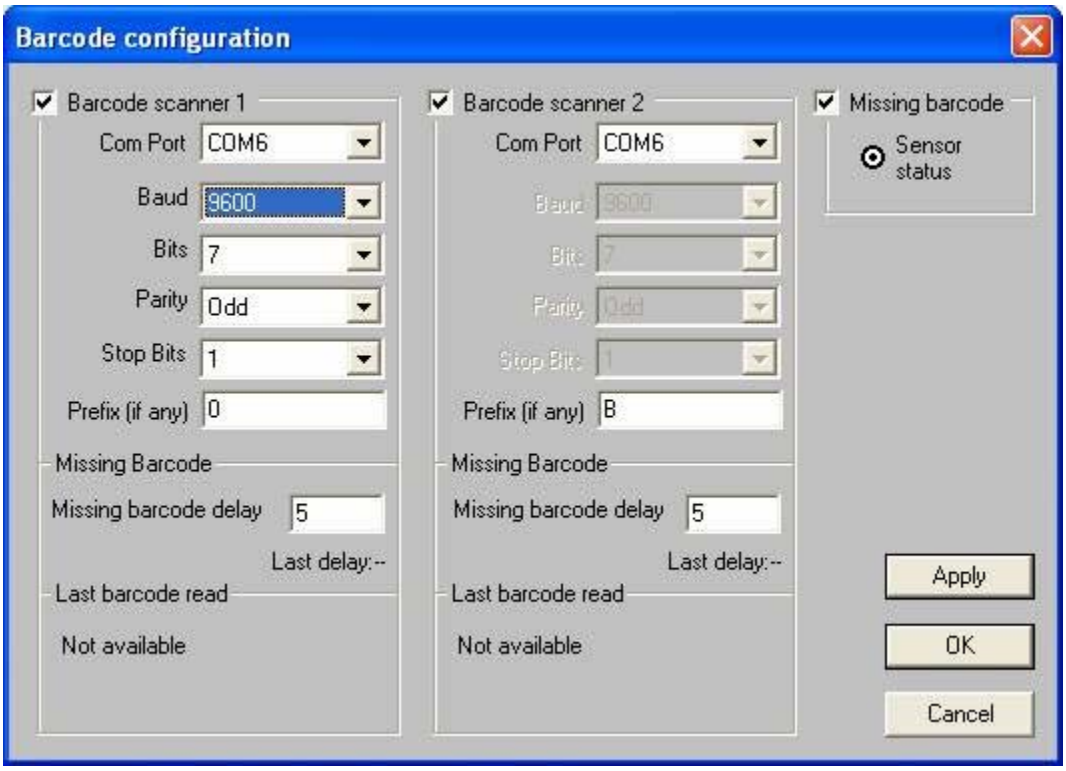
If the *Barcode Configuration* command is dimmed, it must be authorized to prior to use. (Refer to Section *Software Authorization* for additional information)

Barcode scanner 1 & 2

This is where the RS-232 communication settings for the Barcode scanners are configured to communicate with the computer.

A barcode prefix enables the software to distinguish between two barcode scanners connected to the same communication port. Barcode prefixes are stripped off the read barcode. Read barcode prefixes that match the specified prefix for that barcode scanner are recorded in the database by that scanner number.

The Barcode RS-232 communications will need to be set to match the specific communication configurations of the installed barcode scanner.



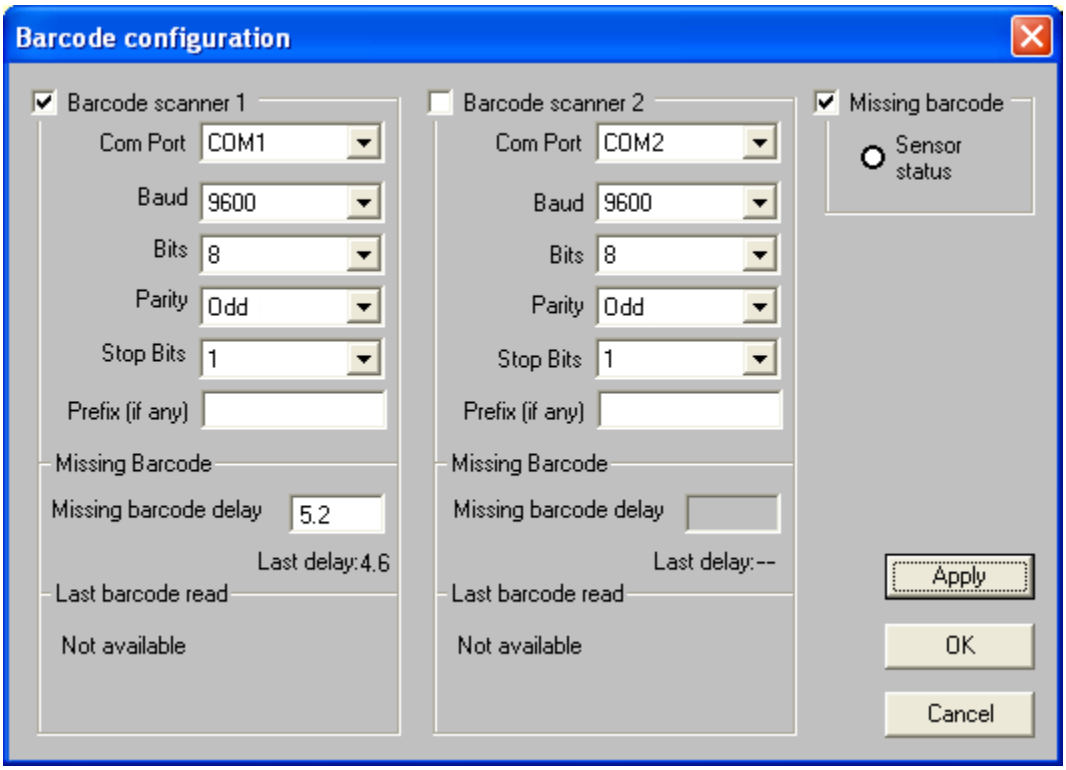
Barcode Configuration

Missing Barcode

The software has the ability to detect when a Barcode scanner does not report a barcode off a product. When this option is checked, the software can be set to alarm.

When the Missing barcode option is enabled, the ***Missing barcode delay*** needs to be entered. The software will report the time when the missing barcode tracking sensor detects the front edge of the product until the barcode scanner reports the barcode. Once the Last delay is reported, a time value must be entered in the ***Missing barcode delay*** box. It is recommended to enter a slightly larger delay number to accommodate variable barcode position on the product

If the Missing barcode delay is set too high the product may reach the end of the conveyor and the SMEMA interface will no longer be able to prevent the product from entering the oven.

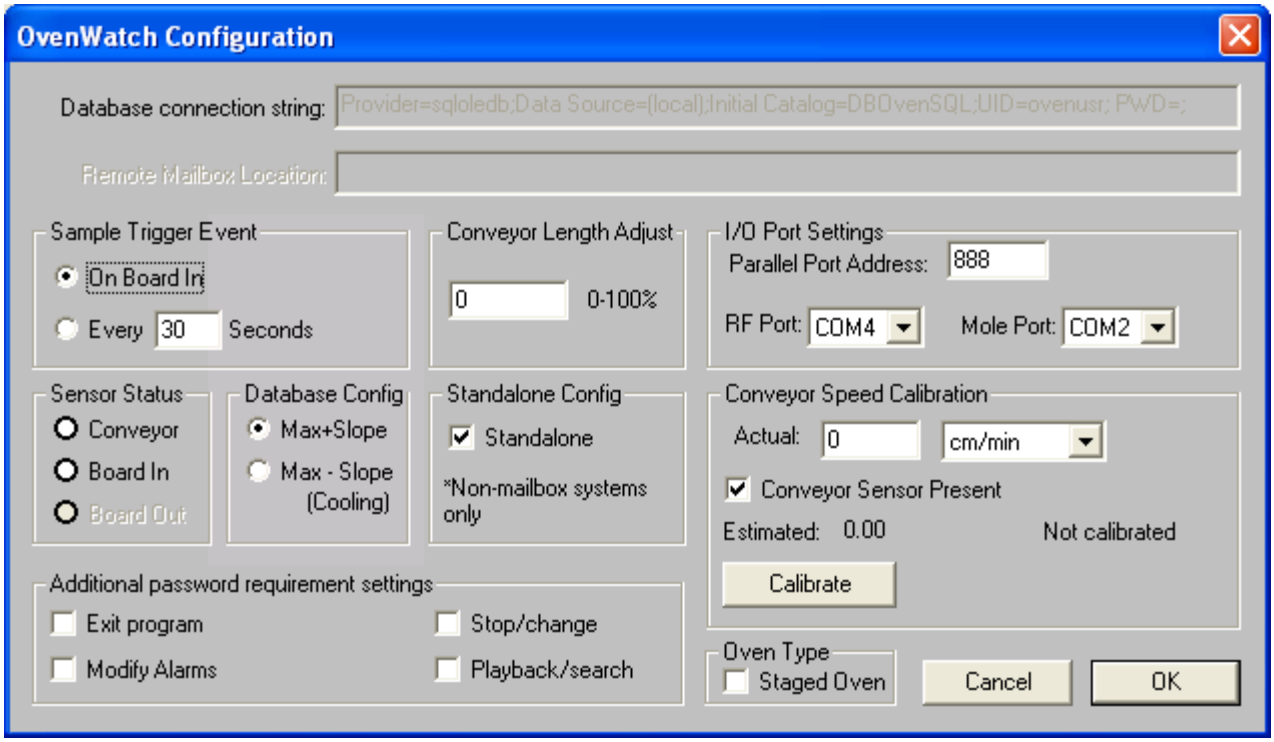


Missing Barcode

If the SMEMA option has been installed the Missing barcode detection will enable the Machine not ready signal.

5.7.7.2 General Configuration

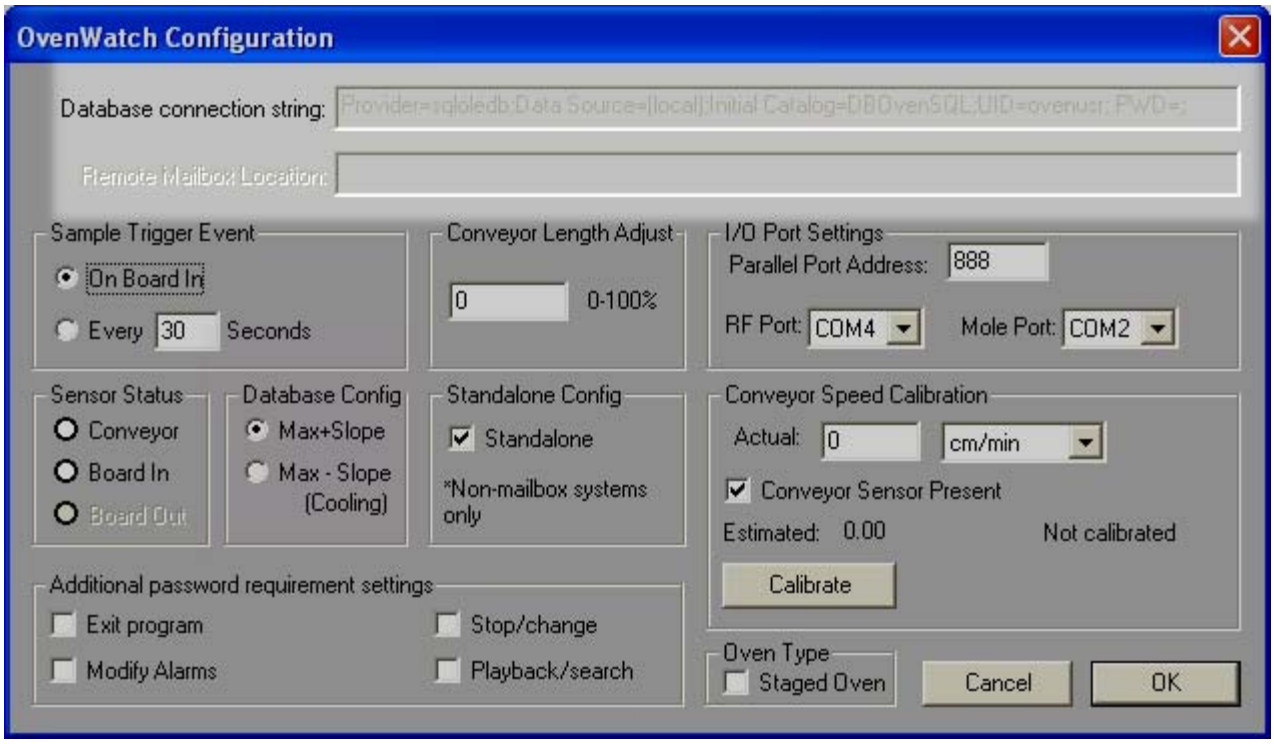
This section offers brief explanations of the OvenWATCH configuration settings.



Configuration Dialog Box

File location boxes

The top text boxes contain the Database connection string and the optional Remote Mailbox location folder path. These settings are automatically configured during installation but can be changed depending on optional installation configurations (refer to ***Appendix C: OvenWATCH File Directory Structure*** for more information).

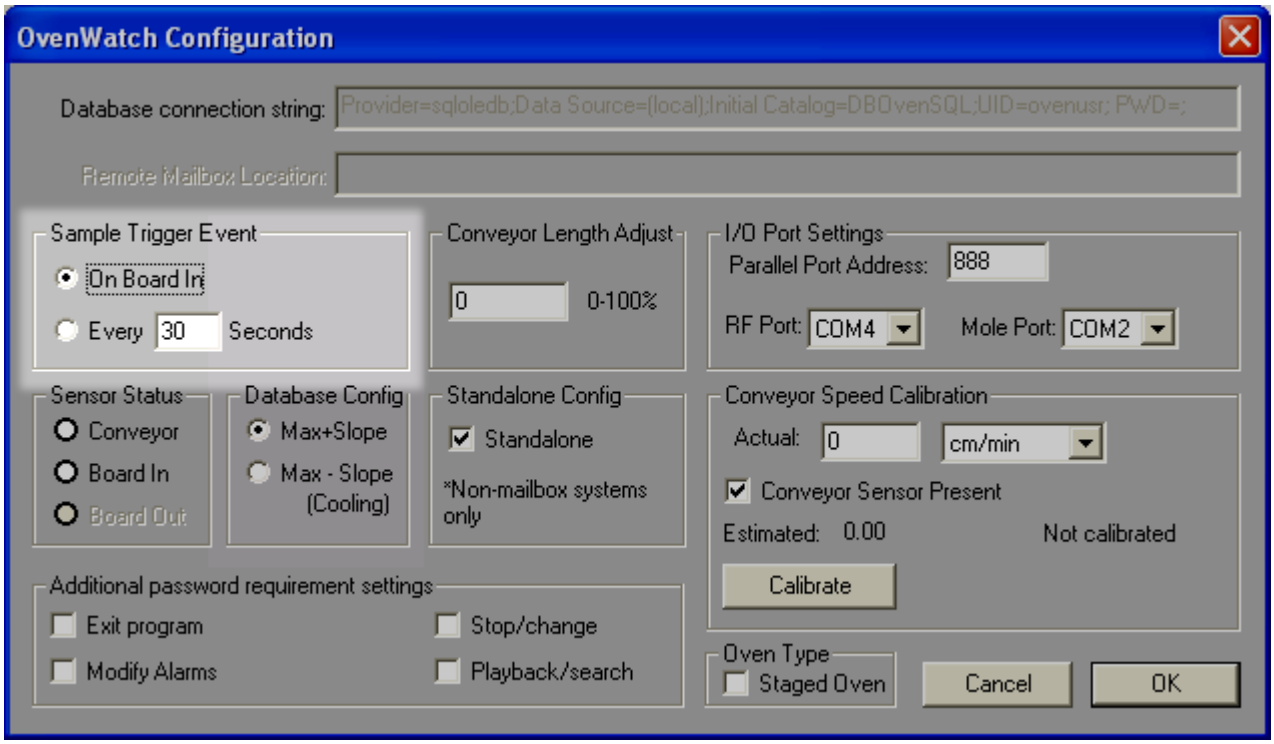


File Location Boxes

Refer to *Appendix C: OvenWATCH File Directory Structure* for more details on modifying File locations.

Sample Trigger Event

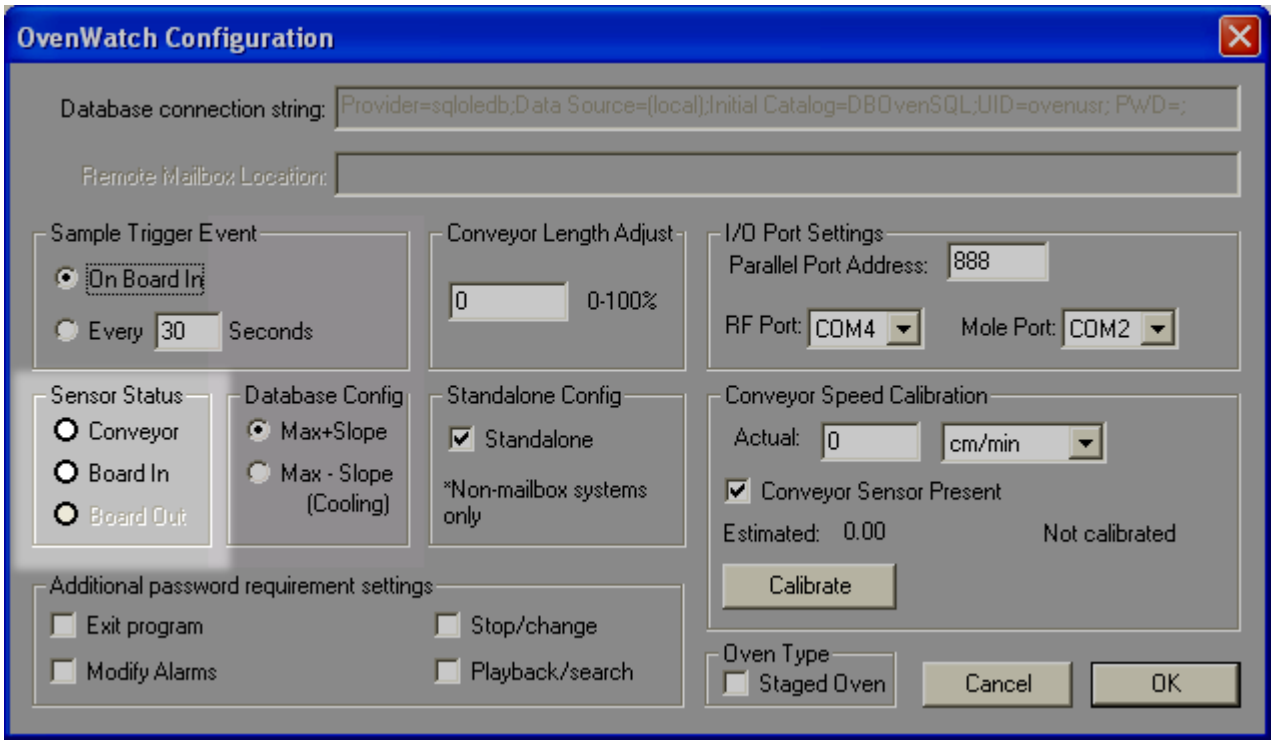
The recording process can be set to be triggered when a board enters the oven or log every 30 seconds.



Sample Trigger Event Settings

Sensor Status

The Sensor status is used for troubleshooting when you want to check if the sensors are operational. Each of these buttons will illuminate when the sensor is activated.



Sensor Status

Database Configuration

This is where the user can select what type of slope measurement they wish to record in the database along with the values extracted from the Data plot. (refer to ***E: Watch Profile Measures*** for Max + and Max - Slope definitions).

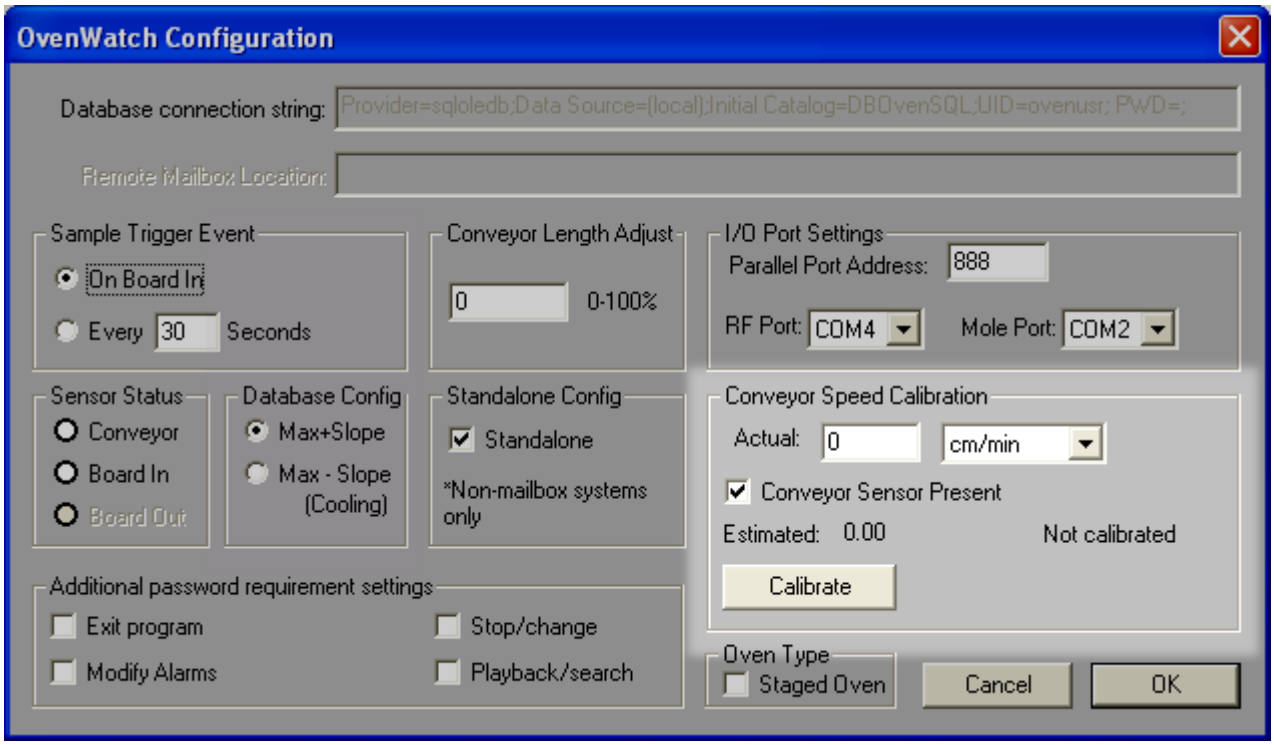
Conveyor Speed Calibration

If the user suspects the software is not accurately reflecting the correct conveyor speed, it can be calibrated to match the actual speed from the oven mailbox.

To calibrate the conveyor:

1) Check the Mailbox Conveyor Speed. If you feel this speed accurately reflects the actual conveyor speed, select the ***Calibrate*** button and the software will start the calibration process.

If the oven is not accurately reporting the conveyor speed the user can manually enter a conveyor speed. The actual conveyor speed must be determined using manual distance/time methods.



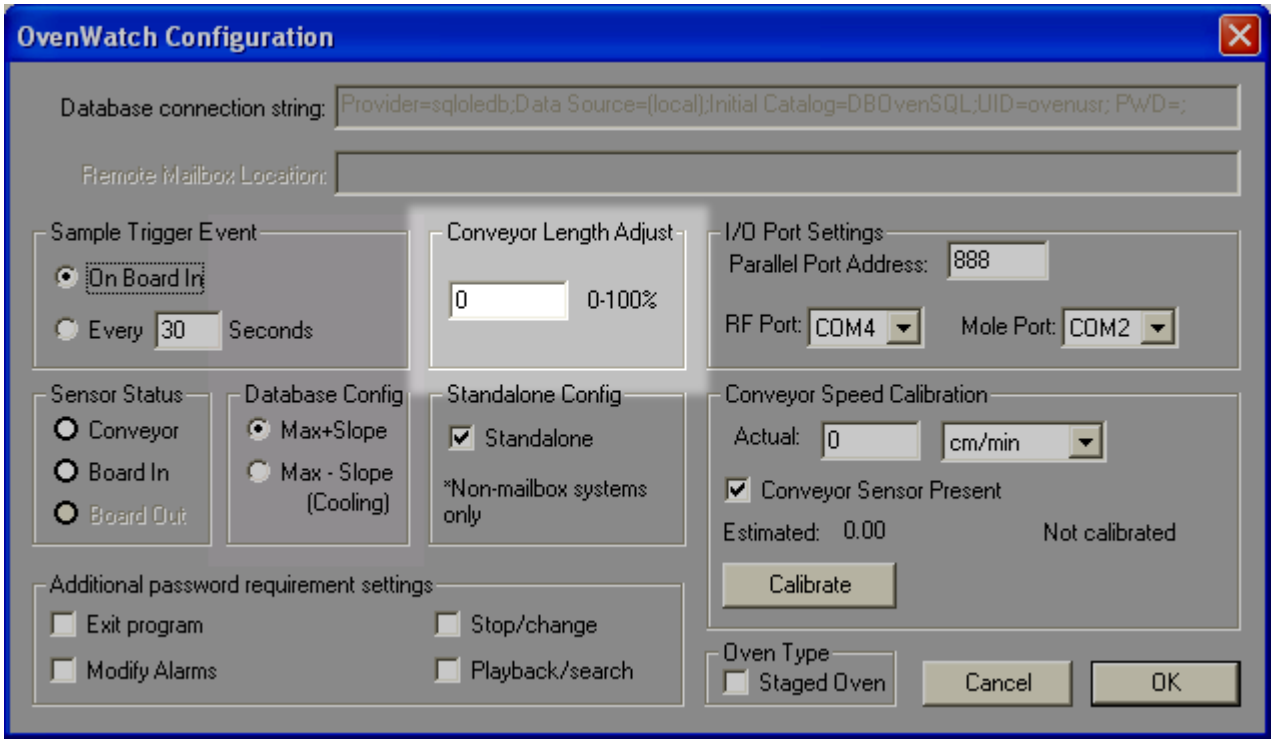
Conveyor Speed Calibration

2) The calibration process takes 1 minute to complete and the software will display a counter to the right of the calibration button. When it is complete, the counter will display a message informing the user that the calibration has been completed.

Conveyor Length Adjustment

If the oven conveyor length is not properly reflected in the Product Tracker, the user can manually adjust it using the Conveyor Length Adjust setting to accurately reflect the total length of the oven.

The Product Tracker on the Watch control panel reflects the heating and cooling zones in the oven based on the zone information from the Baseline Profile. If your oven has entry and exit zones you will need to calculate the extra conveyor length and enter that value as a percentage.



Conveyor Length Adjust

To determine the Conveyor Length Adjust:

1) Measure the total length of the oven and multiply that value by 100.
2) Divide the value produced in Step 1 by the length of the heating and cooling zones
3) Subtract 100 from the value produced in Step 2 producing the Conveyor Length Adjust value.

Conveyor Length Adjust Formula:

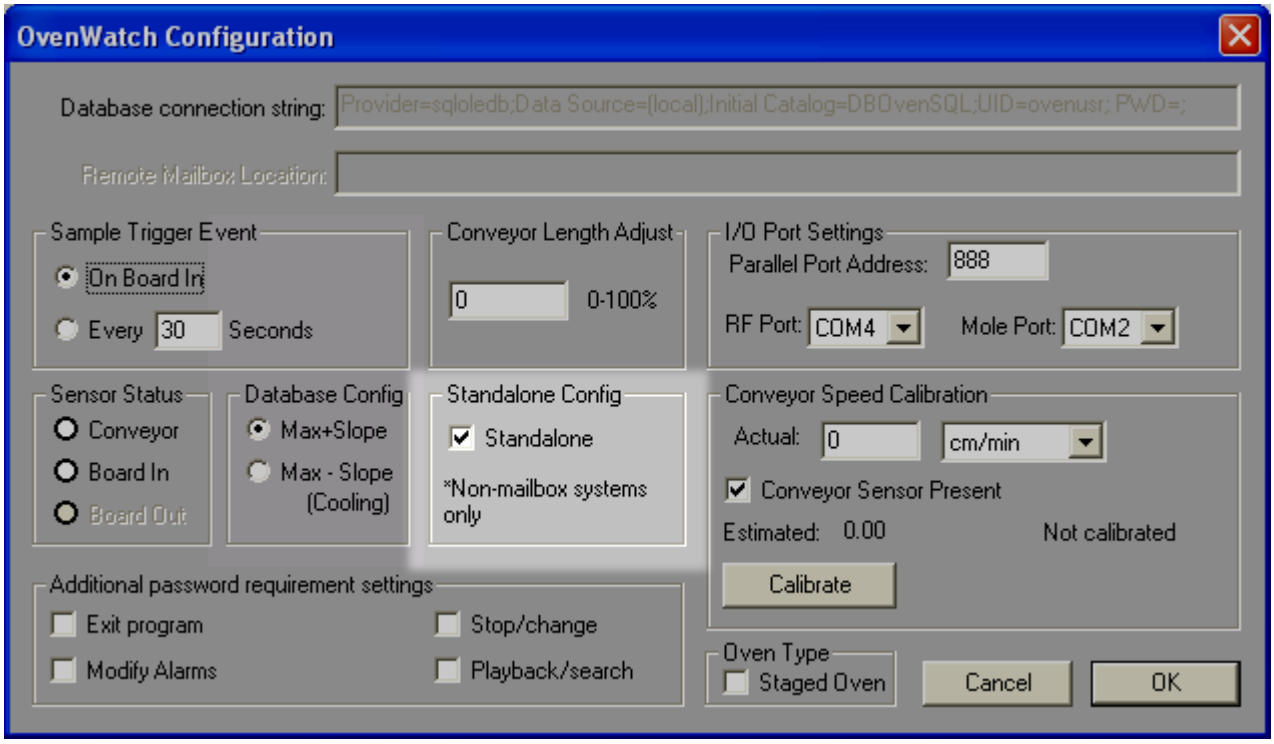
$$CA = \frac{TL\ (100)}{ZL} - 100$$

For example:

1) The total length of an oven is **100”** so multiply that value by **100** producing a value of **10,000**.
2) The length of the heating and cooling zones is **80”** so divide the value produced in Step 1 (**10,000**) by **80** producing a value of **125**.
3) Subtract **100** from the value produced in Step 2 (**125**) producing a Conveyor Length Adjust value of **25%**.

