SuperM.O.L.E.® GOLD
Hardware & Software User's Guide

SuperM.O.L.E.® Gold
Hardware & Software Users Guide
A31-0900-00 Rev 5.0.0

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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 26, 2006

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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

Signature: _____ **Date:** 05/03/2006

Title: CEO

SuperM.O.L.E. ® Gold Users Guide

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1.0 Introduction

1.1 How to use this Users Help Guide

This SuperM.O.L.E. Gold® Users Help Guide explains how to use the ECD SuperM.O.L.E. Gold® 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 5.22c and higher.

The software is designed to be used with the SuperM.O.L.E. Gold® only.

1.2 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:

- SuperM.O.L.E. Gold® software may be referred to as **SMG SPC**.
- **Workbook**, contains all of the worksheets and the uploaded data set saved with file extension (**.MPC**).
- **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.**.

1.3 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.

1.4 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.
	Power Pack battery charger is protected throughout by double or reinforced insulation.
	Indoor use only. For electric-shock protection, always operate the battery charger in a protected, indoor location.

1.5 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.

1.6 Equipment Maintenance

Inspect the enclosure of the Power Pack battery charger for damage. Do not use the charger if the enclosure is cracked or broken, or if the power plug pins are loose or deformed.

1.7 Computer Hardware Requirements

CPU, RAM, Hardware:	300mhz processor or equivalent 128 megabytes of RAM (minimum). 50 megabytes of free disk space.
Operating System:	Windows, XP, 2000 & 98.
Disk Drive:	CD Rom drive.
Mouse:	Windows compatible mouse.
Communication Port:	Serial Port, USB (with supplied port replicator).
Video:	Color VGA or better video card and appropriate video monitor. (SVGA is highly recommended)

It is recommended that the minimum computer 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.

Printer:	Color printer is recommended.

1.8 Operators 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 M.O.L.E. in flammable or explosive atmospheres. Such usage constitutes a fire or explosion risk.
- **NEVER** immerse the M.O.L.E. in liquids.
- **NEVER** subject the M.O.L.E. components to sharp impacts.
- **NEVER** excessively stress the PC Interface cable.
- **NEVER** expose the M.O.L.E. 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.

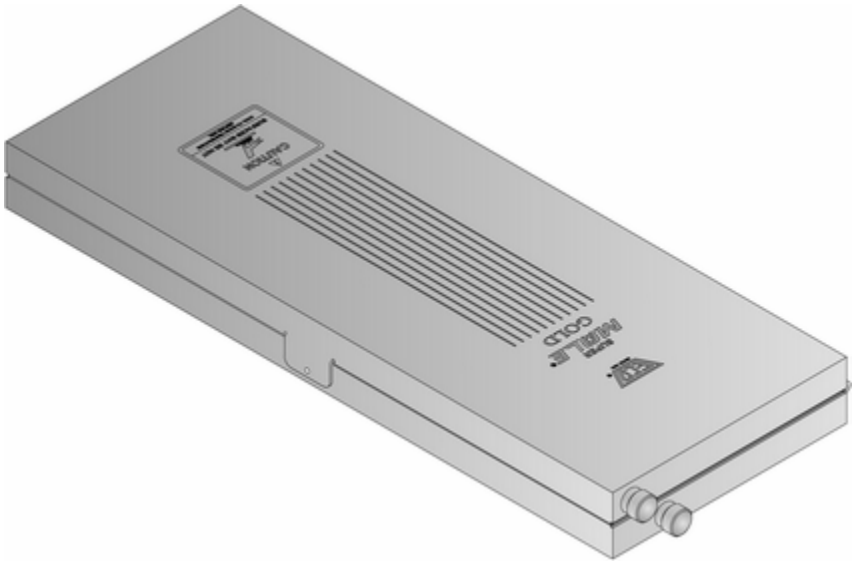
SuperM.O.L.E. Gold Features

M.O.L.E. functions:

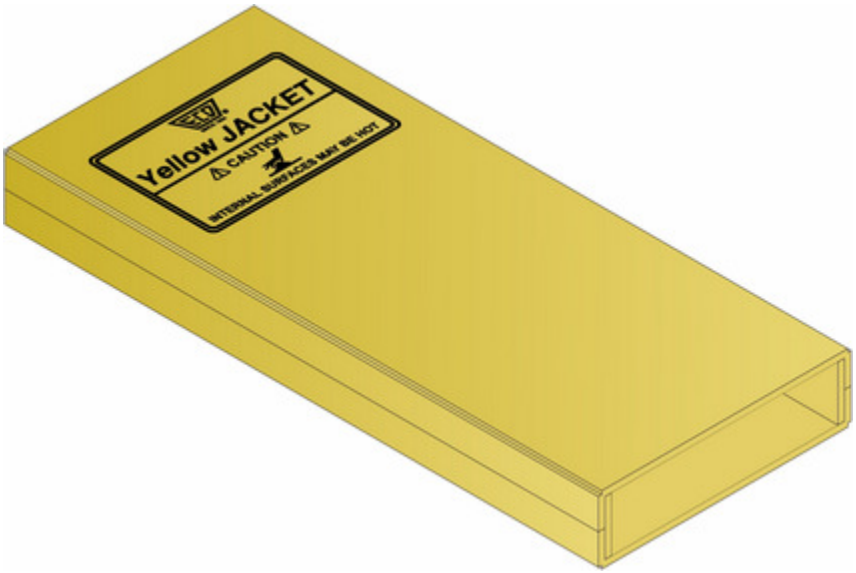
- Thermocouple/Sensor Inputs:This is where Type “K” or “S” Thermocouples and the optional Relative Humidity sensors are connected.
- Start/Stop button: Allows the user to start and stop data collection.
- Power Pack battery: Supplies power to the M.O.L.E.
- Data Port: Transfers data through the PC Interface 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).

2.2 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

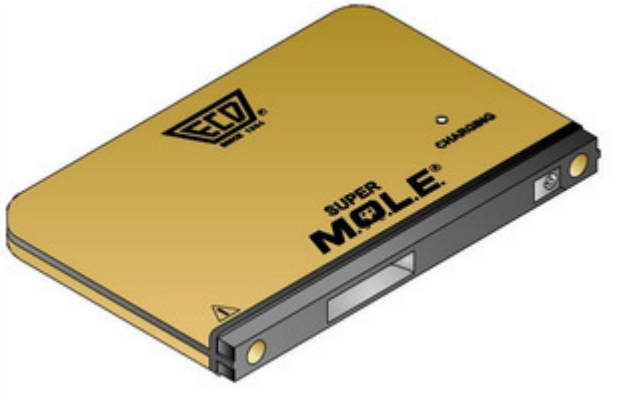


Uni-Barrier w/Yellow Jacket

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

2.3 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. SMG 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.

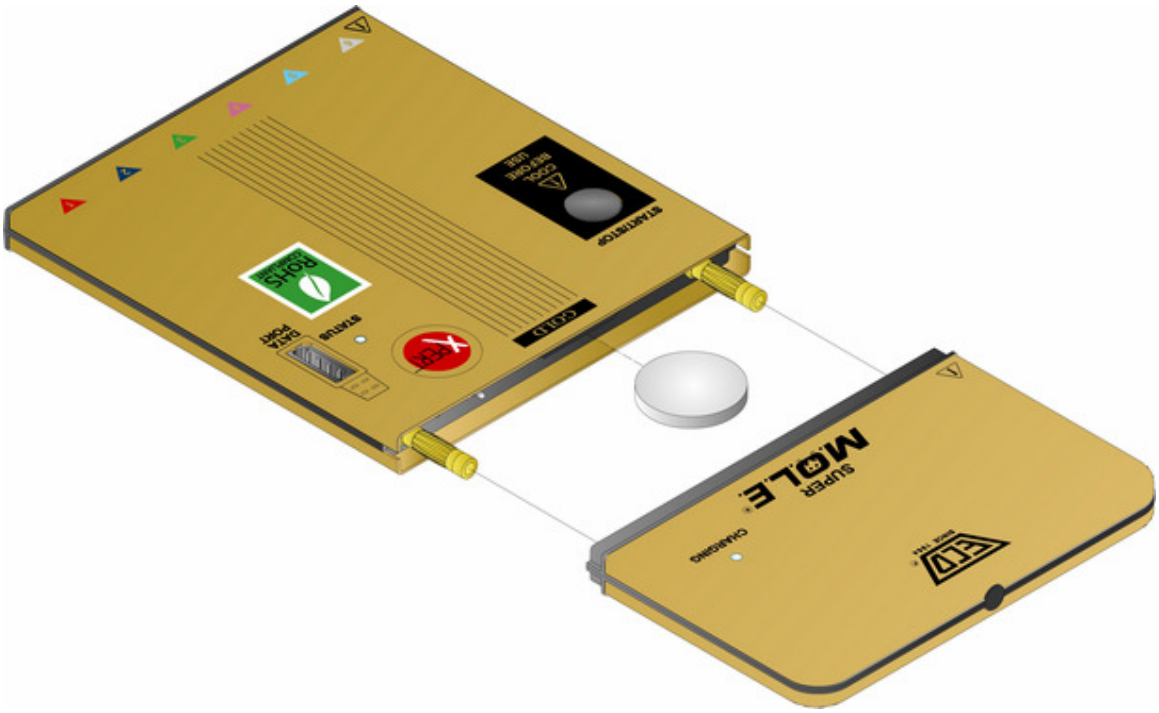


SMG Power Pack Battery

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.

2.4 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.

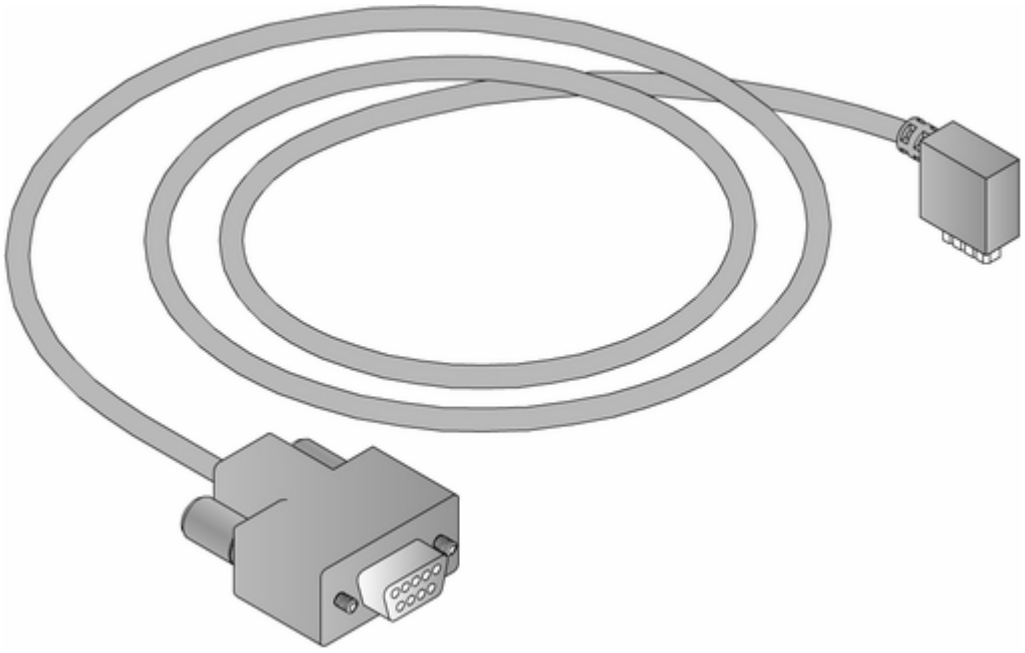


Calendar/Clock battery

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*.

2.5 Computer Interface Cable

A Cable is included in the hardware package that connects the M.O.L.E. to a PC serial port.



PC Interface Cable

The M.O.L.E. requires a four-pin connector and a nine-pin for the PC serial port.

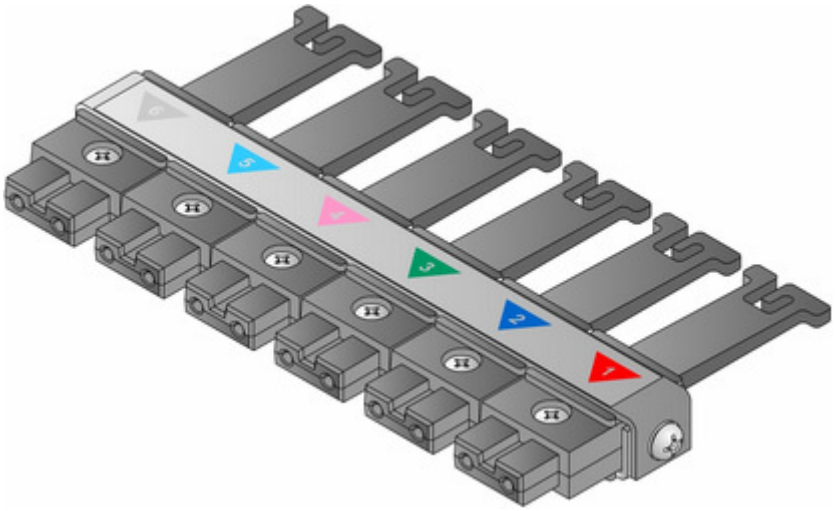
The M.O.L.E. will typically be connected to the PC at two different times:

- Before an experiment: Using the software to configure the M.O.L.E. for how often and how many readings are to be taken (etc…).
- After an experiment: Using the software to upload the collected data from the M.O.L.E..

If your computer does not have an available Serial port, the Kit includes a USB adaptor that connects the M.O.L.E. to the computer via a USB (Universal Serial Bus) port.

2.6 Sensors

Up to six sensors can be attached to the M.O.L.E. per experiment. A set of six 0.010” K-Type Color-Indexed thermocouple sensors are included in the Kit.



T/C Sensors

ECD also offers a wide selection of sensors to meet the needs of many applications. For more information about optional sensors for specific applications, refer to ***How to Get Additional Help*** to contact ECD.

Plug the sensor connector into the desired M.O.L.E. channel. The software helps keep a record of the M.O.L.E. channel number associated with the location and the type of sensor. The Color-Indexed thermocouples correlate to the channels in the software so the sensors can be easy identified.

Thermocouple Organizer Clip:

The T/C organizer clip allows six sensors connectors to be combined so that they can be plugged in and removed as a unit.

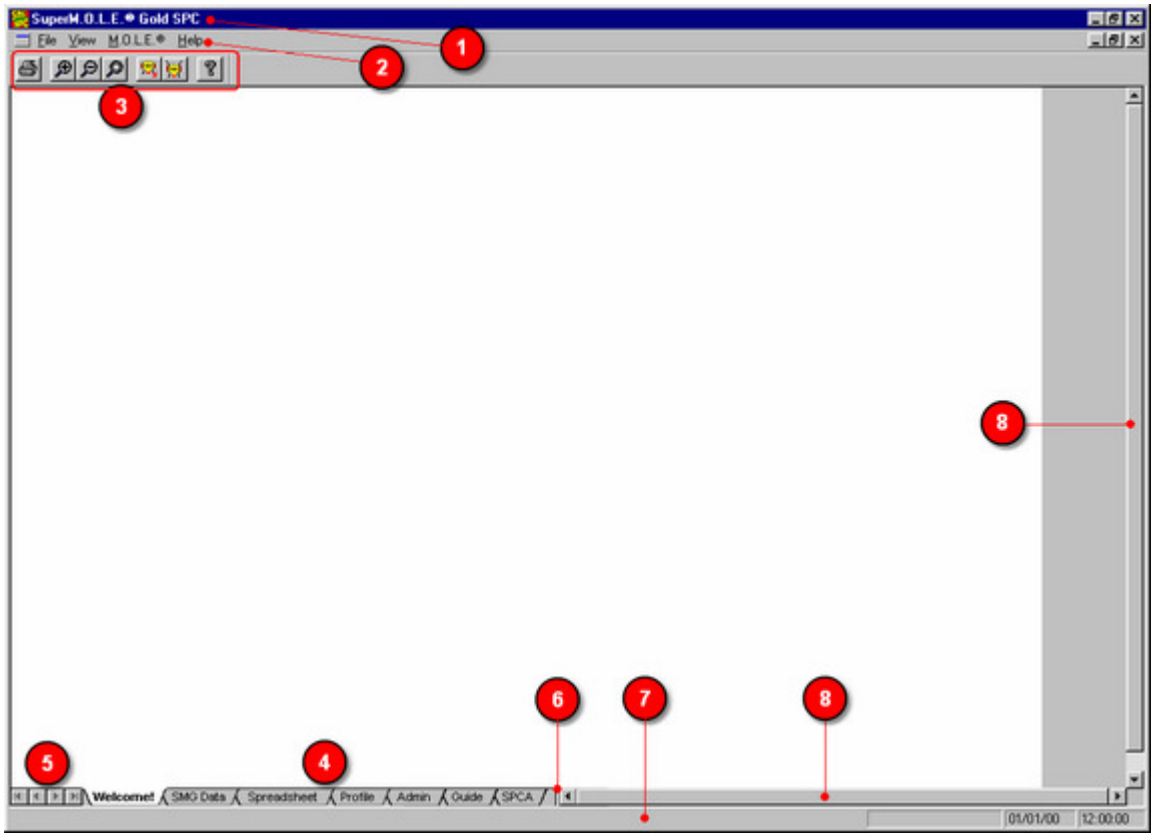
2.7 Software Description

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. SMSample.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.

2.7.1 SMG SPC Workbook Features

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



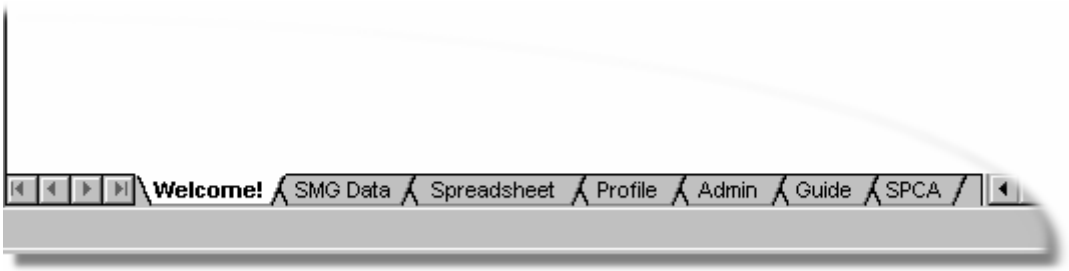
Workbook Features

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.

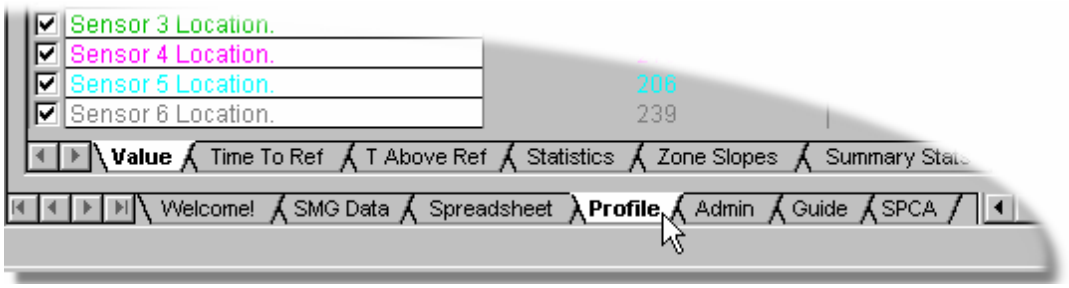
❹ **Worksheet Tabs:** These tabs are used to gain access to each worksheet. There are six standard worksheets and up to nine optional SPC sheets. These tabs are located on the bottom left of the display.



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.

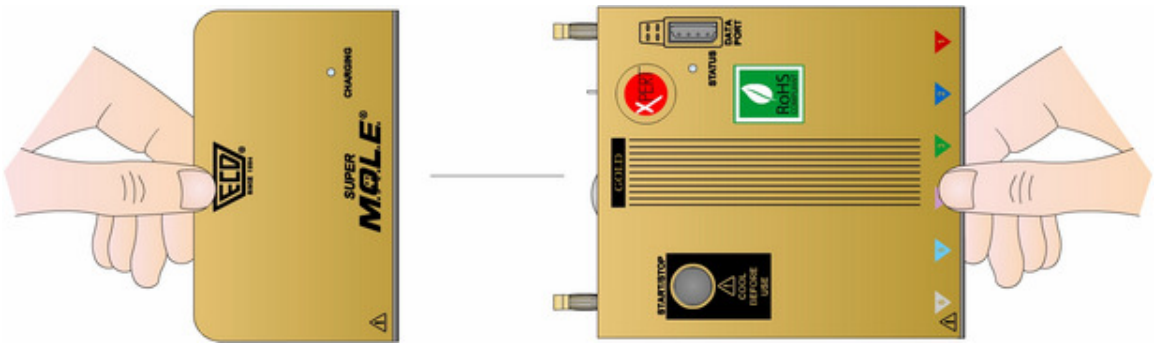
3.0 Setup

3.1 Charging the Power Pack Battery

Because the M.O.L.E. is powered by a rechargeable Power Pack battery, it is important that it is charged and operating properly prior to performing every experiment. A spare Power Pack battery may be ordered so the one battery is charging while the other one is being used.

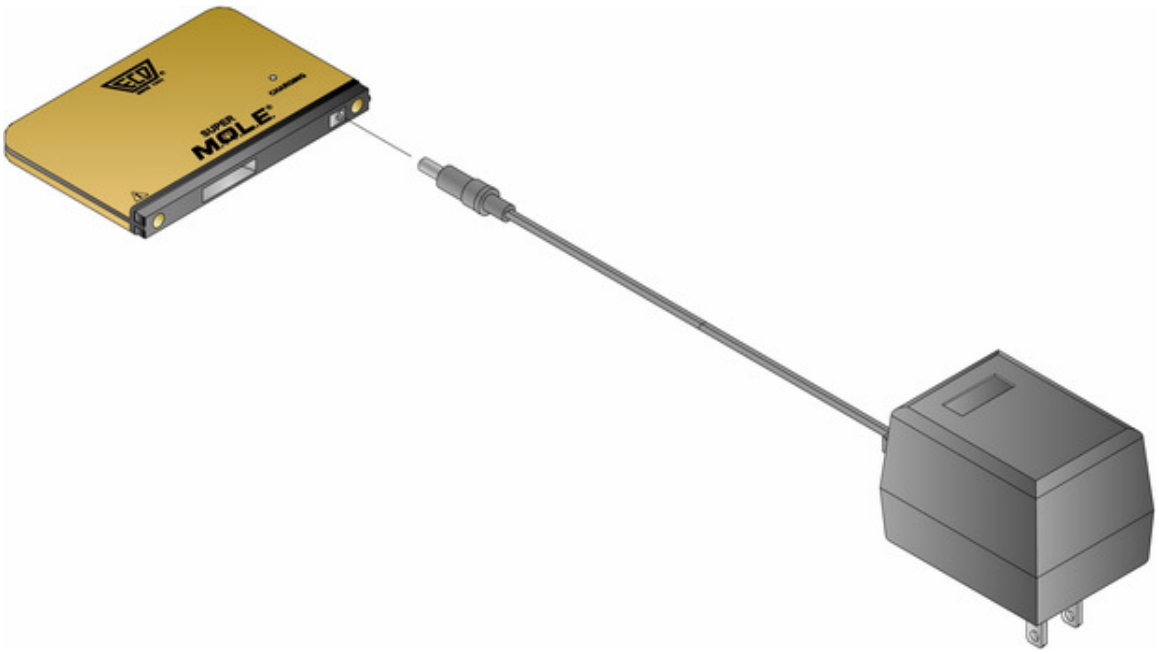
Charging:

1) Remove the Power Pack battery by separating from the unit.



Removing the Power Pack Battery

2) Plug the transformer end of the charger into a (60Hz 120VAC, in North America) or (230VAC) wall outlet and the connector end into the Power Pack.



Power Pack Charger

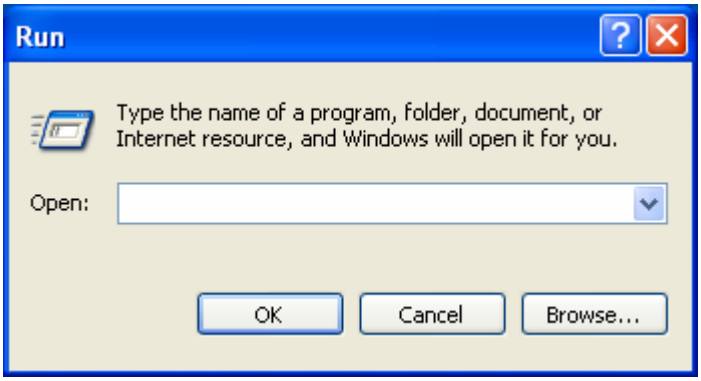
A completely discharged Power Pack takes about 14 hours to be fully charged.

3) When the charging cycle is complete, connect the Power Pack to the M.O.L.E.. When the Power Pack is first connected, the LED will flash once to indicate that the M.O.L.E. is ready to collect data. If the LED flashes more than once, a complete reset has occurred and the M.O.L.E. will need to be re-configured. (Refer to section ***Configuration Wizard*** for more information).

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 charger.

3.2 Software Installation

1) Insert the CD in the drive.
2) Select ***Run*** from the Start menu.
3) Select the ***Browse*** command button and navigate to the software CD. Double-click the installation (**.EXE**) file.
4) Select the ***OK*** command button to start the installation.



Run Dialog Box

5) Closely follow the setup instructions provided with the software.

3.2.1 Starting the Software

Prior to starting, click the README icon from the SuperM.O.L.E. Gold® sub-menu in the ECD AutoM.O.L.E. Suite documentation program menu to read the latest release notes

After the software is installed, start the software program by double-clicking the SuperM.O.L.E. Gold® icon from the desktop.

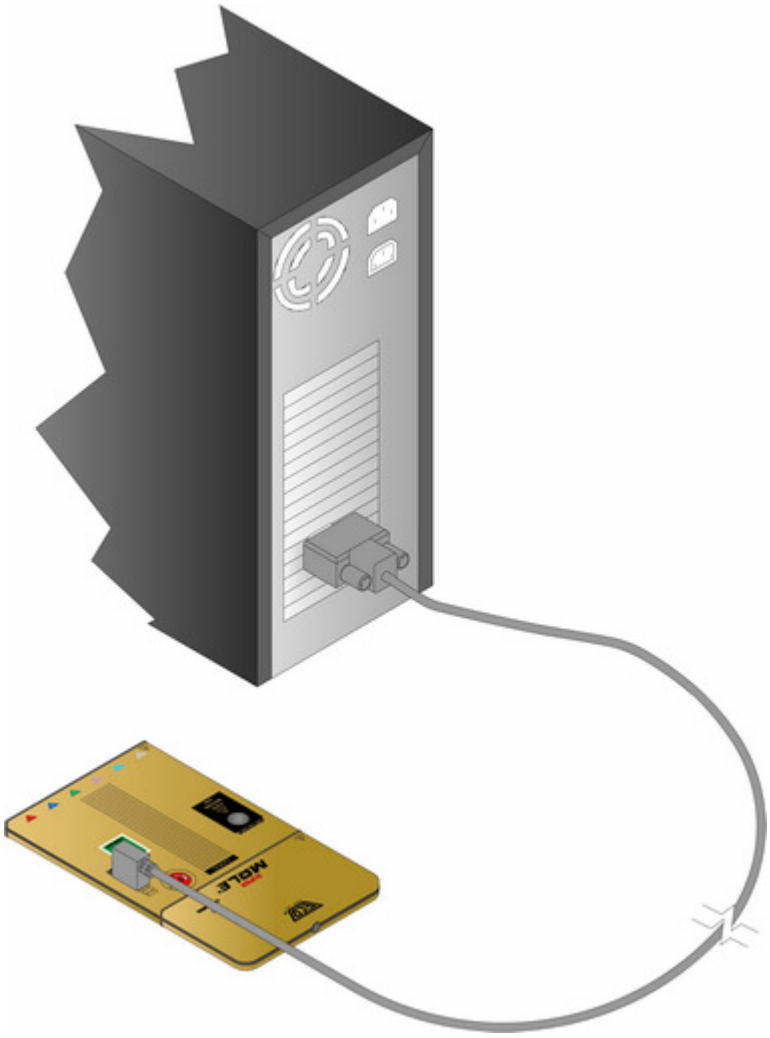
Program Icon

Once the software installation is complete, it is important to start the software and configure the software to communicate with the M.O.L.E.. Refer to *Communications Setup* for more information.