Standalone Configuration

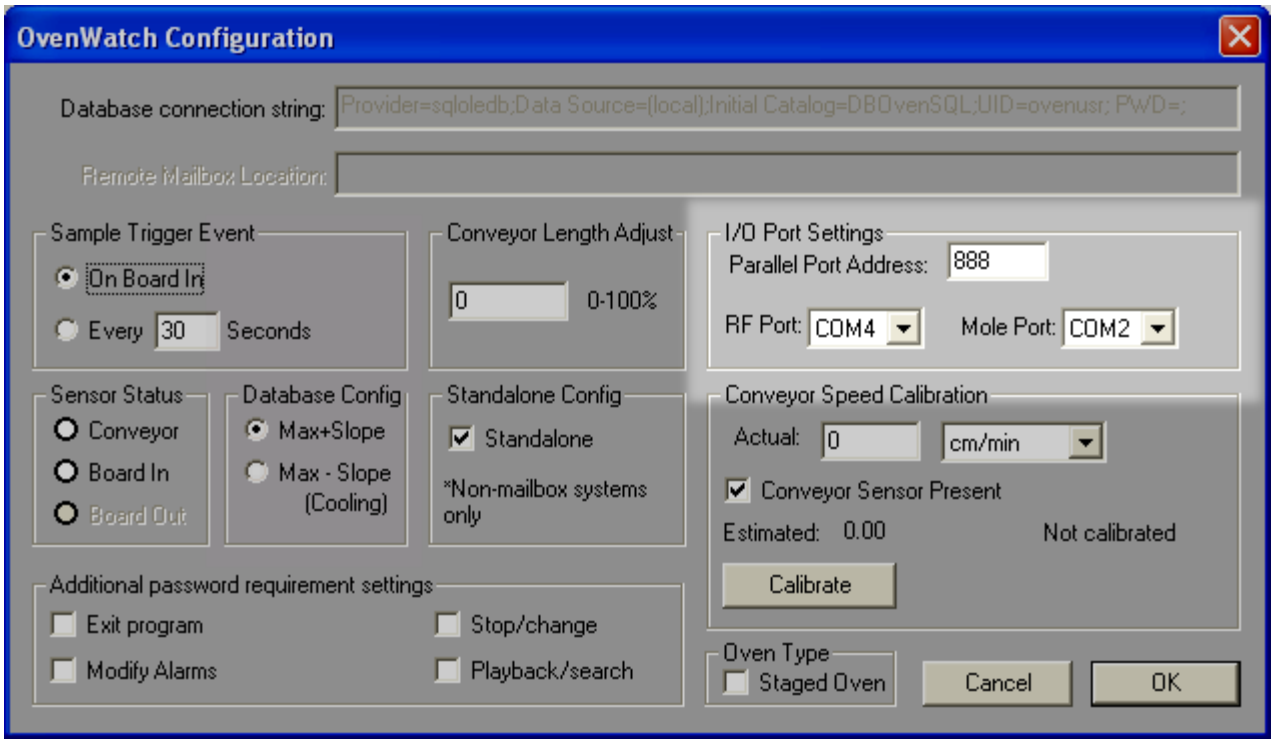
Standalone Configuration allows the software to automatically collect the oven settings from the remote or oven computer. When activated, it collets the oven settings from the oven computer and the Remote Mailbox Location is cleared and disabled.



Standalone Configuration

In & Out (I/O) Port settings

The I/O Port settings are used to set a communication (COM) port so the PC and the OvenWATCH components can communicate. These settings are configured when the software is first installed but may need to be changed if PC hardware has been changed.

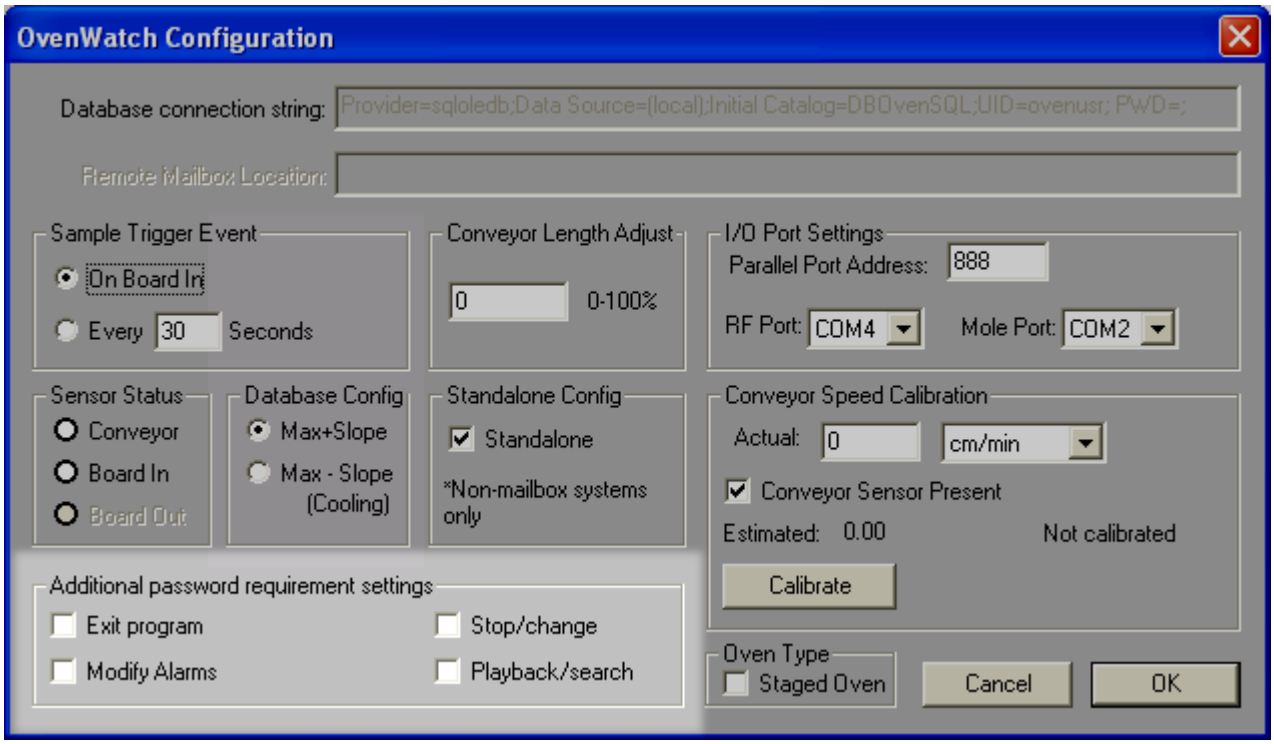


I/O Port Settings

Additional Password protection:

The software allows optional commands to be password protected. When any of these optional protected commands are activated, the user will not be able to use those commands without proper password privileges.

Optional commands are password protected and the default software password Admin will be needed to gain access to them. If the password has been changed, the new password will then be needed. Refer to the section *Passwords* for more information.

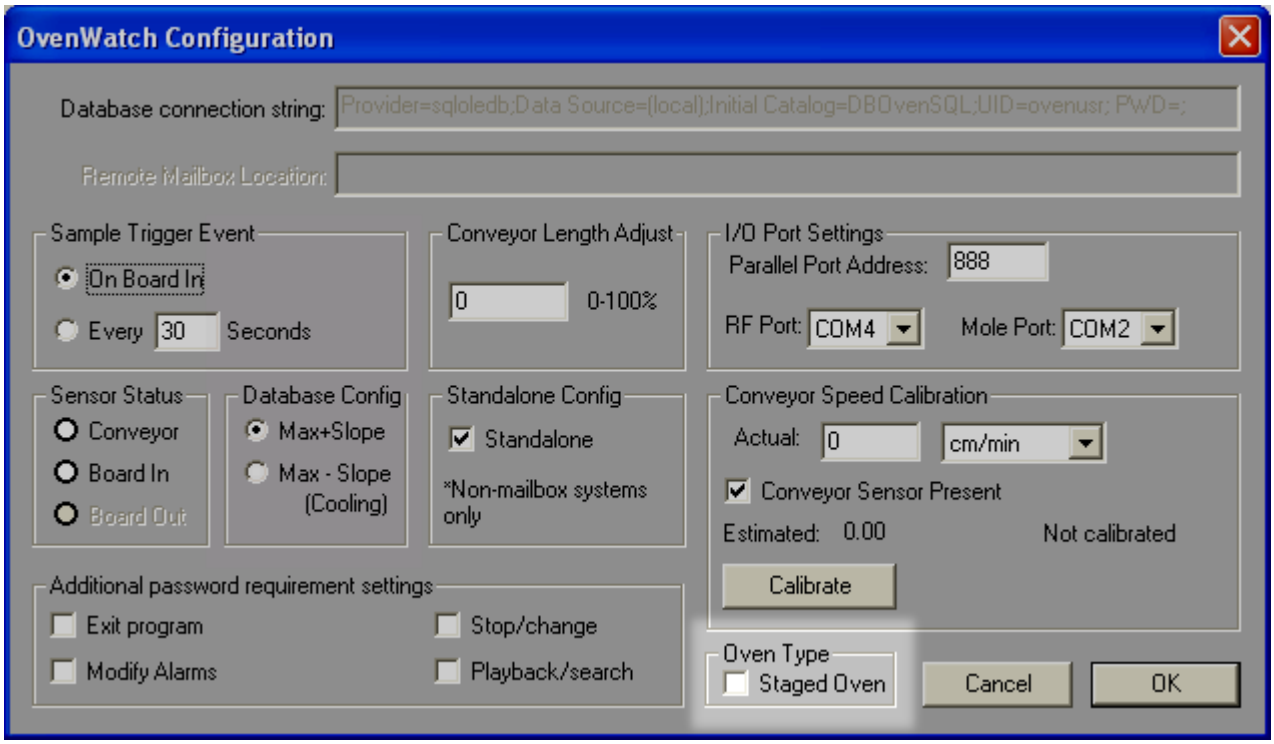


Password Protection

The password for protected commands work on a global basis. The password currently set using the Password command applies to all existing or new workbook files.

Oven Type

This flag can be enabled to allow the user to modify Oven information in Profiles for Staged Ovens. Refer to section ***Oven Configure*** for more information.



Profile oven Configuration

5.7.8 Archive Database

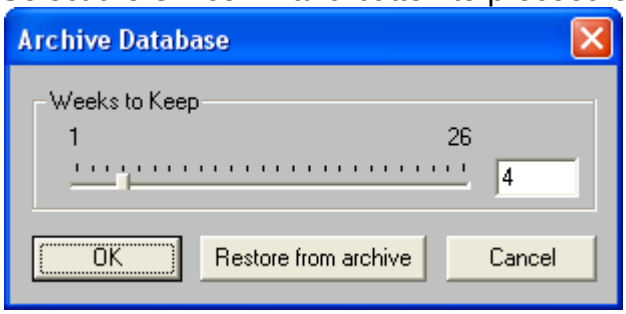
To save hard drive space or backup the database, the software has a command to archive a portion of the database keeping only a desired time period active.

To archive a database:

1) On the ***OvenWATCH*** menu, select ***Archive*** and enter the password

> **The Archive command is password protected and has a preset password Admin. This password will be needed unless it has been changed. Refer to section *Passwords* for more information.**

2) Select the how many weeks of the database to keep active.
3) Select the ***OK*** command button to proceed or ***Cancel*** to return to the worksheet.



Archive Dialog Box

Once the archive process is complete, the software will store this setting unless the user changes it.

> **The archived portion of the database will not be available for instant playback. To review archived data refer to section *Restore Archive*.**

5.7.8.1 Restore Archive

To restore archived database information, the software has a command to load selected archived weeks of the database.

To restore from an archived database:

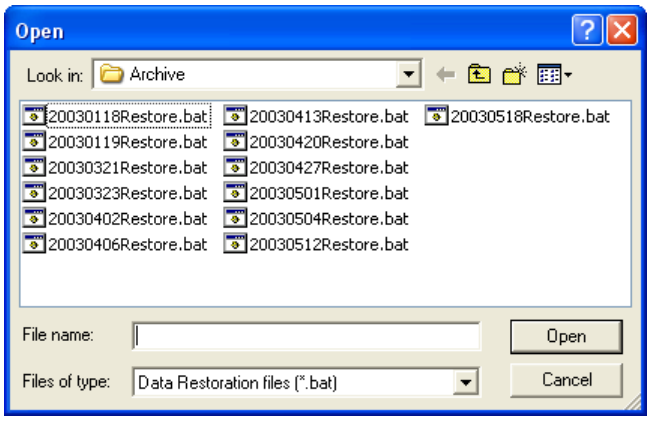
1) On the ***OvenWATCH*** menu, select ***Archive*** and enter the password.

> **The Archive command is password protected and has a preset password Admin. This password will be needed unless it has been changed. Refer to the section *Passwords* for more information.**

2) Select the ***Restore from archive*** command button.

Archive Dialog Box

3) A list box of workbook files with an extension of (**.BAT**) files appears. Highlight the desired file to open by clicking. Each file includes 1 week of data and is labeled in the format of (yyyymmdd).



Open List Box

4) Click the ***Open*** command button to open, or ***Cancel*** to return to the program.

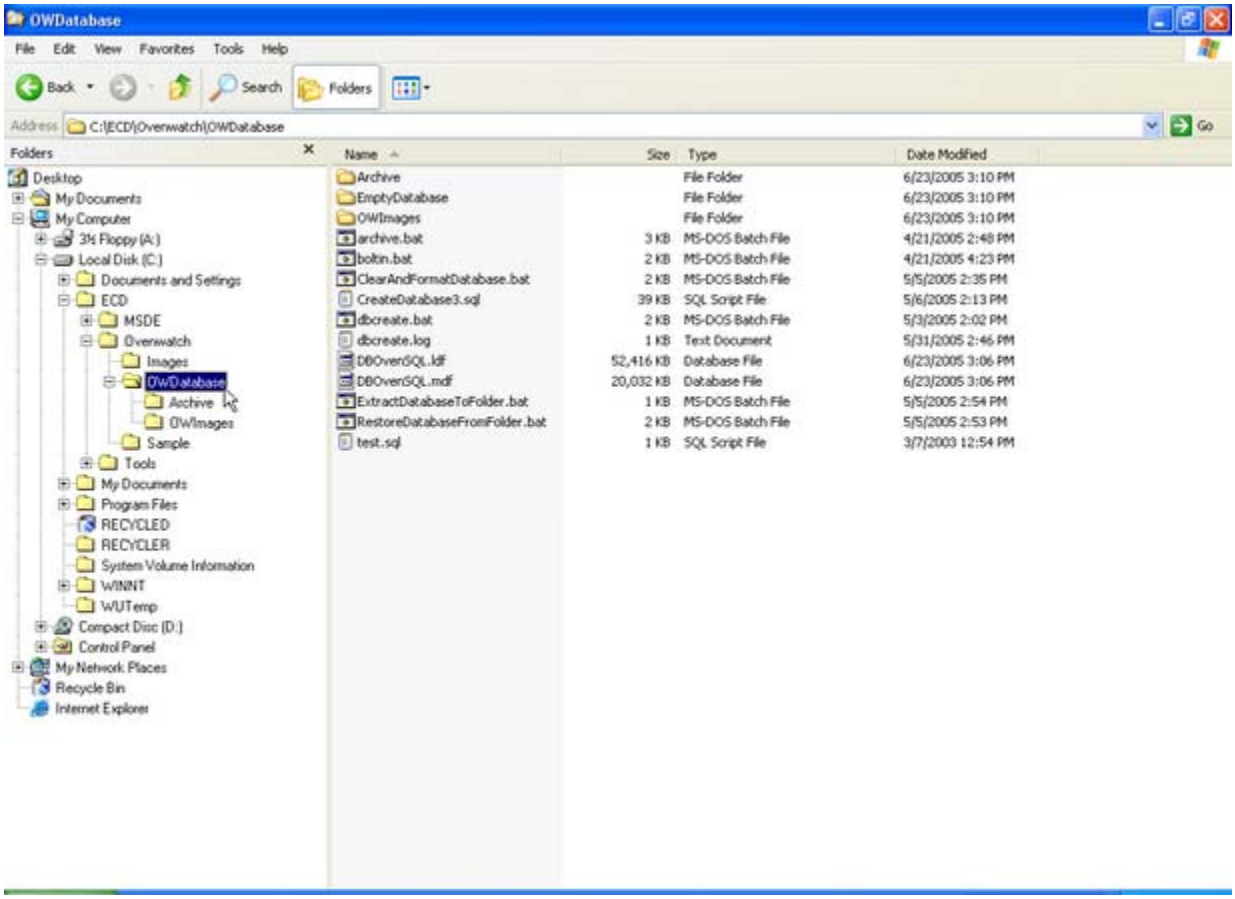
The data can now be reviewed. Once the user starts recording oven data the archived data will automatically be removed from memory.

5.7.8.2 Backing up a Database

Once the database has been archived the data can be backed up into Text files (***.TXT**).

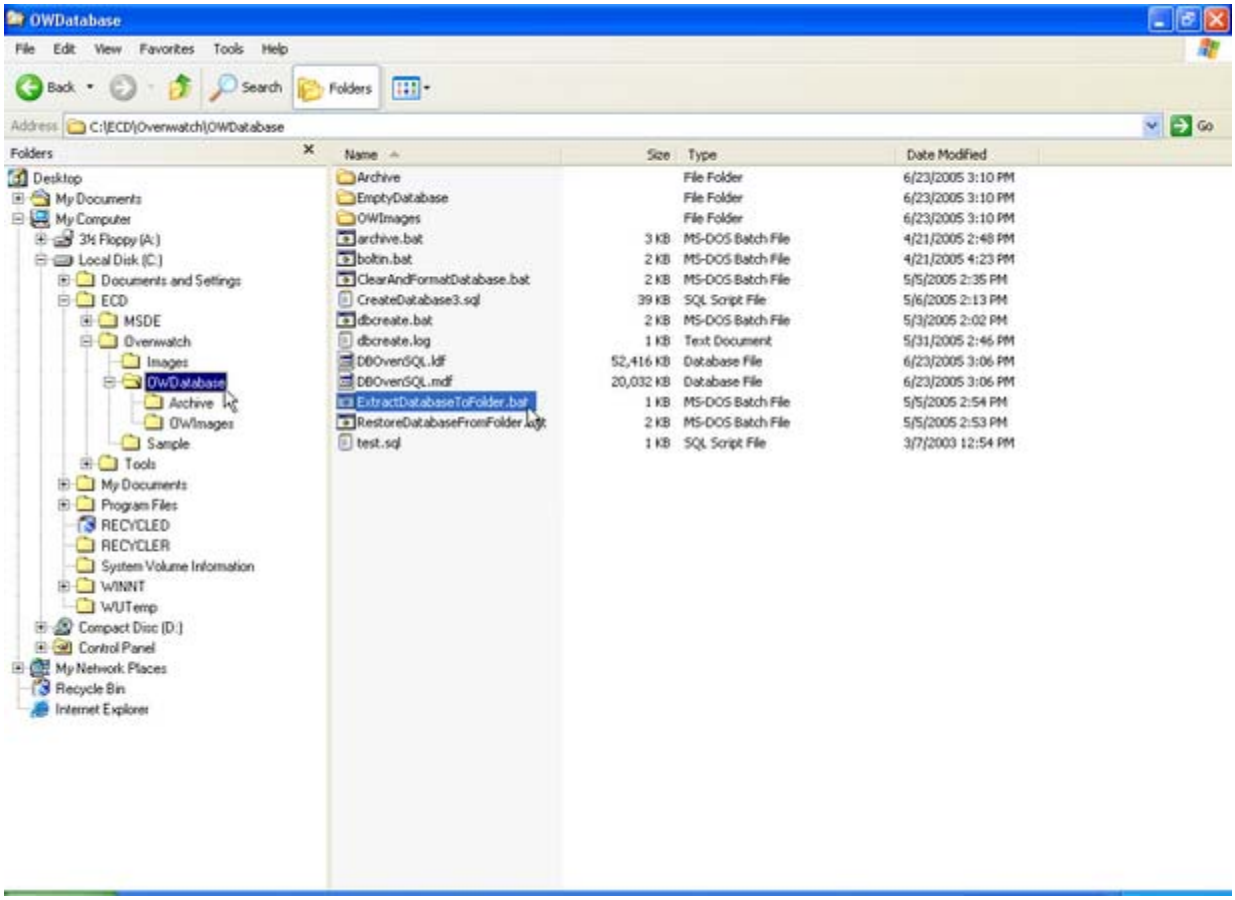
To backup a database:

1) Launch Windows Explorer and navigate to the ***OWDatabase*** file folder to display the files.



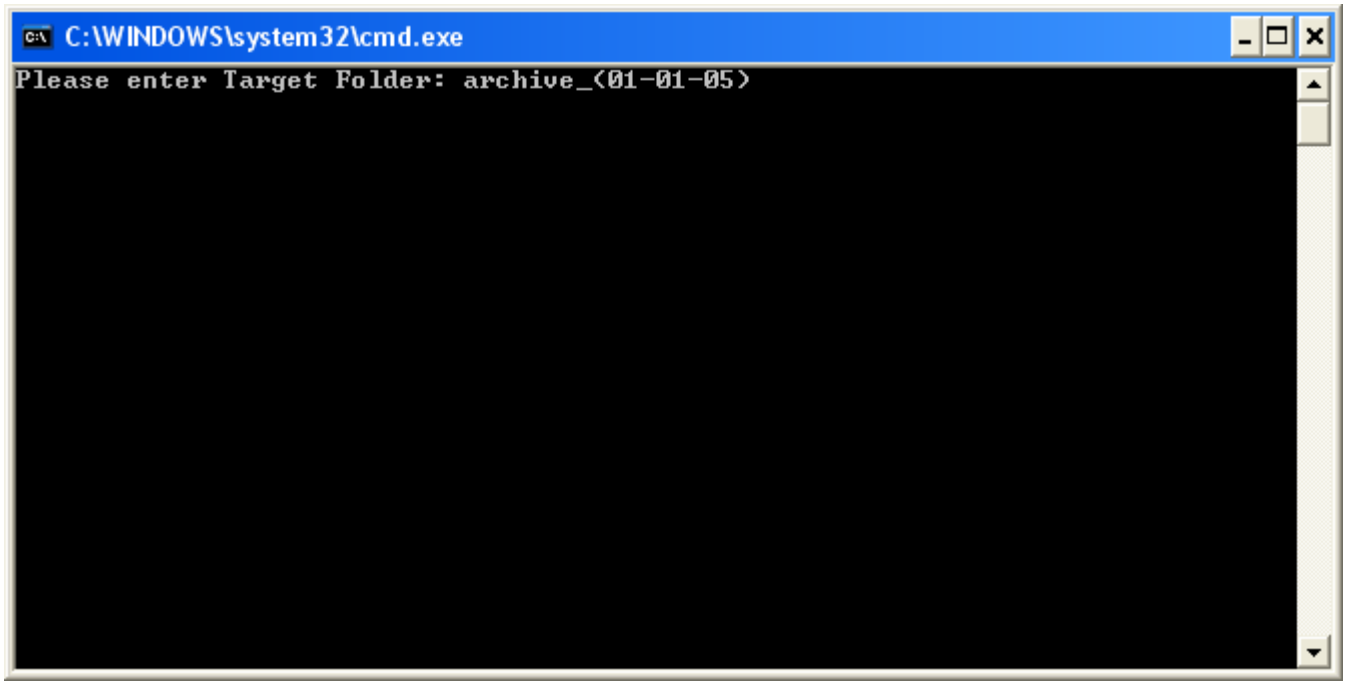
OvenWATCH File Folder

2) Double click the ***ExtractDatabaseToFolder.bat*** file to activate the backup batch file.



Backup bat file

3) Enter a Target Folder to save the backup database files to.



Target Folder

4) Once this file is activated it will create a series of archive text files in the folder specified.

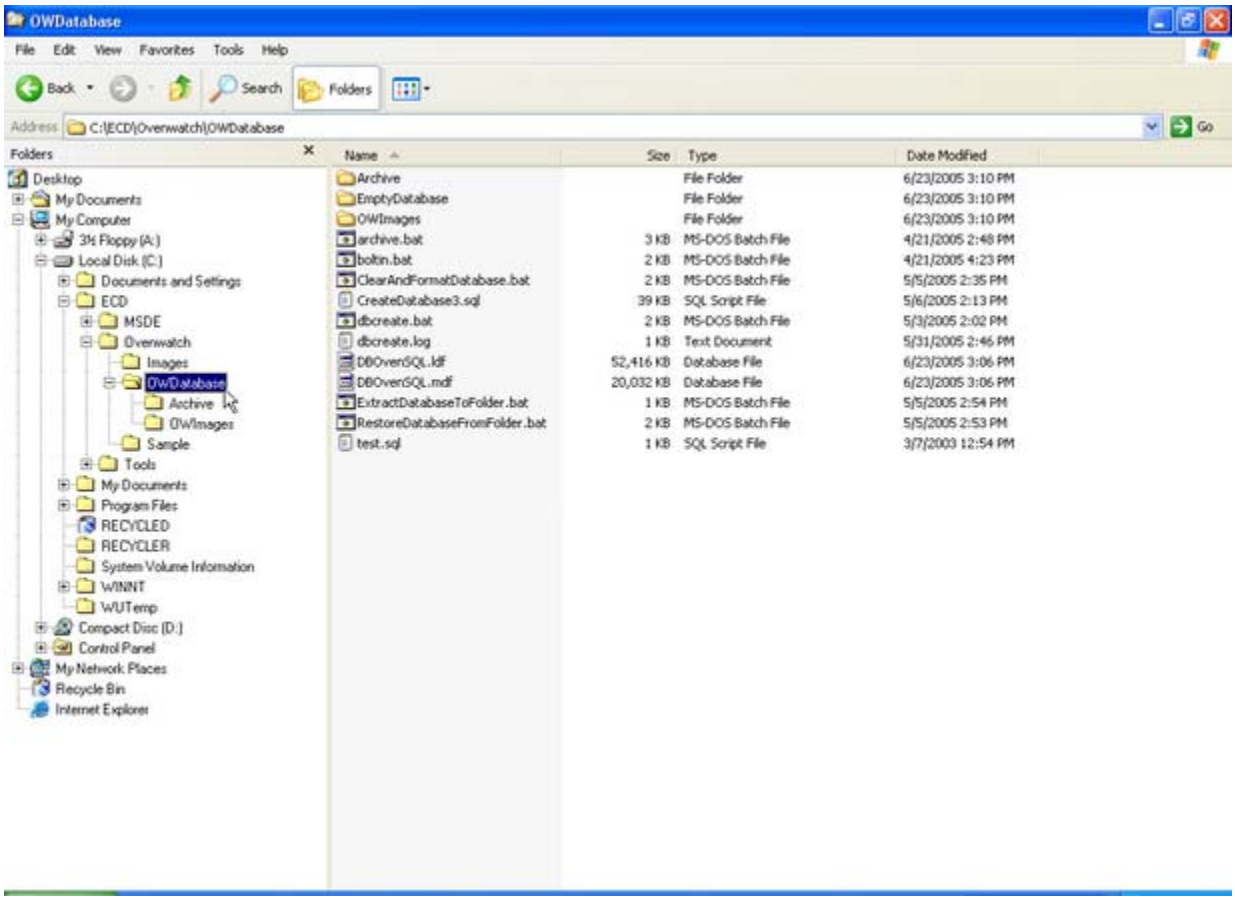
Archive Text Files:

- AlarmSettings.txt
- ErrorLog.txt
- EventHistory.txt
- Events.txt
- OvenZoneConfig.txt
- ProcessChannelEvent.txt
- Products.txt
- SampleOvenEvent.txt
- SampleZoneEvent.txt

If you are planning on un-installing or re-installing the OvenWATCH software, it is recommended to move the archived database file folder to a different location out of the OvenWATCH file structure.