3.3 Communications Setup

1) Locate the PC Interface cable and plug the 9-pin connector into a PC COM port and the other end into the M.O.L.E. Data Port.

If no Serial port exists, use the included USB adaptor to connect the interface cable to the computer.



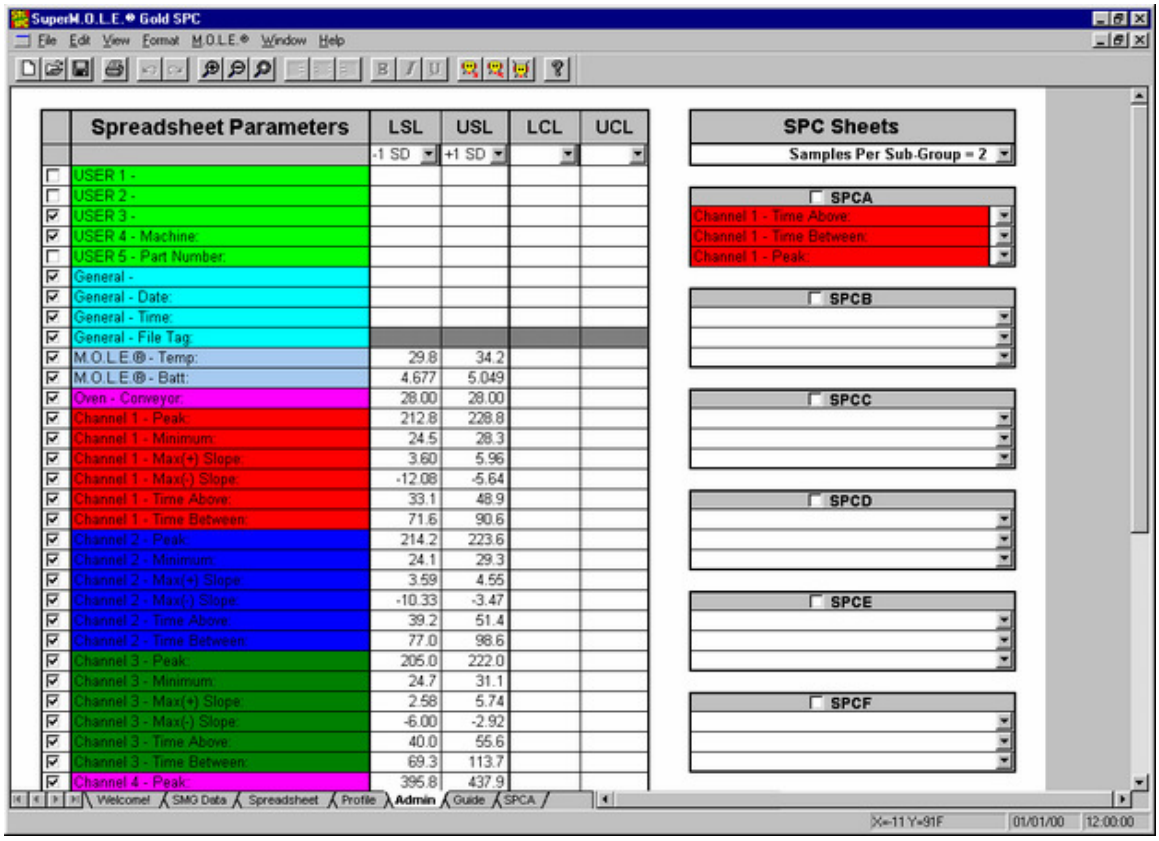
PC to M.O.L.E. Connection

2) After the Computer interface cable is connected to a computer, the Communication (COM) port must be configured in the software to communicate with the M.O.L.E..

3) Start the software program by either double-clicking the SMG SPC icon or selecting it from the ECD AutoM.O.L.E. Suite program sub-menu.

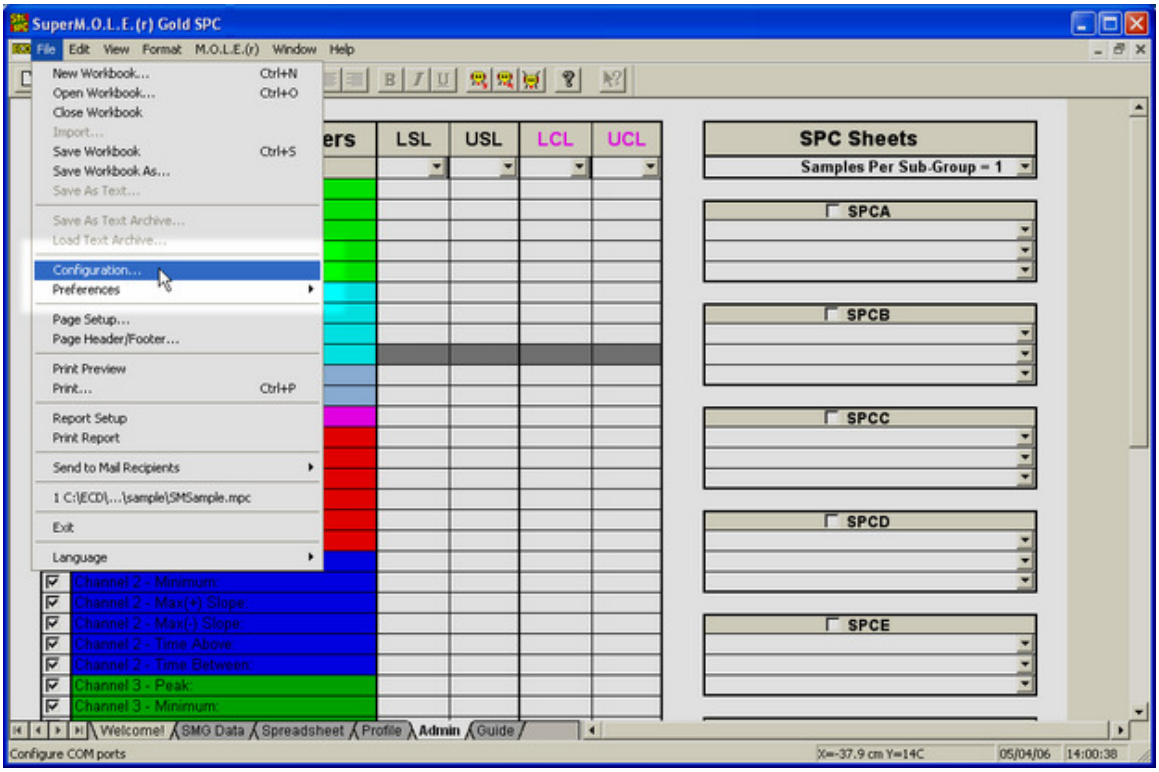
Program Icon

4) Select the ***Admin*** worksheet tab.



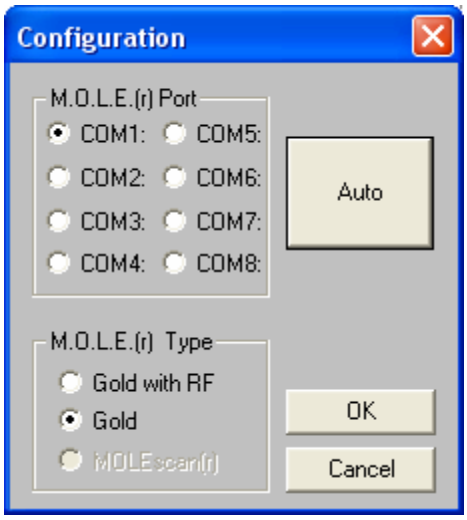
Admin Worksheet

5) On the ***File*** menu, select ***Configuration*** and the Configuration dialog box appears.



Configuration Command

6) 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 ***Service and Troubleshooting*** for help.



Port Configuration Dialog Box

7) Click the ***OK*** command button to finish.

4.0 Operation

4.1 Step 1 - Experiment Setup

This section guides the user through a typical data collection process. Portions of this section will require referral to some software sections of the users guide for additional information.

The M.O.L.E. is dependent on the software to control how it collects and interprets data. Several kinds of experiments might need to be performed to achieve desired information, or the same experiment might need to be performed repeatedly over time to monitor one process. Either way, an experiment will need to be setup at least once.

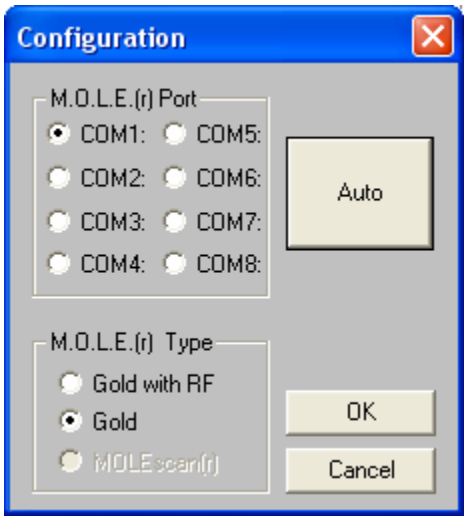
After the hardware is setup and the software is installed, use the following steps to perform an experiment using the SuperM.O.L.E. Gold.

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 displays the battery voltage at the time when the data is uploaded from the M.O.L.E.. The voltage level should be 3.8 volts or higher. Refer to ***M.O.L.E. Status*** for more information.
3) Start the Software by double clicking on the program icon.
4) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.

When the information is being sent to the M.O.L.E. the Activity LED will illuminate indicating that the M.O.L.E. and PC is communicating properly.

5) On the ***M.O.L.E.*** menu, select ***Configuration Wizard*** and the Configuration dialog box appears.
6) Click the option button next to a COM port which the PC is set up for communications or the ***Auto*** command button to have the software automatically find the COM port the M.O.L.E. is connected.

7) Click the ***OK*** command button and then select 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. model configuration parameters, such as number of channels, battery life estimate and minimum logging interval.



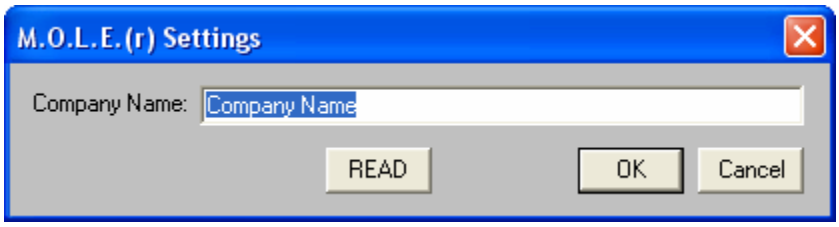
Configuration

8) 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.

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

Select the *Read* command button to view the settings currently stored in the M.O.L.E.. If acceptable proceed to Step 10.

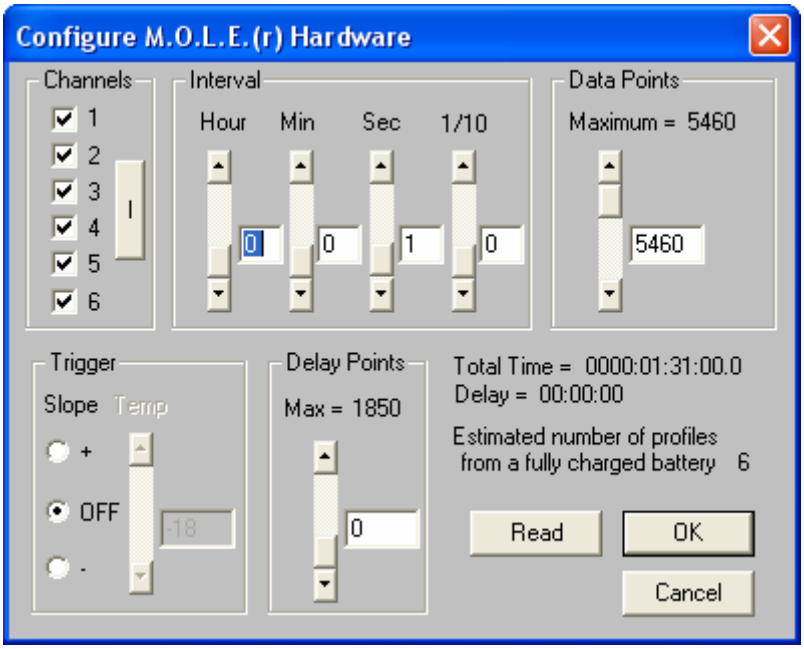


M.O.L.E. Settings

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.

Select the *Read* command button to view the hardware settings currently stored in the M.O.L.E.. If acceptable proceed to Step 13.



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.

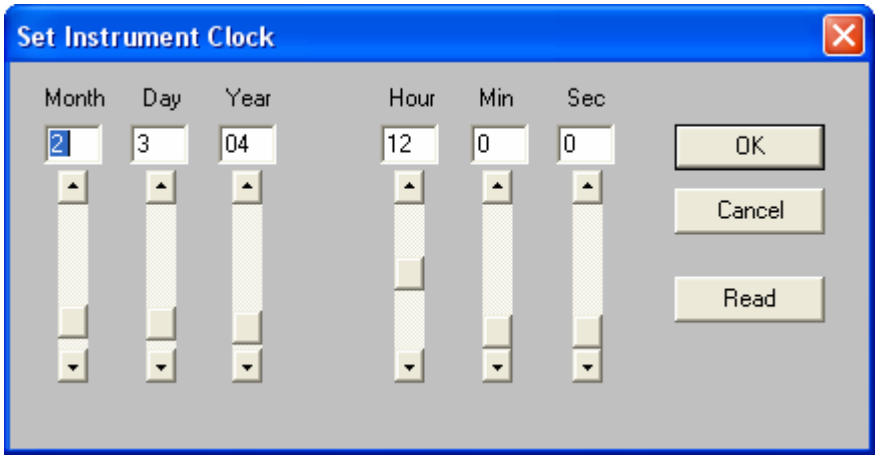
Optional configurations:

- 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.

Select the *Read* command button to view the clock settings currently stored in the M.O.L.E.. If acceptable proceed to Step 16.



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) Disconnect the M.O.L.E. from the PC and data can now be collected.

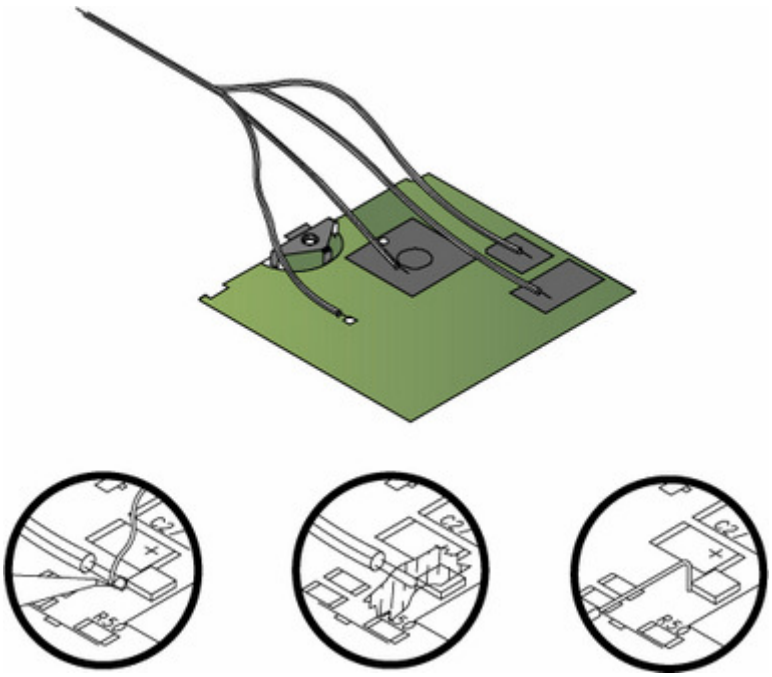
4.2 Step 2 - Data Collection

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).

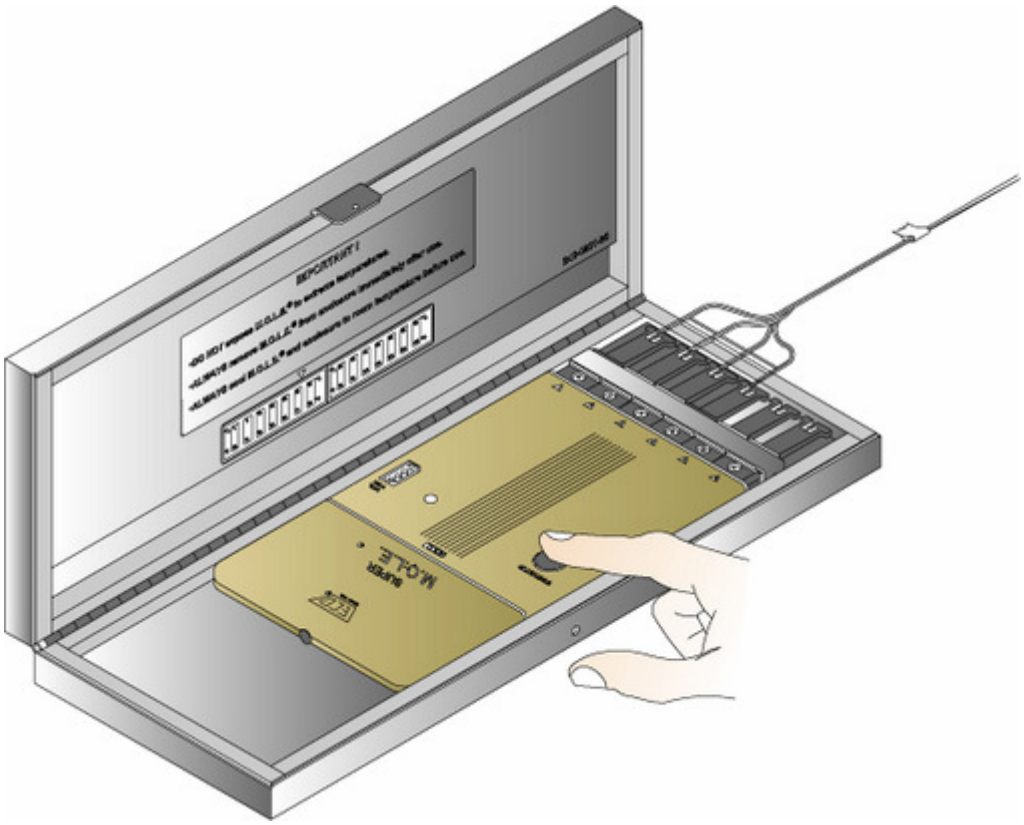
Kapton® tape, aluminum tape and Temprobe™ can also be used to hold T/C wire to the test assembly.



T/C Attachment

If fewer than six sensors used, it is important that the unused channels are turned OFF or shorting plug(s) are used for each channel. Refer to *Constructing a Thermocouple* for instructions on how to make a shorting plug.

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.

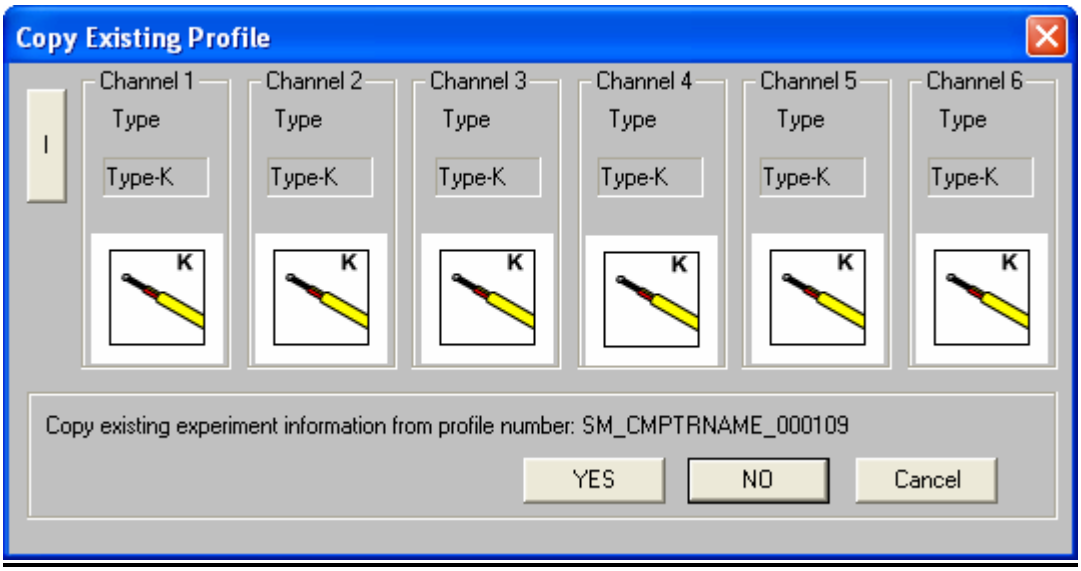
10) Disconnect the sensors from the M.O.L.E. and place it near the computer that has the software installed.

4.3 Step 3 - Transferring Data

When data is transferred from the M.O.L.E. to the PC, it is uploaded and saved in an SMG SPC Workbook file for analysis and report style printing.

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

1) Start SMG SPC and select a desired Workbook file to upload the collected data.
2) Connect the M.O.L.E. to the PC using the PC interface cable. Refer to ***Communications Steup*** for more information.
3) On the ***M.O.L.E.*** menu, select the ***Read M.O.L.E. Data***. A dialog box appears asking the user if they want to copy the existing experiment information from the currently displayed profile on the Profile worksheet.

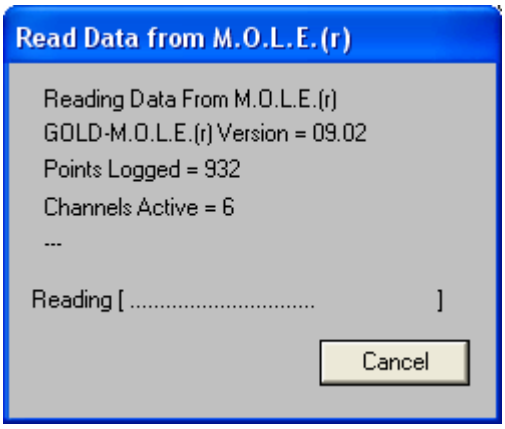


Copy Existing Profile information

- Click the ***Yes*** command button to start the new data run using the settings from the selected profile.
- Click the ***No*** command button to start the new data run using the default settings.
- Click the ***Cancel*** command button to return to the worksheet without uploading the data run.
- Click the input sensors configuration ***("I")*** button to select a different sensor for any of the channels.

If the AutoM.O.L.E.® Feature is installed on the computer, a dialog box will appear asking the user if they wish to have AutoM.O.L.E.® to load the oven settings?

4) If either the ***Yes*** or ***No*** command button was selected 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 configuration, cable connections, and/or the M.O.L.E. itself (i.e. battery).

When the data transfer is complete the status box will disappear and the software will return to the worksheet where the command was activated.

The information is automatically saved and the experiment data can now be analyzed with the software.

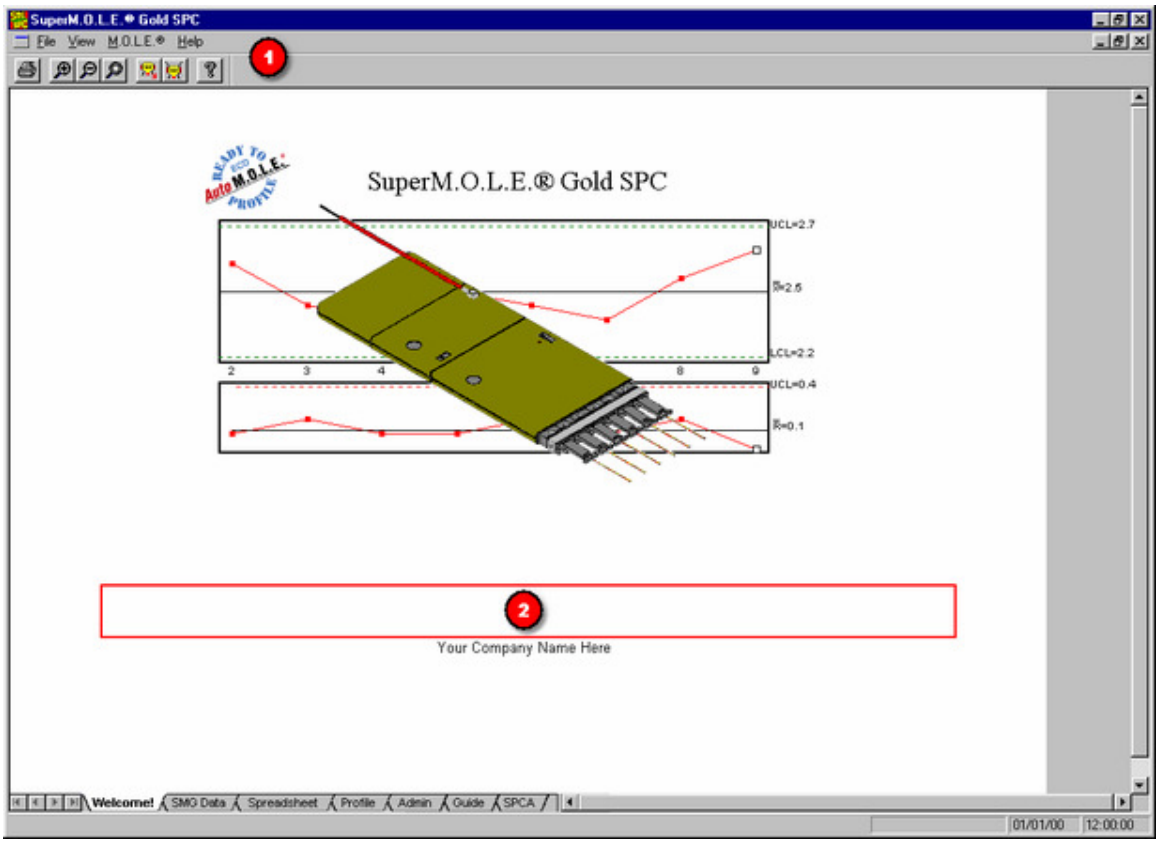
5.0 Worksheet Descriptions

5.1 The Welcome Worksheet

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

Welcome worksheet features:

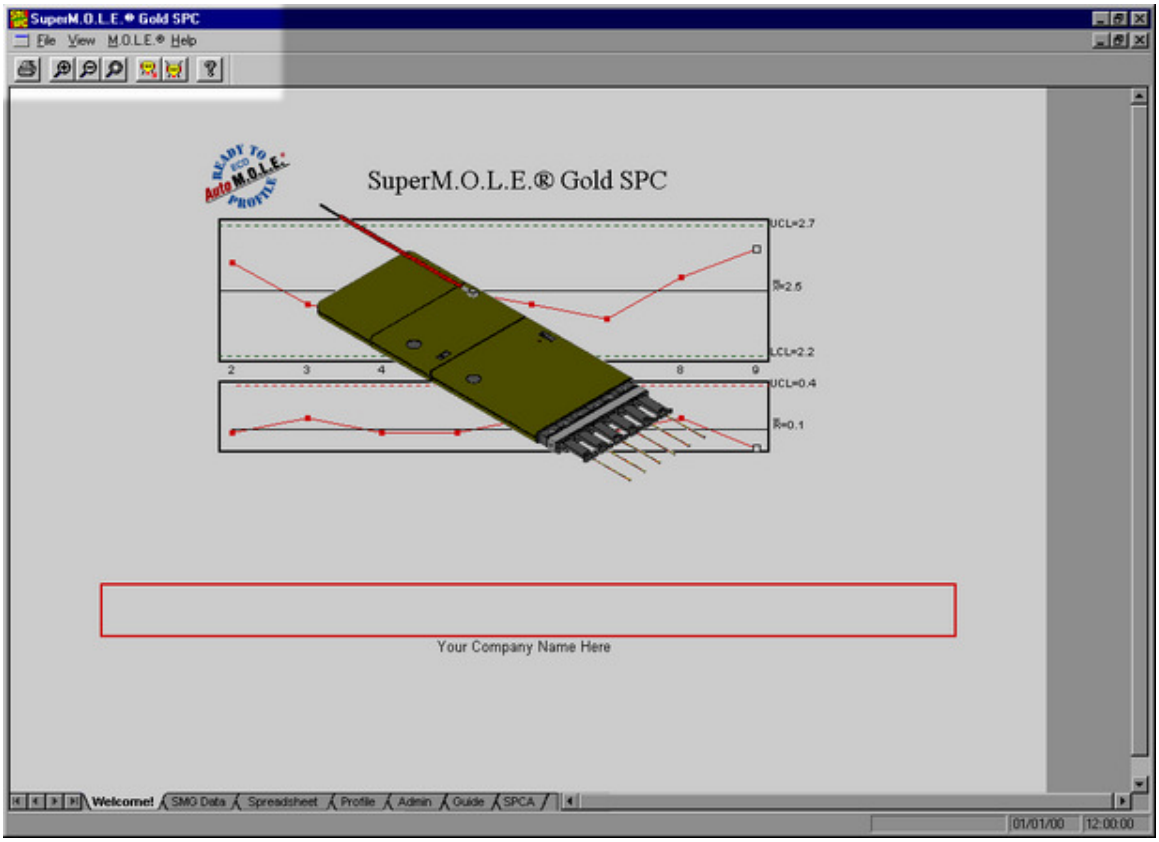
1. Menus and Toolbar
2. Company/Report Name Text Box



Welcome Worksheet

5.1.1 Welcome Worksheet Menus & 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.



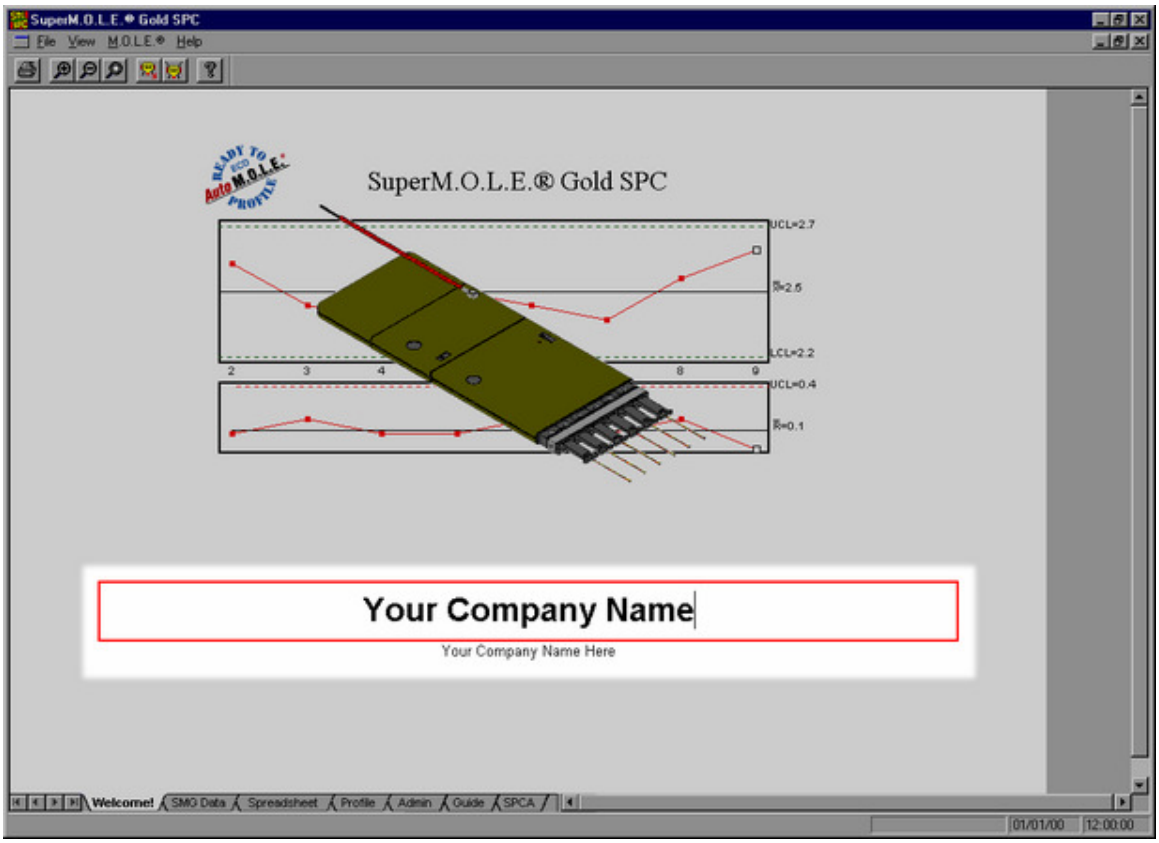
Welcome Worksheet Menus and Toolbar Buttons

5.1.2 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, click in the text box.
2) Type a desired name and then hit the [enter] key to accept or [esc] to cancel.



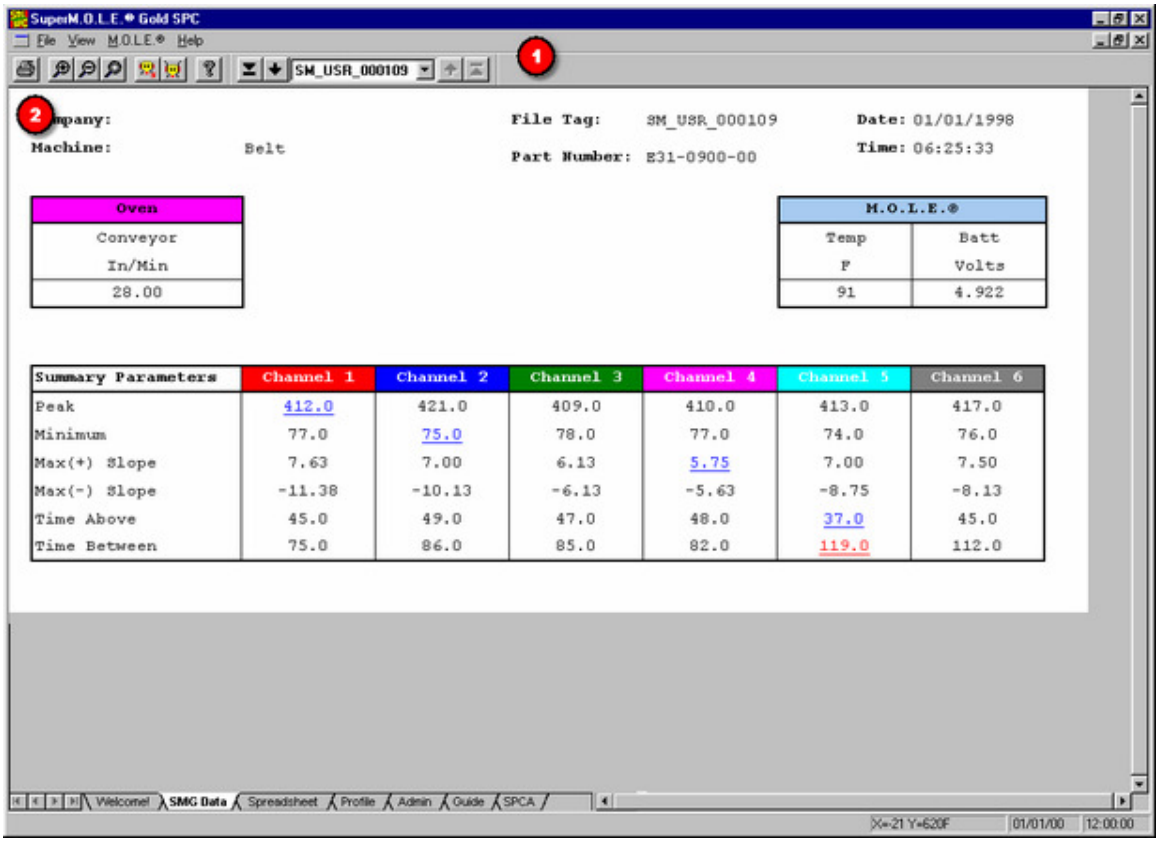
Entering a Company Name

5.2 SMG Data Worksheet

The SMG Data worksheet is where individual data runs are viewed in single page format.

SMG Data worksheet features:

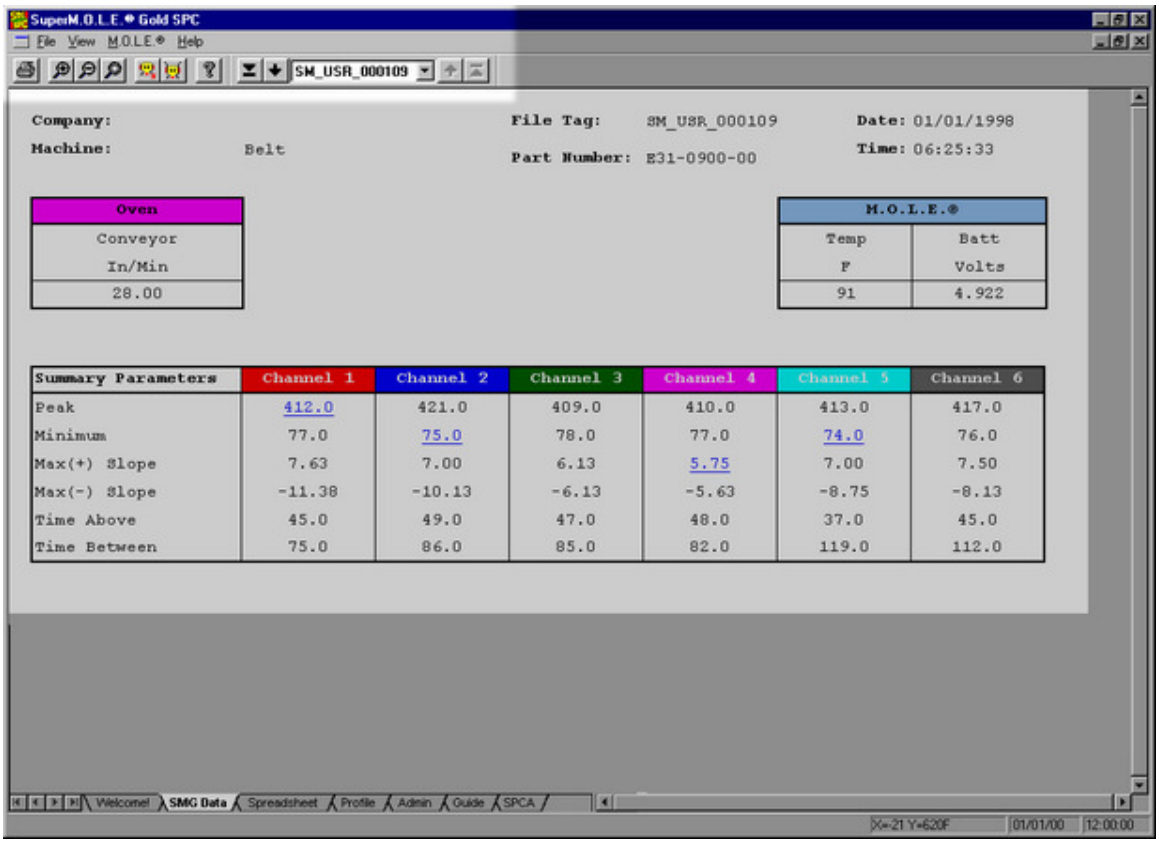
1. Menus and Toolbar
2. Data sheet



SMG Data Worksheet

5.2.1 SMG Data Worksheet Menus & Toolbar

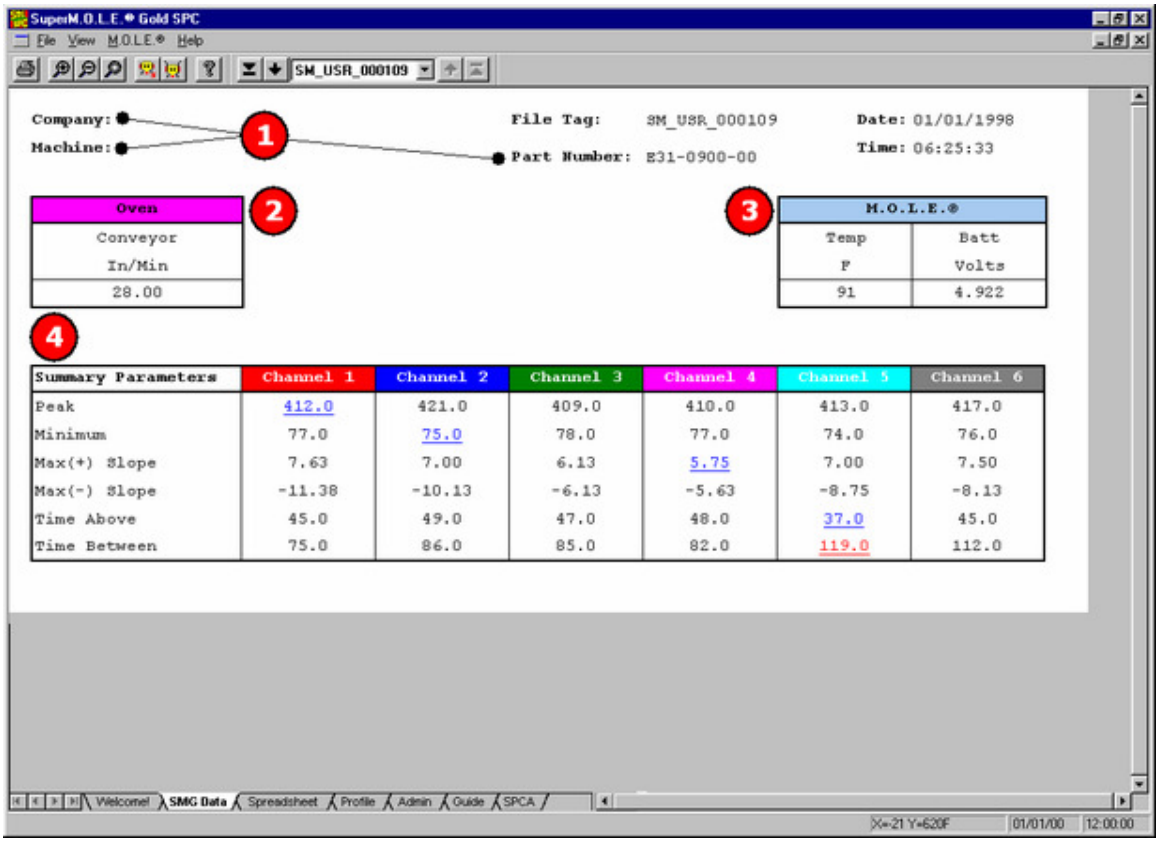
- **Menus:** File, View, M.O.L.E., Navigate, and Help.
- **Toolbar Buttons:** Print, Zoom In, Zoom Out, 100%, Read M.O.L.E., Receive RF, About, First (data run of the data set), Back (to previous data run), Forward (to the next data run), and Last (data run of the data set).



SMG Data Worksheet Menus and Toolbar Buttons

5.2.2 Interpreting the SMG Data Sheet

The following section defines the features of the SMG Data sheet. The Group Parameters on the data sheet are color coded so when they are viewed on other worksheets they can be easily associated with the Label Parameters.



Document View

❶ Company Name, Machine Name, and Part Number configured by user.

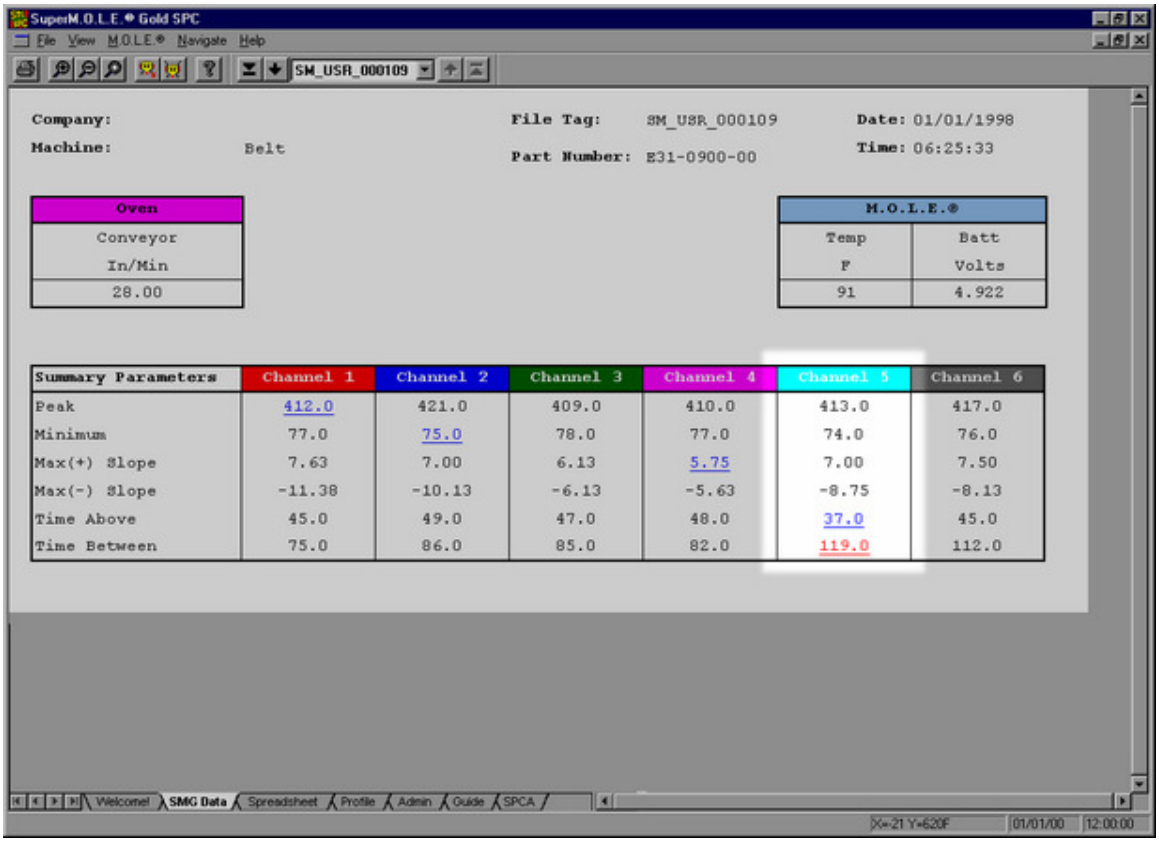
❷ Oven Conveyor speed.

❸ M.O.L.E. Internal Status.

❹ Primary statistics.

5.2.2.1 Data Coloring and LSL / USL

The parameter data and the user specified LSL (Lower Specification Limit) and USL (Upper Specification Limit) text fields on the Admin (Administration) worksheet are linked to indicate that a parameter has exceeded a user specified specification limit. If a USL has been exceeded, that parameter will be underlined and appear on the Data sheet in **Red** (indicating it is above the specification limit). If a parameter is less than the user specified LSL, that parameter will be underlined and appear in the Data sheet in **Blue** (indicating below the specification limit).



Data Coloring

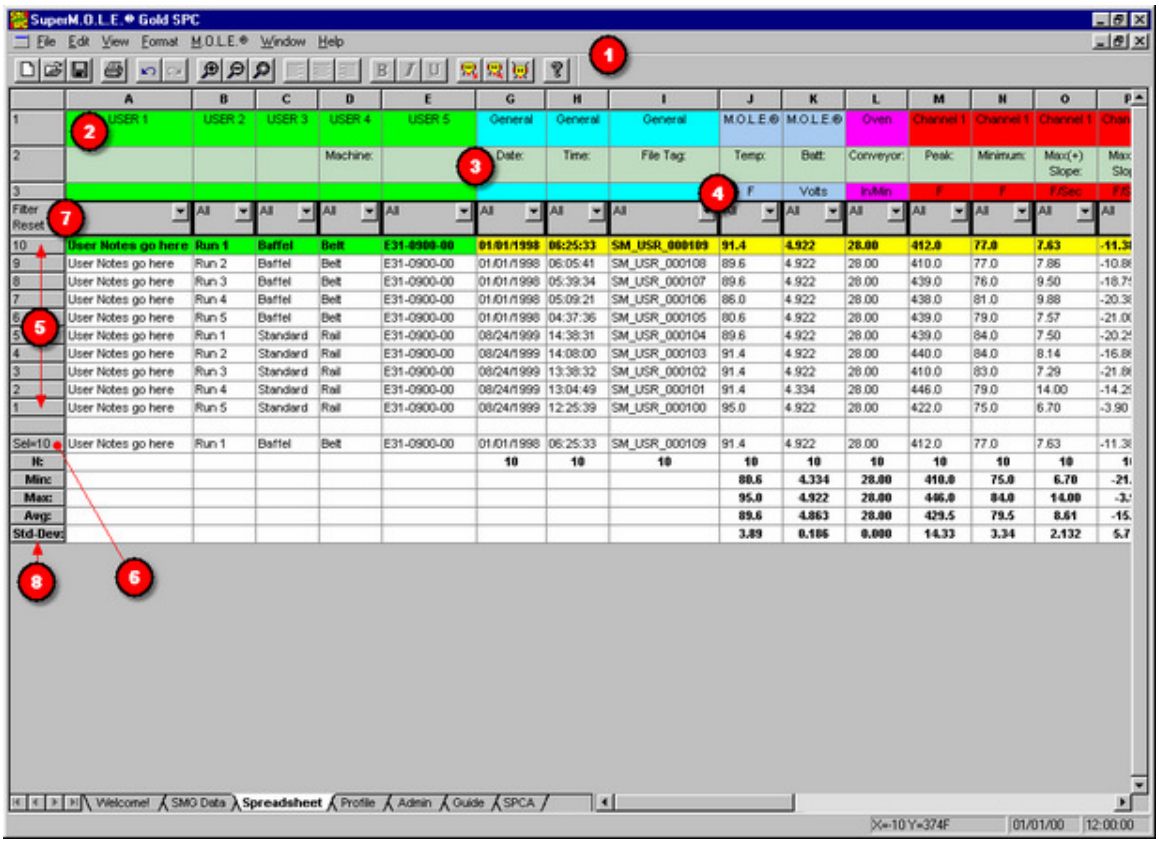
Refer to *Specification and Control Limit Cells* for information on how to enter user LSL and USL values. for information on how to enter user LSL and USL values.

5.3 Spreadsheet Worksheet

The Spreadsheet worksheet contains data that is collected by the M.O.L.E. put into standard spreadsheet format. Each row in the spreadsheet represents one data run. Using the Admin worksheet in conjunction with the Spreadsheet worksheet the user can select parameters to be displayed on the worksheet.

Spreadsheet Worksheet features:

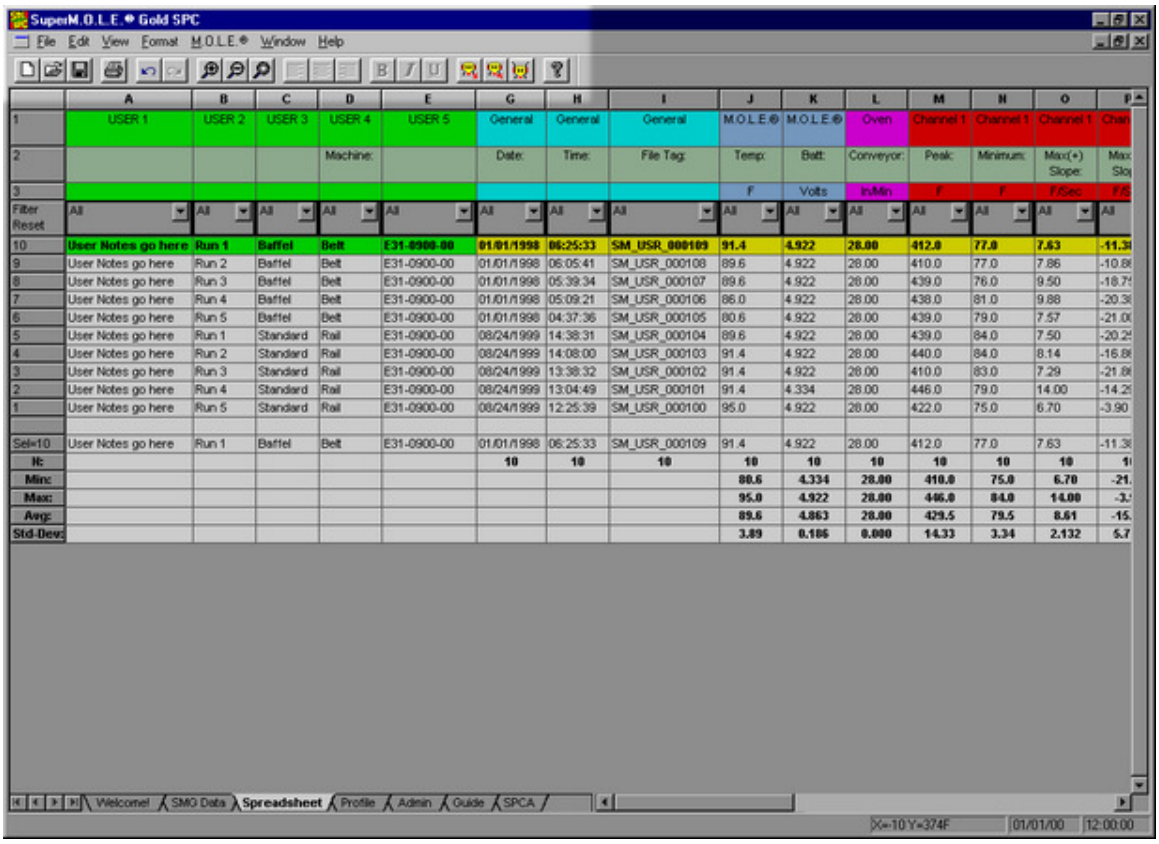
1. Menus and Toolbar
2. Parameter Groups (color coded)
3. Parameter Labels
4. Parameter Units
5. Data Run Rows
6. Selected Data Run
7. Filters
8. Statistics



Spreadsheet Worksheet

5.3.1 Spreadsheet Worksheet Menus & 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.

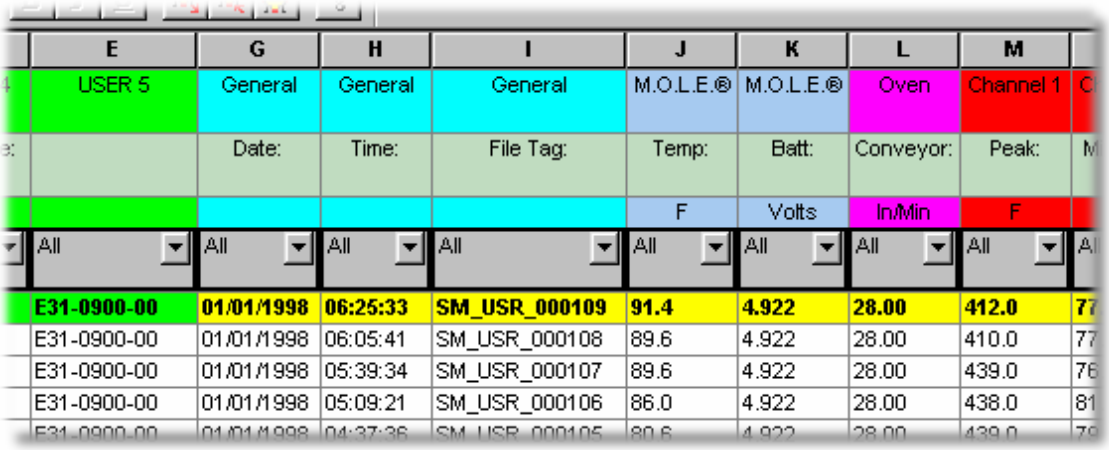


Spreadsheet Worksheet Menus and Toolbar Buttons

5.3.2 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.