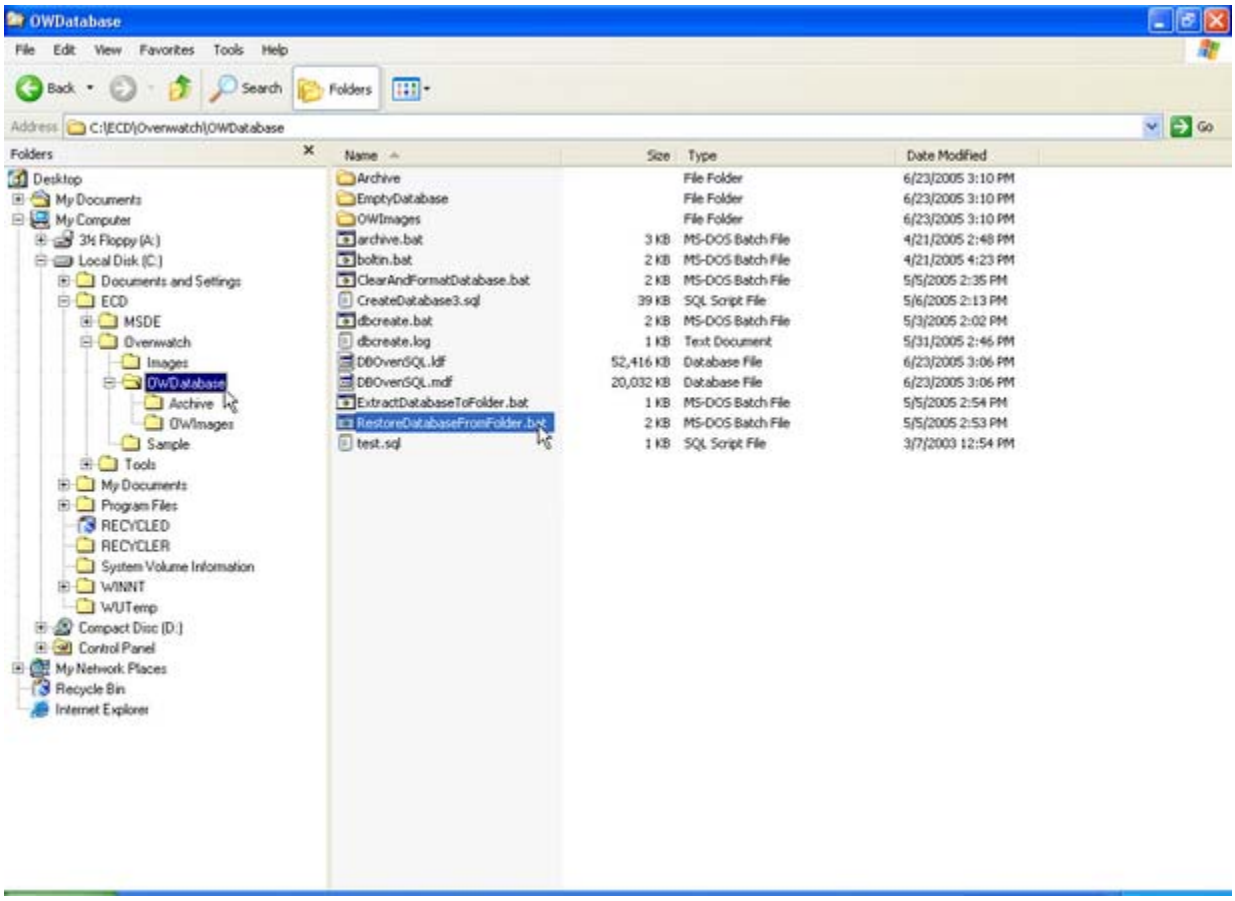
To restore the database backup:

1) Launch Windows Explorer and navigate to the ***OWDatabase*** file folder to display the files.



OvenWATCH Database Folder

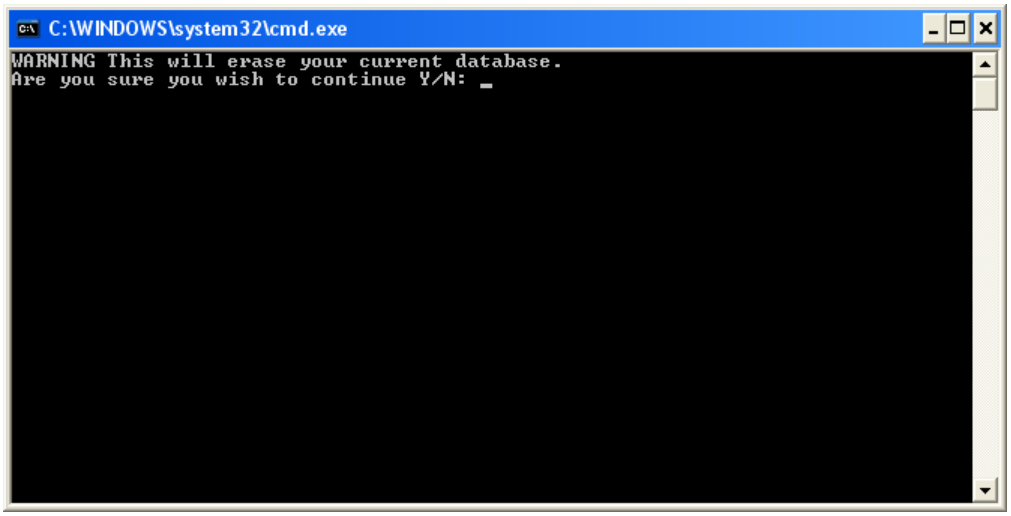
2) Double click the ***RestoreDatabaseFromFolder.bat*** file to activate the restore batch file.



Restore bat file

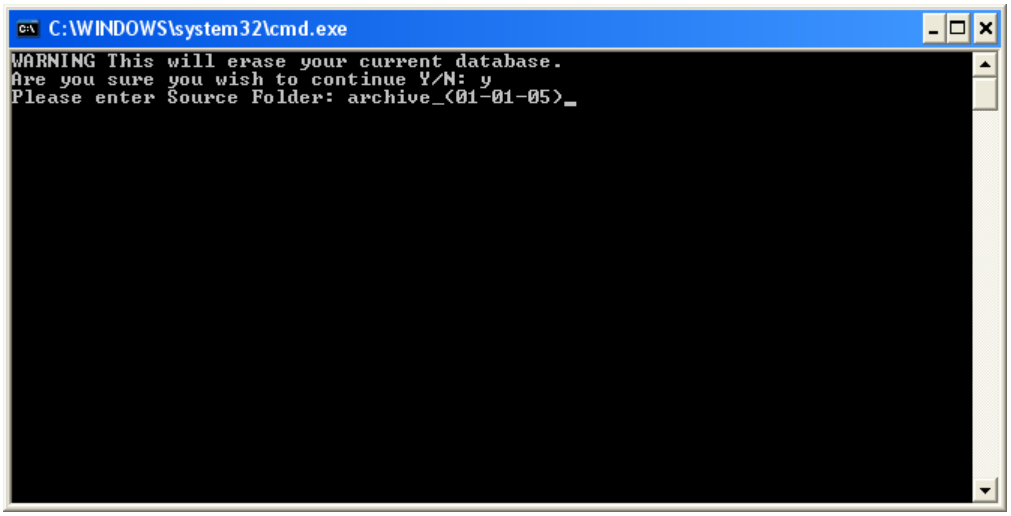
3) Enter your ***y*** to continue the restore process or ***n*** to cancel.

This operation will overwrite existing database files. If you want to preserve the existing database, it must be moved to a different file folder



Restore Database

4) Enter the Source Folder to restore the backup database files from.



Target Folder

If the database is to be restored on another machine, the *Archive* folder, and *OWImages* folder must be copied to the same location on the other machine.

5.8 Tools Menu

Tool menu options help the user manipulate and analyze Baseline and Dynamic Profile data.

The *Tools* menu commands are only used on the *Profile* Worksheet

5.8.1 Magnify Tool

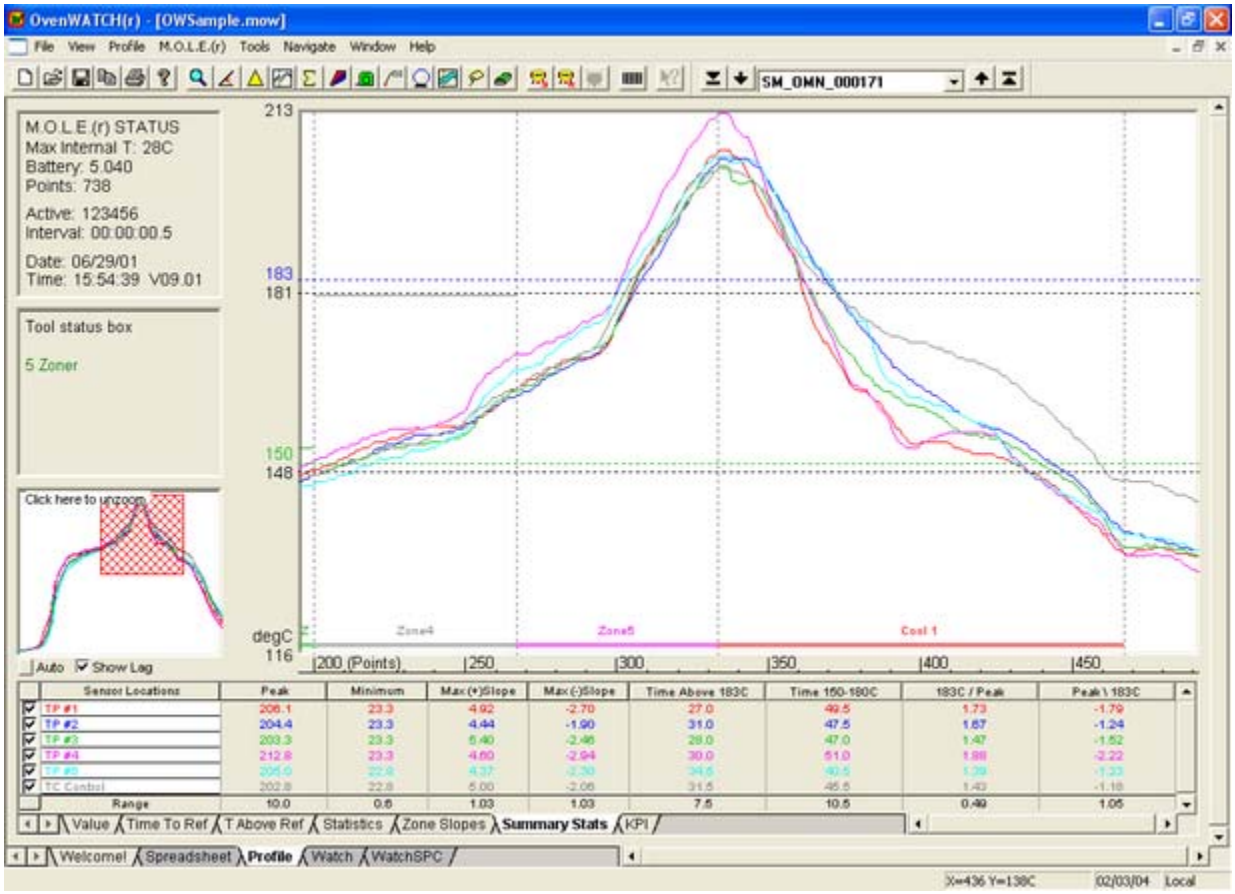
The Magnify tool enlarges any selected area of the Data Graph for easy visual examination.

To Magnify a portion of the Data Graph:

1) On the ***Tools*** menu, select ***Magnify***.
2) Position the mouse pointer on a corner of the area to enlarge.
3) Press the left mouse button and drag the pointer diagonally to the opposite corner to form a box around the area to be magnified. An outline of the box appears as you drag.
4) Release the left mouse button when the outline of the area to be magnified is visible. The area inside the box is then magnified to fill the entire Data Graph.

To show even more detail in the Data Graph, Magnify can be performed multiple times. If the Magnify tool reaches the maximum zoom capability the software will display a message box informing that the user has "Zoomed to Tight".

When using the Magnify tool, the Magnify Map uses a red box to indicate the area currently magnified. If the Data Graph was previously magnified, the current level of magnification is the red box and previous magnified areas are noted with gray boxes.



Magnify Map

When the Magnify tool has been used multiple times, click a red box in the Magnify map once to go back to a previously selected level of magnification or the white area to return to the full view.

- **<u>Magnify Applications</u>**

Magnify is useful for visually examining data, when statistics are used. The statistics (Value, Time to Ref., T Above Ref, and Statistics) compute only data points that fall within the area of the Data Graph. This enables the user to focus the statistical analysis on any portion of time, distance, or data point number in the graph.

The Magnify command can be accessed on the Profile worksheet Toolbar.

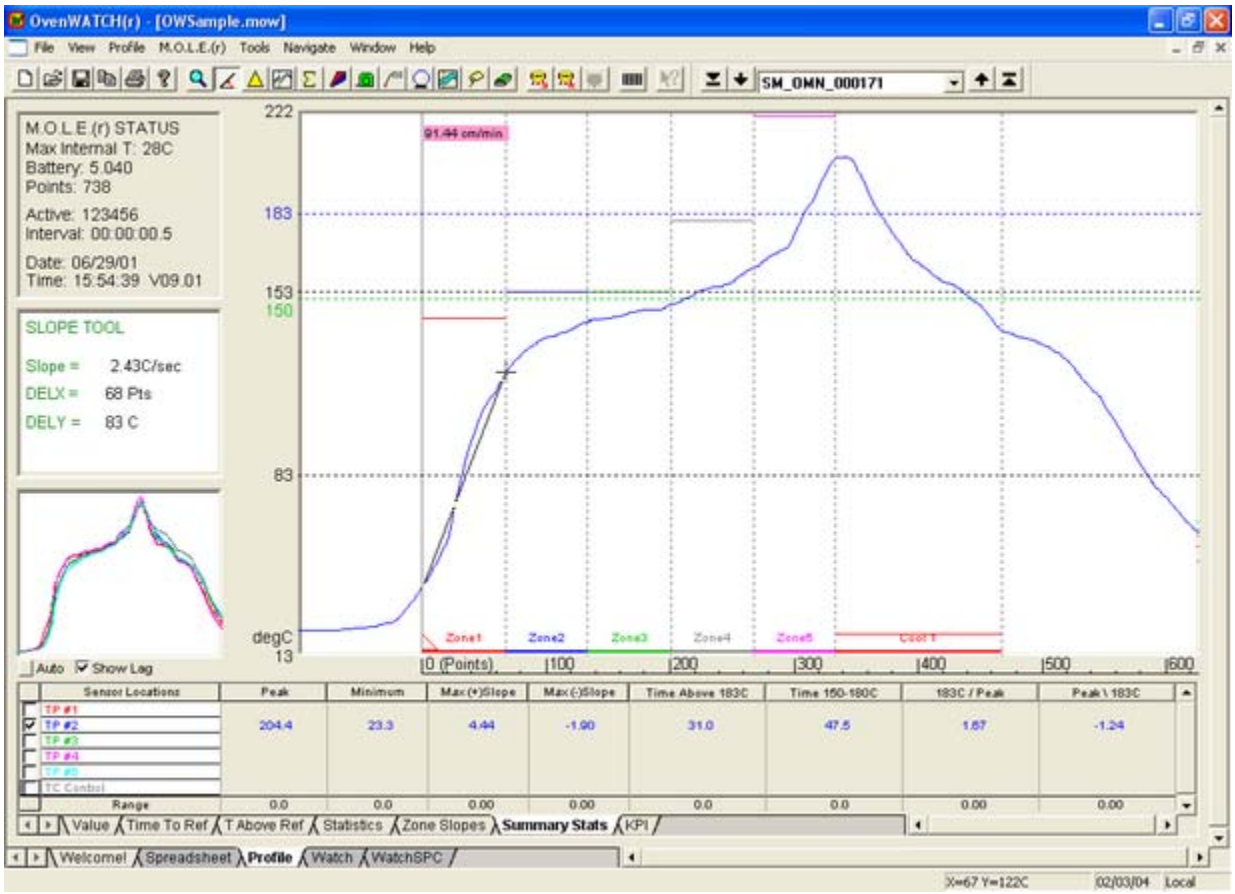
	Magnify Button

5.8.2 Slope Tool

The Slope tool finds the average slope between any two points in the Data Graph.

To find the average slope of a line:

1) On the ***Tools*** menu, select ***Slope***.
2) Position the mouse pointer at a point on the curve.
3) Press and hold the left mouse button.
4) Drag the pointer to the end of the desired slope line.
5) Release the left mouse button when the pointer is at the desired location. The software will draw a slope line on the Data Graph, and label the slope value.



Slope Tool

To obtain more accurate slopes:

1) Magnify a portion of the Data Graph using the Magnify tool, and repeat this procedure.

To remove a slope line from the Data Graph:

1) On the ***Tools*** menu, select ***Erase Objects*** and follow instructions in the Tool status box. Refer to ***Erase Object(s)*** for more information.

- **Slope Applications**

Use the Slope tool to find the average slope between any two points on the graph. Longer slope lines tend to produce more accurate slope calculations.

The Slope tool can be used to compare actual data with ideal conditions by drawing a line with a known slope (to represent the ideal condition) beside a portion of a Data Plot.

- **Slope Limitations**

Slope calculations are based on logged points connected by the slope line. Points occur only at the exact time intervals used to record data.

The Slope tool cannot measure slopes when dx (change in X) is equal to zero (when the line is vertical).

The Slope tool can be accessed on the Profile worksheet Toolbar.

Slope Button

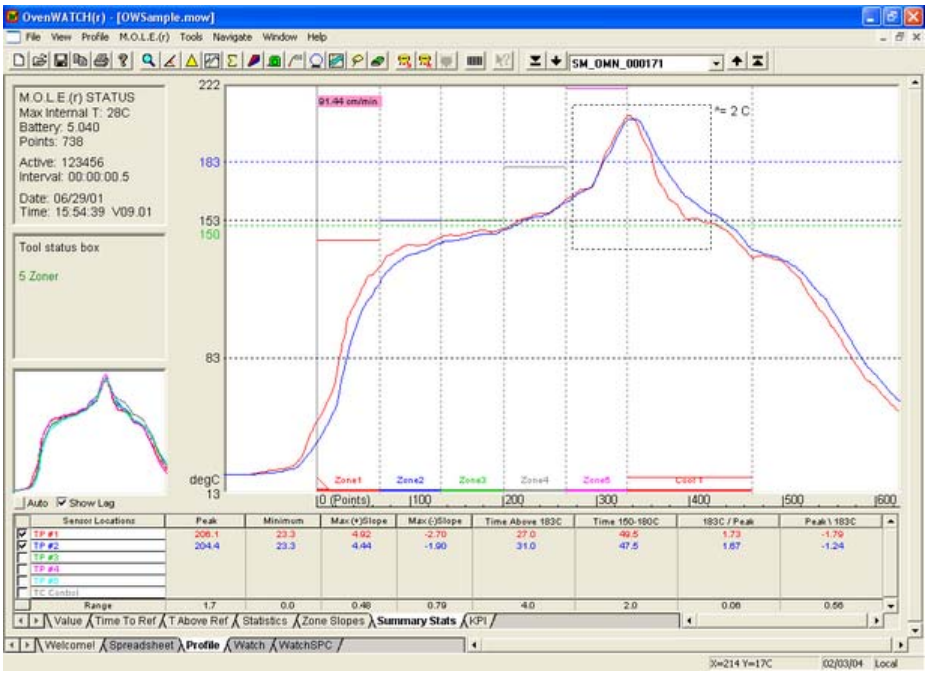
5.8.3 Peak Difference Tool

The Peak Difference tool displays the difference in value between the peak of the maximum Data Plot and the peak of the minimum Data Plot in any location of the Data Graph. This command is especially useful for measuring side-to-side heating differences in ovens.

To display the peak difference between Data Plots:

1) On the ***Tools*** menu, select ***Peak Difference***.
2) Position the mouse pointer on a corner of the area you want to analyze.
3) Press the left mouse button and drag the pointer diagonally to the opposite corner to form a Peak difference box. An outline of the box appears as you drag.

The peak difference is calculated as the maximum difference between the highest peak and the lowest peak within the rectangle.



Peak Difference Tool

To remove the peak difference:

1) On the ***Tools*** menu, select ***Erase Objects*** and follow instructions in the Tool status box. Refer to ***Erase Object(s)*** for more information.

The Peak Difference tool can be accessed on the Profile worksheet Toolbar.

	Peak Difference Button

5.8.4 Overlay Tool

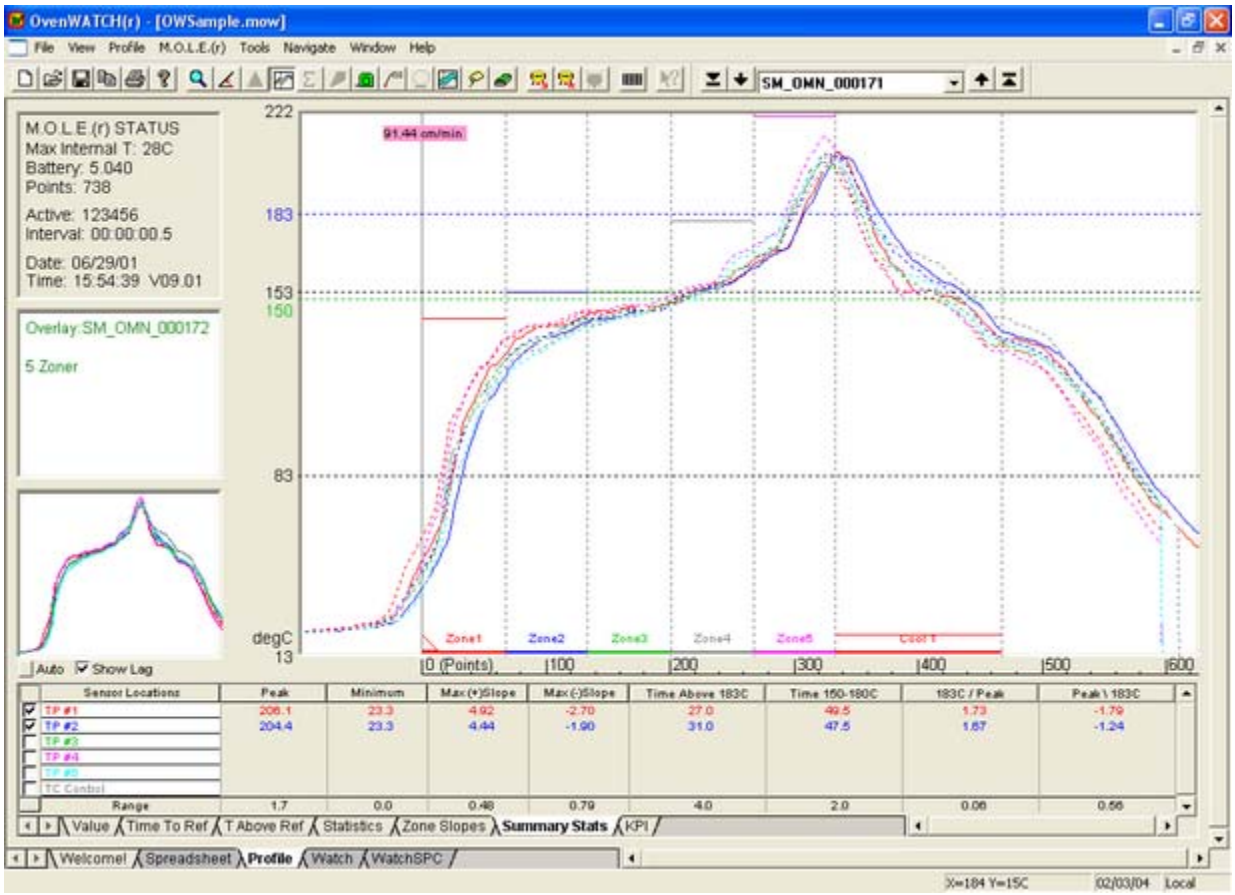
The Overlay tool displays a second data run profile over the currently displayed profile for comparison.

To compare two Profiles:

1) On the ***Tools*** menu, select ***Overlay***. A list box of data files uploaded into the opened workbook appears.
2) Select a data run file to overlay on the original by clicking it.

The profile will be inserted at the same process origin and automatically scaled to the same Y-axis with the Overlaid profile name displayed in the Tool status box. The original Data plots remain as solid lines while those added for comparison are dashed.

The dashed "Overlay" Data Plots are the same color as the original Data Plots.



Overlay Tool

To remove the overlaid Data Graph:

1) Select the ***Overlay*** tool again or press the right mouse button.

- **Overlay Applications**

The Overlay and Magnify tools can be used together to overlay and compare ideal reference profiles and magnified portions of the two data files. They can have different but overlapping X-values (times, point numbers, logging intervals) or temperatures.

- **Overlay Limitations**

If the Data Plots are too numerous to clearly see the information of interest, they can be suppressed by removing the check mark from the desired channel in one or both files. This must be done to the overlaid profile prior to using the Overlay tool. Save that graph and use the Overlay tool again.

The Overlay tool can be accessed on the Profile worksheet Toolbar.

Overlay Button

5.8.5 Total Heat Tool

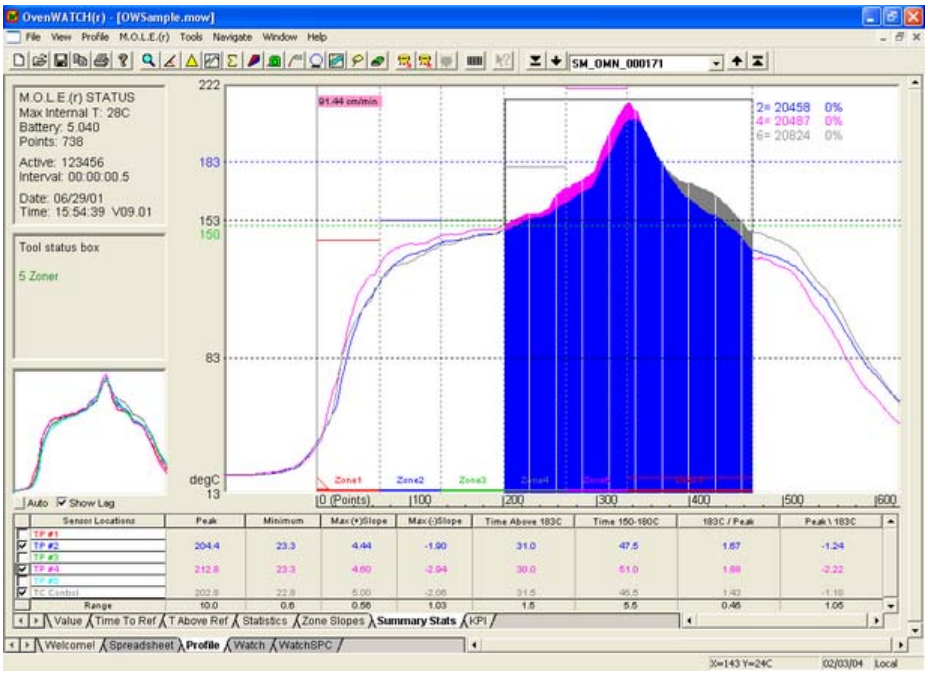
The Total Heat tool computes the area between the Data Plot curves and the bottom border of the selected Total Heat area. This can be used for easy evaluation of heat input.

Total heat is calculated by multiplying the temperature difference at a given X-value by the time between this X-value and the previous one or the area under the curve. The units are Degree Seconds.

To evaluate the heat input for a specific portion of a Data Graph:

1) On the ***Tools*** menu, select ***Total Heat***.
2) Position the mouse pointer at an initial X/Y coordinate.
3) Press the left mouse button and drag diagonally. The outline of a box appears as you drag.
4) Release the mouse button when the box reaches the second X/Y coordinate, enclosing the range of X/Y values that are included in the total heat calculation.

The area under Data Plot(s) and between the two X-boarders are calculated and displayed next to the Total Heat rectangle. The channel that is calculated at 100%, is the channel with the highest total heat. The other channels have a calculated total heat percentage of the 100% channel. The Data Graph displays the calculated areas by filling in the area under the Data Plots.



Total Heat Tool

To remove the Total Heat object from the Data Graph:

1) On the ***Tools*** menu, select ***Erase Objects*** and follow instructions in the Tool status box. Refer to ***Erase Object(s)*** for more information.

The bottom of the Total Heat box can be used at either 0° or room temperature to give "Total" Heat calculations above 0° or room temperature.

- **Total Heat Applications**

The Total Heat tool is helpful to compare the heat input between two sensor channels and averages the small local temperature differences. This tool is especially useful for measuring side-to-side heating differences in ovens.

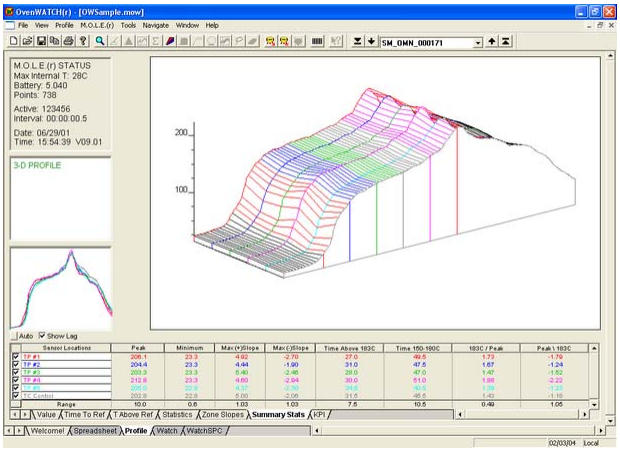
The Total Heat tool can be accessed on the Profile worksheet Toolbar.

Total Heat Button

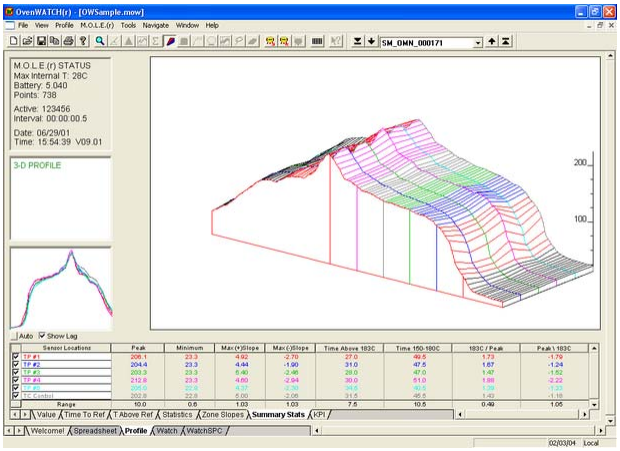
5.8.6 3-DTool

The 3-D tool draws a 3-dimensional representation of the temperature data. When the 3-D tool is selected a dialog box appears prompting the user to select a “Normal” or a “Reverse-Angle” view. A “Normal” view shows channel 1 in back and channel 6 in front, and a “Reverse-Angle” view shows channel 6 in the back and channel 1 in front.

The 3-D profile, shown below, is useful for comparing the general smoothness of the Data Plots for each sensor or showing uniform heating across an oven.