	E	G	H	I	J	K	L	M	
	USER 5	General	General	General	M.O.L.E.®	M.O.L.E.®	Oven	Channel 1	C
		Date:	Time:	File Tag:	Temp:	Batt:	Conveyor:	Peak:	M
					F	Volts	In/Min	F	
	All	All	All	All	All	All	All	All	Al
	E31-0900-00	**01/01/1998**	**06:25:33**	**SM_USR_000109**	**91.4**	**4.922**	**28.00**	**412.0**	**77**
	E31-0900-00	01/01/1998	06:05:41	SM_USR_000108	89.6	4.922	28.00	410.0	77
	E31-0900-00	01/01/1998	05:39:34	SM_USR_000107	89.6	4.922	28.00	439.0	76
	E31-0900-00	01/01/1998	05:09:21	SM_USR_000106	86.0	4.922	28.00	438.0	81
	E31-0900-00	01/01/1998	04:37:36	SM_USR_000105	80.6	4.922	28.00	439.0	79

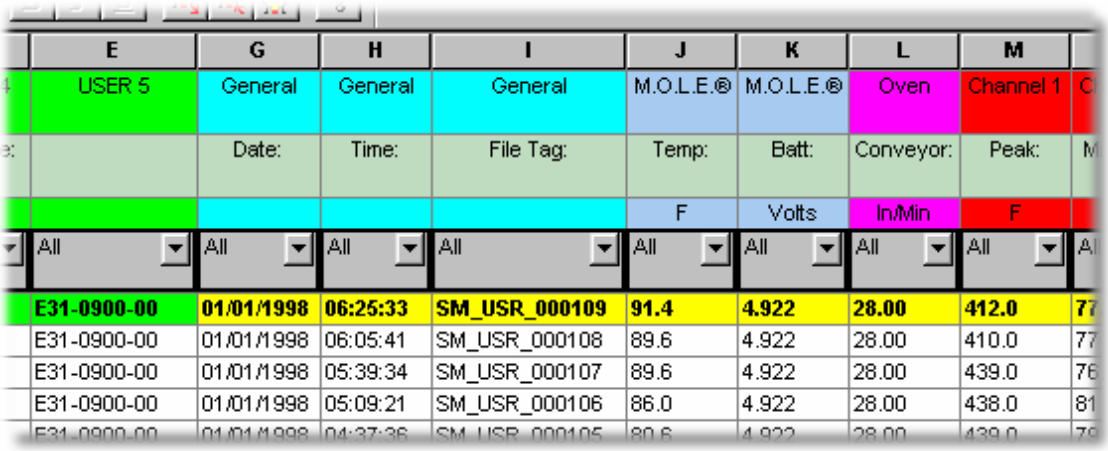
Parameter Group

The Parameter Groups are defined as the following:

User Defined Parameter Group:	These parameter columns can be used to enter text to help identify the 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.
Machine Parameter Group	This group contains the conveyor speed that is configured by the user.
Channels Parameter Group	This group contains the summary statistics for all six M.O.L.E. channels.

5.3.3 Parameter Labels

The Parameter Labels are where all of the specific parameters for each group are listed. The user can decide which parameters will be shown on the Spreadsheet worksheet from the Admin worksheet as discussed in ***Parameter check boxes***.

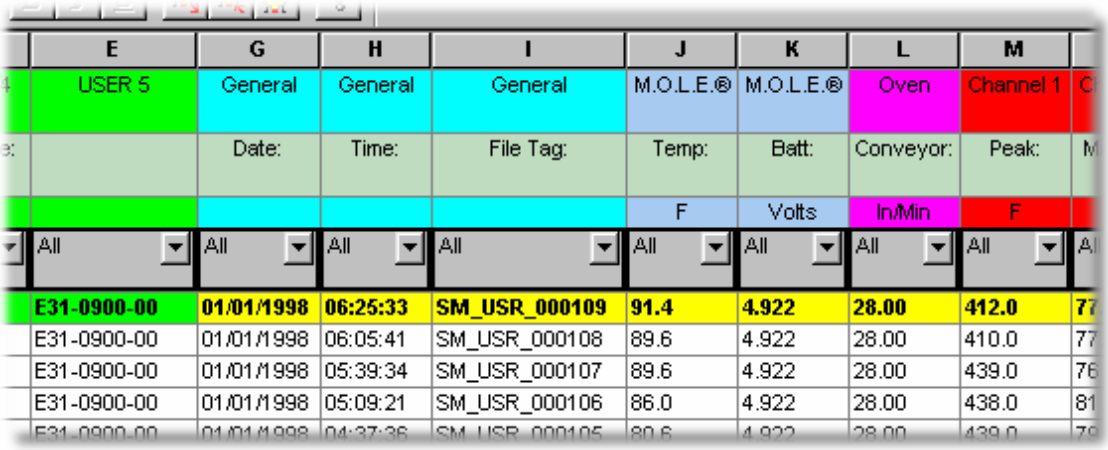


	E	G	H	I	J	K	L	M
	USER 5	General	General	General	M.O.L.E.®	M.O.L.E.®	Oven	Channel 1
		Date:	Time:	File Tag:	Temp:	Batt:	Conveyor:	Peak:
					F	Volts	In/Min	F
	All	All	All	All	All	All	All	All
	E31-0900-00	**01/01/1998**	**06:25:33**	**SM_USR_000109**	**91.4**	**4.922**	**28.00**	**412.0**
	E31-0900-00	01/01/1998	06:05:41	SM_USR_000108	89.6	4.922	28.00	410.0
	E31-0900-00	01/01/1998	05:39:34	SM_USR_000107	89.6	4.922	28.00	439.0
	E31-0900-00	01/01/1998	05:09:21	SM_USR_000106	86.0	4.922	28.00	438.0

Parameter Label

5.3.4 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 ***°F***.



	E	G	H	I	J	K	L	M
	USER 5	General	General	General	M.O.L.E.®	M.O.L.E.®	Oven	Channel 1
		Date:	Time:	File Tag:	Temp:	Batt:	Conveyor:	Peak:
					F	Volts	In/Min	F
	All	All	All	All	All	All	All	All
	E31-0900-00	**01/01/1998**	**06:25:33**	**SM_USR_000109**	**91.4**	**4.922**	**28.00**	**412.0**
	E31-0900-00	01/01/1998	06:05:41	SM_USR_000108	89.6	4.922	28.00	410.0
	E31-0900-00	01/01/1998	05:39:34	SM_USR_000107	89.6	4.922	28.00	439.0
	E31-0900-00	01/01/1998	05:09:21	SM_USR_000106	86.0	4.922	28.00	438.0

Parameter Units

5.3.5 Data Run Rows

All of the data runs uploaded into a workbook file are listed on the Spreadsheet worksheet as individual 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.

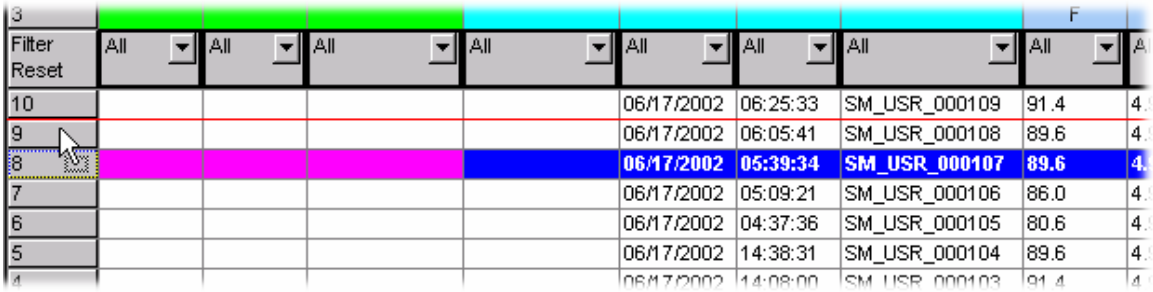
When any data run row is selected, all of the cells in the entire row are highlighted in purple and blue. The purple cells indicate that the cells can be modified and the blue cells indicate the data cannot be modified.

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 order of the data run:

1) Select the number cell of a data run 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

5.3.5.1 Selected 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. This row also allows the user to easily compare the selected data row to the statistics calculations located below the selected run row.

Entire selected rows and columns can be "copied" by pressing keys [CTRL + C] and then "pasted" [Ctrl + V] into other spreadsheet applications.

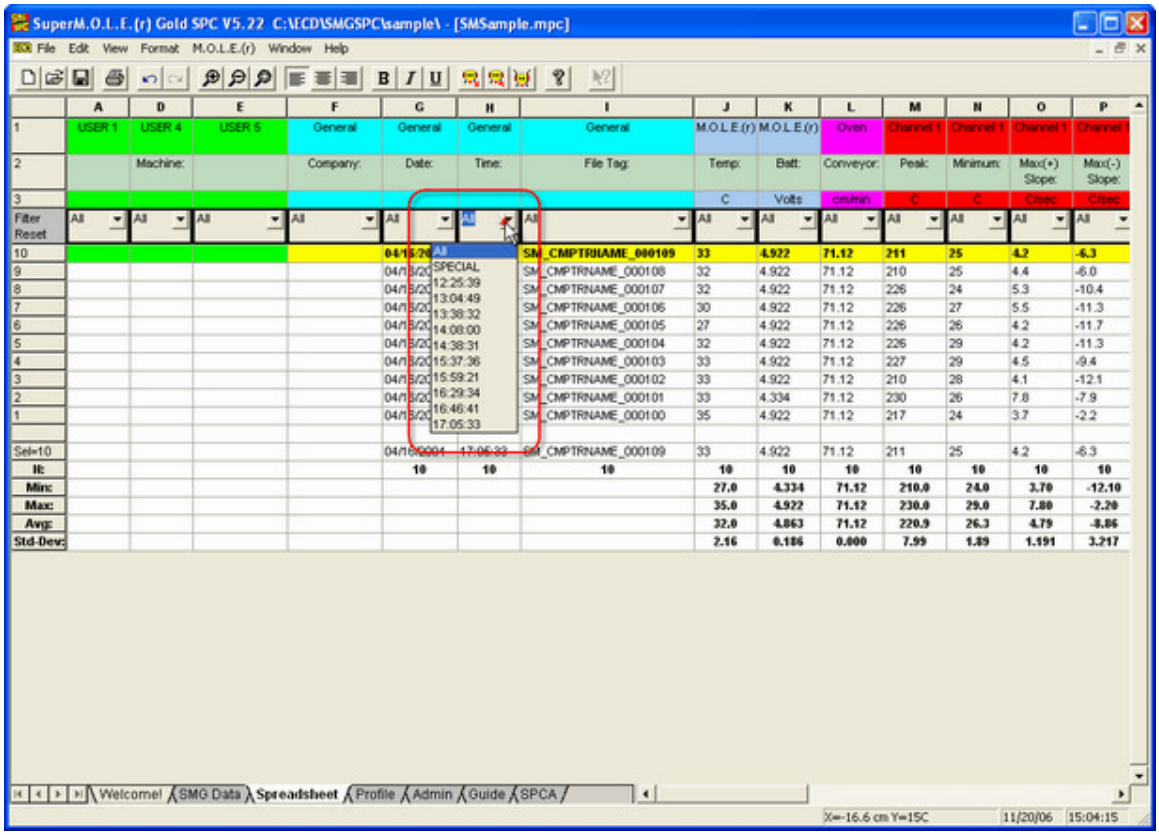
5.3.6 Filters

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**

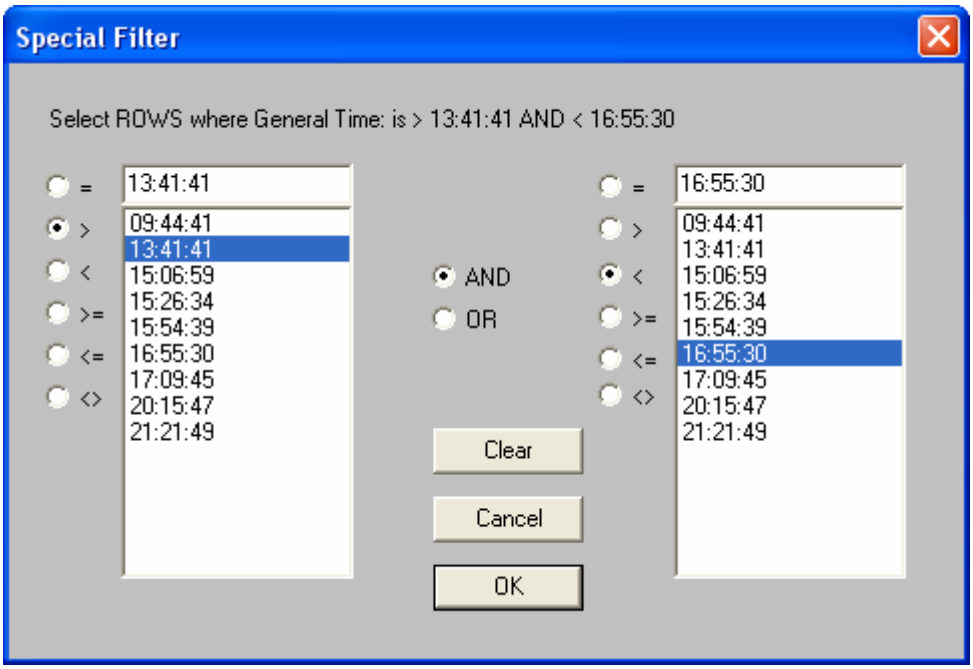
Filter option buttons

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.

5.3.7 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:

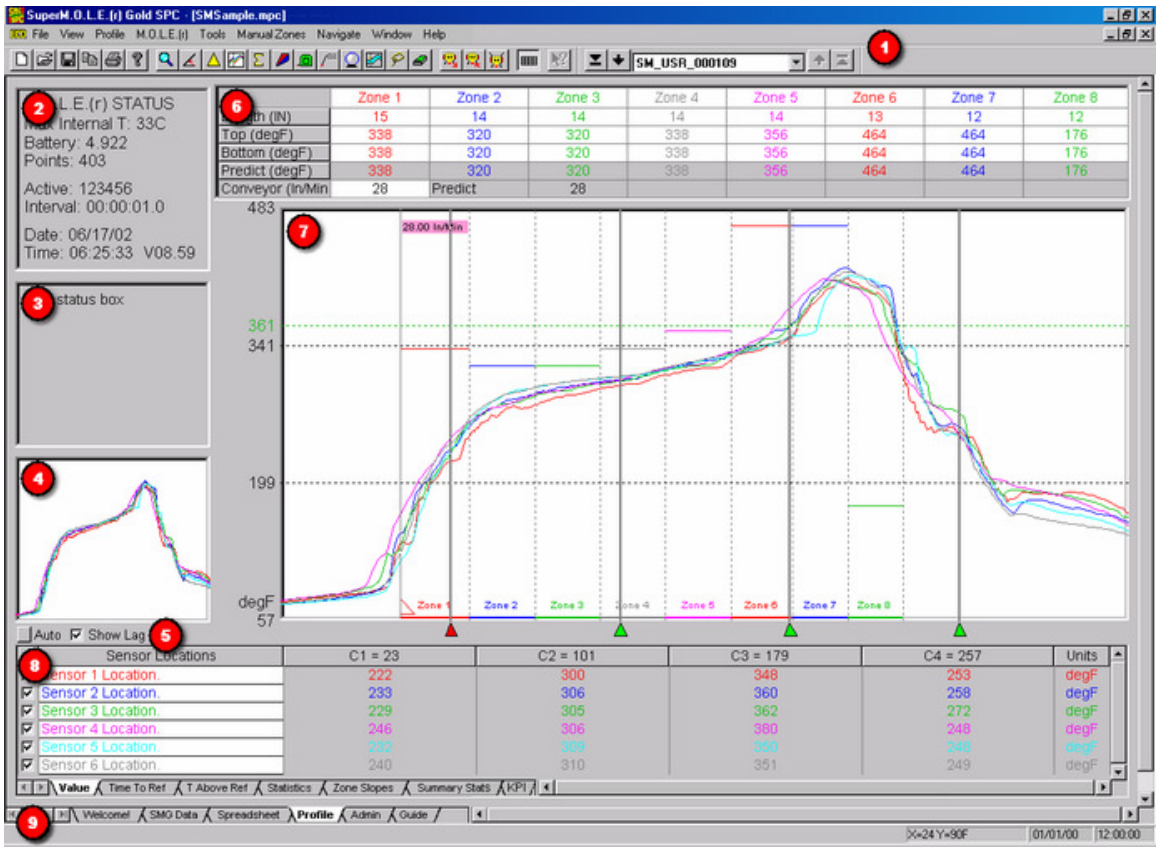
- N = Number of samples included in the calculations
- Min. = The lowest value in the parameter column.
- Max. = The highest value the parameter column.
- Avg = The average of all values in the parameter column.
- Std. Dev. = The standard deviation of the values in that column.

5.4 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:

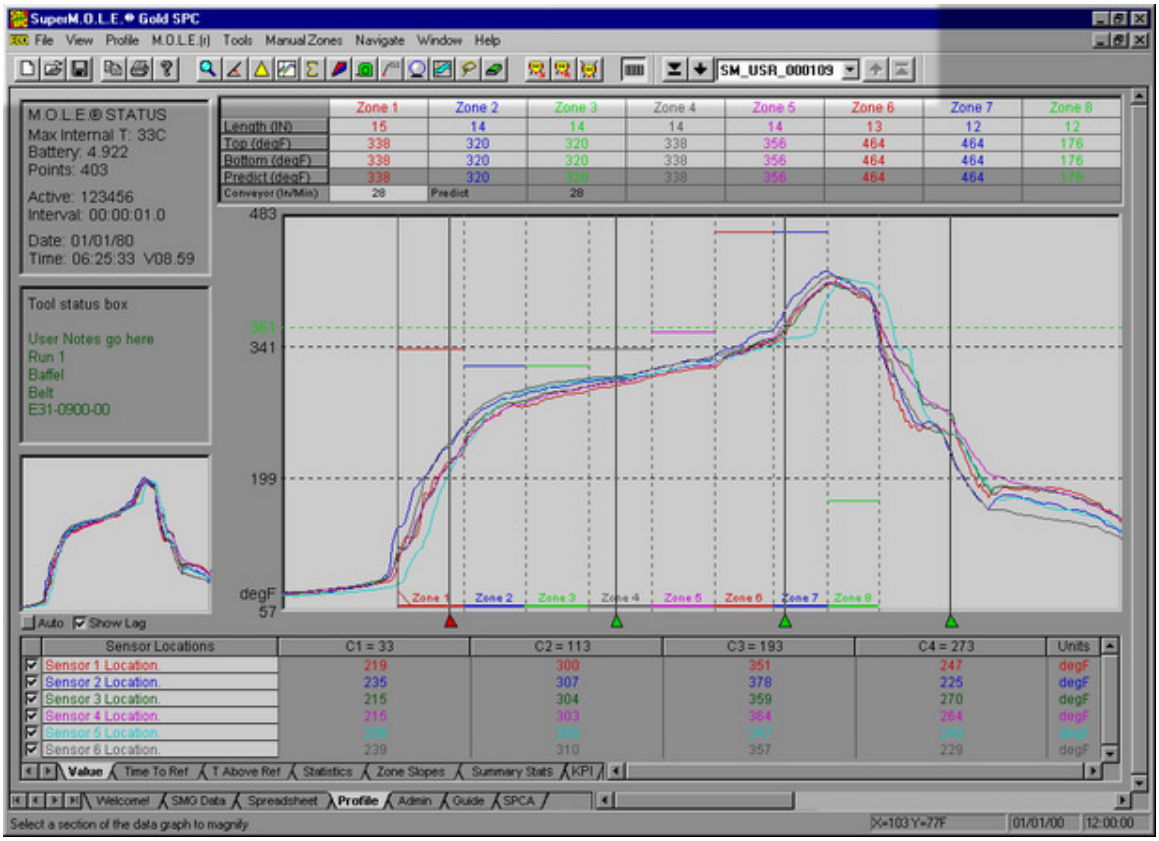
1. Menus and Toolbar
2. M.O.L.E. Status
3. Tool Box Status
4. Magnify Map
5. Auto Lag\
6. Zone Matrix
7. Data Graph
8. Data Table
9. Status Bar



Data Graphics Display

5.4.1 Profile Worksheet Menus & Toolbar

- **Menus:** File, View, Profile, M.O.L.E., Tools, Manual Zones, Navigate, Window, and Help.
- **Toolbar Buttons:** New, Open, 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

5.4.2 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 the data the selected run.

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℃, it appears in BLACK. When the internal temperature is 55℃ and above, it appears in RED indicating that the M.O.L.E. has reached the temperature warning zone.

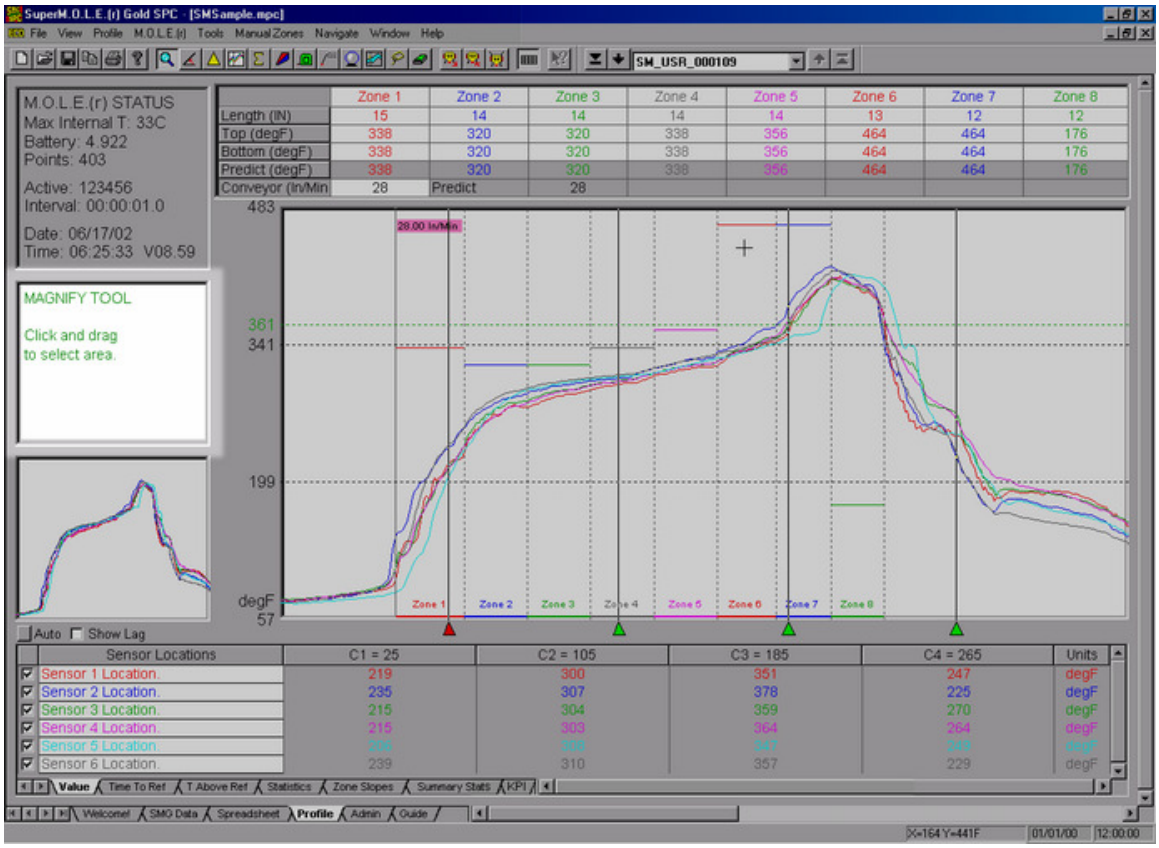
The software has two different internal temperature thresholds. 55-64℃ is the M.O.L.E. is approaching the maximum recommended operating temperature of 65℃. Above 65℃ is the maximum internal operating range.

- ***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.)

5.4.3 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 data run.

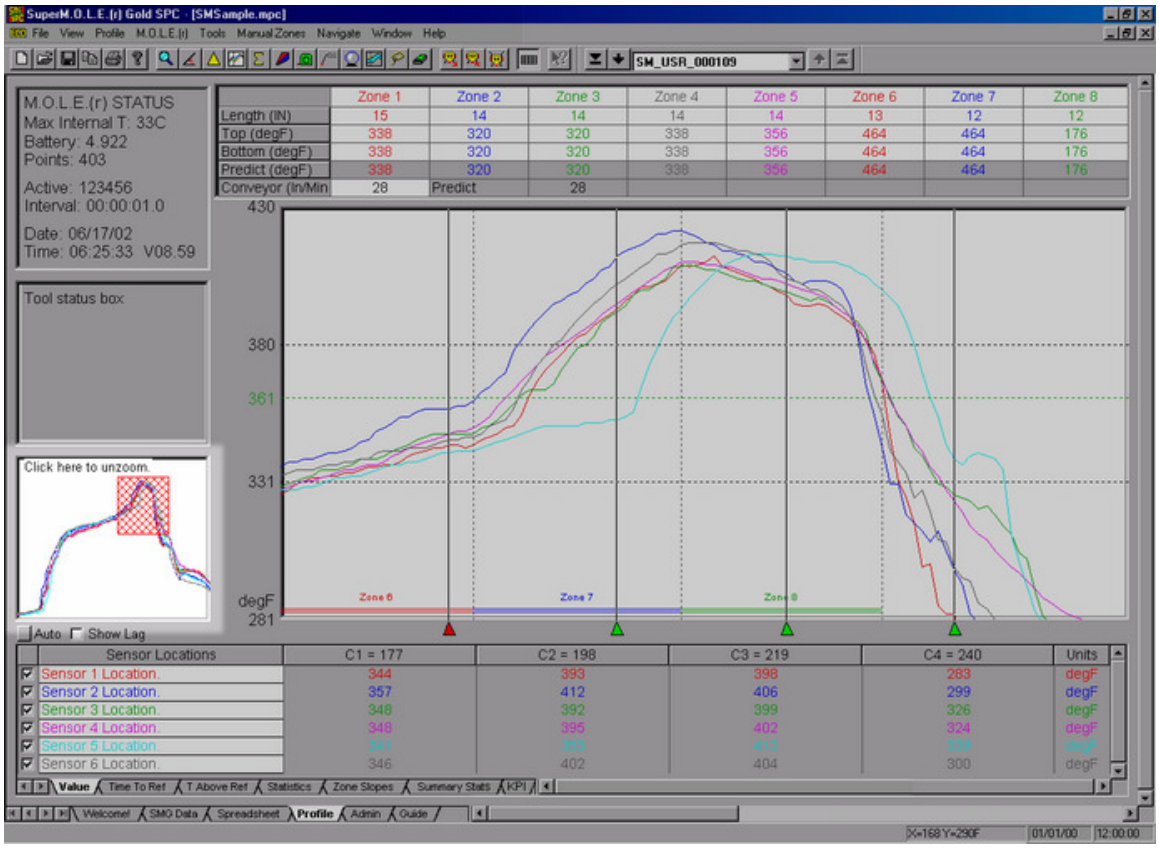
When a Tool command such as Magnify is selected, a message appears in the box stating “Click and drag to select area”.



Tool Status Message

5.4.4 Magnify Map

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

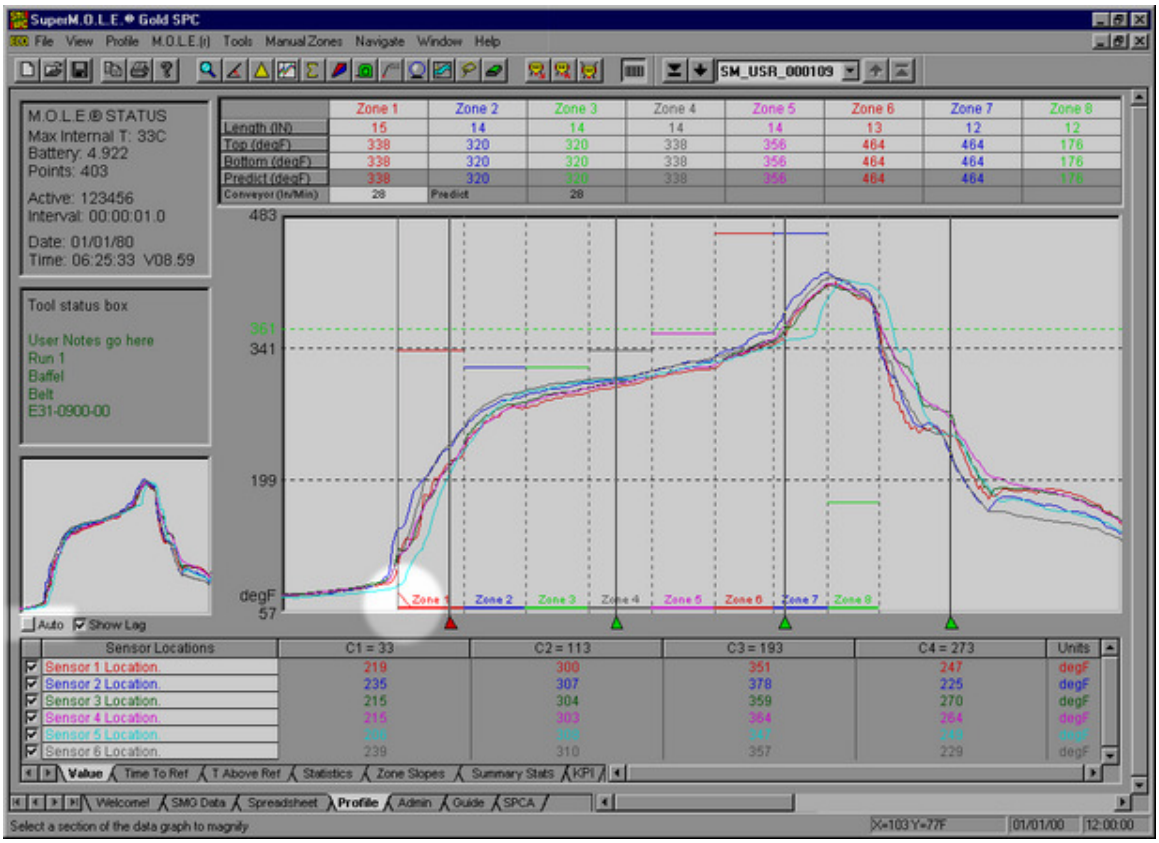


Magnify Map

5.4.5 Auto Lag

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.

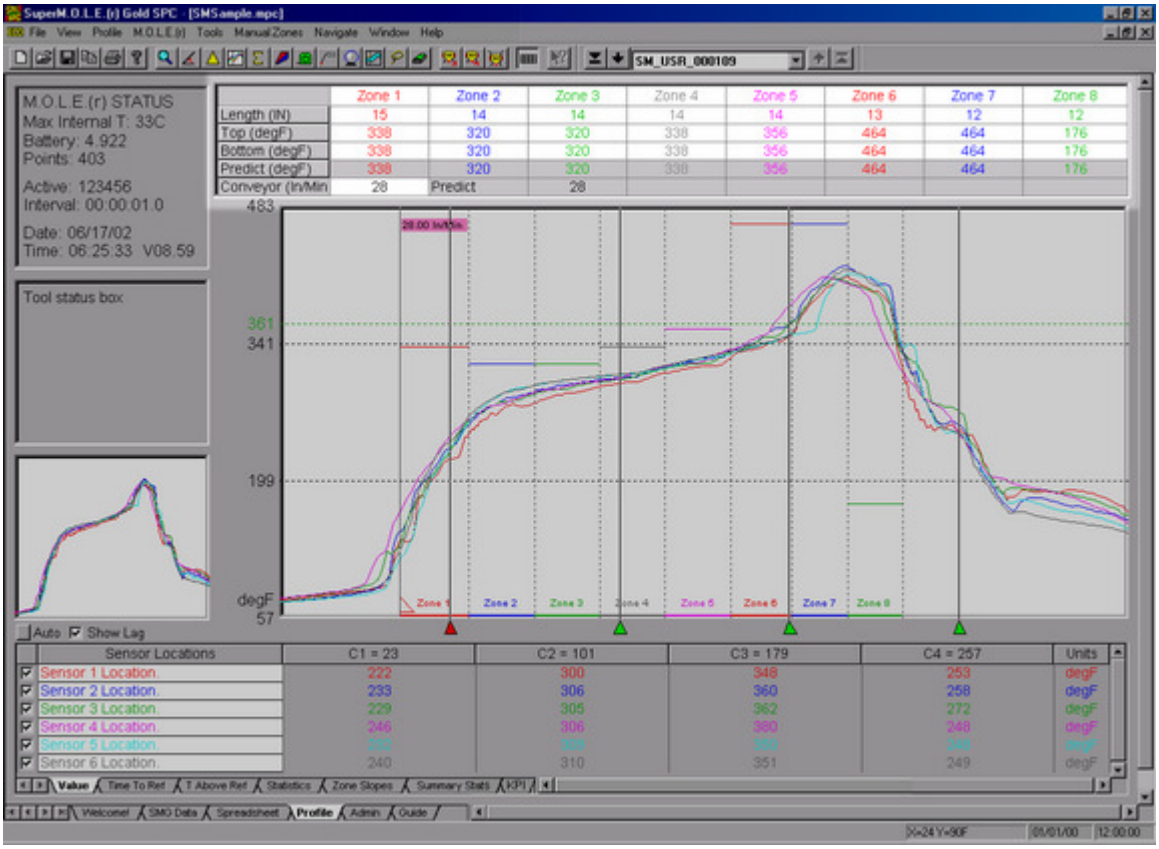
To disable the Channel Lag:

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.

5.4.6 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 new value(s) for the Zone Length and the Top temperatures in the white cells of the matrix.



Zone Matrix

Zone temperature values or the conveyor speed can be changed and plot a prediction of the change that would result in the Data Plots. Refer to ***Prediction Tool*** for more information.

5.4.7 The Data Graph

The Data Graph is a display that shows the data collected from the data run 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. Autoscaling
3. Data Plots
4. Process Origin
5. X-Cursors
6. X-axis Units
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.

5.4.7.1 X and Y-Axes and Labels

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 Admin 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 ***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.

5.4.7.2 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*.

5.4.7.3 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.

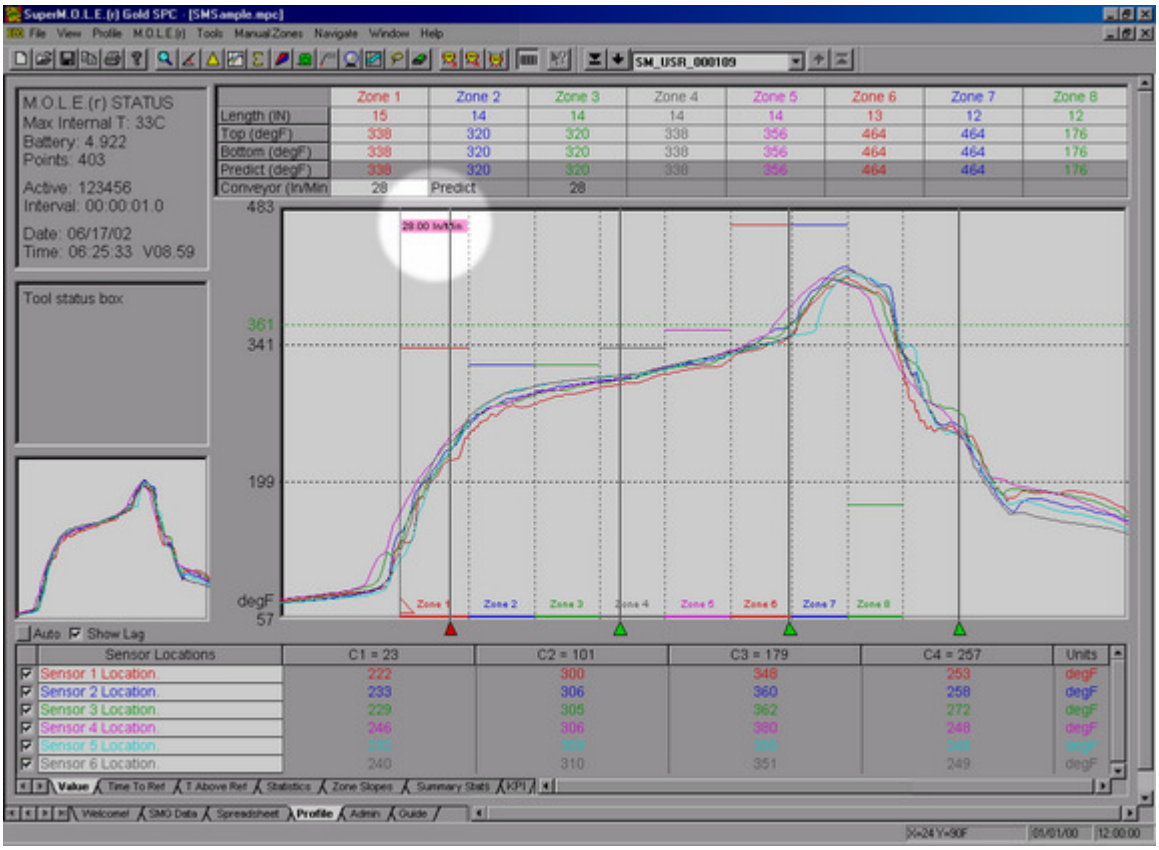
When two or more Data Plots overlap the same values, the Data Plots overwrite each other. For example, if the Data Plot that represents the sensor connected to channel 5 and channel 1 have the same value, the channel 5 Data Plot will only appear unless the user suppresses it.

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.

5.4.7.4 Conveyor Speed Indicator

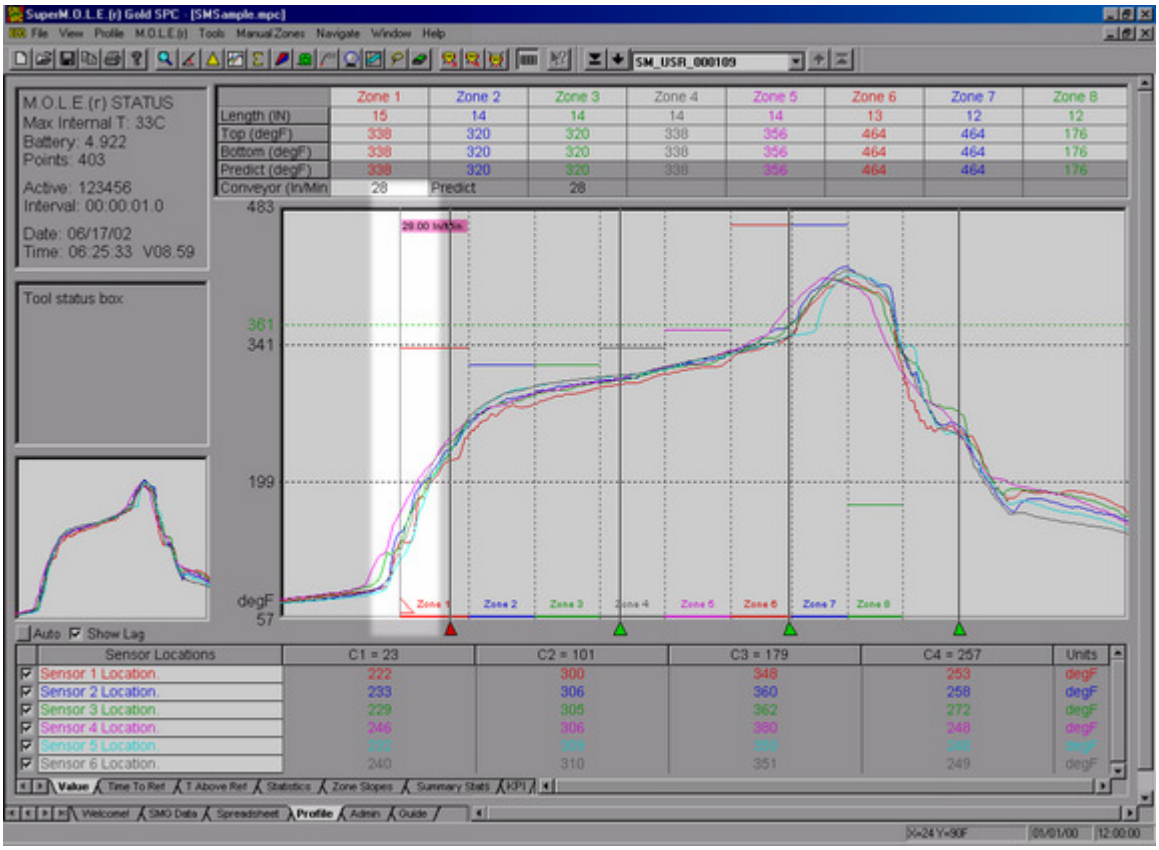
The Conveyor Speed Indicator displays the speed of the conveyor when the data was recorded.



Conveyor Speed Indicator

5.4.7.5 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.

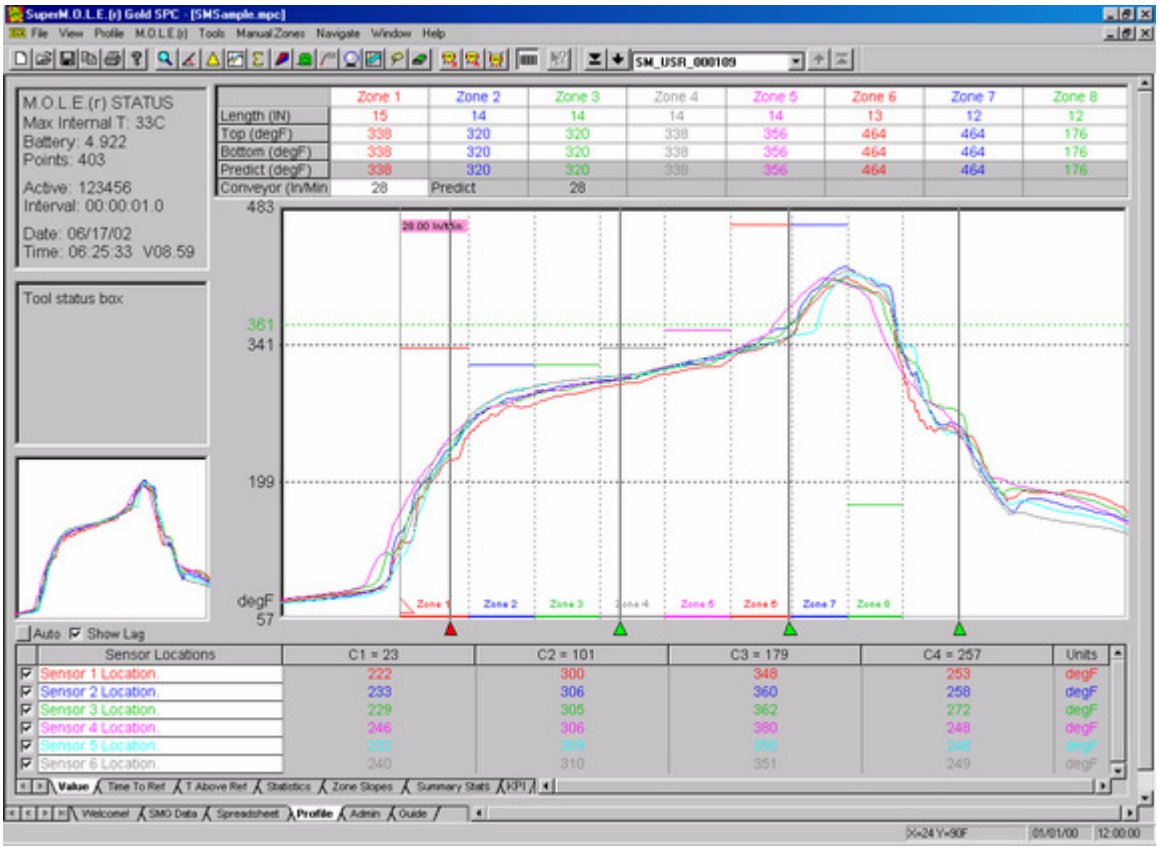
The X/Y Readout in the Status Bar indicates the true position of the Process Origin while it is being moving. After the mouse button is released, the X-Readout changes to zero at the Process Origin and displays negative numbers for X when the mouse pointer is moved to the left of the Process Origin.

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.

5.4.7.6 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.

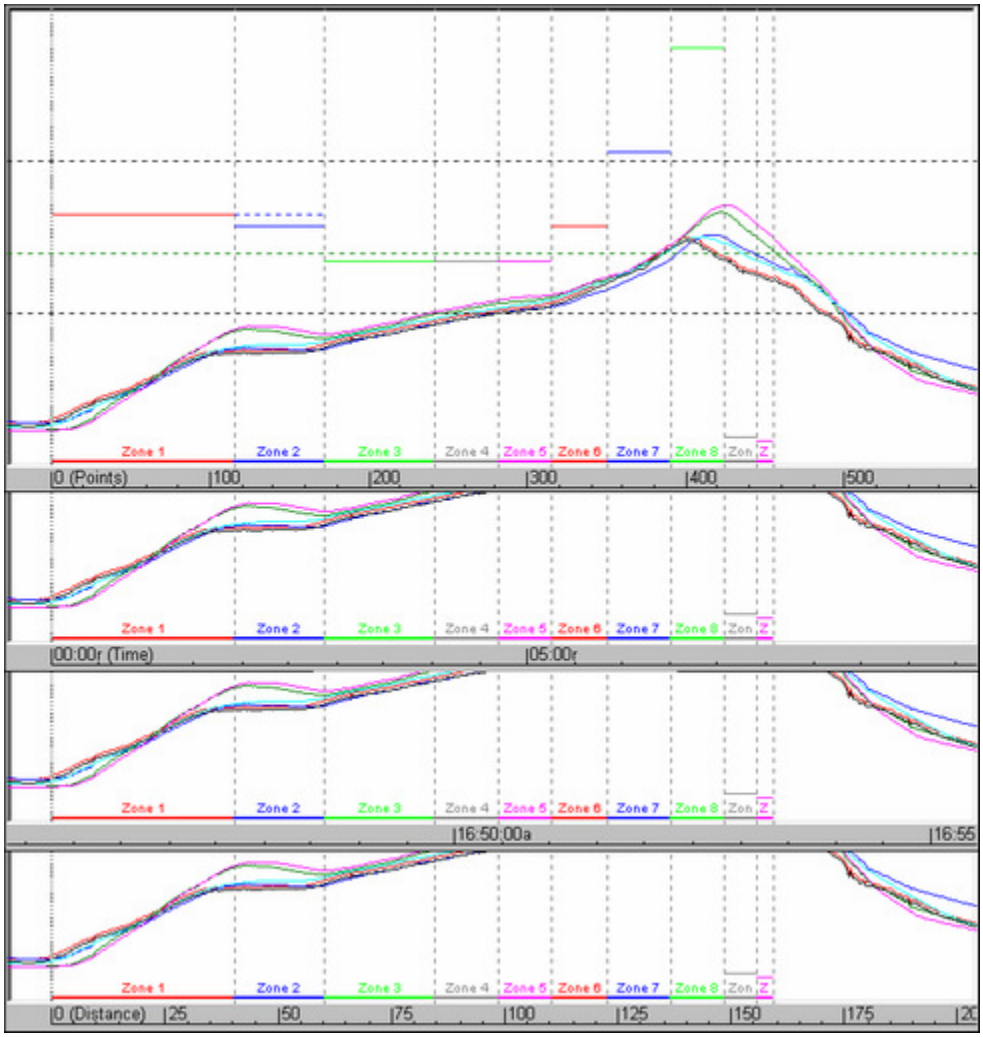
When an X-cursor is dragged to a new position, it automatically snaps to the closest real X-value. Notice on highly magnified graphs that the cursor jumps from point to point. In an extreme case, if the graph is so highly magnified that there are no real X-values to move to, the X-cursors cannot be moved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

5.4.7.7 X-axis Units

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.

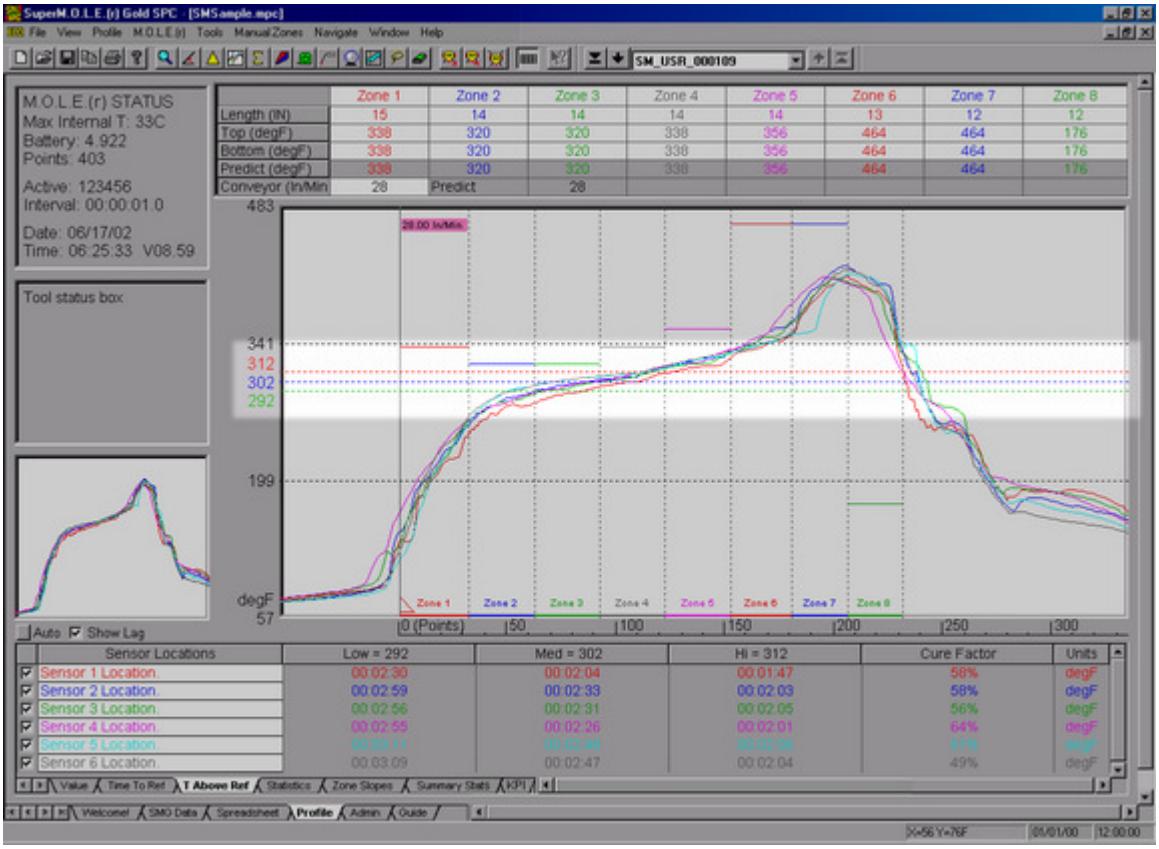


Scale Types

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

5.4.7.8 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.

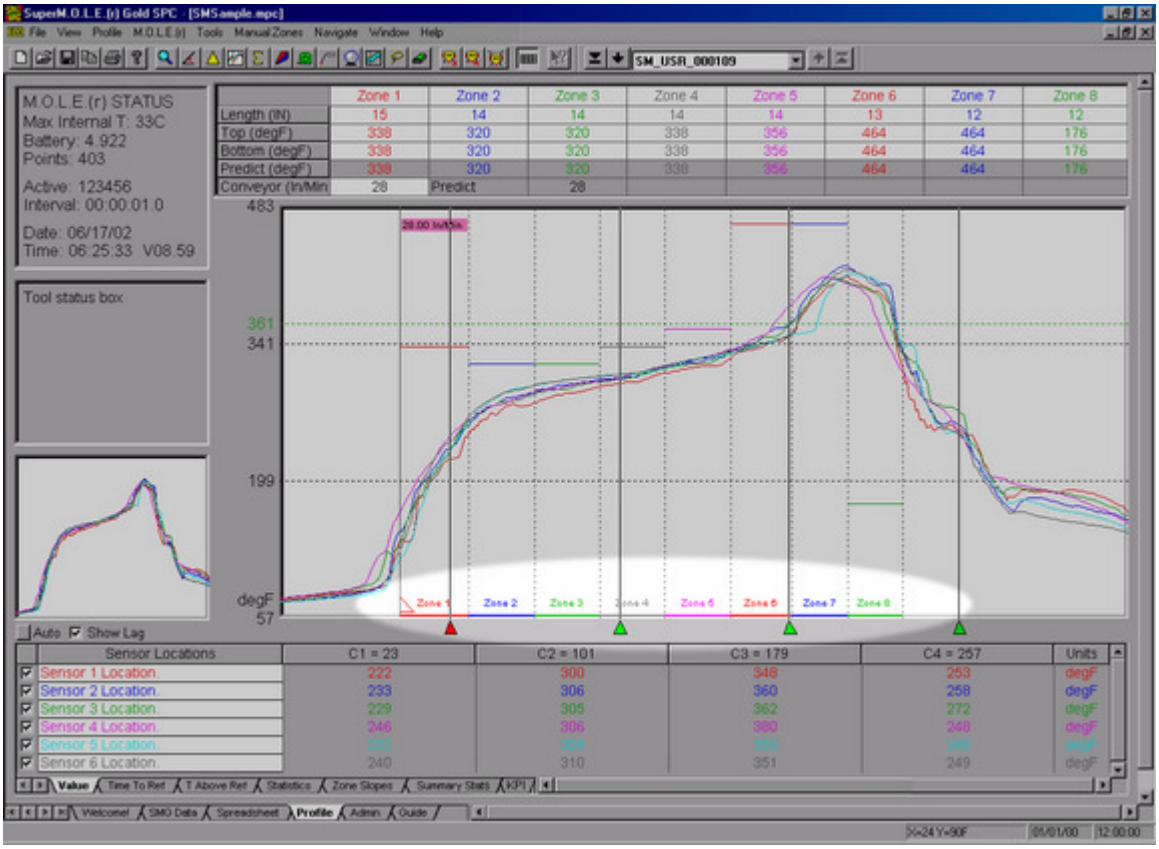


Temperature reference lines

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***.