Normal View



Reverse-Angle View

<u>To remove the 3-D profile:</u>

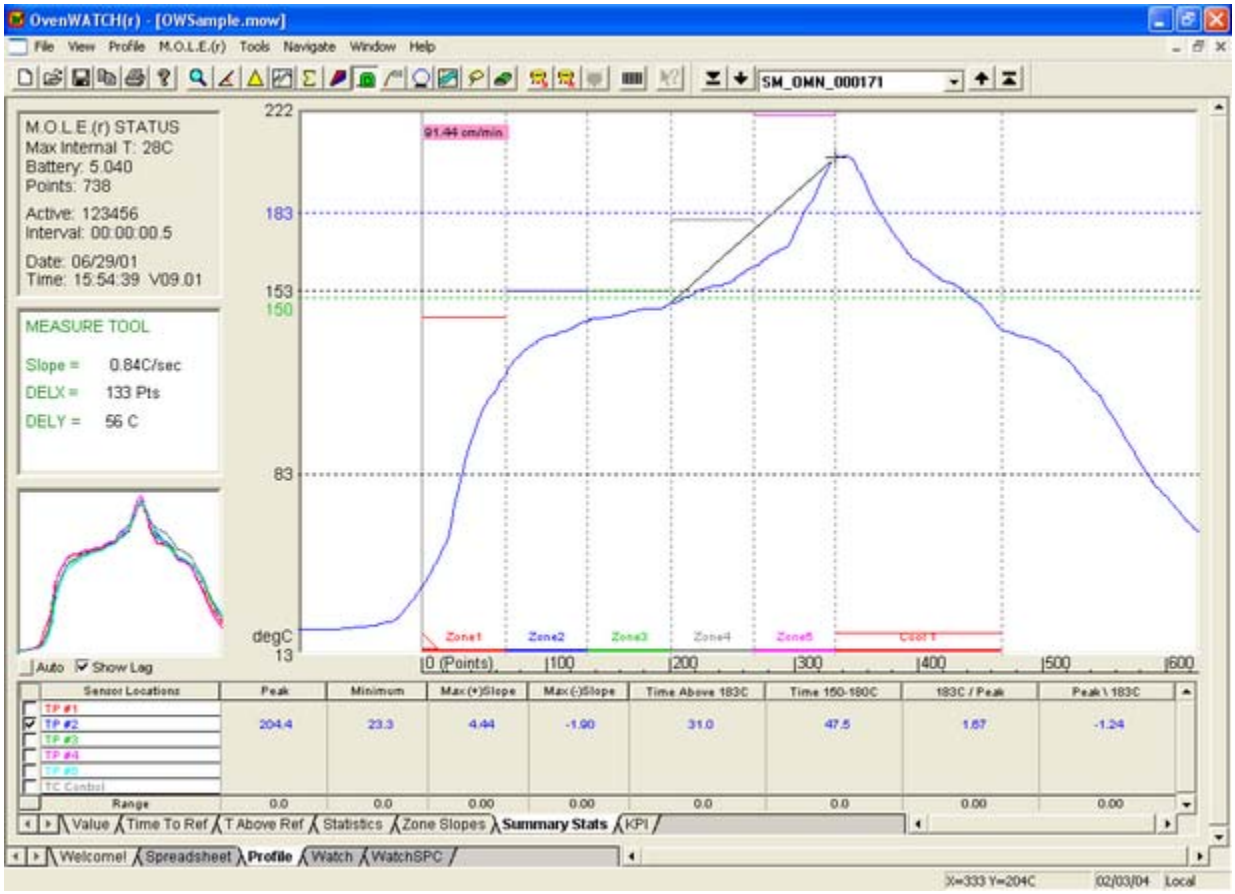
1) Click the 3D tool or click the right mouse button.

The 3-D tool can be accessed on the Profile worksheet Toolbar.

3-D Button

5.8.7 Measure Tool

The Measure tool is similar to the Slope tool except it measures the distance between any two points on the Profile worksheet Data Graph. This tool adds a line labeled with the distance values to the graph, and notes the change in X and change in Y (Delta X and Delta Y) instead of the slope.



Measure Tool

To find the distance between two points:

1) On the ***Tools*** menu, select ***Measure***.
2) Position the mouse pointer at a point on the curve.
3) Press and hold the left mouse button.
4) Drag the pointer to the end of the desired point on the curve.
5) Release the left mouse button when the pointer is at the desired location and a slope line labeled with the change in X and Y appears on the Data Graph.

To obtain more accurate distances:

1) Magnify a portion of the Data Graph using the Magnify tool and repeat this procedure.

To remove the annotated distance:

1) On the ***Tools*** menu, select ***Erase Objects*** and follow instructions in the Tool status box. Refer to ***Erase Object(s)*** for more information.

The Measure tool can be accessed on the Profile worksheet Toolbar.

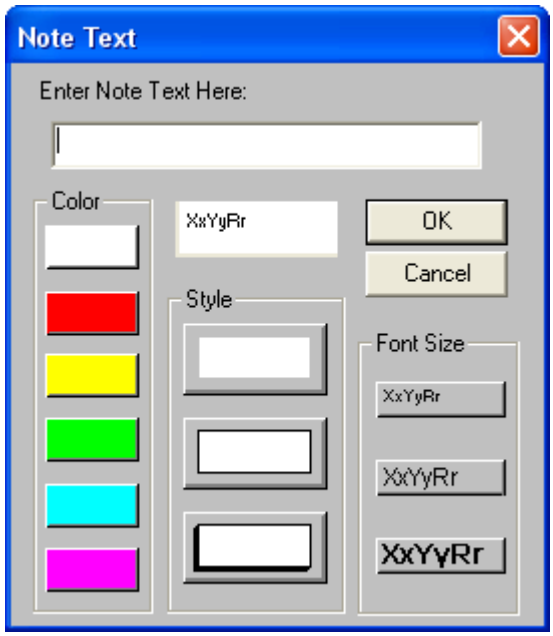
Measure Button

5.8.8 Notes Tool

The Notes tool adds a leader with text to any portion on the Data Graph to label special points of interest.

To add notes to the Data Graph:

1) On the ***Tools*** menu, select ***Notes***.
2) Position the mouse pointer at the desired location to start the note leader, click and drag the mouse pointer to the desired location for the note text and release the mouse button.
3) A dialog box appears allowing the user to enter a note by typing it in the text box. There also are options to customize the color, border and font size of the notes.



Notes Dialog Box

4) Click the ***OK*** command button or press the [***enter***] key to finish adding the note.

To remove notes:

1) On the ***Tools*** menu, select ***Erase Objects*** and follow instructions in the Tool status box. Refer to ***Erase Object(s)*** for more information.

The Notes tool can be accessed on the Profile worksheet Toolbar.

Notes Button

5.8.9 Prediction Tool

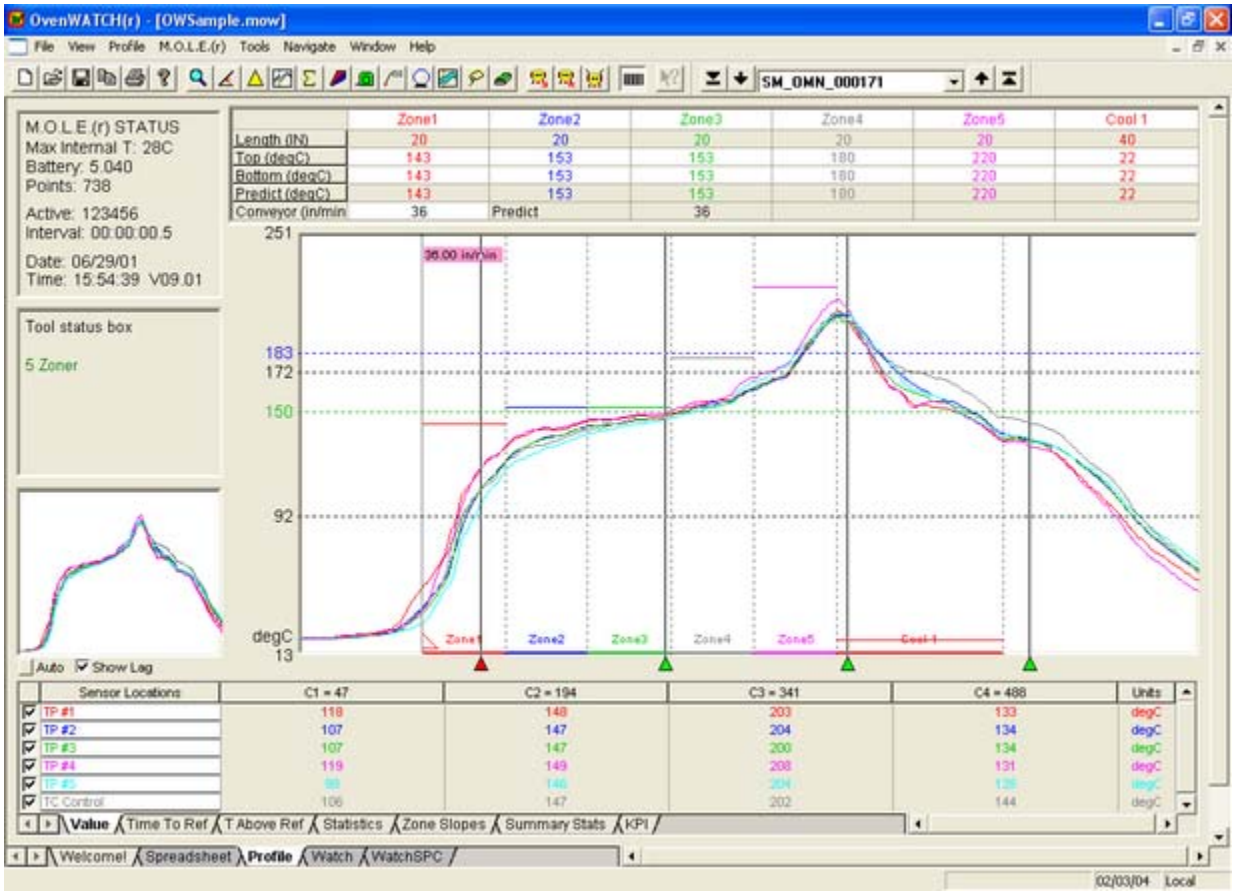
One of the most impressive software features is the Prediction tool. This tool enables the user to change a zone temperature value or the conveyor speed and predict the outcome of that change. Prediction is easy to use and a valuable command that quickly defines process parameters.

To use the Prediction Tool information must first be entered into the Zone Matrix to build an accurate "model" of an oven environment. As experience with modeling grows, the first values selected may need to be modified accurately reflect the process.

5.8.9.1 Model a Process

To model a process:

1) Complete a data run in an oven with a test assembly to establish a Baseline Profile for the process.



Zone Matrix Data

Make sure the zones are visible by clicking the *Show Zones* check box. This enables the user to see how each heating zone affects the results.

3) Enter the temperature for each zone by typing it in the temperature cells for each zone on the Zone Matrix. This is the set temperature of each zone preset within the oven.

If there is a soak zone, then set it to the same temperature as the previous zone.

4) Enter a conveyor speed in the conveyor cell on the Zone Matrix. The conveyor rate documented for this experiment is displayed along with zone temperatures.

The units for the X-Cursor should be set to *Distance*. To set the units to distance, select the *Units* command from the *Profile* menu.

5) Move the Process Origin on the Data Graph to the place that corresponds to the beginning of the oven. Typically, this is where all of the channel temperatures suddenly rise. Now the prediction command is ready to use.

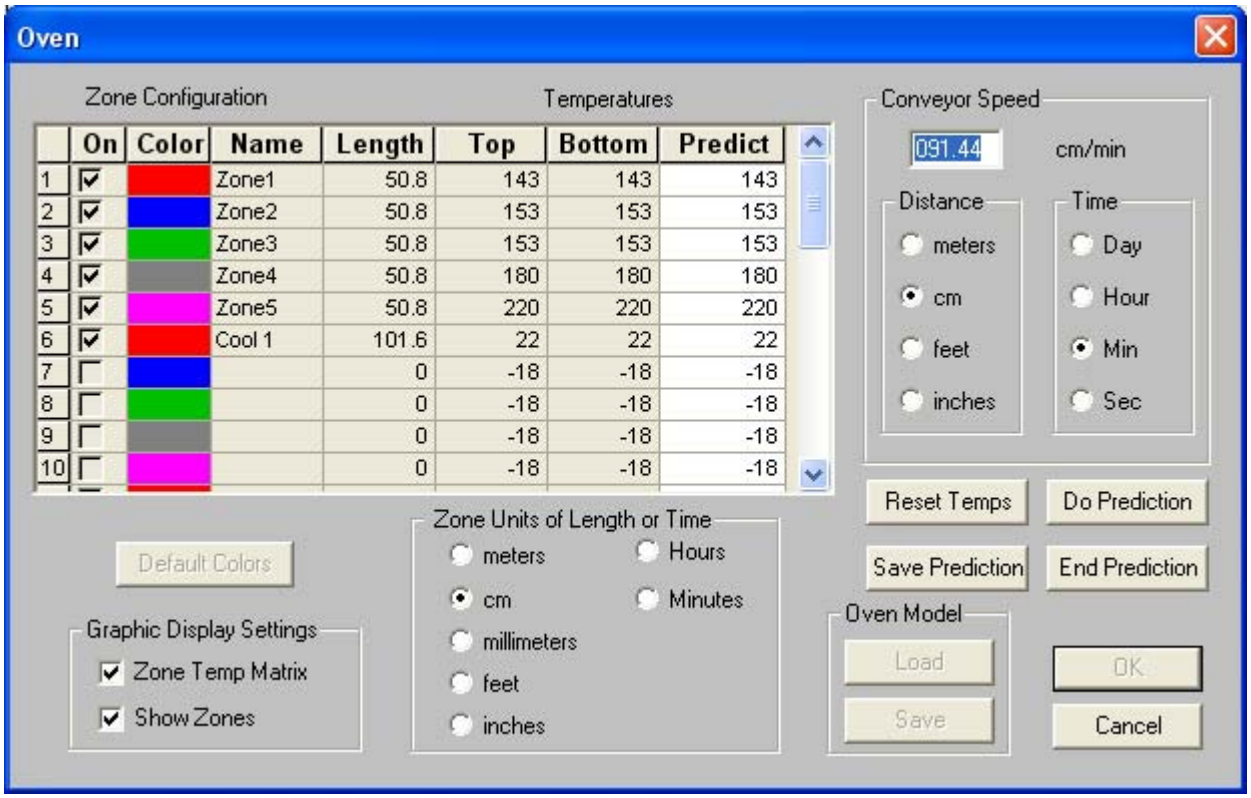
For more information on how to predict results, refer to ***Predict Results***.

5.8.9.2 Predict Results

To predict results:

If Zone temperatures are not set, the Prediction tool will not work.

1) On the ***Tools*** menu, select ***Prediction*** and the Oven dialog box appears. The dimmed portions of this dialog box indicate that they cannot be modified.

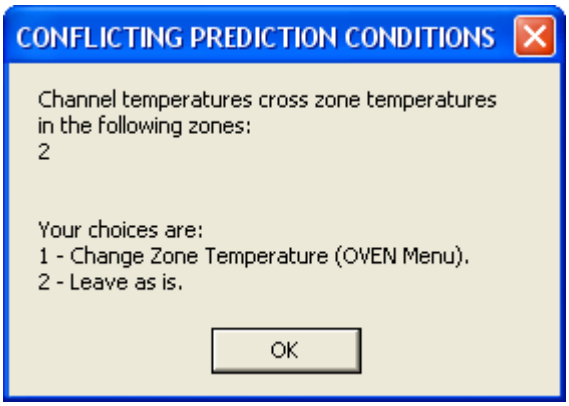


Oven Dialog Box

2) Enter a hypothetical conveyor speed and zone temperatures or click the ***Reset Temps*** command button to change zone temperatures back to the original oven values.

3) Click the ***Do Prediction*** command button and the software will calculate and plot the predicted outcome based on the changed value(s). The predicted Data plots appear on the Data graph as dashed lines. Use the Slope, Measure, and Magnify tools to see if the ideal profile has been achieved.

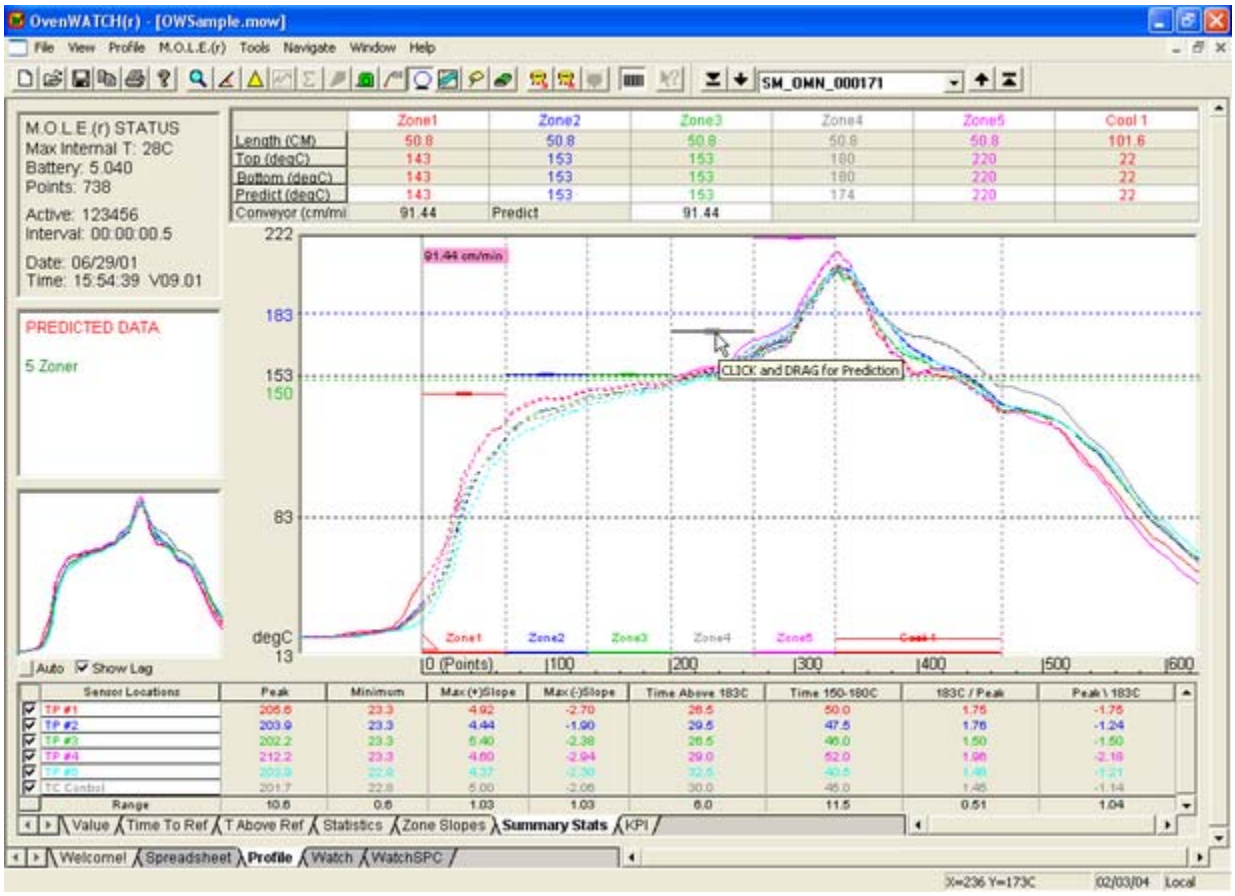
If sensor temperatures inconsistent with zone temperature settings are detected, a message box with an explanation appears. The explanation appears only once for all zones, each time Prediction is used. After that, the software assumes the user is aware of the potential problem.



Conflicting Conditions Dialog Box

The inconsistent setting does not prevent the software from making a prediction. It makes a rational assumption about what is happening. In addition to the explanation, several logical ways are displayed to correct the conflicting conditions at the bottom of the dialog box.

4) Experiment by making more “what if” changes to the conveyor speed and sliding Zone Temperature Prediction Handles up or down to the preferred prediction temperature.



Dynamic Prediction Feature

5) Set the oven to the final prediction values, and then perform another data run to check if the process has been optimized.

6) Select the Prediction command again and the original zone temperatures can now be reset. Save the current prediction, proceed with another prediction, or click the ***End Prediction*** command button to remove the predicted Data Plots.

For more information how to save a predicted profile, refer to *Saving a Predicted Profile*.

The Prediction tool can be accessed on the Profile worksheet Toolbar.

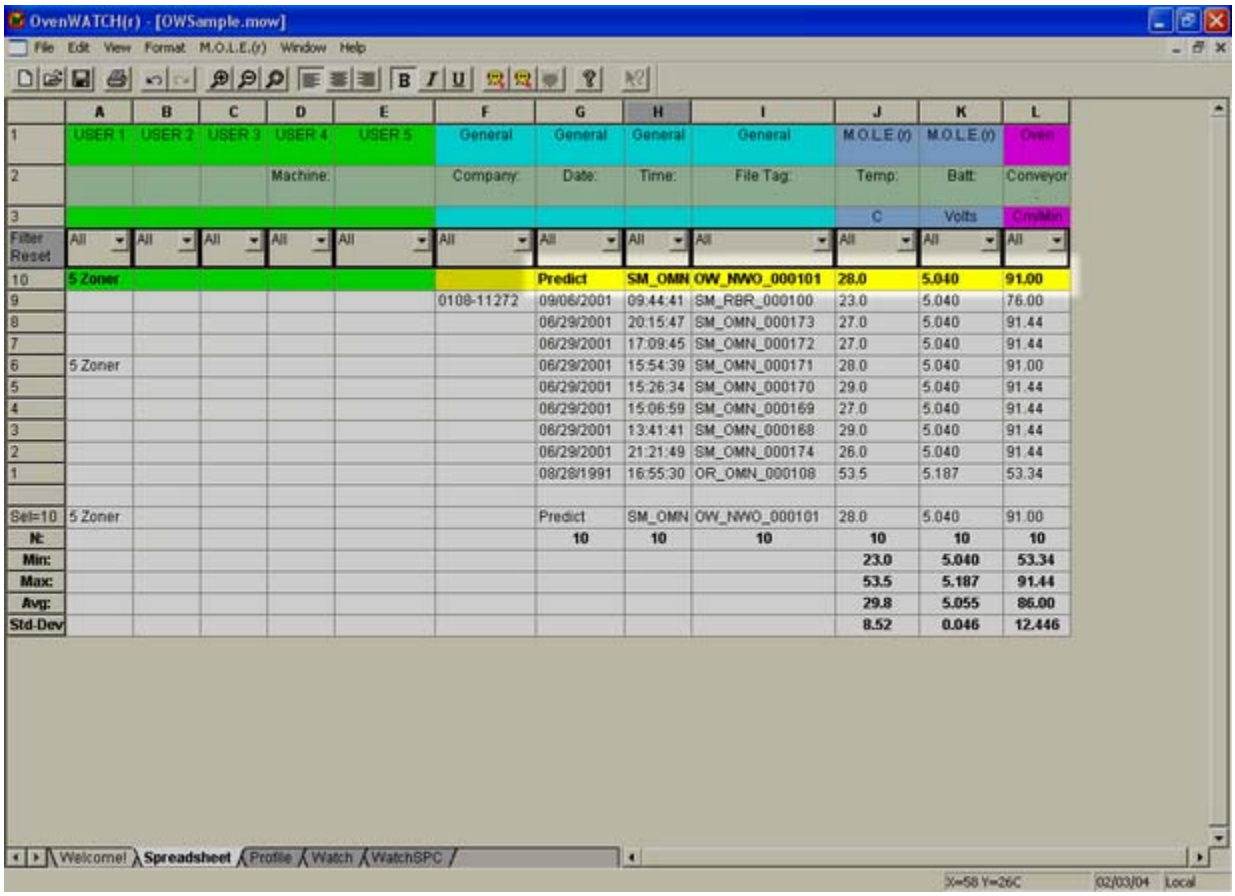
Prediction Button

5.8.9.3 Saving a Predicted Profile

To save a predicted profile:

1) On the ***Oven Prediction*** dialog box, click the ***Save Prediction*** command button.

The software automatically saves the prediction profile as a new (**.MDM**) file. The predicted profile data is also loaded into the Spreadsheet worksheet as a data run labeled with a description, original data run and new File name.



	A	B	C	D	E	F	G	H	I	J	K	L
1	USER 1	USER 2	USER 3	USER 4	USER 5	General	General	General	General	M.O.L.E.(r)	M.O.L.E.(r)	Oven
2				Machine:		Company:	Date:	Time:	File Tag:	Temp:	Batt:	Conveyor
3										C	Volts	Cm/Min
Filter Reset	All	All	All	All	All	All	All	All	All	All	All	All
10	5 Zoner						Predict	SM_OMN	OW_NWO_000101	28.0	5.040	91.00
9						0108-11272	09/06/2001	09:44:41	SM_RBR_000100	23.0	5.040	76.00
8							06/29/2001	20:15:47	SM_OMN_000173	27.0	5.040	91.44
7							06/29/2001	17:09:45	SM_OMN_000172	27.0	5.040	91.44
6	5 Zoner						06/29/2001	15:54:39	SM_OMN_000171	28.0	5.040	91.00
5							06/29/2001	15:26:34	SM_OMN_000170	29.0	5.040	91.44
4							06/29/2001	15:06:59	SM_OMN_000169	27.0	5.040	91.44
3							06/29/2001	13:41:41	SM_OMN_000168	29.0	5.040	91.44
2							06/29/2001	21:21:49	SM_OMN_000174	26.0	5.040	91.44
1							08/28/1991	16:55:30	OR_OMN_000108	53.5	5.187	53.34
Sel=10	5 Zoner						Predict	SM_OMN	OW_NWO_000101	28.0	5.040	91.00
Nt:							10	10	10	10	10	10
Min:										23.0	5.040	53.34
Max:										53.5	5.187	91.44
Avg:										29.8	5.055	86.00
Std-Dev										8.52	0.046	12.446

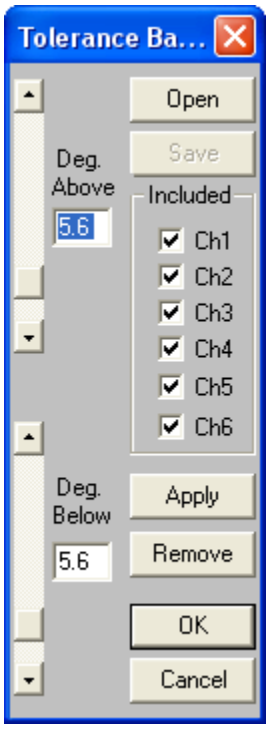
Saved Prediction

5.8.10 Tolerance Band Tool

The Tolerance Band tool develops standard temperature profile bands that can be used to determine compliance with required process limits.

To develop a tolerance band:

1) On the ***Tools*** menu, select ***Tolerance Band*** and the Tolerance Band dialog box appears.



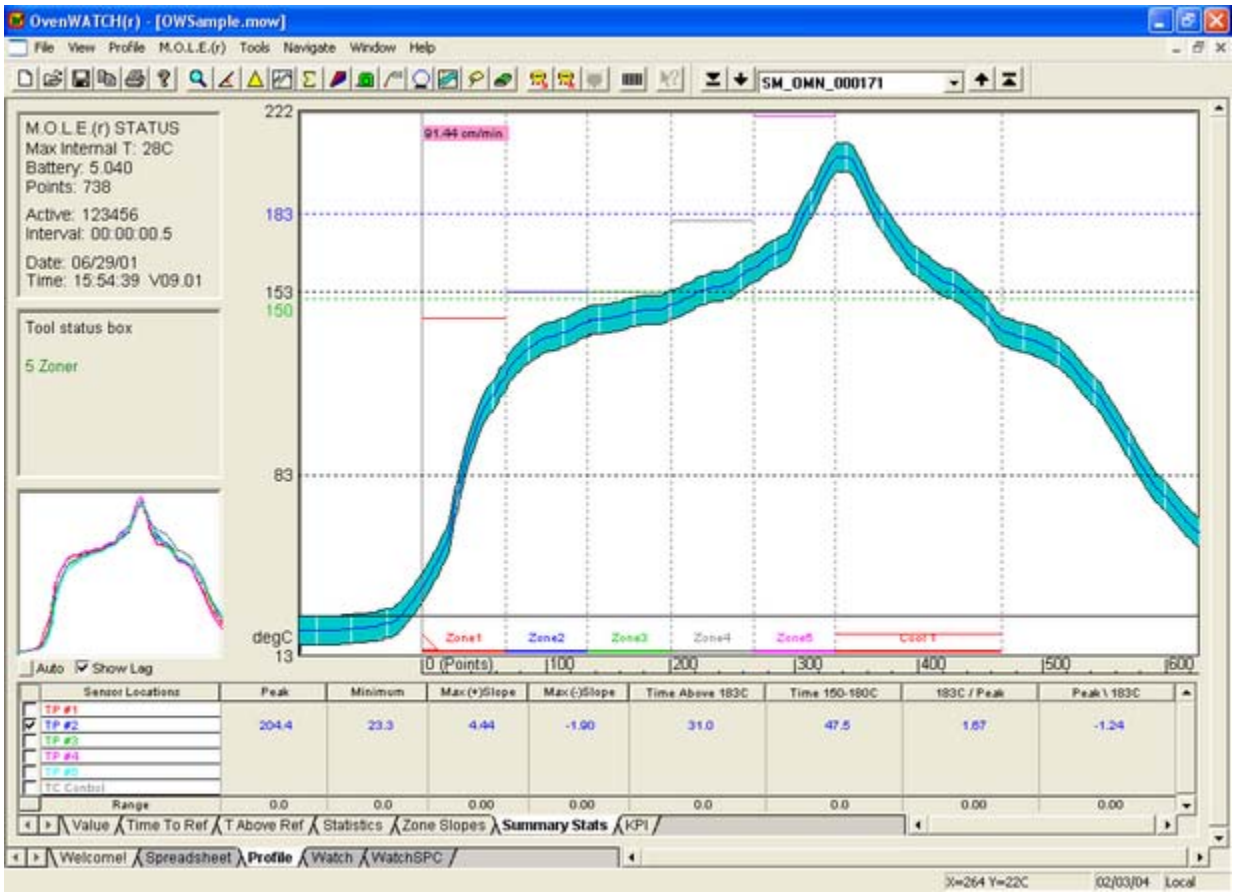
Tolerance Band Dialog Box

2) Select the check boxes next to the desired channels to apply the tolerance to.