5.4.7.9 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.

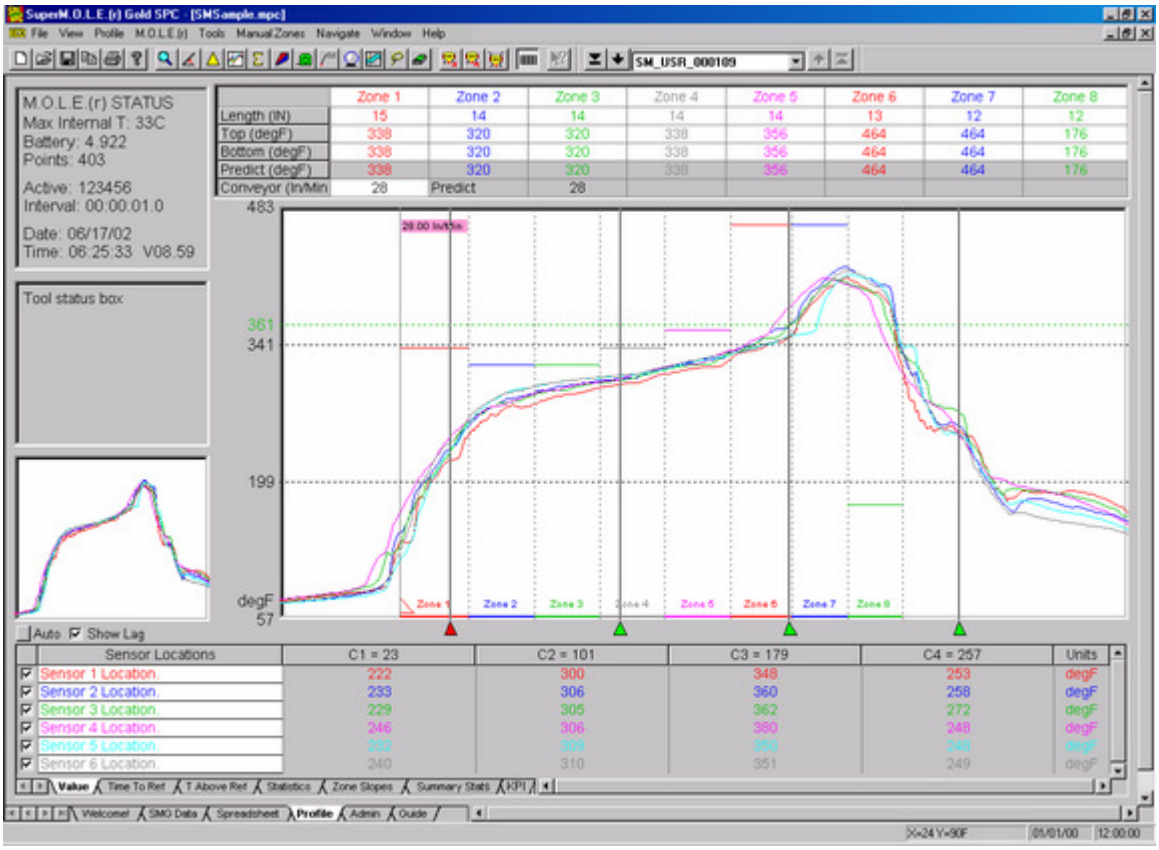


Zones

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.

5.4.7.10 Zone Temperatures

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



Zone Temperatures

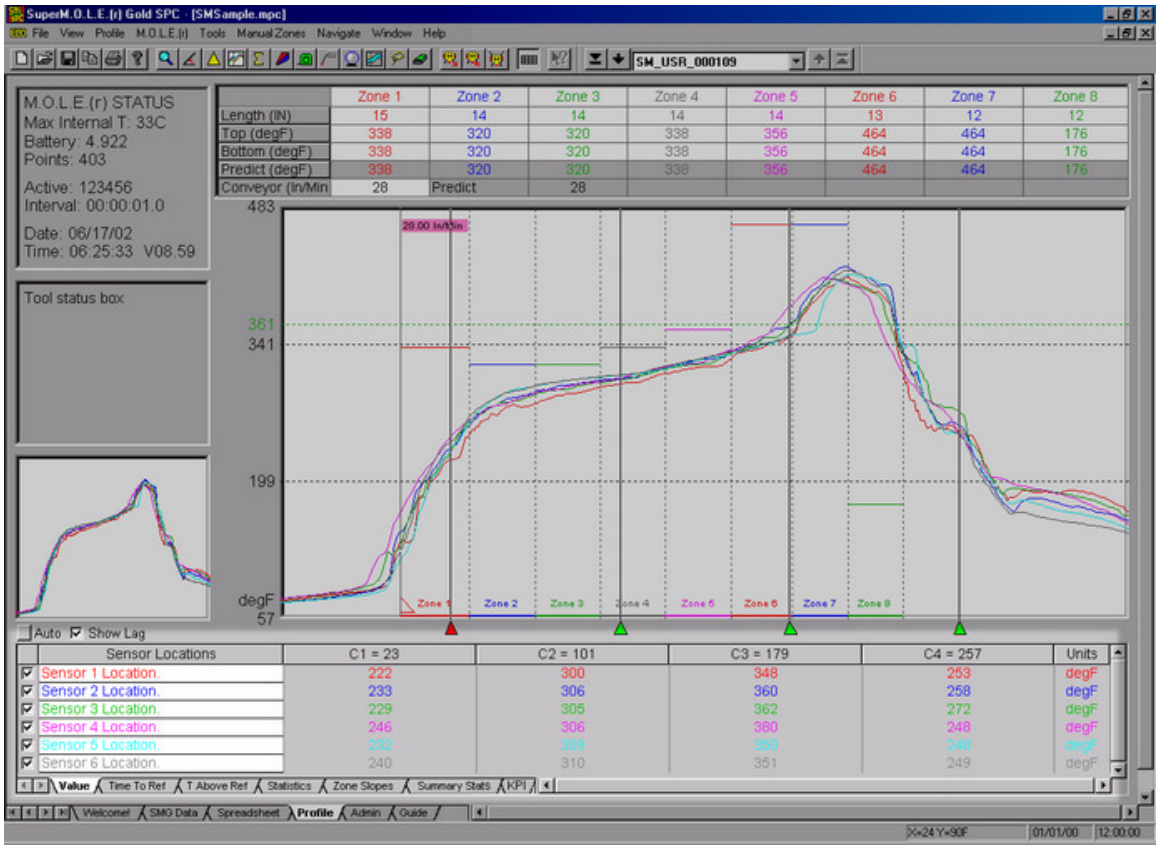
Zone Temperature Lines appear in the Data Graph as colored bars at the temperature set for each zone. (Zone Temperatures can be displayed only after zone sizes are defined). Upper Zone Temperature Lines appear in the Data graph as solid colored bars and the lower Zone Temperature Lines are dashed.

5.4.8 The 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



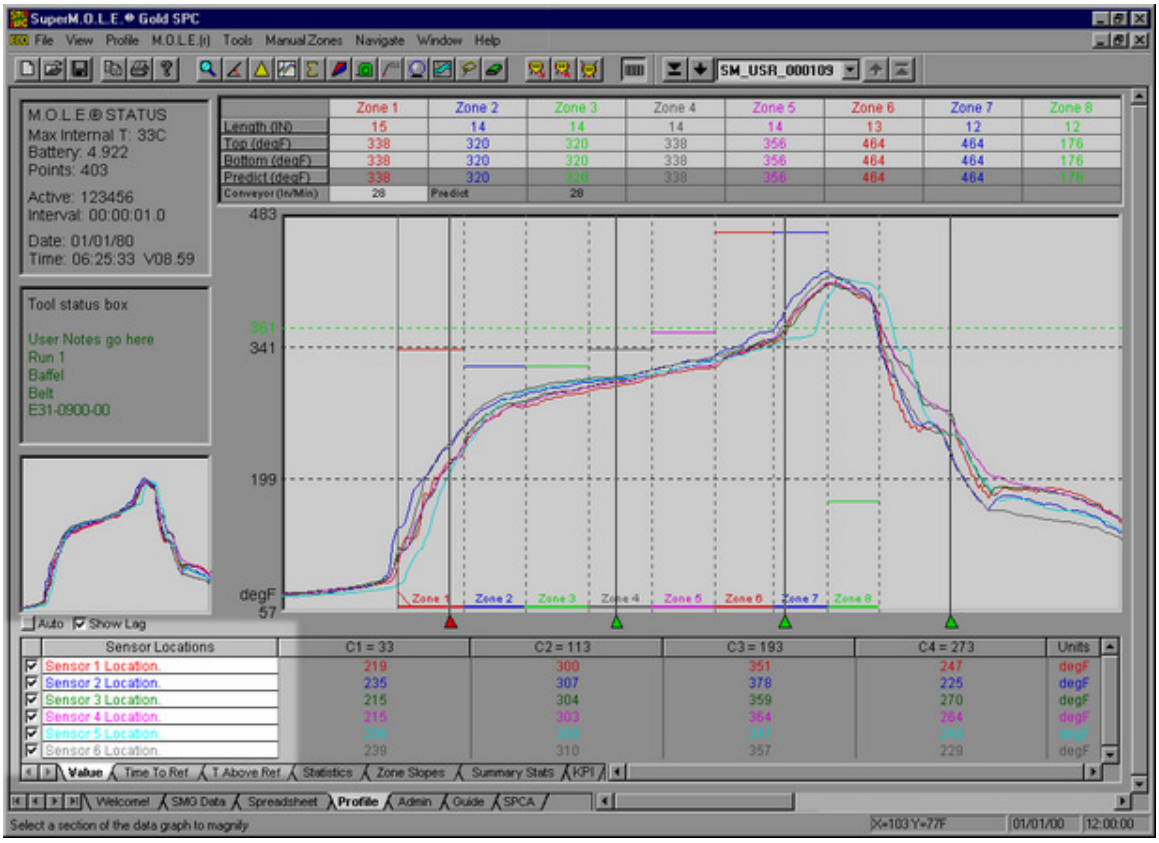
Data Table

5.4.8.1 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.



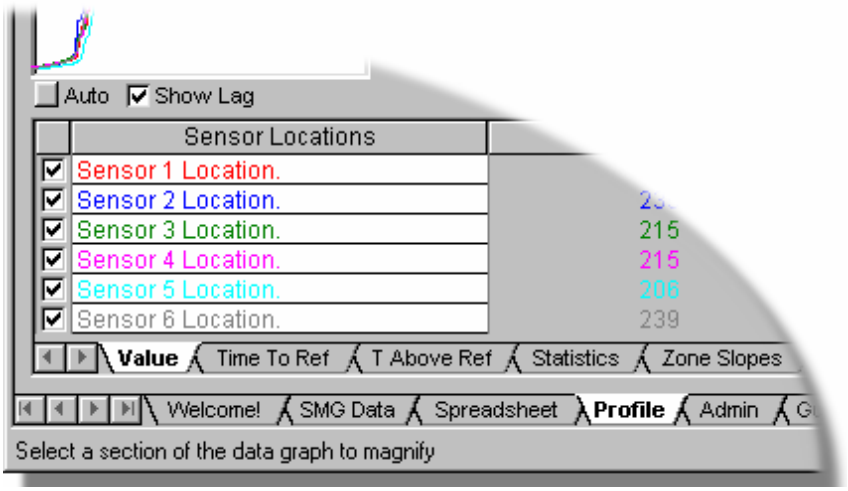
Channel Descriptions

5.4.8.2 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

5.4.8.3 Data Tabs

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

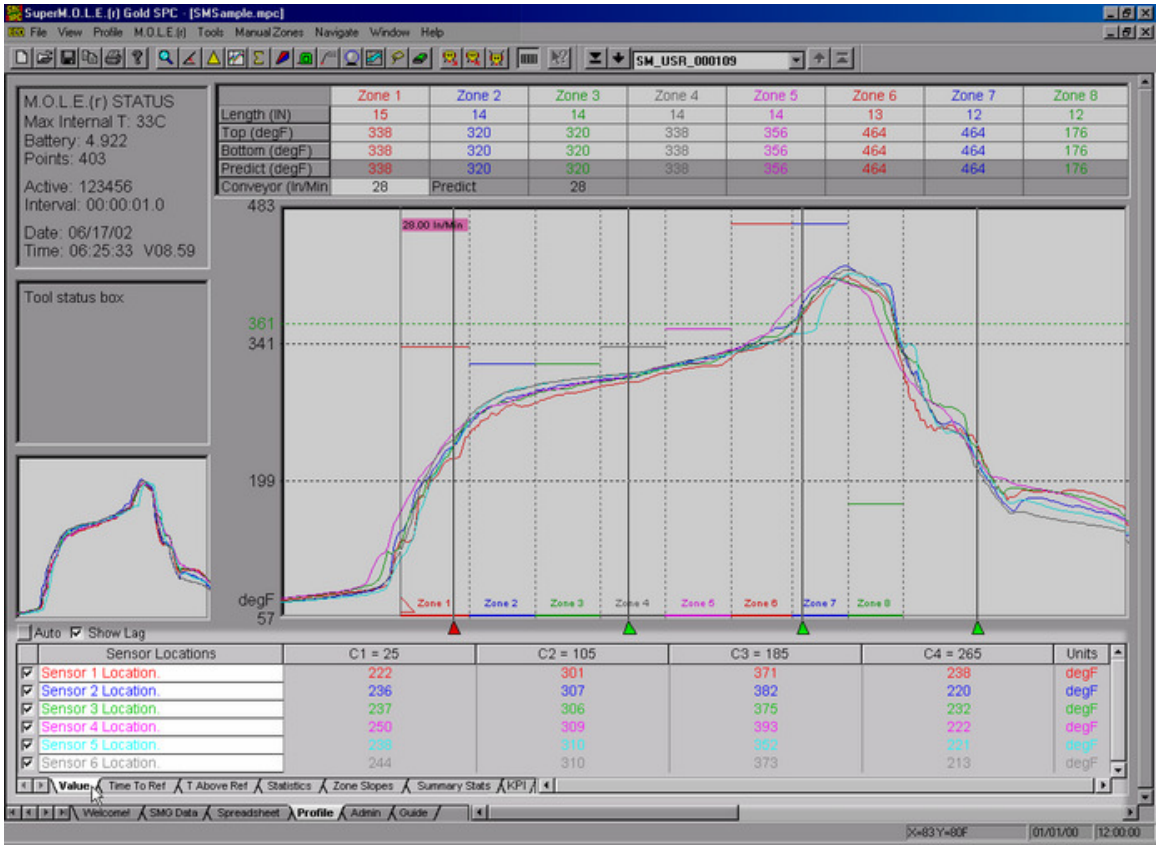
The Data Tabs are:

- 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).

5.4.8.3.1 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.

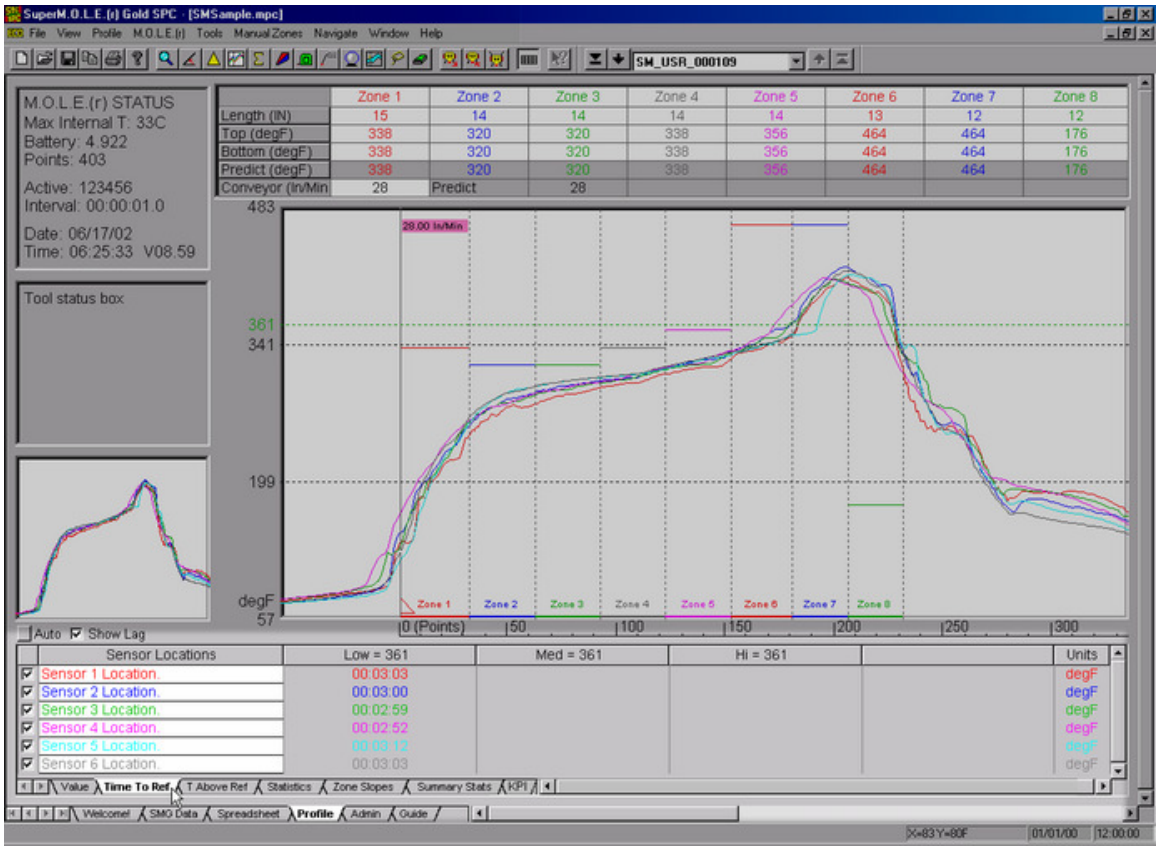


Value Data Tab

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

5.4.8.3.2 Time to Reference

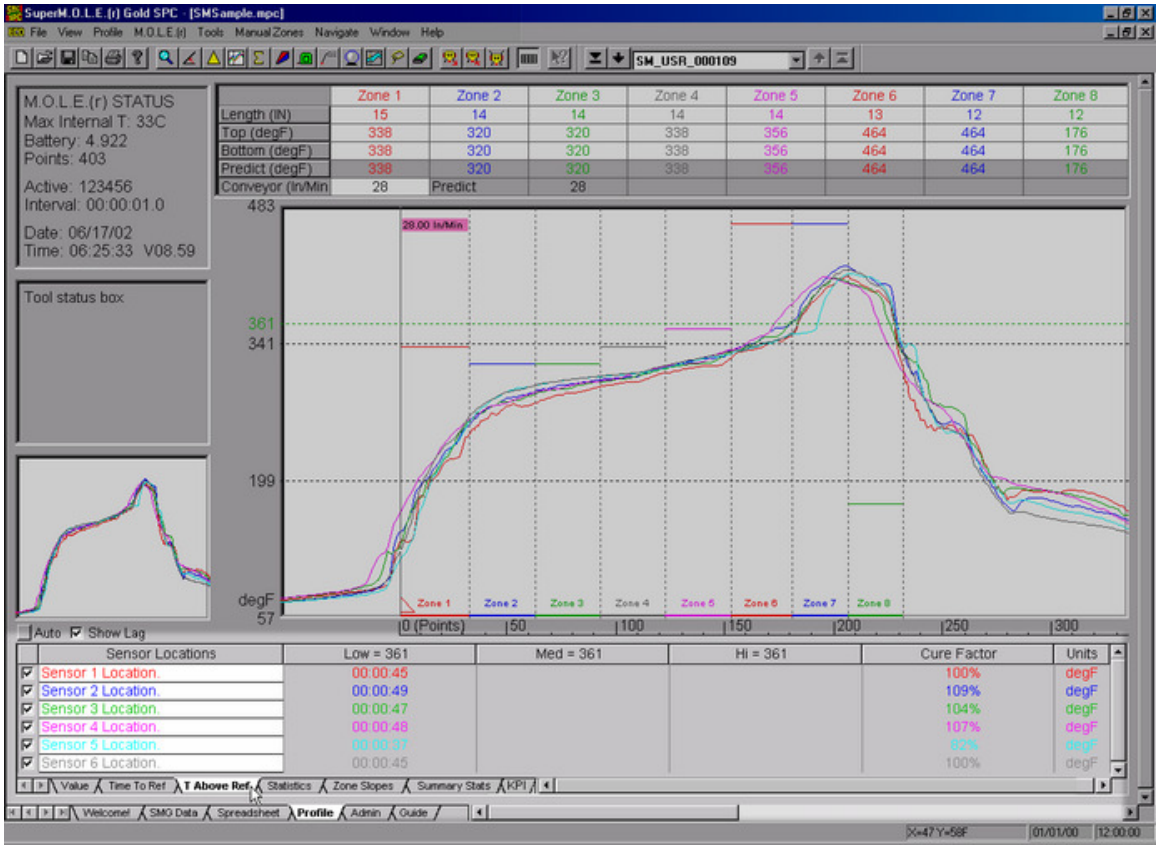
When the ***Time to Reference*** Tab is selected, the Data Table displays the time it takes the channels to reach fixed Temperature Reference Line(s). Times are expressed as HH:MM:SS (H=hours, M=minutes, S=seconds). Up to three Temperature Reference Lines can be added to the Data Graph that are used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



Time to Ref Data Tab

5.4.8.3.3 T Above Ref

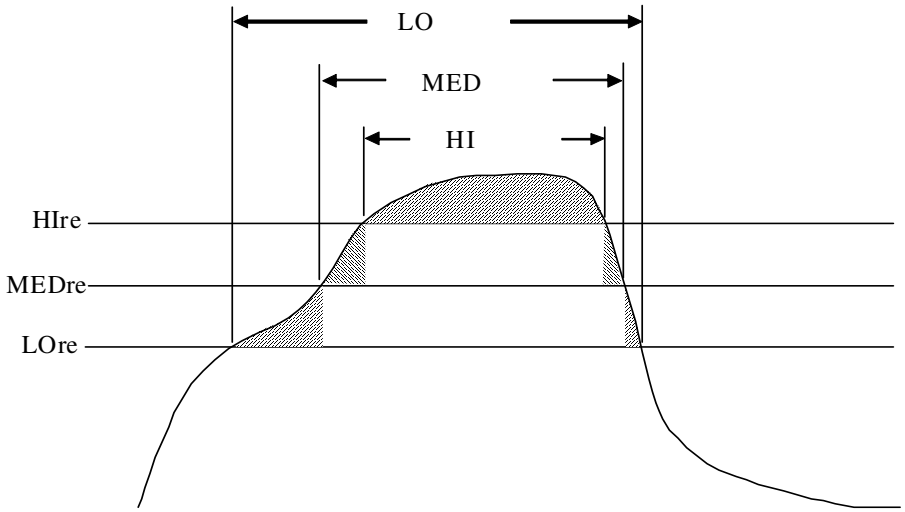
When the ***T Above Ref*** Tab is selected, the Data Table shows the amount of time each sensor measured data above the Temperature Reference Lines. Times are expressed as HH:MM:SS (H=hours, M=minutes, S=seconds) and are the total time above reference line regardless of when the value was above.



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.

The last column labeled ***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)

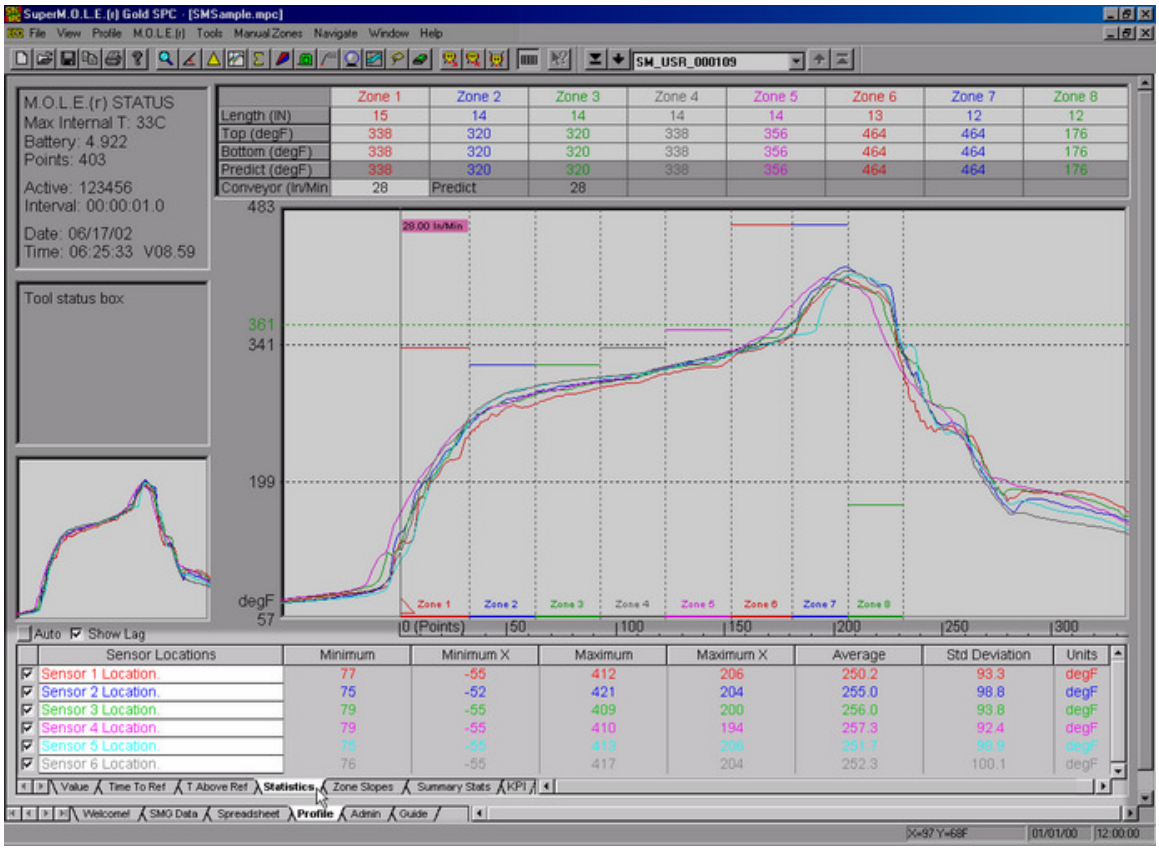
Finally, if only one temperature reference line is used, the equation is simply:

Cure Factor % = 100 * time/tat (which ever temp ref line you are using)

5.4.8.3.4 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.

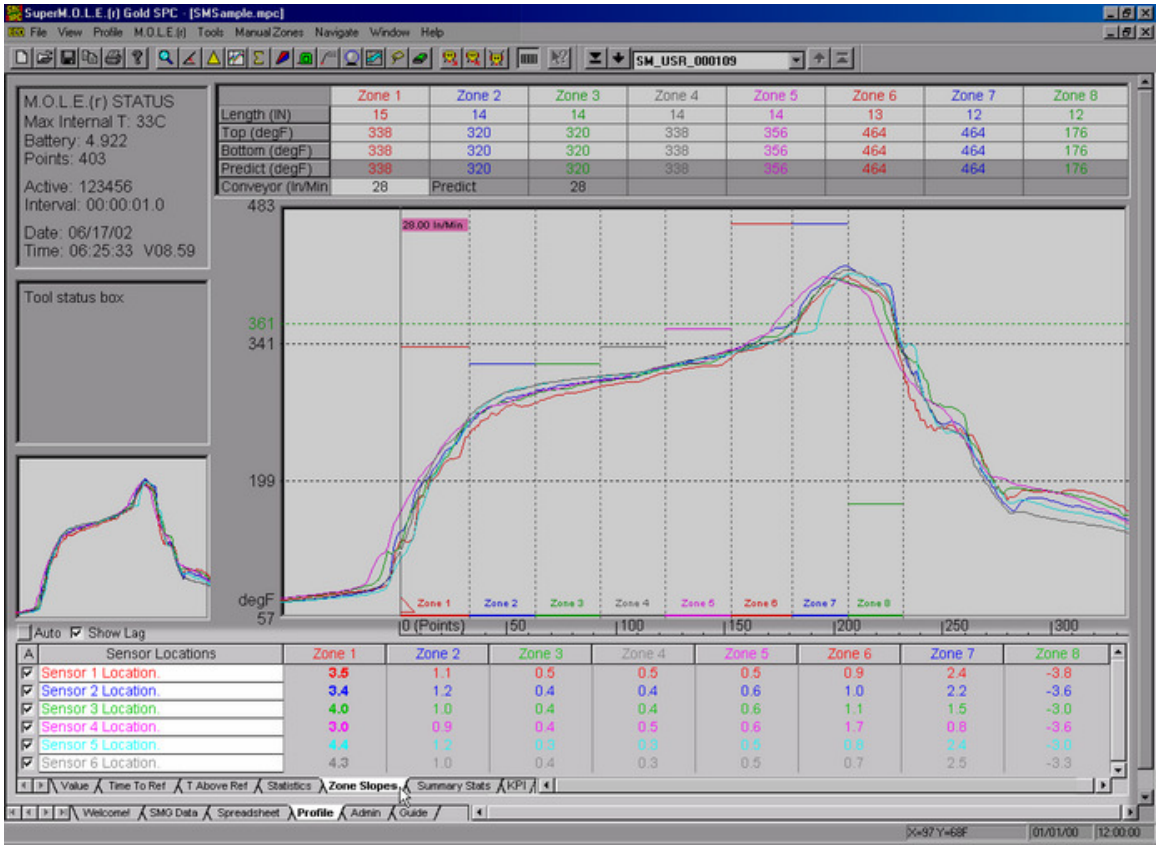


Statistics Data Tab

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.

5.4.8.3.5 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 1.

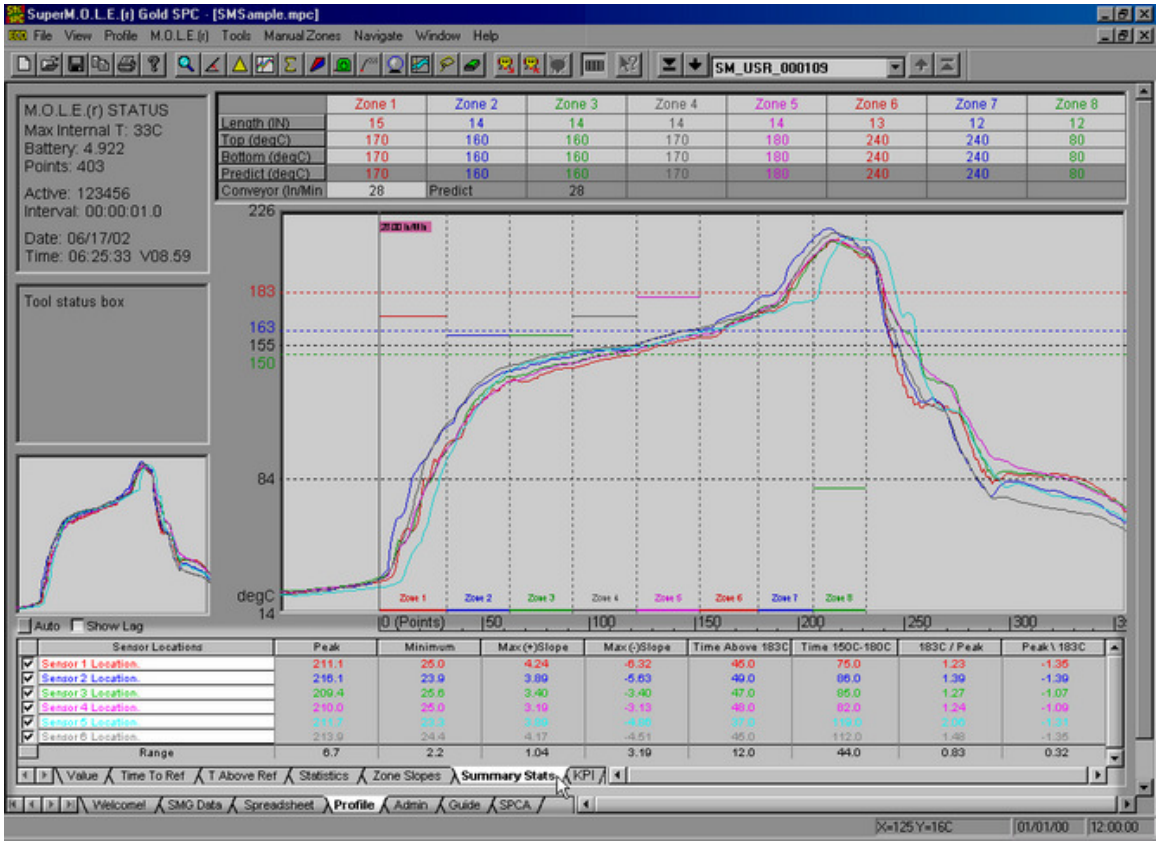


Zone Slopes Data Tab

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.

5.4.8.3.6 Summary Statistics

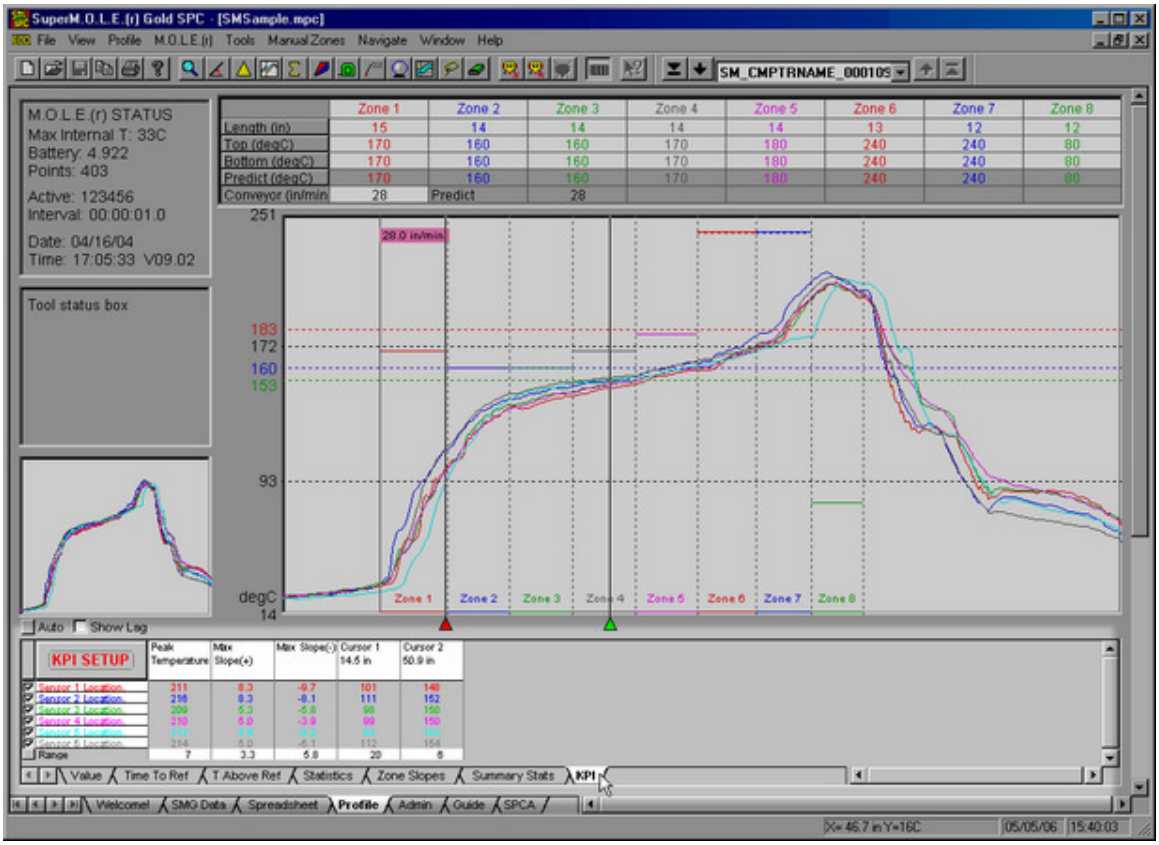
When ***Summary Stats*** is the active data tab, the Data Table displays a summary of primary statistics from the Profile. The summary statistics are always derived from the entire profile.



Summary Stats Data Tab

5.4.8.3.7 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.

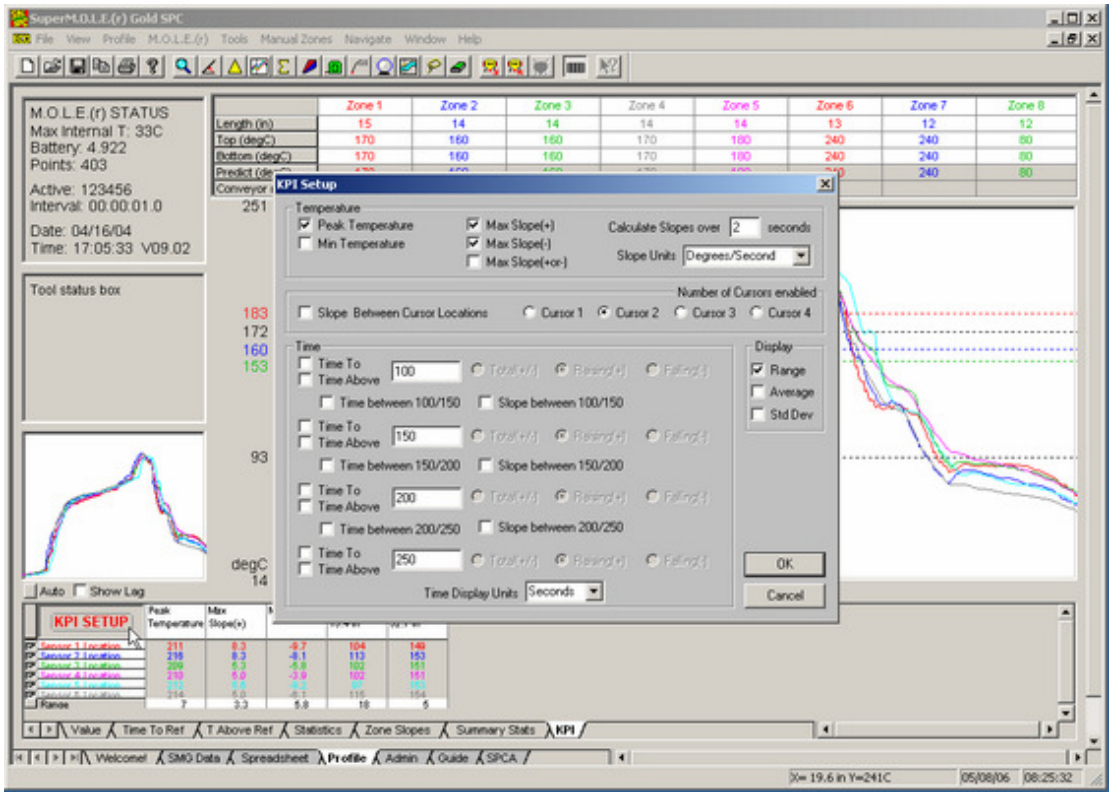


KPI Data Tab

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

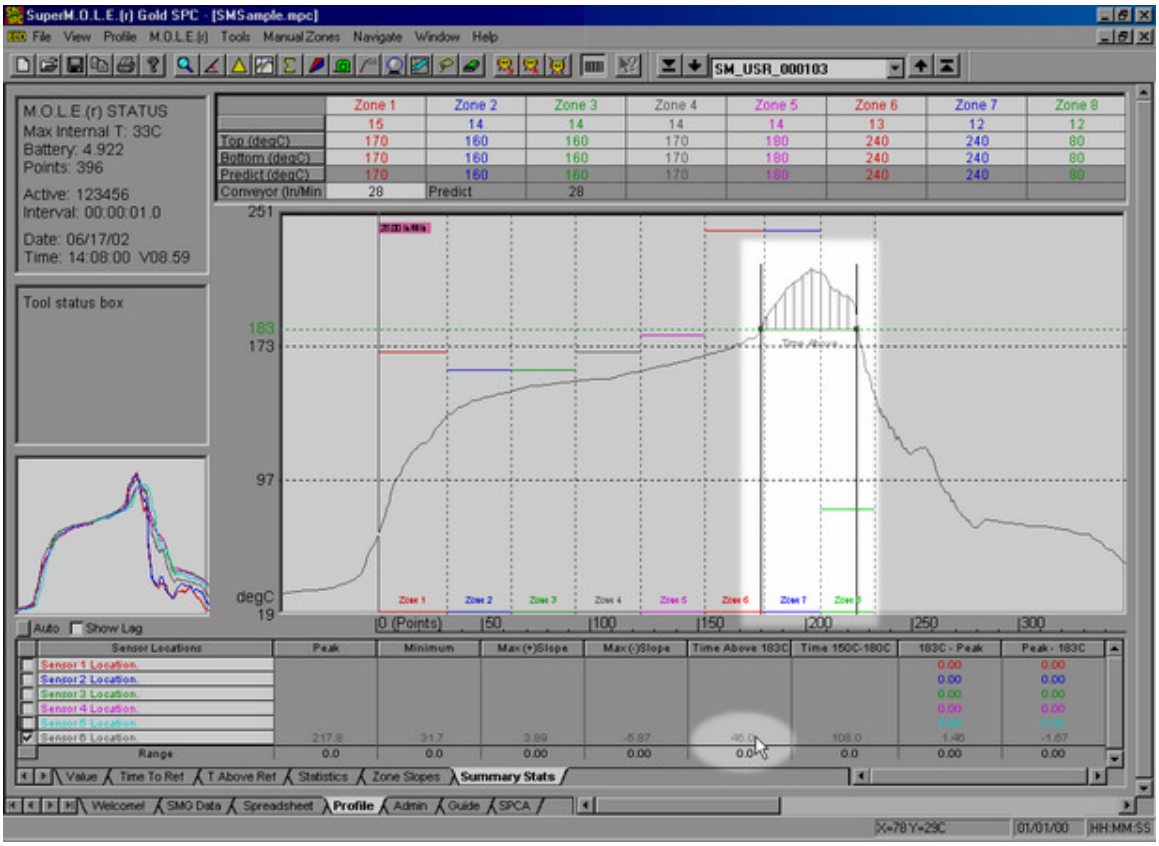
3) Click the desired parameters to display in the Data Table. The parameters are grouped by Temperature, Cursor data with slope between, and Time. The user can also select to display Range, Average and Standard Deviation rows for each of the columns.
4) When finished select the ***OK*** button to display 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.

5.4.8.4 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

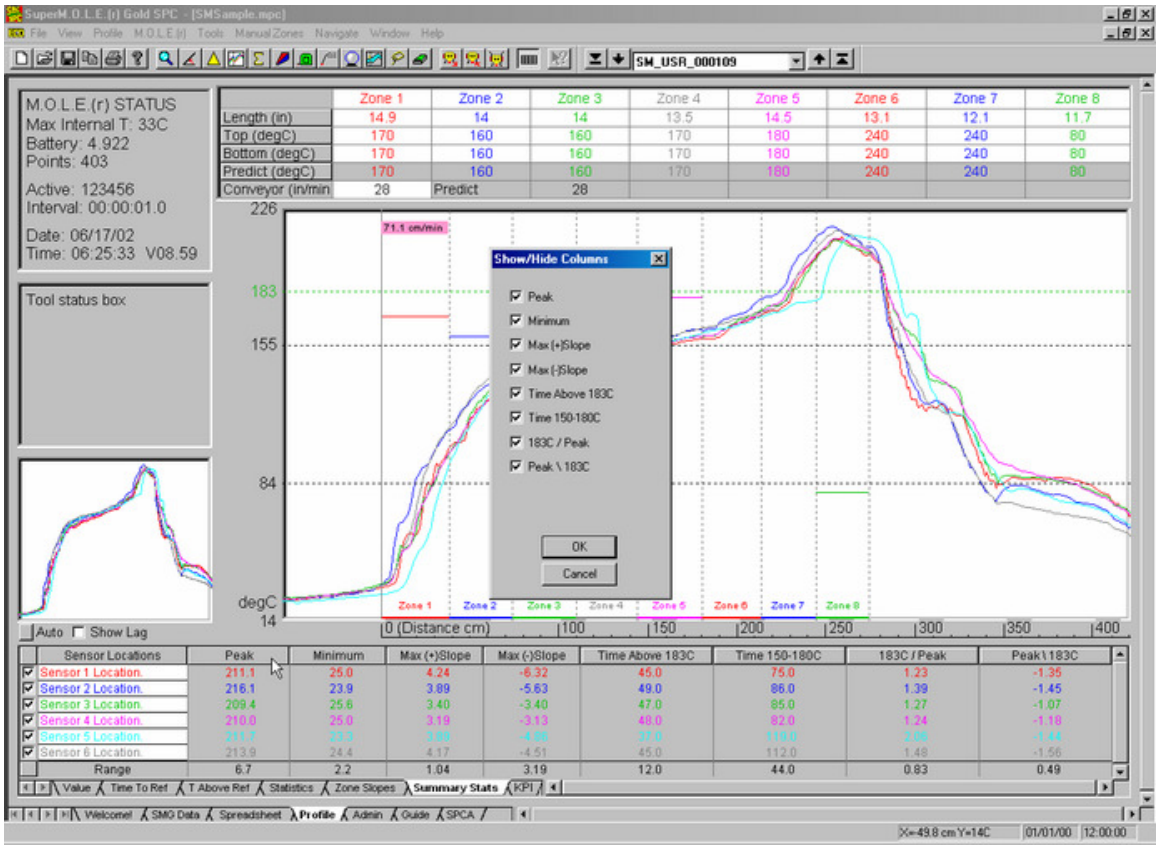
To display a Value Pop-up:

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.

5.4.8.5 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

<u>To display Show/Hide columns:</u>

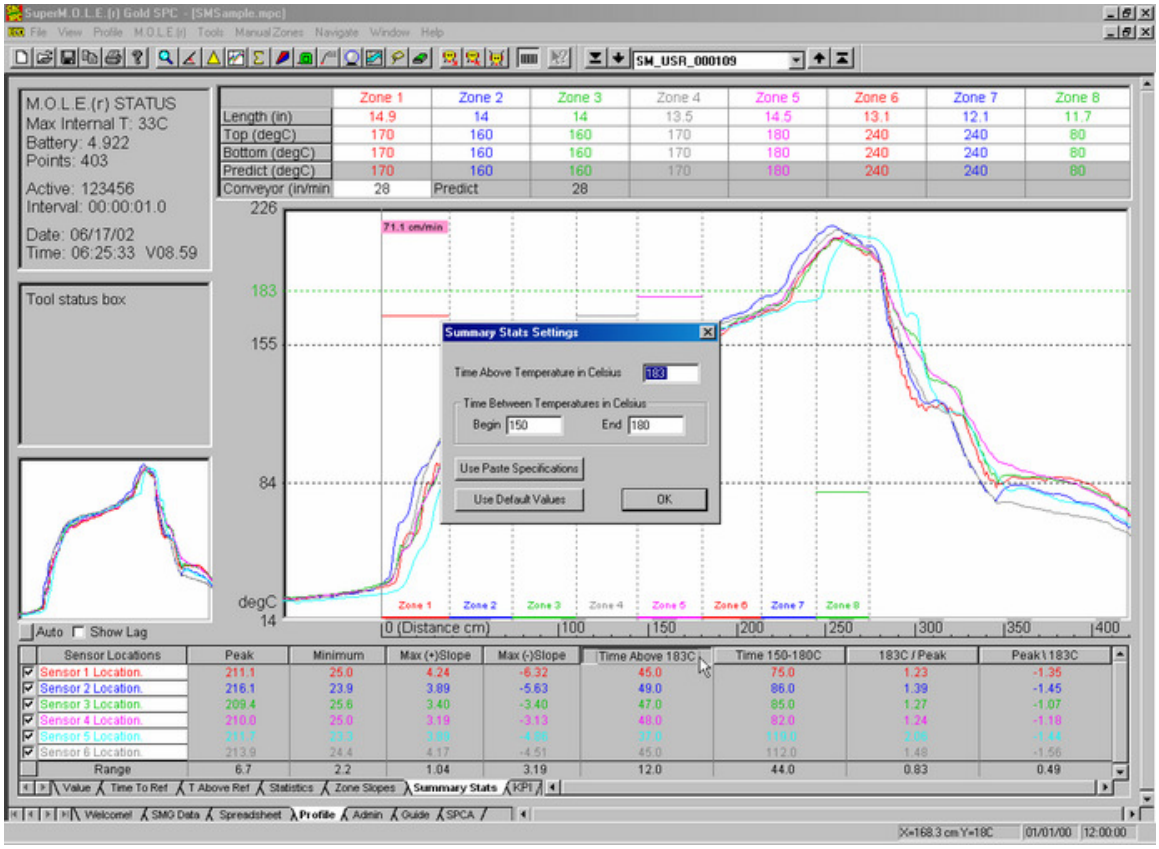
1) Select the Profile worksheet.
2) Right click a parameter column header.
3) Clear a parameter check box to hide or select to display.

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.

5.4.8.6 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.



Modify Summary Stat Settings

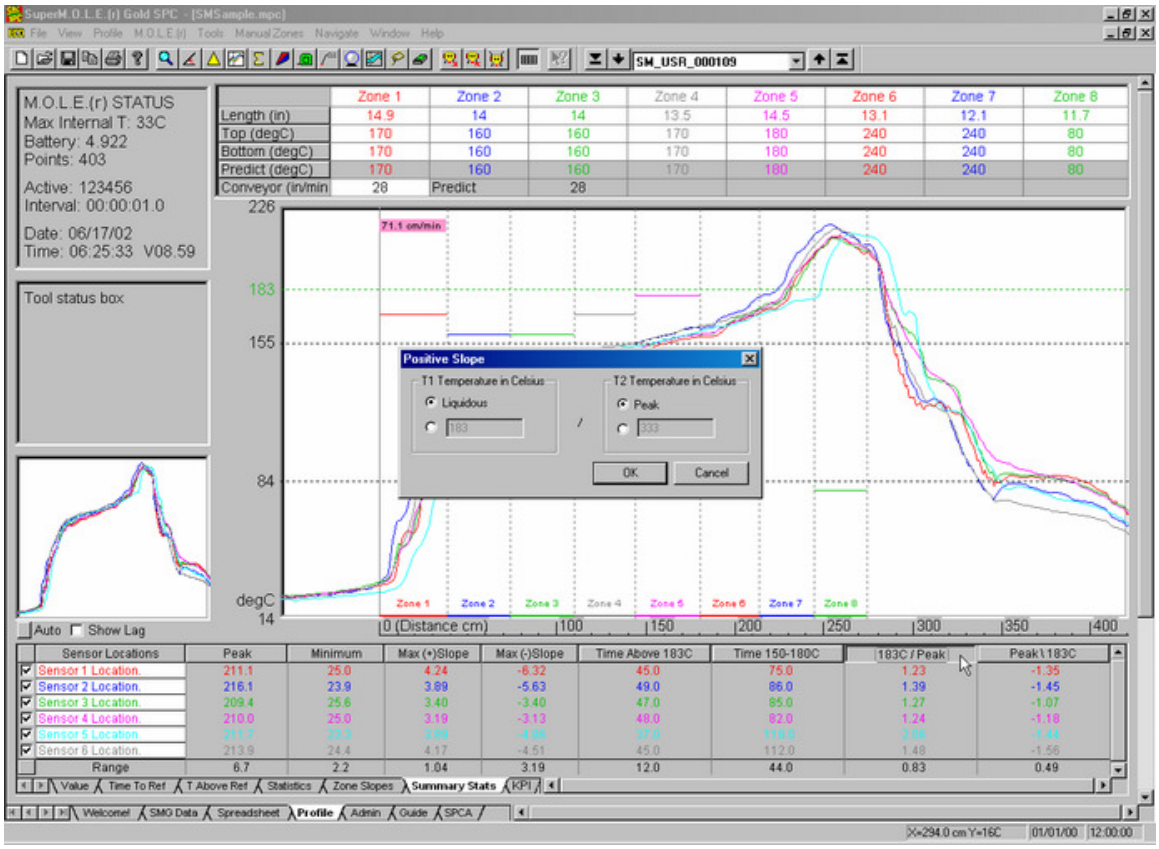
To Change Summary Stats Settings:

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.

5.4.8.7 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.