Only active channels will be enabled.

3) Set the ***Deg Above*** with the slider bar or by typing a value in the text box. This value is the degrees above the highest selected channel and ***Deg Below*** which is the degrees below the lowest selected profile channel.
4) Click the ***Apply*** command button and the values for the Tolerance Band are now calculated and displayed on the Data Graph.
5) Click the ***OK*** command button to hide the Tolerance Band dialog box and view the applied tolerance band.

The maximum of the selected channel data values is used and then the ***Deg Above*** is calculated for the upper value of the band. The lower value is calculated in the same manner using the minimum of the channels selected and the ***Deg below***. Once the band is defined, a line is drawn from the top to the bottom value at each data point.



Tolerance Band

6) Click the ***Remove*** command button to remove the Tolerance Band from the Data Graph.
7) Click the ***Cancel*** command button to return to the Data Graph.

Once a Tolerance Band has been developed and applied, it can be saved as a copy for future retrieval from the Standards file folder. When the Tolerance band tool is being used an existing or previously defined Tolerance Band may be loaded by using the Open command button.

To Save a Tolerance band:

1) On the ***Tolerance Band*** dialog box, click the ***Save*** command button and a list box appears.

Tolerance Band Save List Box

2) Enter a name in the File name text box. The Tolerance Band will be assigned the file name extension (***.STD**).
3) Click the ***Save*** command button to save or ***Cancel*** to return to the Tolerance Band dialog box.

To Open a tolerance band:

1) On the ***Tolerance Band*** dialog box, click the ***Open*** command button and a list box appears.
2) Select a Tolerance Band file by clicking it.
3) Click the ***Open*** command button to apply the saved tolerance or ***Cancel*** to return to the Tolerance Band dialog box.

The Tolerance Band tool can be accessed on the Profile worksheet Toolbar.

Tolerance Band Button

5.8.11 Erase Object(s)

The Erase Object(s) command deletes objects and information that have been added to the Data Graph.

To erase object(s):

1) On the ***Tools*** menu, select ***Erase Object(s)***.
2) Position the mouse pointer beside the object(s) to erase.
3) Press the left mouse button and drag diagonally to outline the object(s) to be deleted.
4) A message box asking, "***Do you wish to erase this object?***" appears for each object selected. (The object that the question is referring to will be surrounded by a red dashed box).
5) Click the ***Yes*** command button to continue erasing, or the ***No*** command button to cancel the operation.

If the Erase Objects command is selected and there are no object(s) to be deleted, click the right mouse button to escape from that command.

The Erase Object(s) command can be accessed on the Profile worksheet Toolbar.

Erase Object(s) Button

5.8.12 Erase All

The Erase All command deletes, in one operation, all the objects and information that have been added to the Data Graph.

This operation is not reversable, so use with CAUTION.

To erase all objects:

1) On the ***Tools*** menu, select ***Erase All***.
2) A message box appears asking, "***Do you really want to erase all your objects***".
3) Click the ***Yes*** command button to continue erasing, or the ***No*** command button to cancel the operation.

If the Erase All command is selected and there are no object(s) to be deleted, the erase all command will simply redraw the screen.

The Erase All command can be accessed on the Profile worksheet Toolbar.

Erase All Button

5.8.13 Photo Shop

The brightness and contrast of a Product identification photo can be edited to enhance the quality of the photo.

Editing photos will not change identification photos for existing products. The edited photos will only effect new products.

To edit a photo:

1) On the ***Tools*** menu, select ***Photo Shop*** and the ***Photo Shop*** window appears.
2) Select the ***Load*** button and a list box appears.
3) Select the desired photo or navigate to the file folder where the file is located.
4) Highlight the desired workbook file to open by clicking.
5) Click the ***Open*** command button to open, or ***Cancel*** to return to the Photo Shop window.

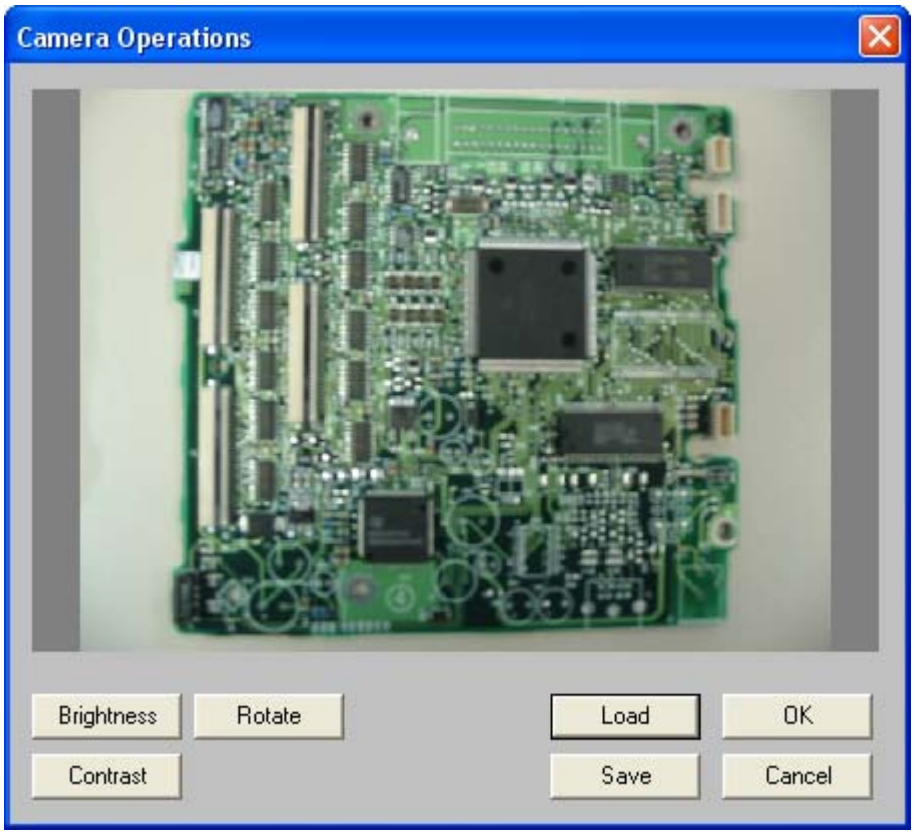


Photo Shop Window

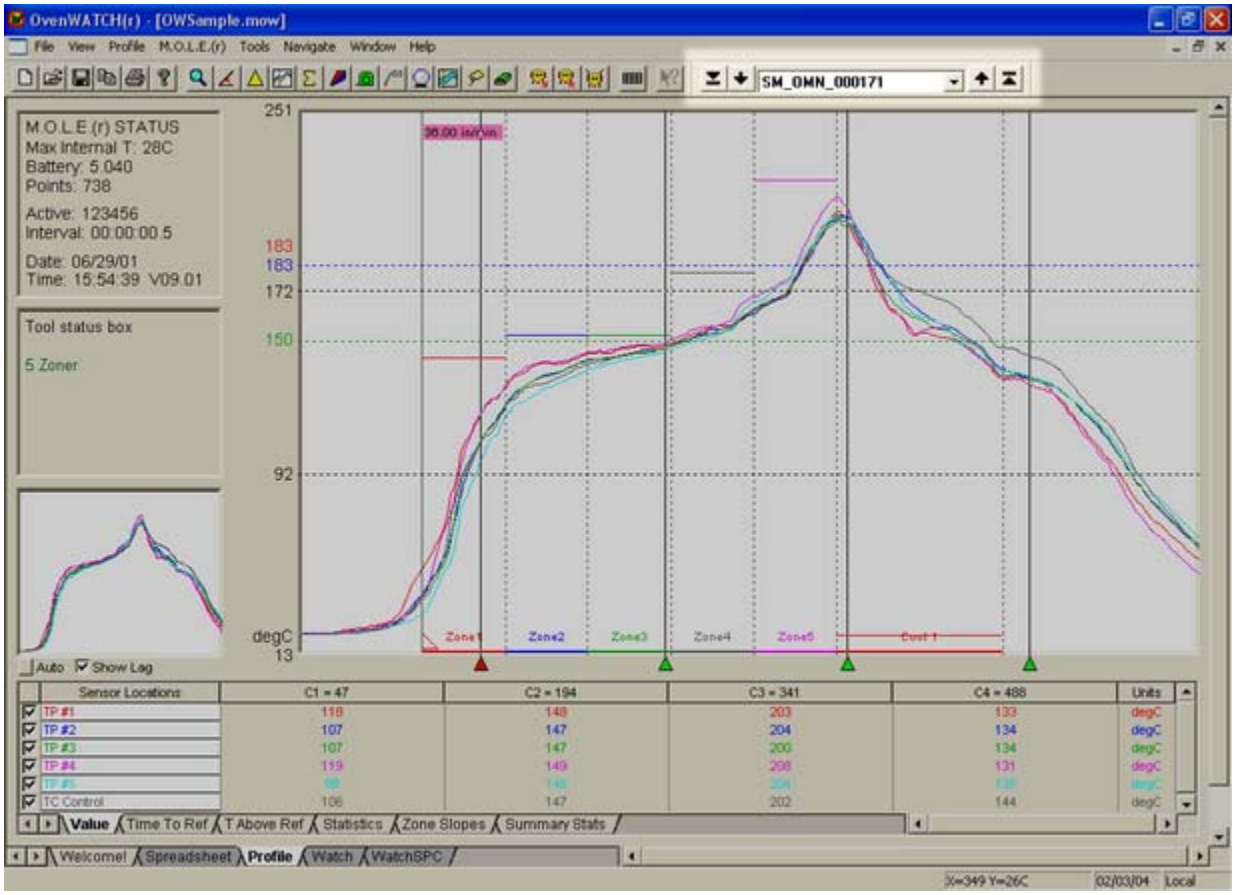
6) Adjust the photo using the Brightness and/or Contrast tools. The photo can also be rotated to a better fit in the window.
7) Click the ***Save*** command button to save the changes, or ***Cancel*** to return to the current workbook.

5.9 Navigate Menu

When viewing a data run on the Profile worksheet, the Navigate menu allows the user to view other Profiles without having to select them from the Spreadsheet worksheet. It enables the user to view profiles that are one above or below the one currently being viewed, or jump to the first or last one uploaded into the open workbook.

Navigate Buttons:

The Navigate commands can be accessed on the Profile worksheet Toolbar.



Navigate Tool Buttons

5.10 Help Menu

The Help menu commands are useful when information is needed quickly or when this Users guide is not available.

5.10.1 Help

The Help Index is a complete reference tool that can be used at any time.

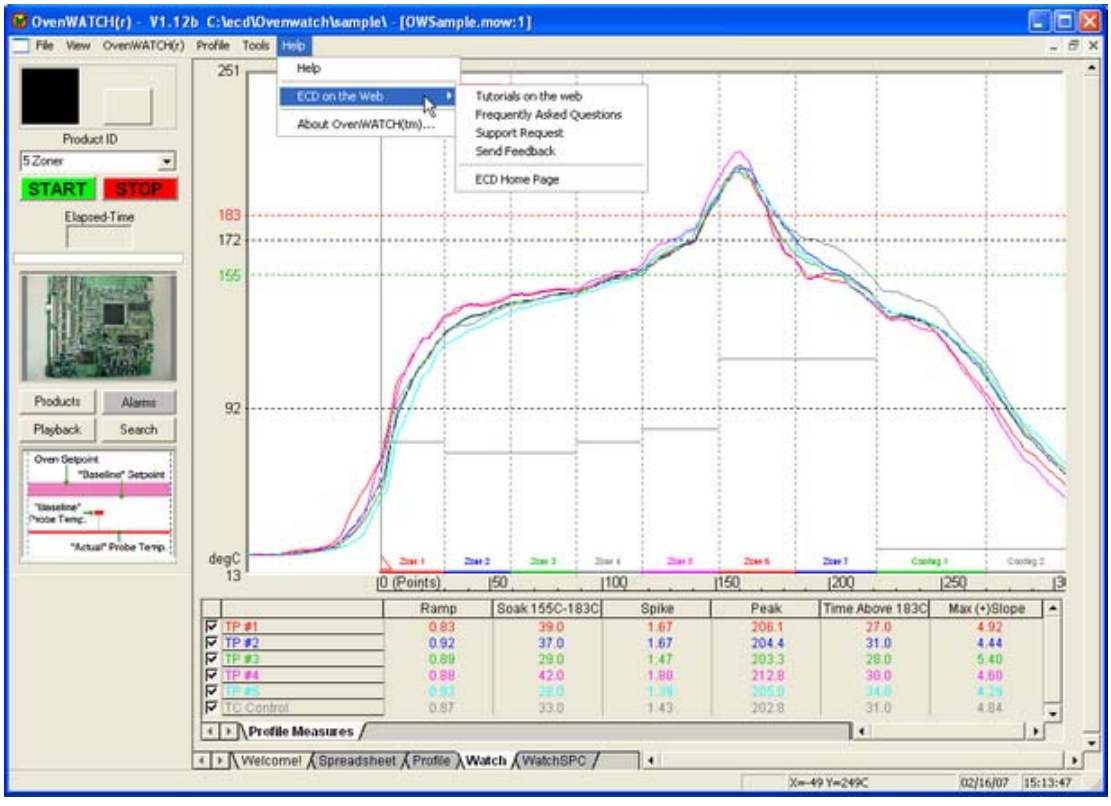
To launch the help system:

1) On the ***Help*** menu, select ***Help*** to launch the user's help guide. You may now search for the help topic of your choice.

This command can also be used by pressing the [***F1***] key.

5.10.2 ECD on the Web

You can access more help by using ECD web commands. Let us help you by using the linked commands to the ECD Web site.



ECD Web Sub-Menu

5.10.3 About

To view About information:

1) On the ***Help*** menu, select ***About M.O.L.E.*** to display the software version, release date and company information.

About OW SPC Dialog Box

The About command can be accessed on all of the worksheet Toolbars.

	About Button

5.10.3.1 Software Authorization

The software includes an optional software Barcode feature that can be purchased from ECD. This option can be activated when the software is authorized with an Activation Key. For contact information refer to Section ***How to Get Additional Help***.

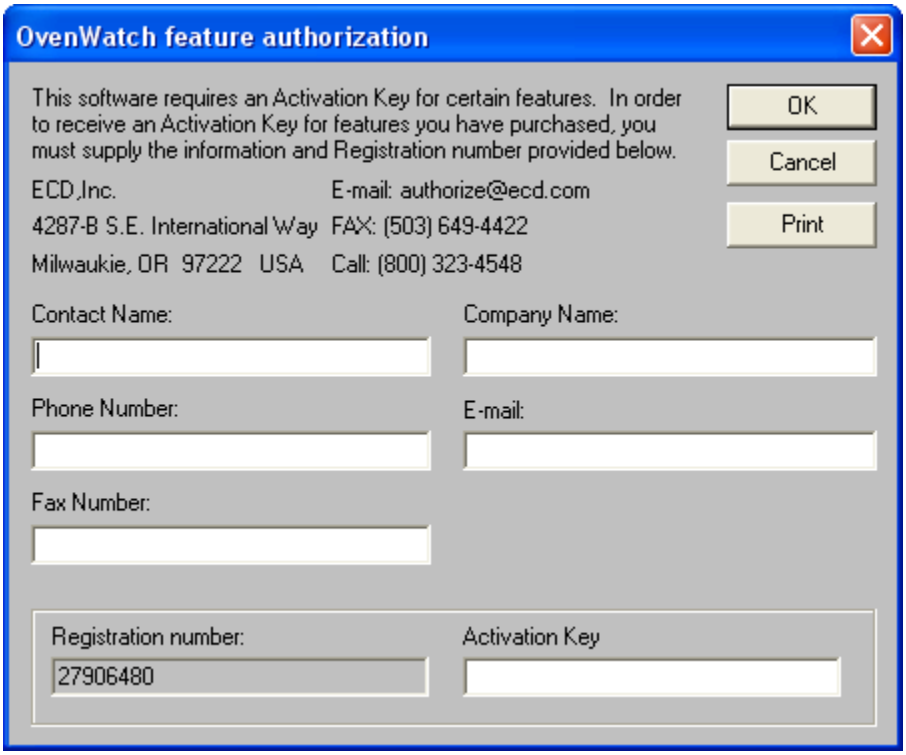
To authorize optional Barcode feature:

1) Start the software program by either double-clicking the OvenWATCH icon or selecting it from the ECD OvenWATCH program sub-menu.
2) On the ***Help*** menu, select ***About OvenWATCH***.

About Dialog Box

3) Select the ***Authorize*** button on the Help message box and the Authorization dialog box appears.

4) Enter the information on the Authorization dialog box and supply that information to ECD with one of the methods supplied on the dialog box. Once ECD receives this information you will be contacted.



Authorization Dialog Box

5) Upon receiving the Activation Key, enter it into the corresponding text box and click the ***OK*** command button to authorize.

6.0 Service and Troubleshooting

6.1 General Service Information

This section covers maintaining and troubleshooting for the OvenWATCH® System.

The following service and calibration instructions are for use by qualified personnel only. Refer to the *Operators Safety Information* prior to performing any service.

6.2 Service Troubleshooting

Decide if the problem is with the M.O.L.E. Hardware, Communications, or Software.

- If the problem occurs while attempting to log data, the Hardware may be faulty.
- If the problem occurs while attempting to communicate between SuperM.O.L.E. Gold and the PC, the Communications links may be faulty.
- If the problem occurs while attempting to use a software function, the software may be faulty.

Once it has been determined what item is causing the problem, refer to the appropriate service section. Start at the top of the list and work your way down. If the problem is still unresolved go to ***How to Get Additional Help***.

6.2.1 Hardware Problems

This section describes basic problems that can occur with the hardware.

Incorrect calibration:

If the recorded temperatures for all of the Zones are wrong in the same direction (e.g., all too high), then possibly the M.O.L.E. has incorrect calibration. Refer to section ***Calibration Information*** for cautions and procedures, or return the M.O.L.E. to ECD for re-calibration.

Wrong or erratic temperature readings:

1) Check the MUX to Zone Temperature probe connection.
2) Make sure the M.O.L.E. is fully seated in the Station.

M.O.L.E. doesn't turn "ON" when after "Starting" to record data:

1) Make sure the M.O.L.E. is fully seated in the Station.
2) Clean the Station communication contacts. (Refer to section ***Cleaning Communication Contacts***).
3) Check the logging configuration. If set for board entry the M.O.L.E. will only log when board enters the oven.

Internal temperature effects:

If the M.O.L.E. has been subjected to an internal temperature in excess of the published specifications, temperatures outside the specified operating range may cause incorrect readings and shorten Power Pack life. **Internal temperatures in excess of the specified maximum temperature may cause permanent, irreparable damage to your Super M.O.L.E. Gold.**

Conductive contamination inside the M.O.L.E.:

Although unlikely, this is known to cause "spikes" (abrupt jumps in value) in the recorded temperatures. Other kinds of errors are also possible.

LED stays on steady (no flashing) when power pack is replaced:

Remove the Power Pack and wait a minute before plugging it in again. If the problem is still persists, the start switch is probably damaged.

6.2.2 Communications Problems

This section describes basic problems that can occur with the communication links.

Conflicting use of COM port:

Perhaps some other software, such as a mouse driver, communications programs, or PDA is trying to use the COM port that the Station is configured for.

Serial and/or Parallel PC Interface cables defective:

Contact ECD to order a replacement cable, refer to section ***How to Get Additional Help*** for additional product information.

6.2.3 Software Problems

This section describes basic problems that can occur with the software.

"You must place M.O.L.E. in docking station first" error message:

1) Make sure the M.O.L.E. is fully seated in the Station.
2) Check the communication links (i.e. the Serial and Parallel PC interface cables).

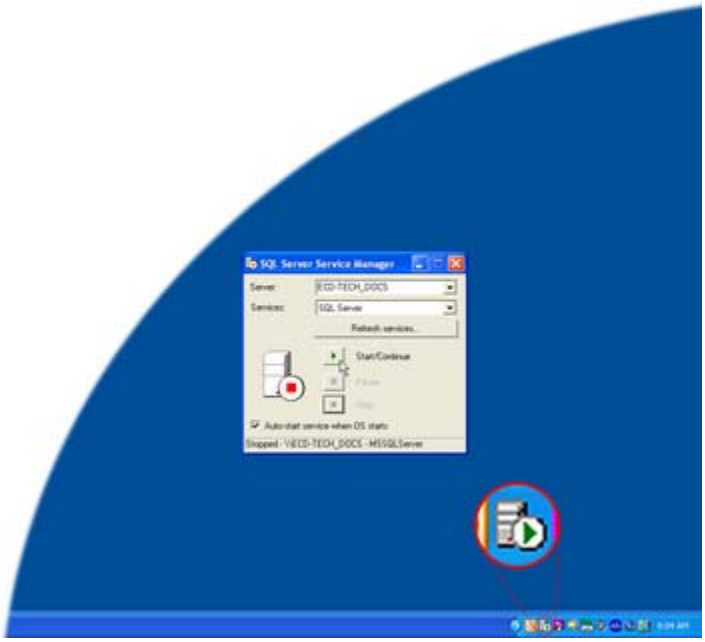
"M.O.L.E. not responding" error message:

1) The M.O.L.E. must be programmed with firmware version 9.08 and higher.
2) Make sure the M.O.L.E. is fully seated in the Station.
3) Clean the Station communication contacts. (Refer to section ***Cleaning Communication Contacts***).

"The database is not responding" error message:

1) Make sure the SQL software server is running.

- Activate the SQL Server Service Manager by double-clicking the icon on the Notification Area of the windows Taskbar.
- Select the Start/Continue button.
- Start the OvenWATCH software.



SQL Server Service Manager

6.3 Calibration Information

Because the SuperM.O.L.E. Gold is made with precision components with high temperature stability and tight tolerances; the analog-to-digital converter remains stable for years. High quality components together with software algorithms based on the IPTS-68 standard for Type K thermocouples have been provided to yield specified accuracy and long-term stability. Each unit has been tested at the factory before it is shipped.

ECD recommends the M.O.L.E. is factory re-calibrated every 6 months when it is being used constantly. If the use is occasional, a period of no greater than 12 months between calibrations is recommended.

Depending on use, however, temperature accuracy should be periodically verified using a suitable temperature standard. Any observed inaccuracies are probably not caused by calibration error but by any one of a number of other sources, primarily the following:

1) Poor thermocouple connectors or open thermocouples.
2) Using a temperature standard that is inaccurate or is not traceable to the National Institute of Standards and Technology (NIST, formerly the Nation Bureau of Standards).

- Check the accuracy of your temperature standard and that it is traceable to NIST. Be sure that you're using Type K wire connected to the standard. Be sure that your temperature standard is cold-junction compensated, or use an ice point reference.

3) Extremely low Power Pack charge.

- Recharge the Power Pack.

4) Sudden changes or excessive ambient temperatures.

- Allow SuperM.O.L.E. Gold temperature to stabilize for 1/2 hour before calibration.

If after checking these possible sources of inaccuracy the SuperM.O.L.E. Gold still needs to be calibrated, there are two calibration methods: Using a thermocouple simulator and another using a voltage reference and an ice point.

Do not attempt to calibrate the M.O.L.E. if you have never used a thermocouple simulator, or you are unsure of the accuracy of your thermocouple simulator. (Contact ECD for the proper calibration procedure P/N A31-0900-05).

If you need to return the M.O.L.E. for re-calibration, contact ECD and request an RMA (Return Merchandise Authorization) to return the M.O.L.E. for service. Refer to section ***How to Get Additional Help*** for contact information.

IPTS-68 (International Practical Temperature Scale of 1968)

6.4 Changing the Calendar/Clock Battery

If the clock is resetting itself, it may be necessary to replace the calendar/clock battery.

Changing this battery resets the hardware configuration parameters stored in the M.O.L.E.

Change the battery as follows:

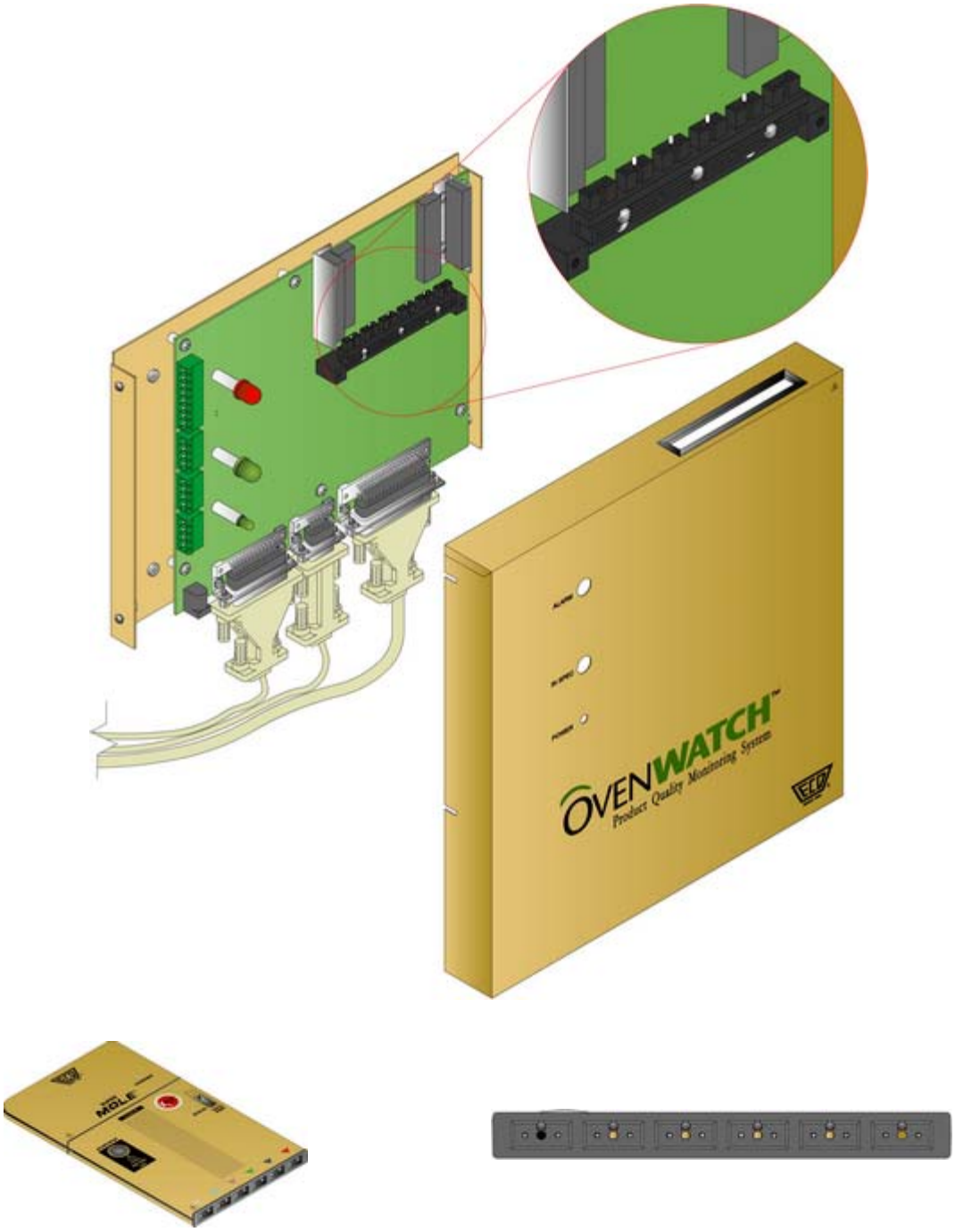
1) Remove the Power Pack battery by separating the unit. This exposes the clock battery.

SuperM.O.L.E. Gold calendar/clock battery

2) Pull the tab to remove the old battery.
3) Insert a new 3V Lithium battery (ECD P/N #SF30-0041-00), making sure it is oriented as pictured on the M.O.L.E. and making sure the tab is tucked in behind the battery.
4) To help prolong clock battery life, the Power Pack battery should be replaced so power is not drawing off the Calendar/Clock battery. The Activity LED blinks rapidly for two seconds when the Power Pack is first reconnected indicating complete reset has occurred.
5) Start and then stop the M.O.L.E. to clear the memory.
6) Reconfigure the M.O.L.E..

6.5 Cleaning Communication Contacts

Over time the communication contacts on the M.O.L.E. and the station may become dirty. To ensure proper communication between the components, it is recommended to periodically clean the contacts with a mild mixture of 50%-75% IPA and water.

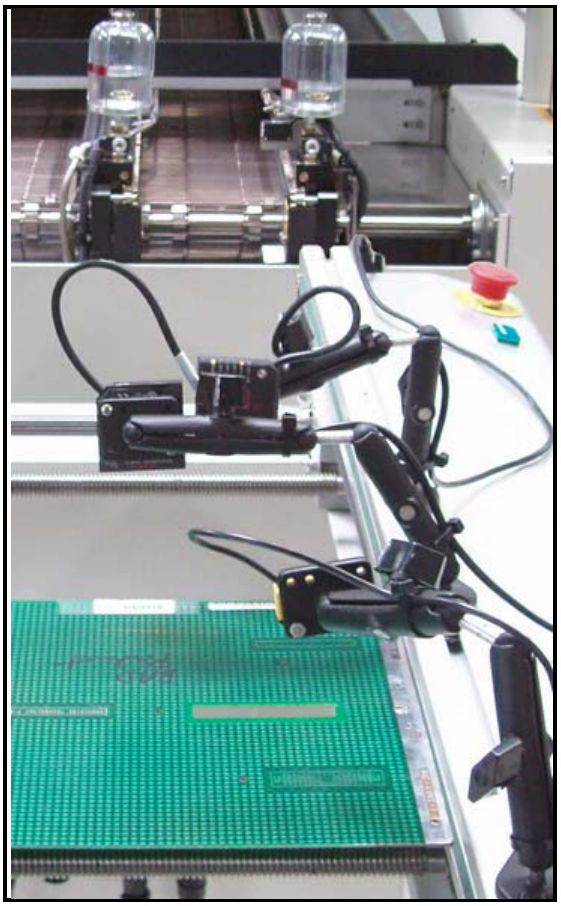


Communication Contacts

6.6 Barcode Hardware Setup

This section covers the typical placement and mounting of the required sensor and barcodes on an oven conveyor.

The Product Tracking sensor should be placed at the beginning of the conveyor



Barcode Hardware Setup

Barcode scanner(s) should be placed approx 6” from the Product Tracking sensor. It should also be placed as far from the end of the conveyor as possible, allowing the conveyor time to react to the optional SMEMA Interface signals.

Test the functionality and adjust the Barcode scanner and Product Tracking sensor as necessary. The Product Tracking sensor must detect the product before the Barcode scanner(s).

6.7 How to Get Additional Help

If you still have problems, let us help you. We offer many ways to service your problems. You can call our Service/Test technicians, visit our web site to view our FAQ section (Frequently asked Questions) or send us e-mail explaining your problem in detail.

When calling our Service/Test technicians or sending us e-mail, please include the following information:

- Product Description (i.e. SuperM.O.L.E. Gold, OvenWATCH Station).
- Product Serial Number.
- Software Version (i.e. **1.12c**).

Here is how to contact ECD:

Telephone: (503) 659-6100
FAX: (503) 654-4422
Technical Support: (800) 323-4548
Email: support@ecd.com
Internet: http://www.ecd.com

Appendix:

A: Specifications

SuperM.O.L.E.® Gold:

INPUTS:	Up to 6 type K ECD Micro-Thermocouples
PHYSICAL DIMENSIONS:	3.5" x 6" x 0.37"
TEMPERATURE MEASUREMENT RANGE:	-129°C to +1250°C (200°F to +2282°F)
INTERNAL OPERATING TEMPERATURE RANGE:	0°C to 65°C (32°F to 150°F)
Temperatures outside this range may result in inaccurate readings and reduced battery life.	
Absolute Maximum Warranteed Internal Temperature:	82°C (180°F)* SuperM.O.L.E. Gold automatically stops monitoring when the internal temperature exceeds 80°C (176°F)
WARNING:	*Exceeding this temperature may permanently damage the instrument!
ACCURACY:	Within ± 0.1%+1°C. at –73, 100, 250 and 1000°C. Channel to channel compliance within 1°C.
PROGRAMMABLE SAMPLING PERIOD:	0.1 seconds to 24 hours
HARDWARE REAL-TIME CLOCK/CALENDER:	±1 minute/month at 25°C
OPEN THERMOCOUPLE DETECTION.	All six channels
NUMBER OF SAMPLES PER CHANNEL	5460 total for six channels

Power Pack Charger Model Specifications:

NORTH AMERICA:	ECD Part No. E31-0900-25 Input: 120 V, AC, 50/60 Hz, 2.8 VA Output: 9V DC, 120-200mA, 1.08VA
CONTINENTAL EUROPE:	ECD Part No. E31-0900-21 Input: 230 V, AC, 50/60 Hz, 2.8 VA Output: 9V DC, 120-200mA, 1.08VA

Station Specifications:

INPUTS:	6 Male Connectors (Type K)
PHYSICAL DIMENSIONS:	10.47" x 11" x 1.41"

Station Transformer Specifications:

POWER PACK CHARGE:	Typical 50 ten-minute profiles.
CHARGE TIME:	14 hours.
EXPECTED POWER PACK LIFE:	300-400 charging cycles.
OPERATING RANGE:	5.1V to 4.9V (the unit may become unreliable below 4.5V).

SuperM.O.L.E.® Gold Thermocouple Specifications:

Thermocouples: Type K, Micro-Connector, Teflon insulated. (Other insulation types available.)

THERMOCOUPLE RESPONSE TIME

Wire Size	Still Air 800/100 °F	60 Ft./Sec. Air 800/100 °F	Still H2O 200/100 °F
.001 in. .005 in. .015 in.	0.05 sec. 1.0 sec. 10.0 sec.	0.004 sec. 0.08 sec. 0.80 sec.	0.002 sec. 0.04 sec. 0.40 sec.

Zone Temperature Probe:

Solid Shell:	
EXTERNAL CONSTRUCTION:	Extension cable - SS Overbraid shield. Probe - ¼" OD x 0.020 Wall SS tubing.
INTERNAL CONSTRUCTION:	Type K conductors with Magnesium Oxide filler.
• T/C junctions are electrically isolated from each other, and the SS tube. • SS tubing and T/Cs must withstand 325°C continuous	
Flexible:	
EXTERNAL CONSTRUCTION:	Extension cable - SS Overbraid shield. Probe - SS Overbraid shield.
INTERNAL CONSTRUCTION	Type K conductors w/Fiberglass Sleeving.

Zone Temperature Probe - Limits of error (whichever is greater):

- **Special:** 1.1°C or 0.4%.

Environmental Limitation Specifications:

- Altitude up to 2000 meters
- Maximum relative humidity 80% RH from 0°C to 31°C, decreasing linearly to 17% RH at 50°C.
- Pollution Degree 2 (Normally only dry pollution, but with temporary conductivity caused by condensation)

Power Pack Charger Only:

- Mains Voltage Fluctuations + 10%
- Mains Transient Overvoltage Installation Category II (Per IEC 664)
- Pollution Degree 2 (Normally only dry pollution, but with temporary conductivity caused by condensation)

NOTE:Tests have shown that because of the sensitive nature of the measurement and logic circuits, the following precautions must be observed:

- **Minimize exposure to ESD Events.** If the M.O.L.E. or one of the thermocouples receives an 8kV electrostatic discharge during the data collection sequence, the M.O.L.E. may switch itself "OFF". To retrieve the data, simply upload the data that was recorded prior to the event. If a new data collection sequence is started without uploading first, the existing data stored in the M.O.L.E. will be lost.

- **Keep strong electromagnetic fields away.** The thermocouple wires serve as an antenna for electromagnetic radiation. If field strength of 3 volts per meter is present (usually due to close proximity of radio transmitters) while the M.O.L.E. is collecting data, the accuracy of the data may be compromised. This interference is compounded by using long thermocouple wires, as well as the effect of the thermocouple wires acting as a "tuned" antenna.

B: Statistical Process Control (SPC) Background Information

This appendix deals with the subset of SPC that is incorporated into software. It does not address general SPC principals. A working knowledge of general statistical principals and SPC terms is assumed and is not addressed here. There are many good basic SPC books such as the DataMyte Handbook where this information may be obtained.

Reflow operators, engineers and production managers are expected to understand their soldering process so as to deliver quality products cost effectively. This is a continuous process.

First, the machine must be checked for consistency. A standard or typical set up should be routinely checked prior to any process set point determinations, or actual production run machine checks. Only after the machine has been determined to be operating correctly and not experiencing abnormal variation, should data from the machine be utilized. SPC is all about identifying common or normal variation from abnormal variation.

Second, the correct process set points must be determined for a particular product. Utilizing the M.O.L.E., the correct set points for a particular product may be determined. These set points, if selected correctly and followed, should deliver the maximum throughput of quality product.

Third, the machine must consistently deliver the correctly determined set points. SPC will help identify common or normal variation from abnormal variation. Checking the machine using your M.O.L.E. and the software with its SPC capability will help ensure that the machine is consistently performing to its set points and your expectations.

Fourth, repeat the above three steps. Continuous improvement is a never-ending cycle. Check the long-term variation of the machine by graphing typical set point samples. Using the M.O.L.E., recheck/adjust part number specific set points to maximize your quality throughput. Check the machine during a part number run to control the machine variation from that part number’s actual ideal set points.

While SPC had its start in high volume repetitive operations, SPC is applicable to many other types of operations as well. However, SPC can be difficult to apply to short runs. Short runs may be runs that take a long time to process, runs in which multiple samples are difficult to collect, and runs where samples are difficult to place into subgroups or runs where small quantities are run.

The software charts will be more meaningful to the user if SPC charts are generated based on data sets that have the same set points each time.

Process Capability

A process capability index is a standard measure of how a process compares with its specification limits—how a process **is** performing relative to how **it is supposed** to perform. As opposed to the control chart, which shows detailed information about how the data compares with control limits, a capability index is a summary of how the data compares with the specification limits.

Two common capability indicators are Cp and Cpk. These values are shown in the Statistics Box on each SPC Worksheet.

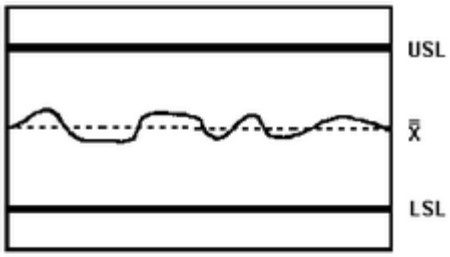
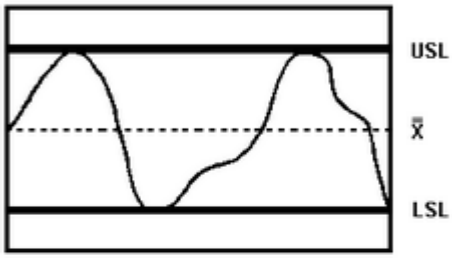
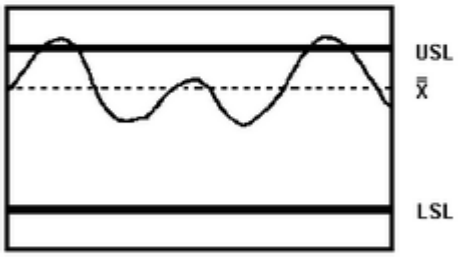
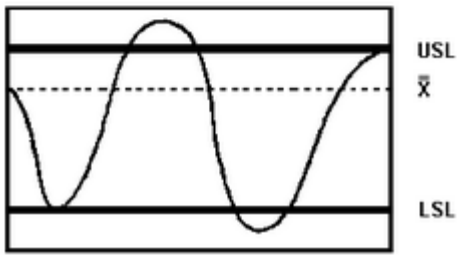
Samples Per Sub-Group = 2

Channel 1	
Time Above:	Sec
N:	9
Min:	22.0
Max:	50.0
X-2Bar:	37.6
Std-Dev:	8.61
Cp:	0.97
Cpk:	0.87

For both of the index values, the data used to determine them is dictated by the subgroup size (N) chosen by the user. In the case where N=1, individual data is used—for N>1, average data is used (x bar).

The charts on the next page give a graphical representation of the concept of Cp and Cpk. Notice that in each graph, the same upper and lower specification limits (USL, LSL) are used. The values of Cp and Cpk will differ according to the data that is compared with those specifications.

Depending on the particular process being monitored, the desired value for Cp and Cpk may differ. In general, however, a Cp and Cpk of 1.33 or above is desired. This assures that the process is not only capable of meeting the required specification limits, but also has a built-in margin for error that may be needed in special circumstances. In addition to targeting a certain minimum Cp and Cpk, it is also desirable to have these two values equal one another. This indicates that the process is well-centered between the specification limits.

	**Cp** ≥ **1.33**: Data tightly distributed. **Cpk** ≥ **1.33**: Data well inside spec limits.
	**Cp = 1.00**: Data fills entire spec range. **Cpk = 1.00**: Data fills entire spec range.
	**Cp > 1.00**: Data tightly distributed. If it were centered between the spec limits, no data would lie beyond those limits. **Cpk < 1.00**: Some data is outside the spec limits.
	**Cp < 1.00**: Data not tightly distributed. If it were centered between the spec limits, some data would still lie outside those limits. **Cpk < 1.00**: Some data is outside the spec limits.

The equations used to calculate the index values are as follows:

$$Cp = \frac{USL - LSL}{6 * (Std.Dev.)}$$

$$Cpk = \frac{USL - \bar{\bar{x}}}{3 * (Std.Dev.)} \quad \text{OR} \quad Cpk = \frac{\bar{\bar{x}} - LSL}{3 * (Std.Dev.)}$$, whichever is less

As can be interpreted from the above equations, Cp gives an indication of how narrow the data distribution is relative to the width of the specification limits. Essentially, it indicates how well the process would be able to stay within the specified limits if the data were perfectly centered between those limits.

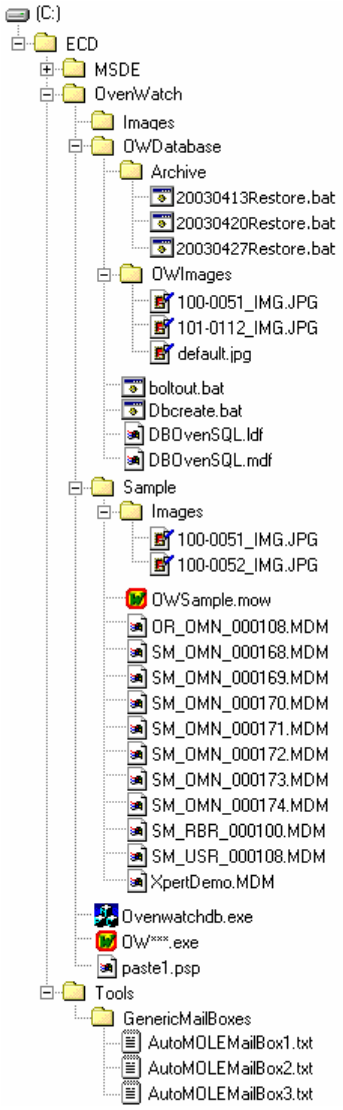
Cpk compares the widest half of the data distribution to the appropriate specification limit. It indicates whether the process is capable of meeting the specification as indicated by the “worst half” of the measurements. Unlike Cp, the Cpk index measures process capability without assuming the data is well-centered.

C: OvenWATCH File Directory Structure

The software uses a variety of executables and support files as listed. The list does not include an even larger number of DLL files, which contain executable code that may be shared by other programs.

The OvenWATCH program (**OW***.EXE**) manages four different database like files:

- The (***.MOW**) file, which contains all profiles that you may choose from to use as Baseline Profiles for a Product's definition.
- The DBOvenSQL.ldf & DBOvenSQL.mdf database files, which contains all of the Product definitions, data collected from the oven, and the Paste1.PST file, which is a library of solder pastes and there specified profiles.

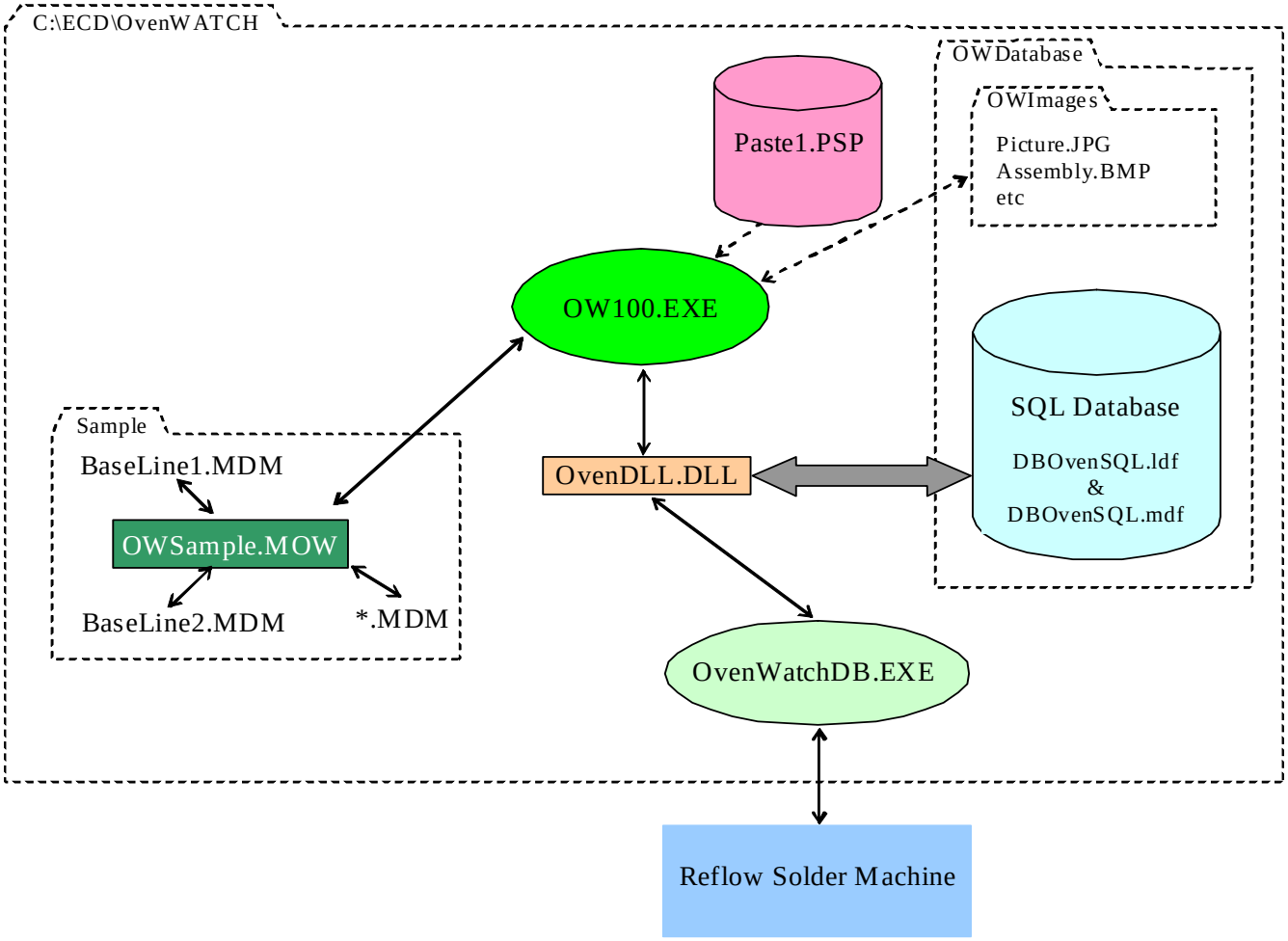


OvenWATCH File Structure

As new products are defined or existing product modified, the software uses the following files to tie together all the needed information to fully define the product. All the information is then stored in the database file (DBOvenSQL.ldf & DBOvenSQL.mdf) in the following way:

1) The Baseline Profile's **(*.MDM)** file is copied and stored in the database.
2) The Paste Profile's name is stored in the database.
3) The Baseline Product's picture (image) is copied and stored the OWImages folder and it's name stored in the database.

The illustration below shows the basic file structure and the interrelationship between the files when it is installed.



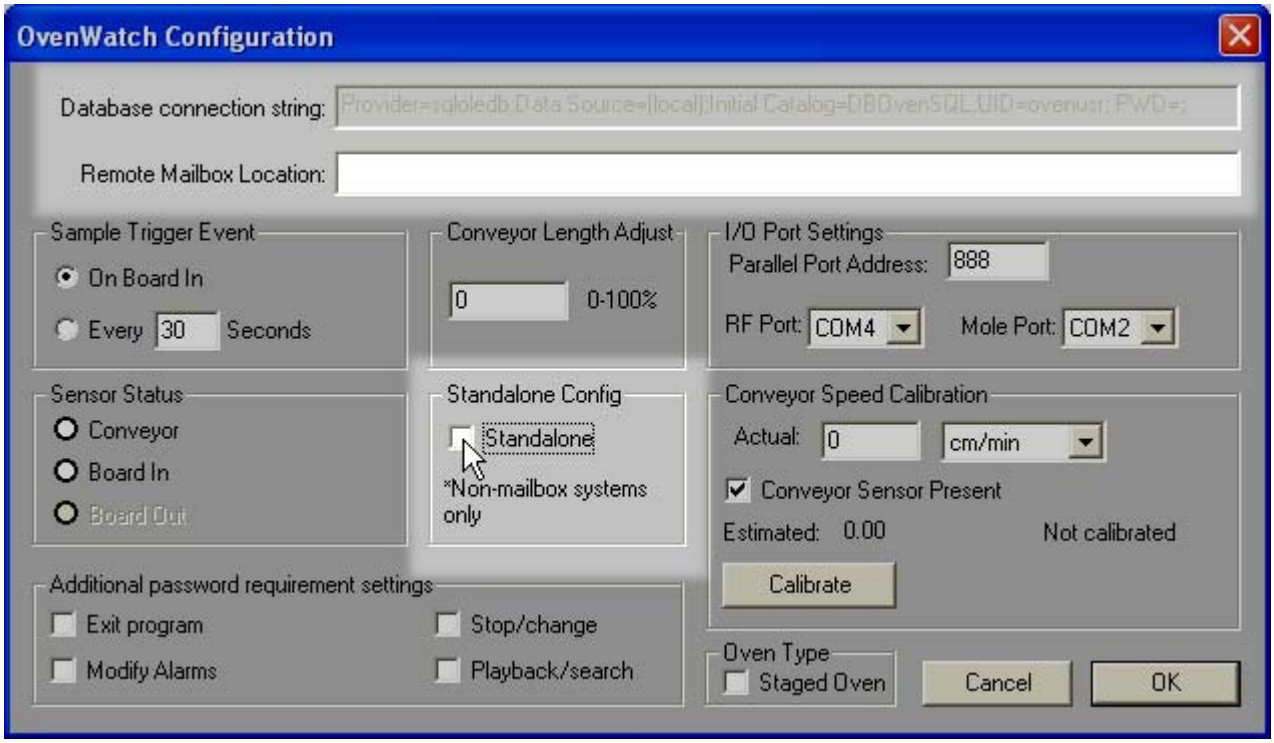
OvenWATCH File Relationship

The location may be changed and or the name of any of the following files:

1) The Remote Mailbox Location.
2) The OWSample.MOW file and it's related Baseline Profiles, **(*.MDM)** files and it's directory as follows:

Changing the location of the Remote Mailbox Location:

1) Start the OvenWATCH program and select the Watch worksheet.
2) On the ***OvenWATCH*** menu, select the ***Configuration*** command.
3) Enter the password (refer to section ***Passwords*** for more information).
4) Click to clear the ***Standalone*** check box.
5) In the Remote Mailbox Location text box, edit the path to match the new network path of the remote mailbox folder.



Images Folder Location

Changing the name or location of and existing *.MOW file:

1) Via Windows, navigate to the directory which contains the **(*.MOW)** workbook file, as installed, C:\ECD\OvenWatch\Sample.
2) Move the folder and the contents to the new directory of your choice.
3) Start the OvenWATCH program.
4) If you moved the last opened **(*.MOW)** workbook file folder, a message box appears indicating that it can't find the **(*.MOW)** workbook file.

Missing File Message Box

5) On the ***File*** menu, select the ***Open*** command. The Open list box appears then navigate to the new **(*.MOW)** workbook file location.
6) Highlight the renamed workbook file to open by clicking and click the ***Open*** command button.

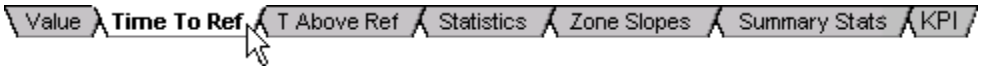
If a different *.MOW file was moved other than the last opened file, close the currently opened (*.MOW) workbook file and open it using the *Open* command on the *File* menu.

D: Parameter Definitions

ValueTab

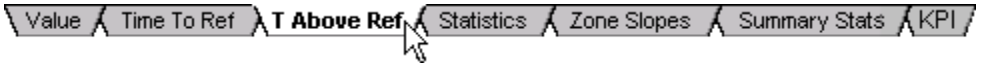
C1, **C2**, **C3**, **C4** indicate the point, time relative, time absolute, or distance (depending on the Units setting) on the X axis where the vertical cursors are set, respectively. The values below are the measured values for each channel at that position.

Time To Reference Tab



Low, **Medium**, and **Hi** are the temperatures set in the Temp Ref Lines dialog, if set. The values below these are the times in hours, minutes, and seconds (hh:mm:ss) that it takes for each channel to reach the respective reference value starting from the process origin.

Time Above Reference Tab



Values shown in this tab are taken from the graph at it's present level of magnification. X-axis values outside of view are not included in the calculations. Y-axis values, however are included regardless of magnification level.

Low, **Medium**, and **Hi** are the temperatures set in the Temp Ref Lines dialog, if set. The values below these are the times in hours, minutes, and seconds (hh:mm:ss) that each channel spent at or above the reference value, if at all. All time above the reference values are accumulated in the total no matter where they occur.

Cure Factor%. The cure factor % is based on the time a sensor temperature was above a temperature reference line divided by the time you entered in the Times Above Temp (TAT) section of the Temp Ref Lines dialog box. This equation gets more complicated as you add more temperature reference lines. The graph illustrates the times used (shaded area) to sum the total curing time each temperature threshold contributes.

The following equation is used when all three temperature reference lines are used:

Cure Factor % = 100 * (HItime/HItat + (MEDtime – HItime) /MEDtat + (LOtime – MEDtime)/LOtat)

The same basic equation is used when there are only two (any two) temperature reference lines used:

Cure Factor % = 100 * (HItime/HItat + (MEDtime – HItime) /MEDtat)

or

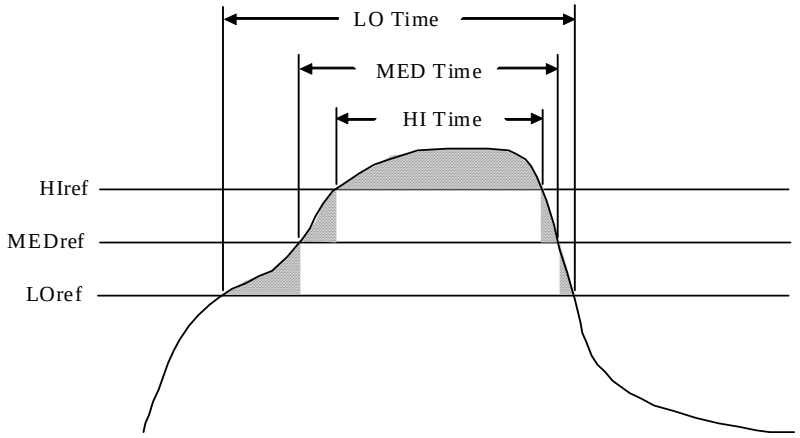
Cure Factor % = 100 * (MEDtime/MEDtat + (LOtime – MEDtime) /LOtat)

or

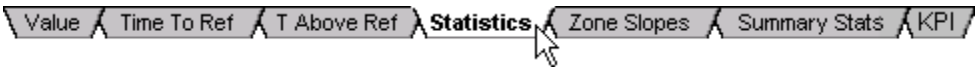
Cure Factor % = 100 * (HItime/HItat + (LOtime – HItime) /LOtat)

Finally, if only one temperature reference line is used, the equation is simply:

Cure Factor % = 100 * time/tat (which ever temp ref line you are using)



Statistics Tab



Values shown in this tab are taken from the graph at it's present level of magnification. X-axis values outside of view are not included in the calculations. Y-axis values, however are included regardless of magnification level.

Minimum is the lowest value measured. The values below are the minimum values for each channel.

Minimum X is the point in time where the minimum value occurred. The values below are the first point on the X-axis where the minimum value occurred for each channel.

Maximum is the highest value measured. The values below are the maximum values for each channel.

Maximum X is the point in time where the maximum value occurred. The values below are the first point on the X-axis where the maximum value occurred for each channel.

Average is based on the following equation:

$$\Sigma x/n$$

Where **n** is the number of data points and x is the value of any given data point. The values below are the average values for each channel.

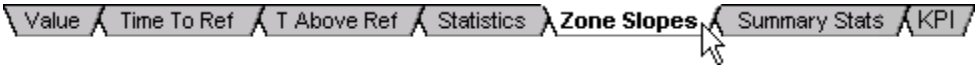
Standar**d Dev**iation is based on the following equation:

$$\sqrt{(n \cdot \Sigma x^2 - (\Sigma x)^2)/n \cdot}$$

Where **n** is the number of data points and x is the value of any given data point. The values below are the standard deviation values for each channel. Small standard deviation means the data is used to calculate it is well centered around the average of that same data.

Zone Slopes

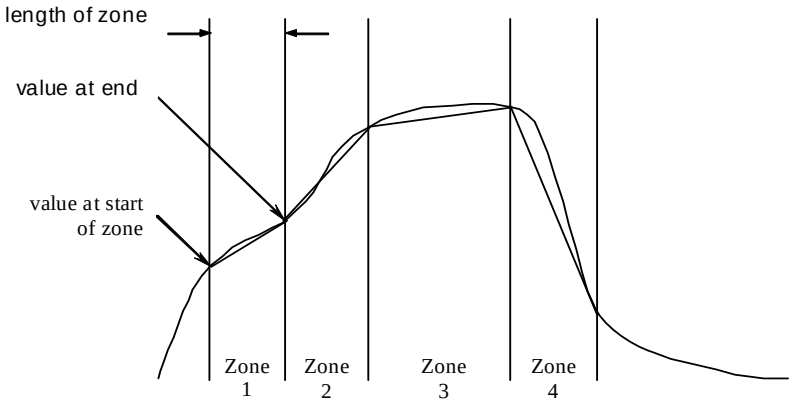
Zone Slopes tab



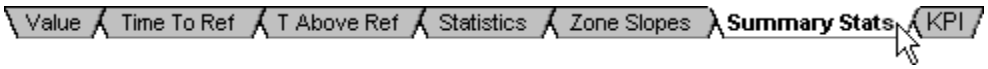
Zone 1, **Zone 2**, **Zone3**, … are the zones that correspond to the zone parameters entered in the Oven Configure dialog box. Up to 30 zones can be represented. The values below are the slopes within each zone for each channel using the following equation:

(value at end of zone – value at start of zone)/length of zone in time

Values in **bold** are the largest values measured for that channel. Slope values are over the entire zone and cannot reflect transient changes in temperature within a zone. Large zone slopes represent faster heating within a given zone.



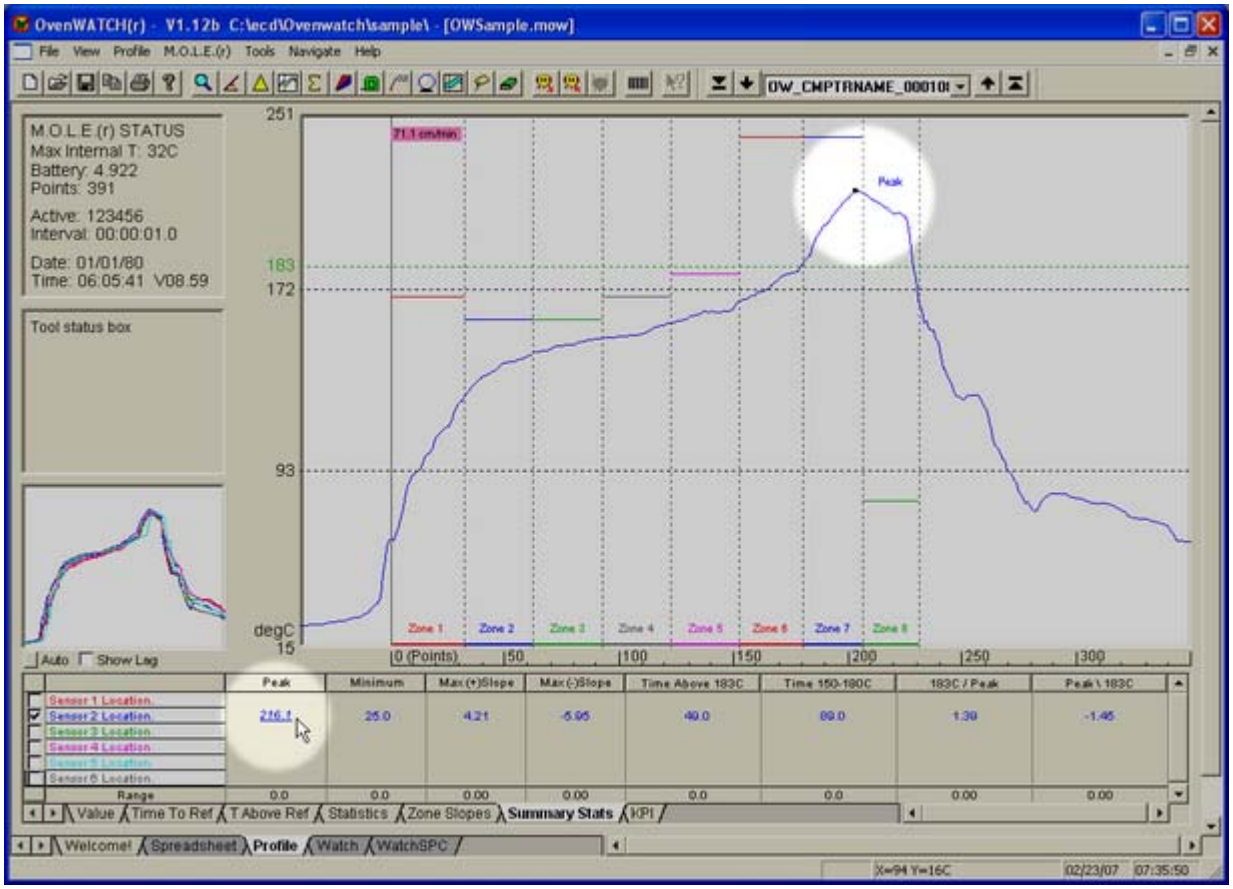
Summary Stats Tab



Values shown in this tab are taken from the intire graph regardless of its level of magnification.

Peak Temperature:

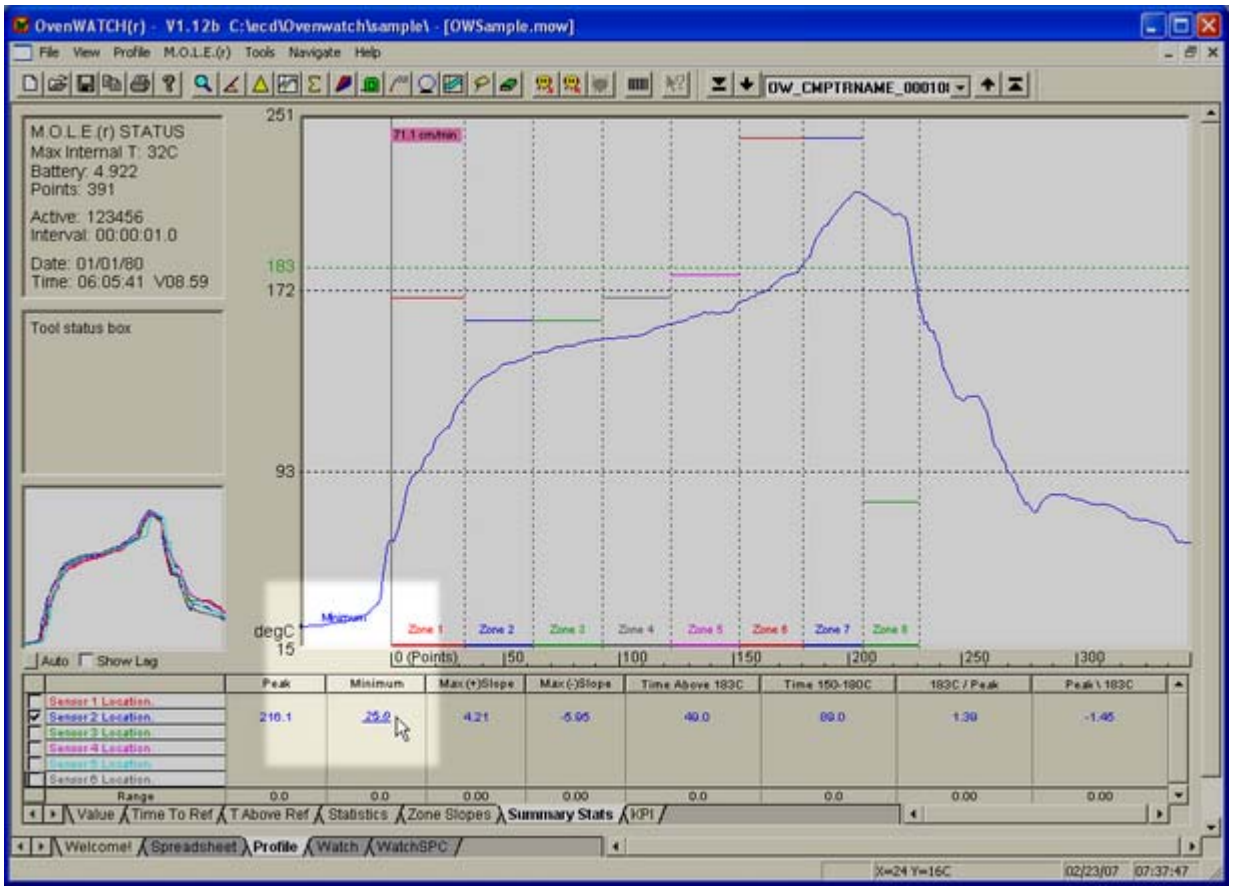
The largest measured value. Values below are the largest value recorded for that channel. The higher the peak temperature, the greater the possibility for component damage.



Peak Temp

Minimum Temperature:

The smallest measured value. Values below are the smallest value recorded for that channel. Typically, these are the starting values, unless there is active cooling employed. It is best if starting temperature values are close to the same. This will allow a consistent starting point for other measurements.

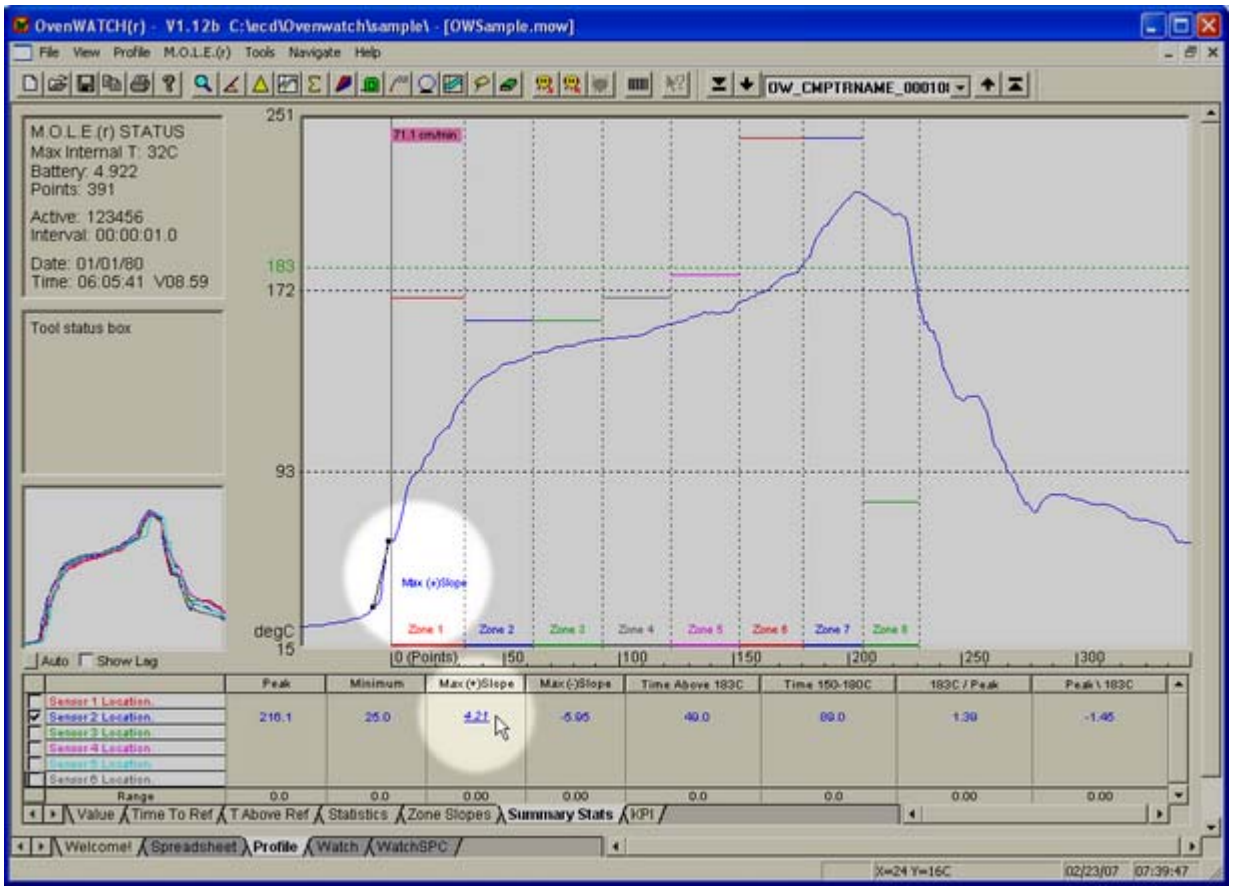


Minimum Temp

Maximum **(+) Slope:**

The largest positive slope measured using a 2% of the total points in the Profile length (x-axis) differential. Thus, the equation for slope calculation is as follows:

Slope at point X = (Value at point (X + 10) – Value at point X) / (10 * Log interval in seconds)



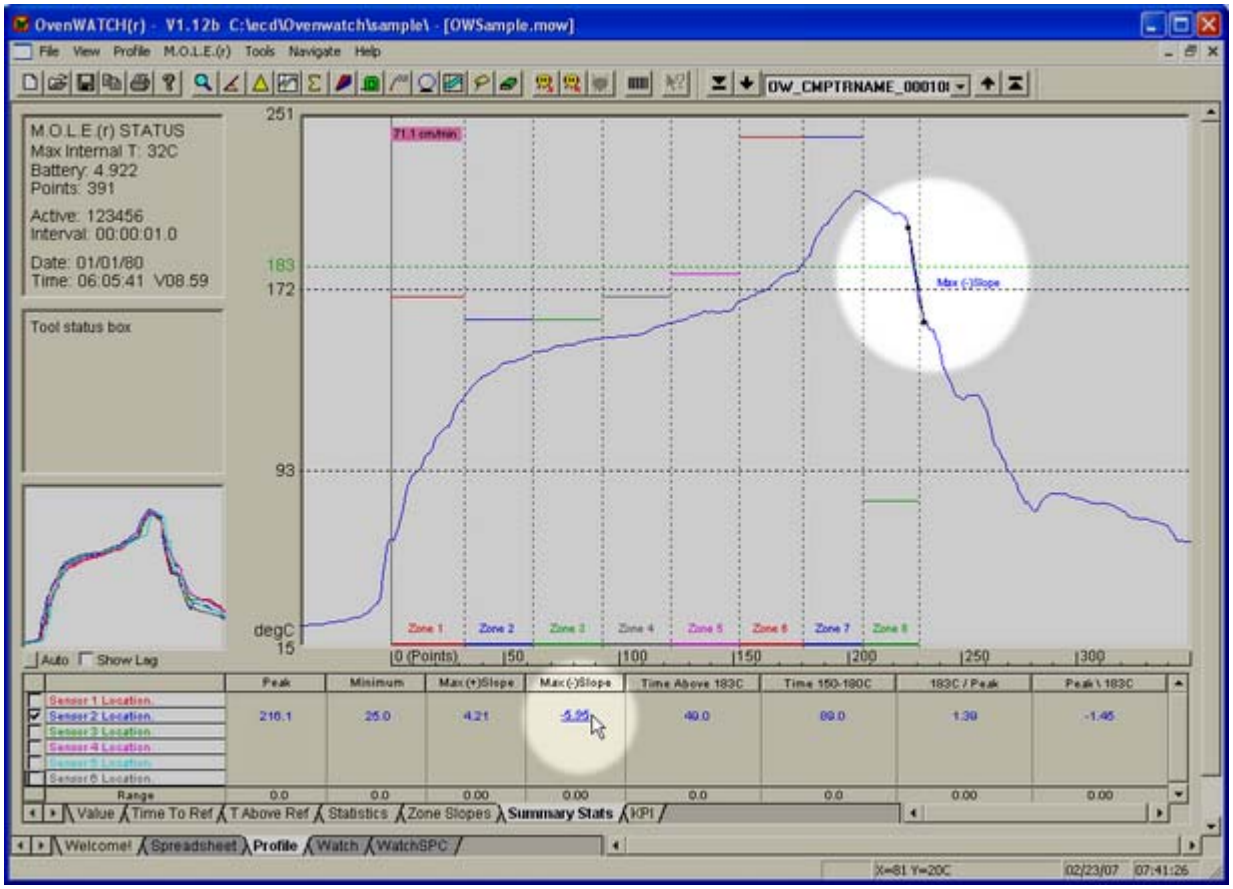
Max (+) Slope

The values below are the largest positive slope values calculated for each channel. The larger the slope, the faster the temperature is increasing (heating).

Maximum **(-) Slope:**

The largest negative slope measured using a 2% of the total points in the Profile length (x-axis) differential. Thus, the equation for slope calculation is as follows:

Slope at point n = (Value at point (n + 10) – Value at point n) / (10 * Log interval in seconds)

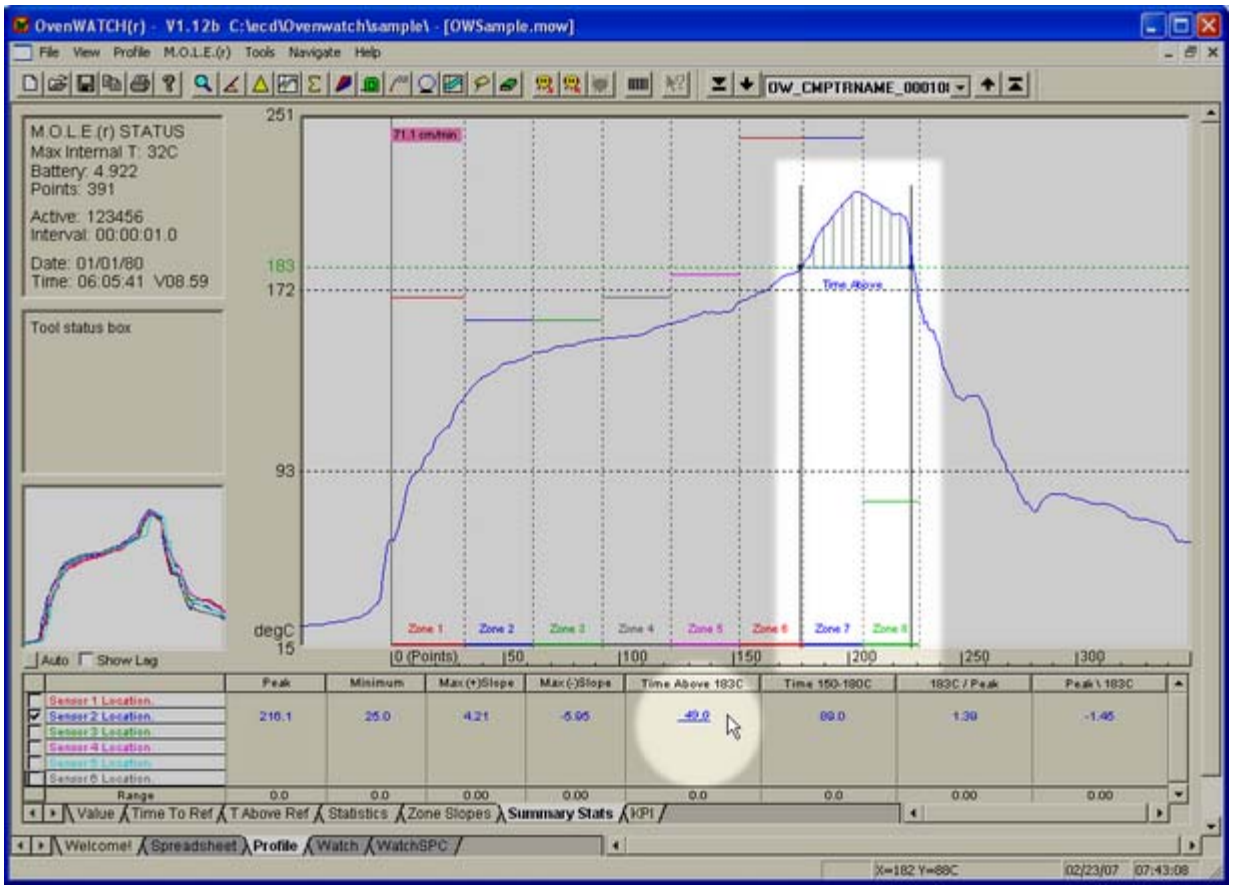


Max (-) Slope

The values below are the largest negative slope values calculated for each channel. The larger the slope, the faster the temperature is falling (cooling).

Time above Temperature:

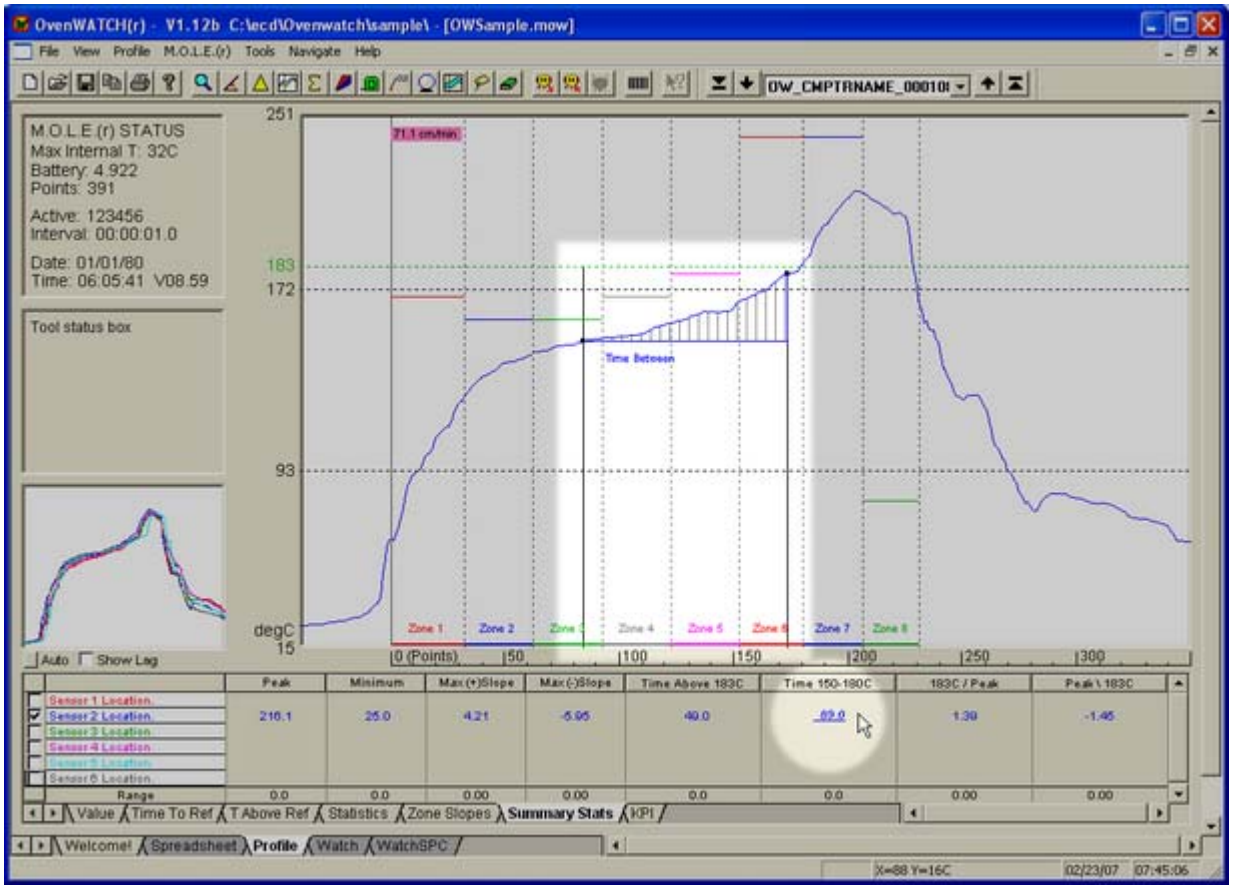
The total time spent at or above the selected liquidous temperature in seconds. This time above may occur anywhere along the x-axis and all will be accumulated in the total time. Values below are the total times spent at or above for each channel. The longer the time, the longer typical solder will be in its liquid state.



Time above

Time between Temperatures:

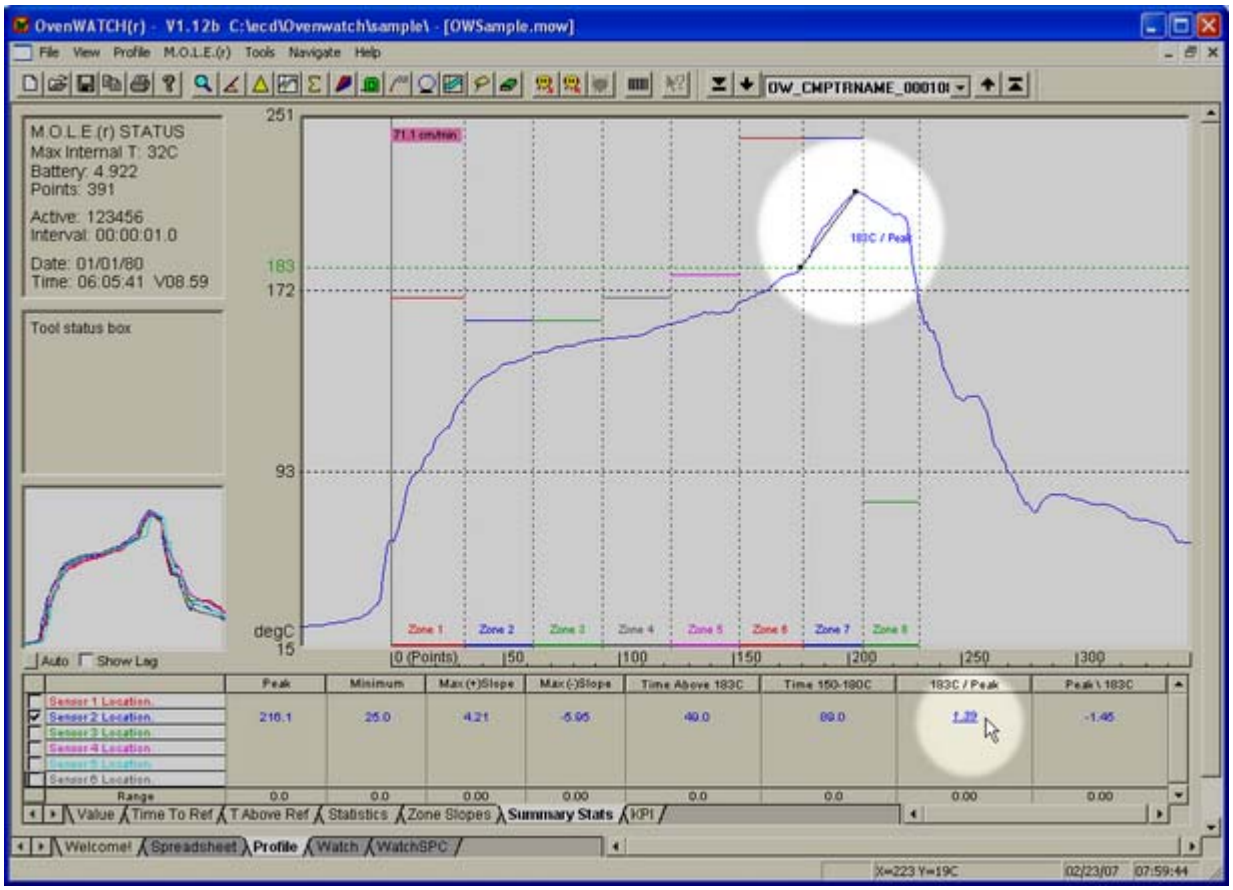
The time required for the temperature to rise from the begin temperature to the end temperature. The values below are the times in seconds measured for each channel. The larger this value, the longer it takes to heat the given temperature sense point.



Time between

Time above Temperature / Peak Slope:

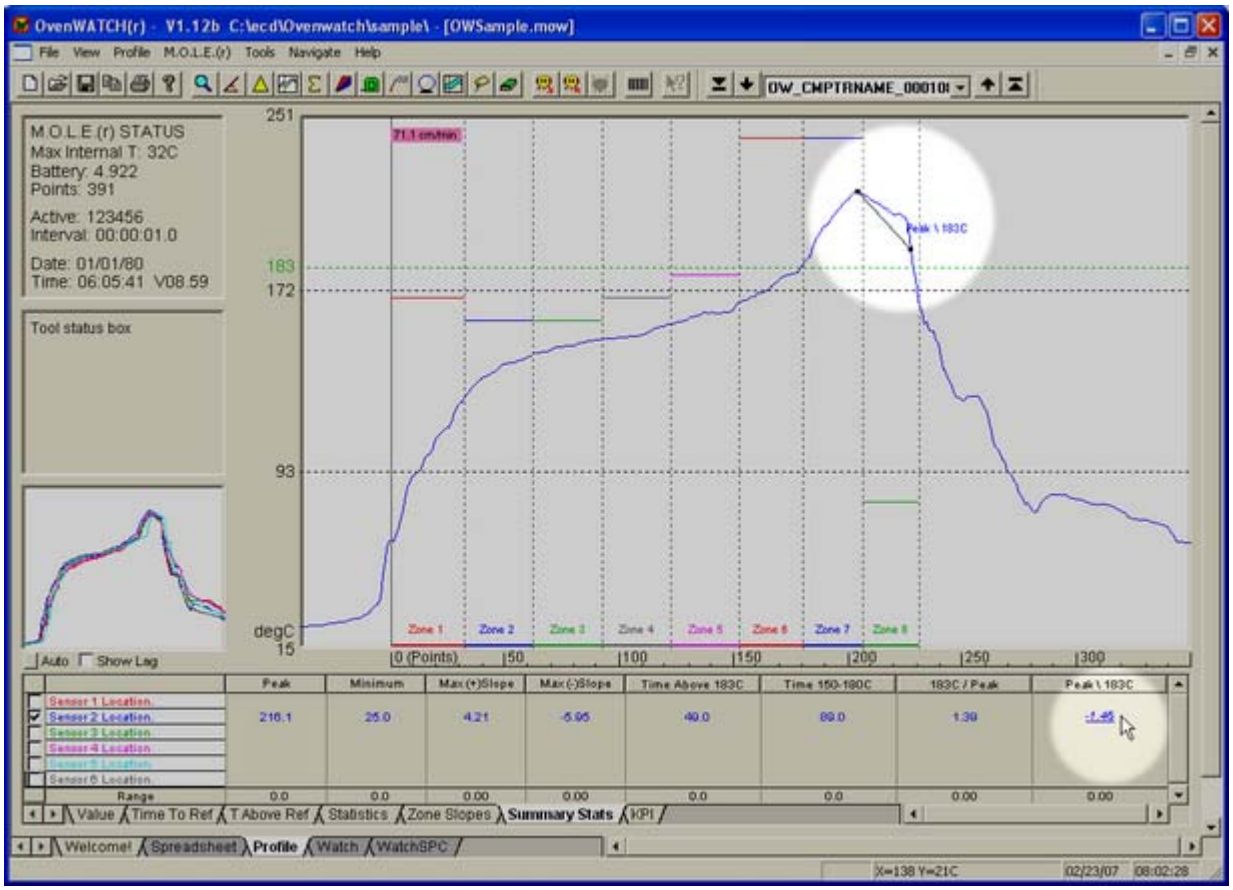
The Slope between the point where the profile rise above the liquidous Temperature and the Profiles Peak temperature.



Time Above Temp / Peak Slope

Peak Slope / Time above Temperature:

The Slope between the point where the profile drops below the liquidous Temperature and the Profiles Peak temperature.



Peak Slope / Time Above Temp

KPI (Key Process Indicators) Tab

Values shown in this tab are set by the user.

Temperature Parameters:

Peak Temperature is the largest measured value. Values below are the largest value recorded for that channel. The higher the peak temperature, the greater the possibility for component damage.

Min Temperature is the smallest measured value. Values below are the smallest value recorded for that channel. Typically, these are the starting values, unless there is active cooling employed. It is best if starting temperature values are close to the same. This will allow a consistent starting point for other measurements.

Max Slope (+) is the largest slope measured using the seconds specified in the user configured calculate slope value text box. This column then displays slopes in the positive direction.

Max Slope (-) is the largest slope measured using the seconds specified in the user configured calculate slope value text box. This column then displays slopes in the negative direction.

Max Slope (+ or -) is the largest slope measured using the seconds specified in the user configured calculate slope value text box. This column then displays the largest slope in the positive or negative direction depending on which is larger.

X Cursor Parameter Data:

C1, **C2**, **C3**, **C4** indicate the point, time relative, time absolute, or distance (depending on the Units setting) on the X axis where the vertical cursors are set, respectively. The values below are the measured values for each channel at that position.
Slope between Cursor locations is the straight line slope between any two cursors.

Time Parameter Data:

Time To Temperature is the time that it takes for each channel to reach the selected value in seconds or minutes.

Time above Temperature is the total time spent at or above the selected temperature in seconds or minutes.

- Total (+/-): Total Time above temperature.
- Rising (+): Time above during the rising portion of the temperature Profile.
- Falling (-): Time above during the falling portion of the temperature Profile.

Time between Temperatures is the time required for the temperature to rise from the begin temperature to the end temperature in seconds or minutes.

Slope between Temperatures is the straight line slope measured between the beginning and ending temperatures.

Display Values:

Range is the difference between the largest and smallest value recorded or calculated for each column of data. The smaller the range, the smaller the spread between the values collected from each channel.

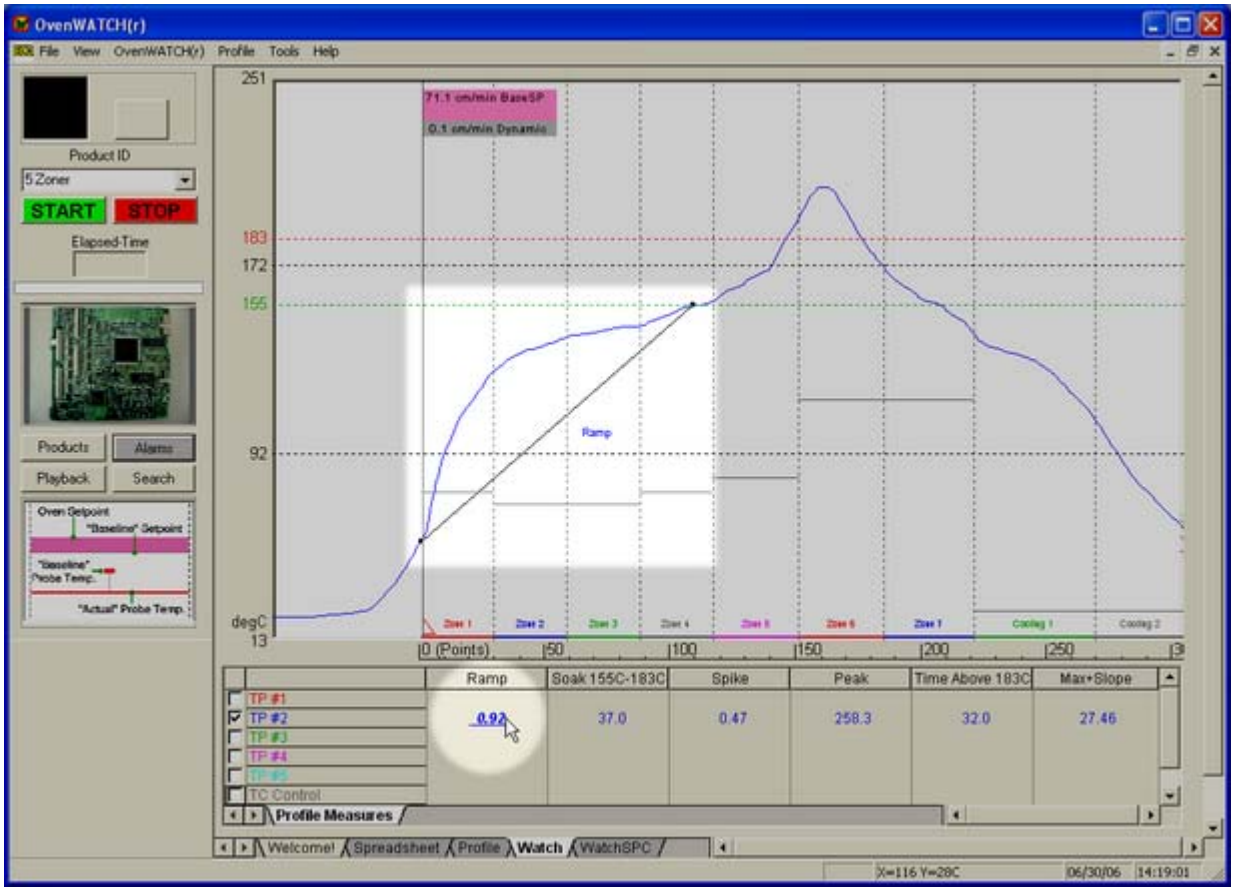
Average is the calculation of the average value for each column displayed.

Standard Deviation is the calculation of the Standard Deviation for each column displayed.

E: Watch Profile Measures

Ramp (slope):

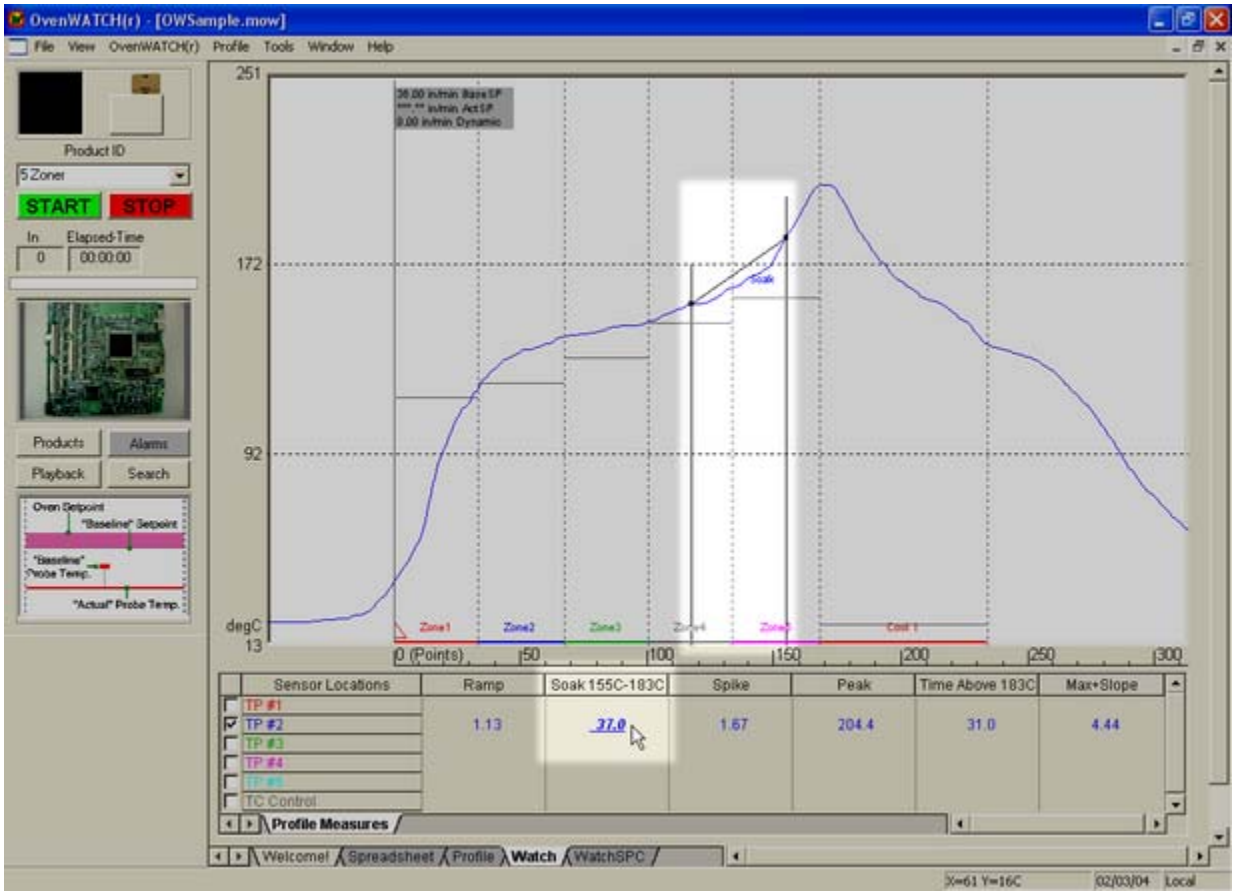
The straight-line slope in degrees per second measured from the intersection of the Process Origin and the Temperature of each channel to the Temp where the profile each channel reaches the Soak Begin Temp. Profiles that do not reach the Soak Begin Temp report a Ramp of 0.



Ramp

Soak (time):

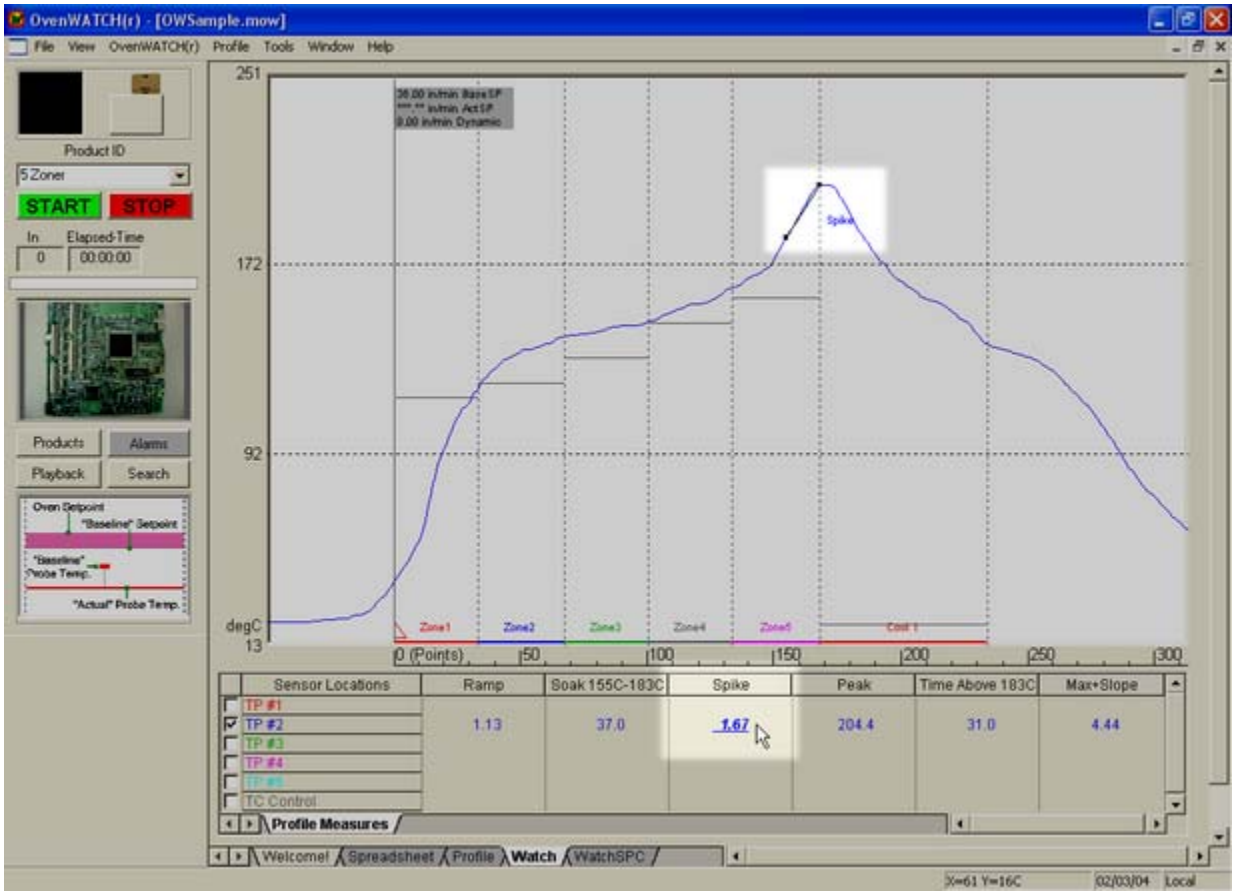
The number of profile temperature values that fall between Soak Begin Temp and Soak End Temp Times the log interval. Profiles that do not reach the Soak Begin Temp report a Soak of 0.



Soak

Spike (slope):

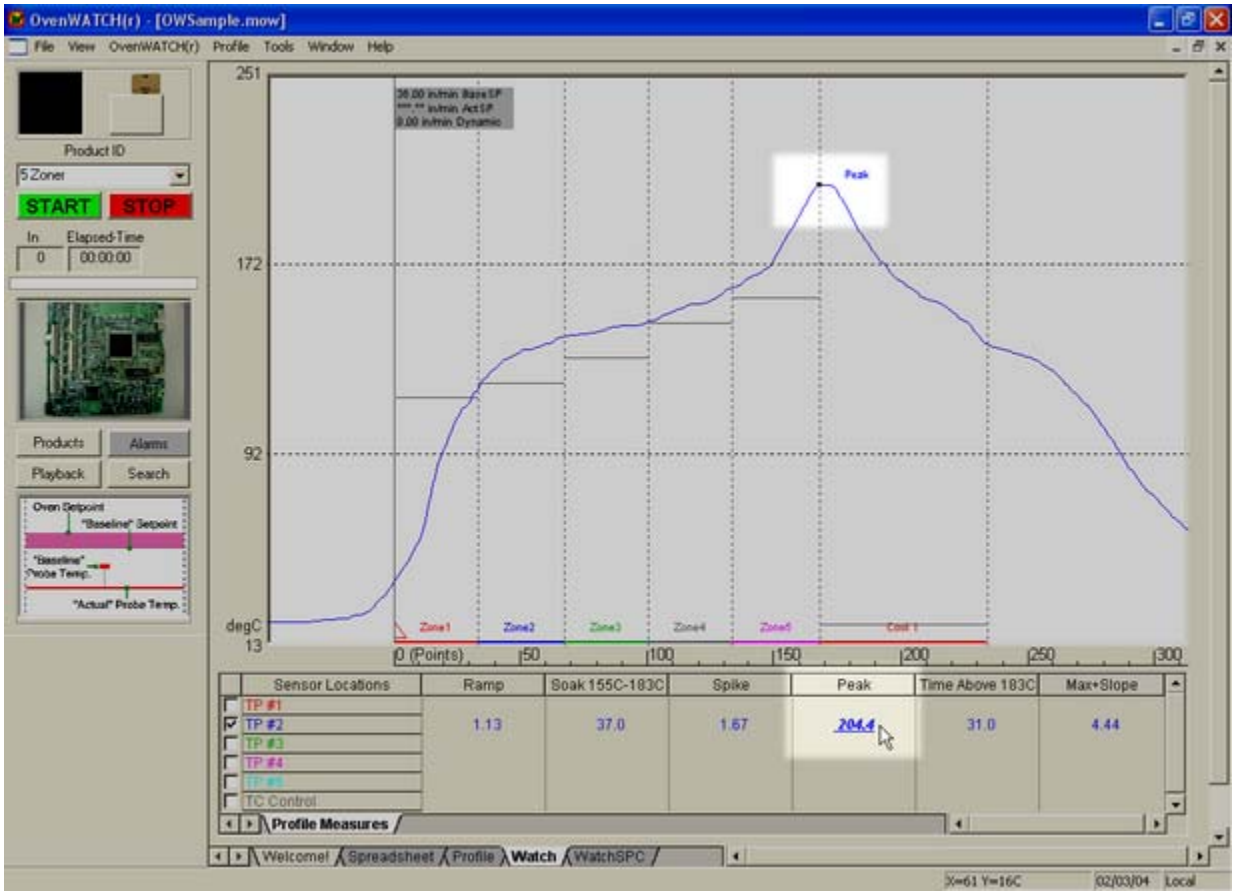
The straight line slope in degrees per second measured from where the profile reaches the Soak End Temp to where the profile reaches a Peak temperature value. Profiles that do not go above the Soak End Temp report a Spike of 0.



Spike

Peak (temp):

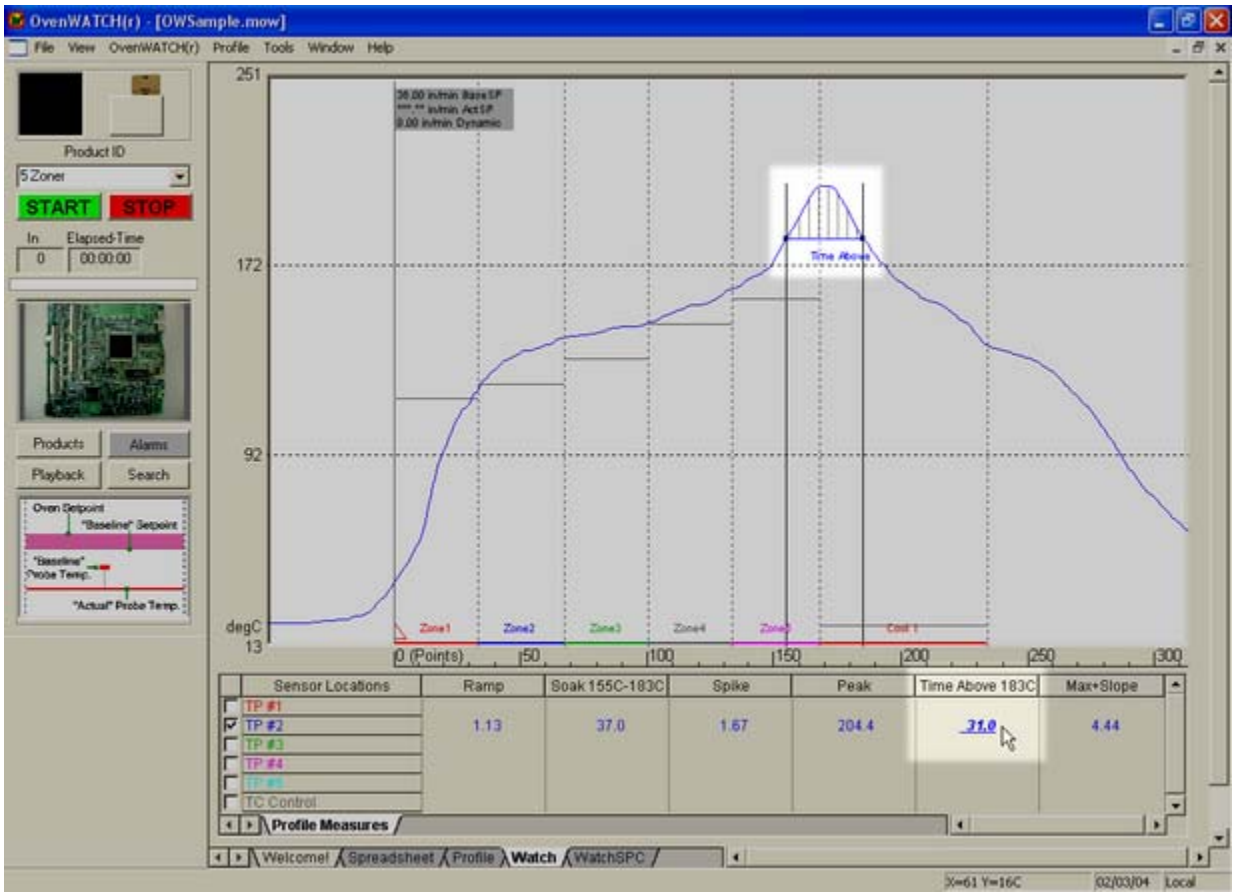
The first maximum temperature value after the Process Origin.



Peak

Time Above:

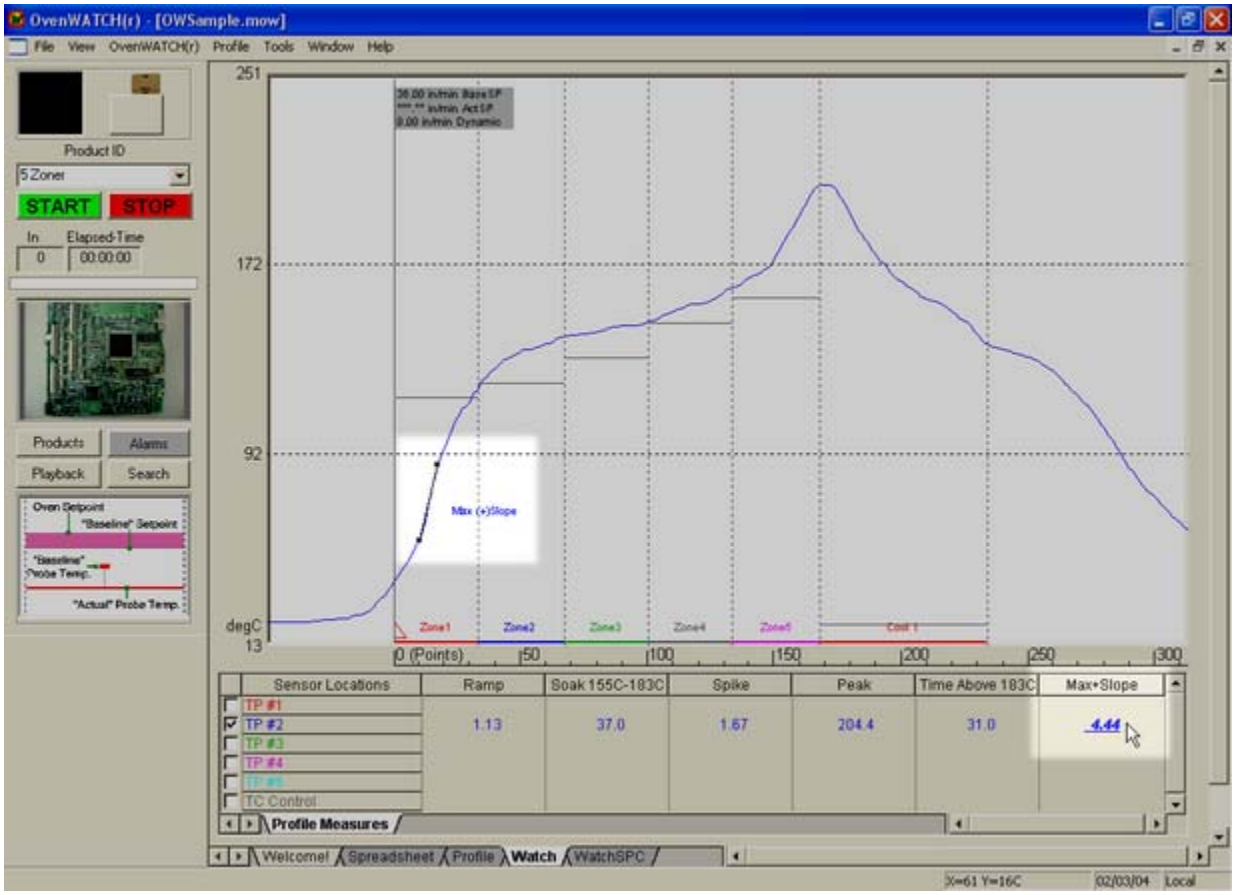
The number of profile temperature values that are above the Liquidous Temp times the log interval. Profiles that do not go above the Liquidous Temp report Time Above as 0.



Time Above

Max + Slope:

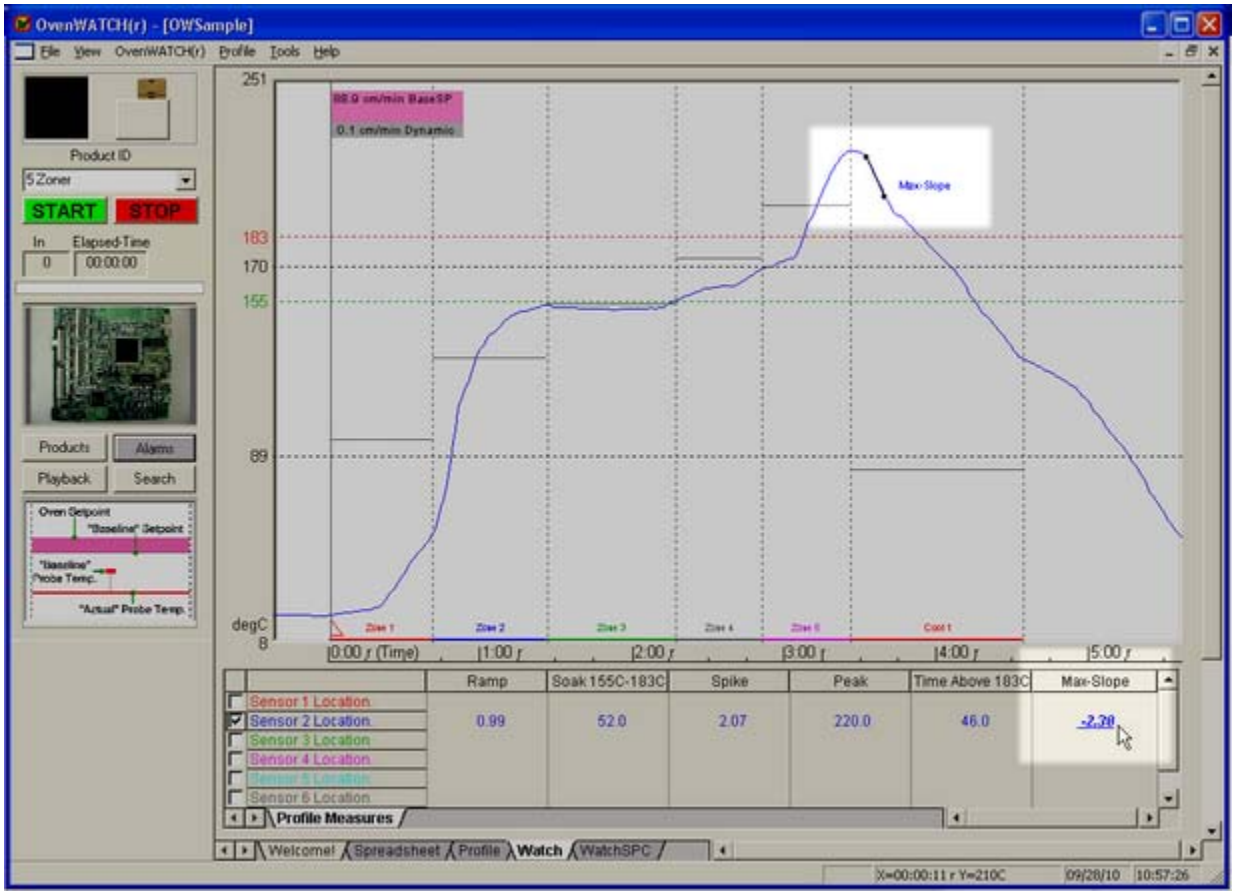
The largest positive slope in degrees per second detected from the Process Origin to the end of the last Zone as measured using the change in temperature divided by 2% of the total number of logged points multiplied by the log interval.



Max + Slope

Max - Slope:

The most negative slope in degrees per second detected from the Peak down to 150°C [302°F] as measured using the change in temperature divided by 2% of the total number of logged points times the log interval.



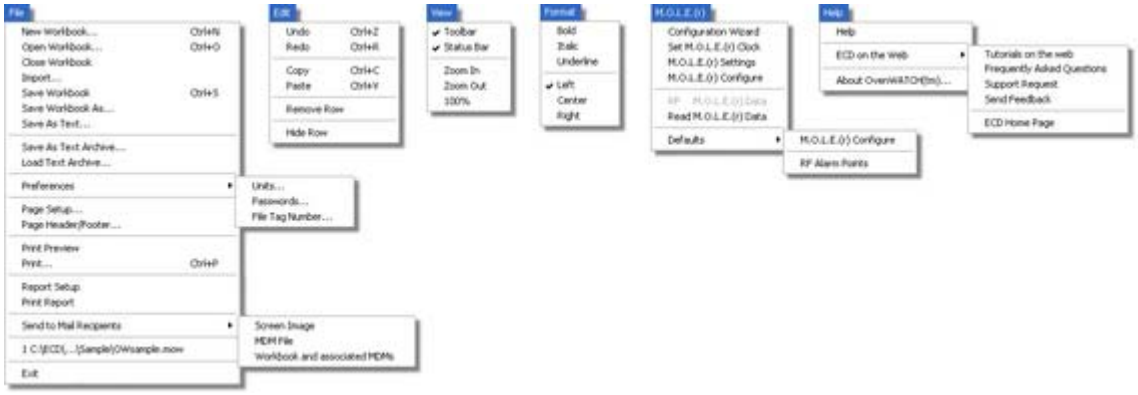
Max - Slope

F: Pull Down Menus & Toolbar Buttons

The dimmed menu commands are used in other worksheets.

Active menus for the Welcome, SMG Data Worksheets & Guide Worksheets:

Active menus for the Spreadsheet Worksheet



Active menus for the Profile Worksheet:

Active menus for the Admin Worksheet:

Active menus for the SPC Worksheet(s):

Toolbar buttons:

3d View

About

Align Left

Align Right

Back (To Previous Data Run)

Bold

Center

Configure M.O.L.E

Context Help

Copy

Erase All

Erase Objects

First (Data Run)

Italic

Last (Data Run)

Magnify

Measure

New

Next (Data Run)

Notes

Open

Overlay

Peak Difference

Prediction

Print

Read M.O.L.E. Data

Receive RF

Redo

Save

Slope

Total Heat

Tolerance Band

Underline

Undo

Zone Matrix

Zoom 100%

Zoom In

Zoom Out