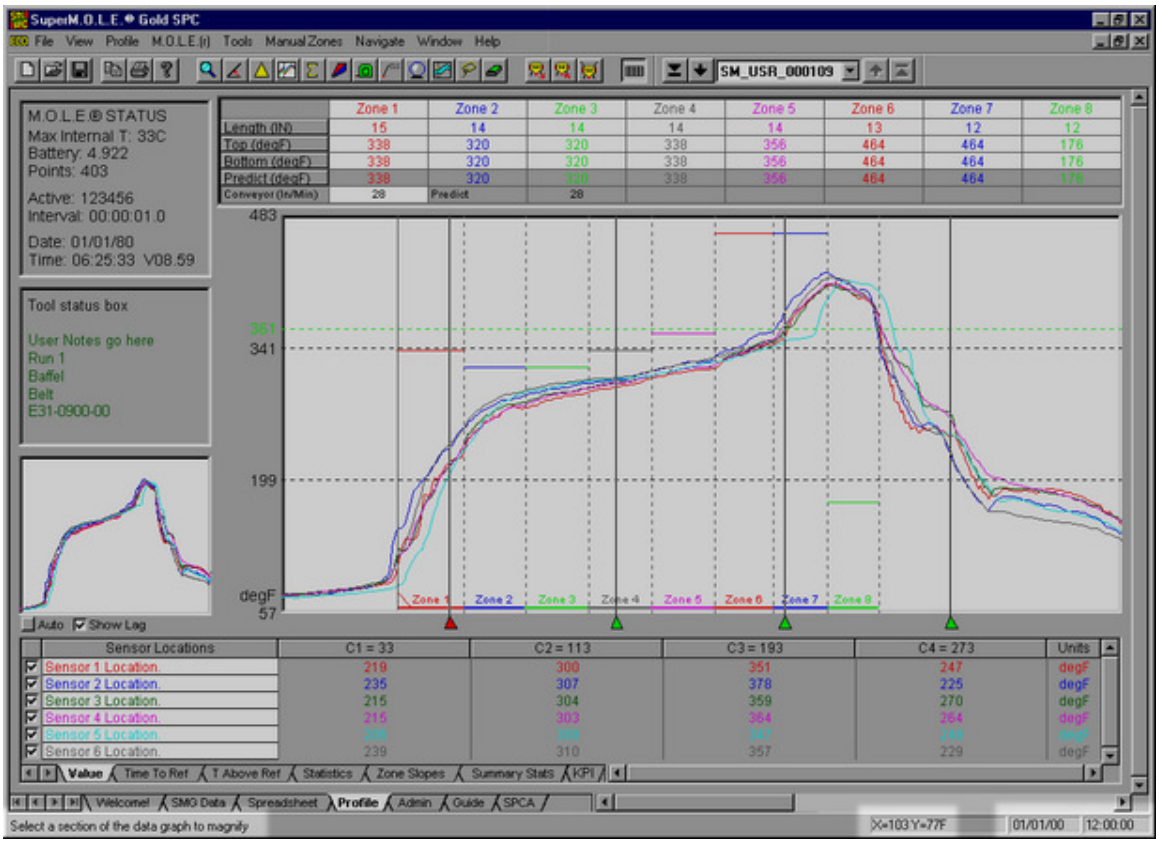
Slope Calculator

To Change Slope Calculator:

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.

5.4.9 Status Bar

The Status Bar displays the available Help information, X-Y positions of the mouse pointer, current date and time.



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.

5.4.10 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.

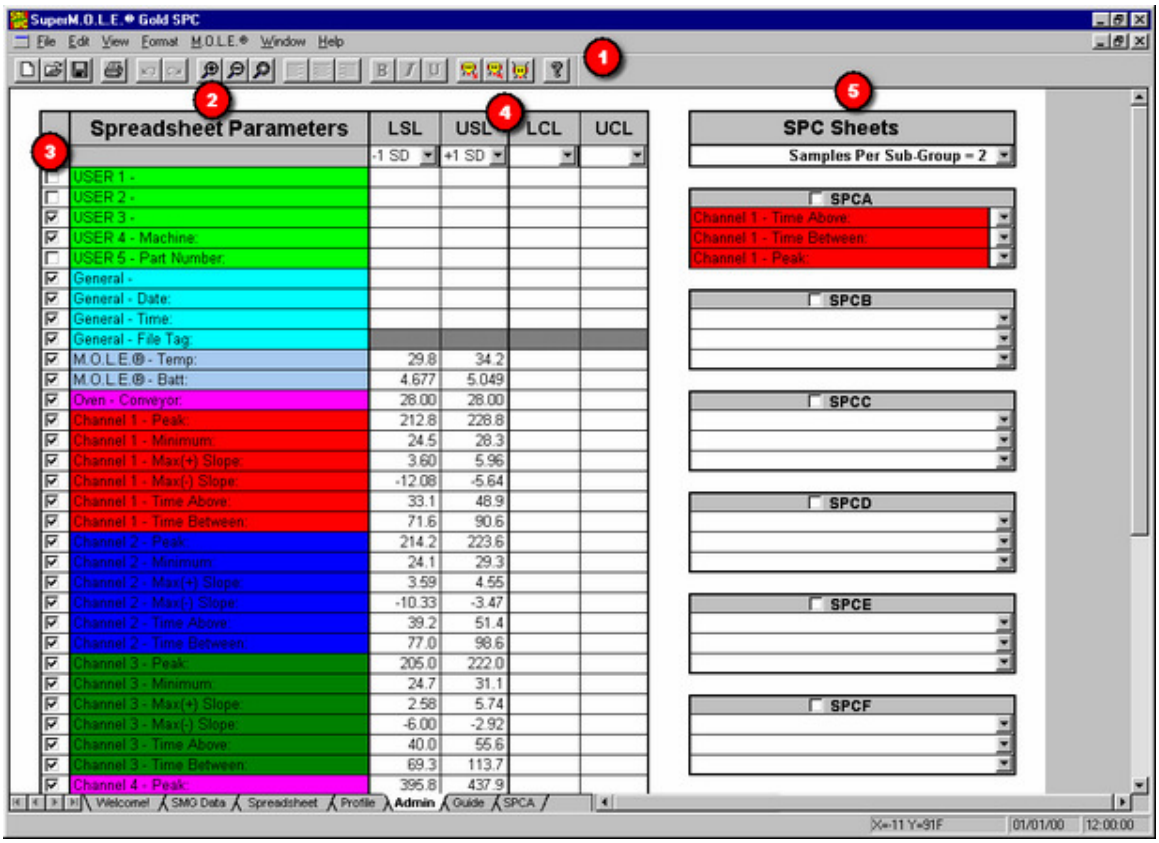
Copy Button

5.5 Administration Worksheet

The Administration worksheet is where all of the M.O.L.E. parameters are controlled. The parameters collected by the M.O.L.E. are in the Spreadsheet parameter column located on the left side of the worksheet. Each parameter has a check box for viewing (or not) on the Spreadsheet worksheet. The right side of the Admin worksheet contains SPC sheet setup boxes, for defining the SPC charts. There is also an option to specify LSL (Lower Specification Limits), USL (Upper Specification Limits), LCL (Lower Control Limits), and UCL (Upper Control Limits) in the cells located to the right of each parameter.

Admin Worksheet features:

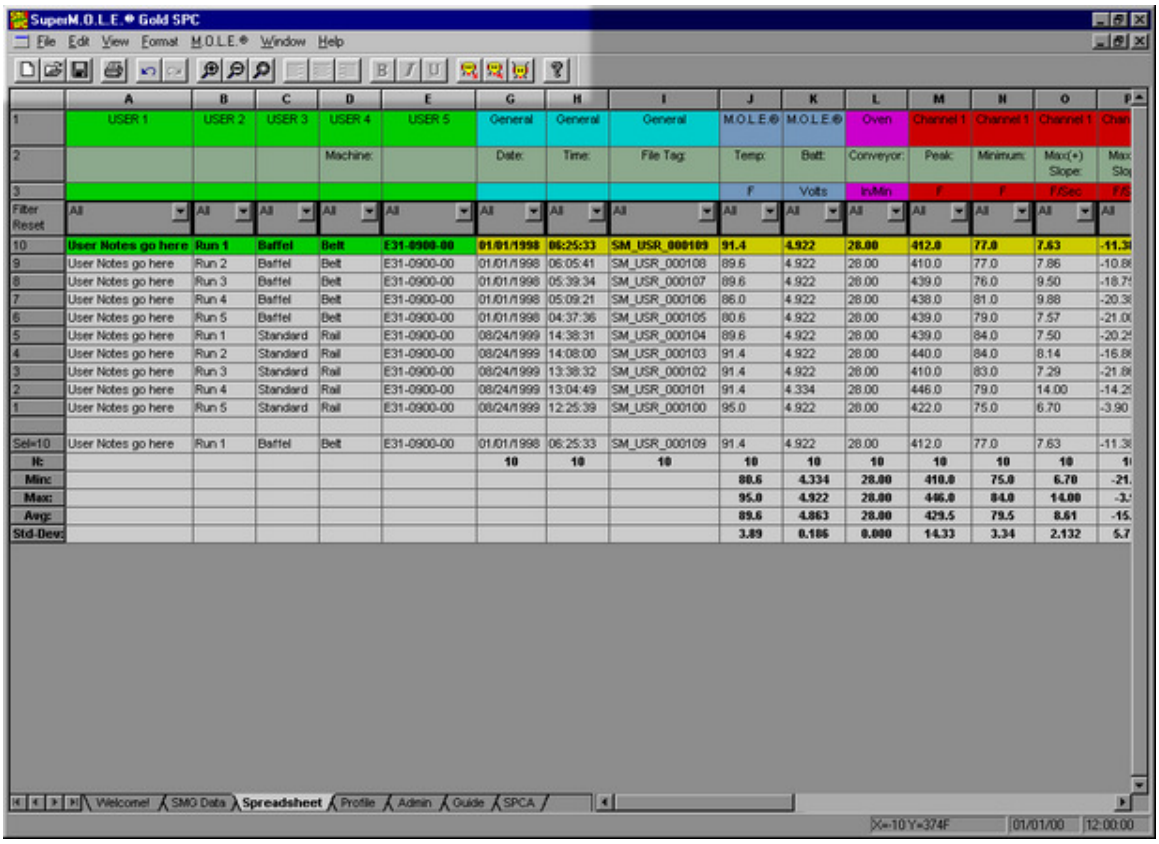
1. Menus and Toolbar buttons
2. Spreadsheet Parameters
3. Parameter Check Boxes
4. Spec and Control Limit Cells
5. SPC Sheet Parameter Boxes



Administration Worksheet

5.5.1 Admin(istration) Menus and Toolbar Buttons

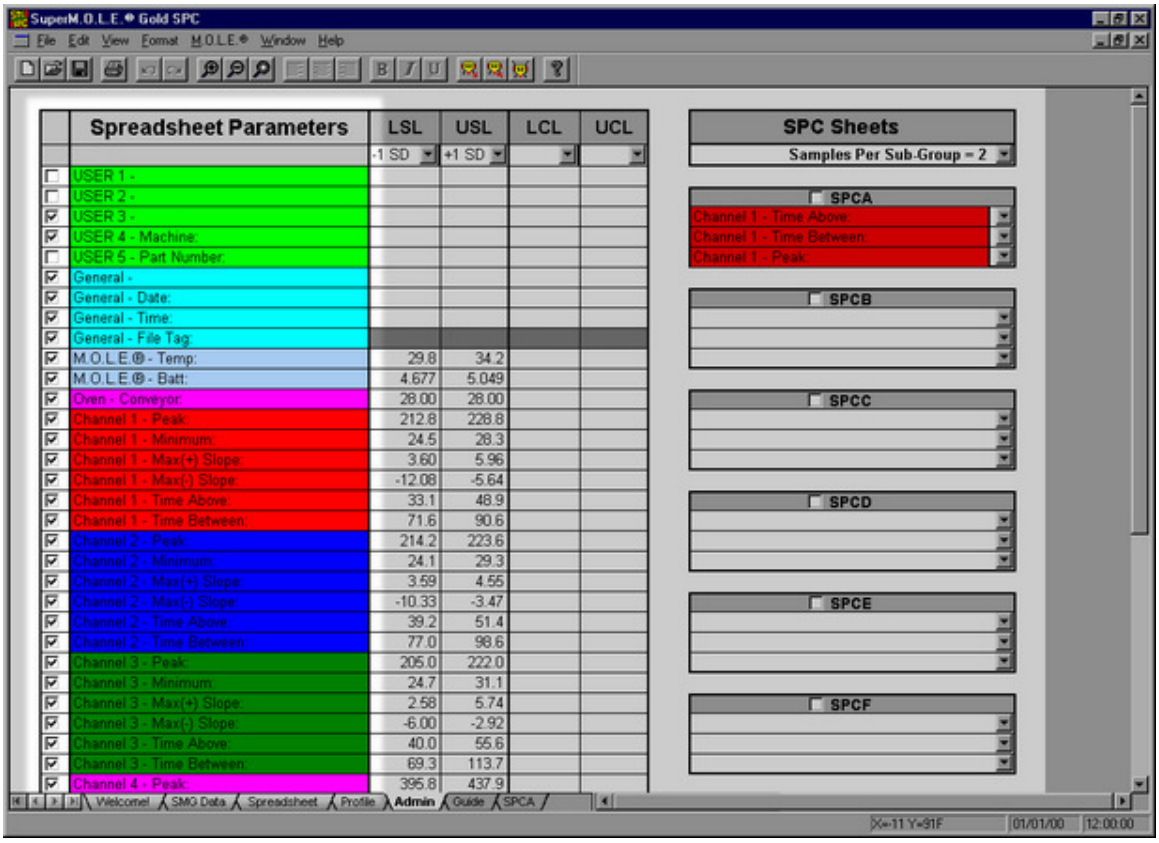
- **Menus:** File, Edit, View, Format, M.O.L.E., Window, and Help.
- **Toolbar buttons:** New, Open, Save Workbook, Print, Undo, Redo, Zoom In, Zoom Out, 100%, Align left, Center, Align right, Bold, Italic, Underline, Read M.O.L.E., Configure M.O.L.E., Receive RF, and About.



Admin Worksheet Menu Bar and Tool Buttons

5.5.2 Spreadsheet Parameters

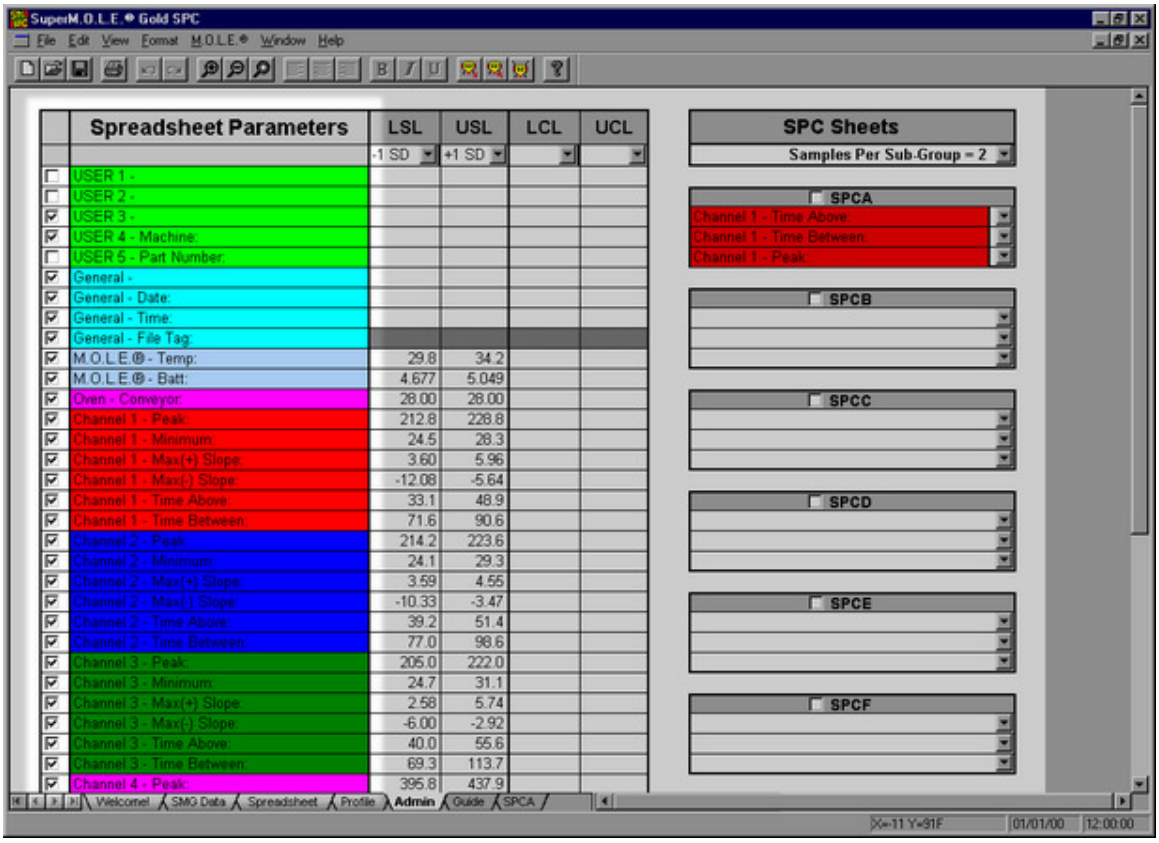
The Spreadsheet Parameters are arranged in a column that contains all of the parameters that the M.O.L.E. collects during a data run. The parameters are arranged by colors as described in ***Parameter Groups***. Each cell has the Group Parameter listed first and the Label Parameter listed second.



Spreadsheet Parameters Defined

5.5.3 Parameter Check Boxes

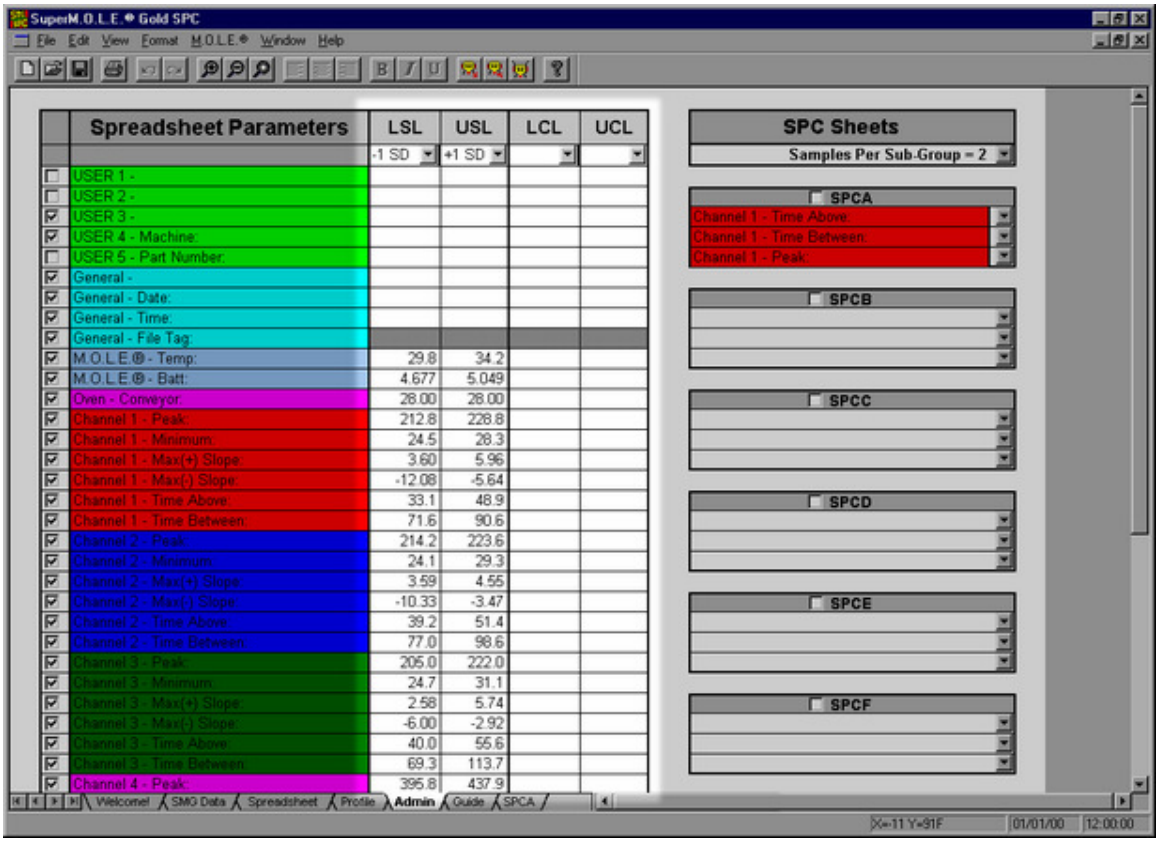
Each Spreadsheet Parameter on the Admin worksheet has a check box located on the left. To display a parameter on the Spreadsheet worksheet, click the corresponding check box. Similarly if you do not want to view the parameter, remove the check mark by clicking the check box.



Parameter Check Boxes

5.5.4 Specification and Control Limit Cells

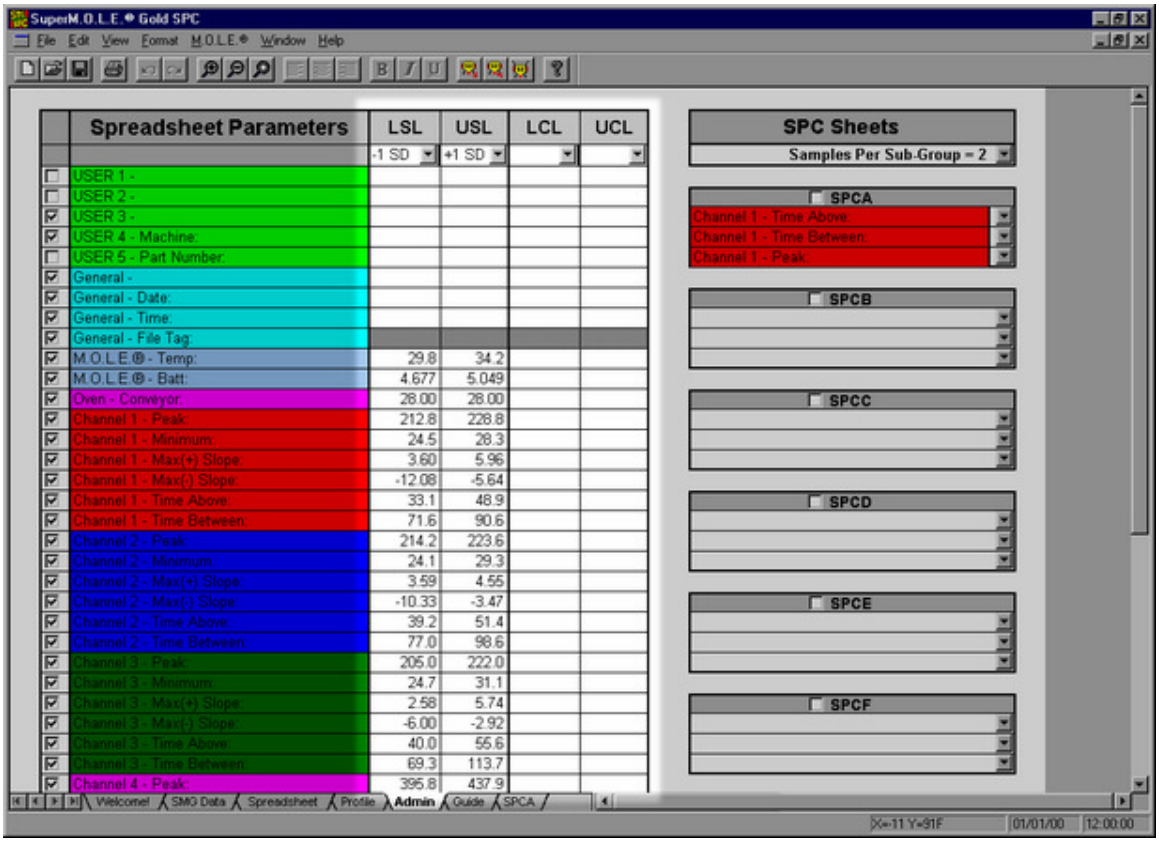
There are cells to the right of each parameter for specifying an LSL (lower specification limit) and an USL (upper specification limit) for each parameter. The user can also specify an LCL (upper control limit) and UCL (upper control limit) to be applied to a SPC chart.



Control Limit Cells

5.5.4.1 LSL and USL Cells

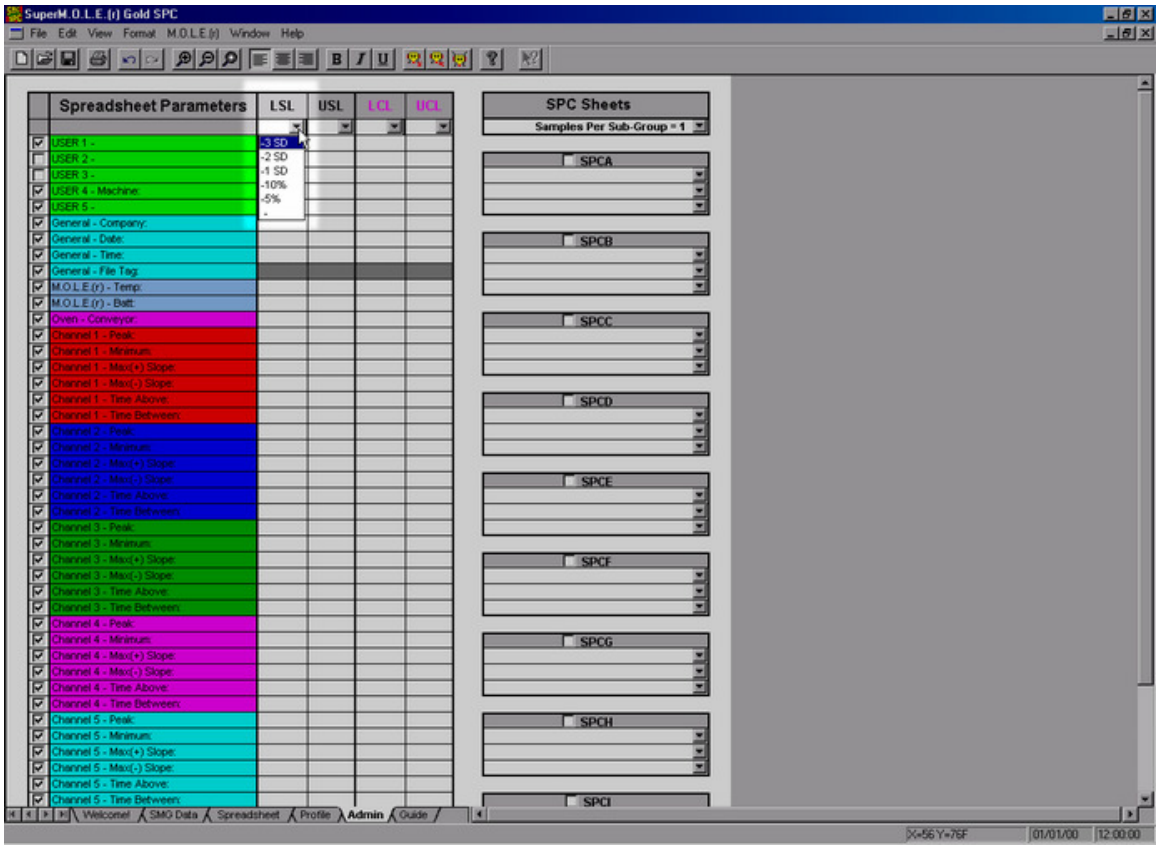
These limits notify the user if the parameter is above or below the LSL or USL during a data run. When a parameter is below the user specified LSL, it appears on the SMG Data worksheet in **blue** and will be underlined. When a parameter is above the user specified USL it appears on the SMG Data worksheet in **red** and will be underlined.



User Specified Specification Limits

5.5.4.2 User Controlled LSL and USL

The user can automatically set a LSL and USL for each parameter by using a drop down list box that contains options to set the LSL to -3, -2, -1, standard deviation or –10% and –5%. The USL can be set to +3, +2, +1 standard deviation or +10% and +5%.

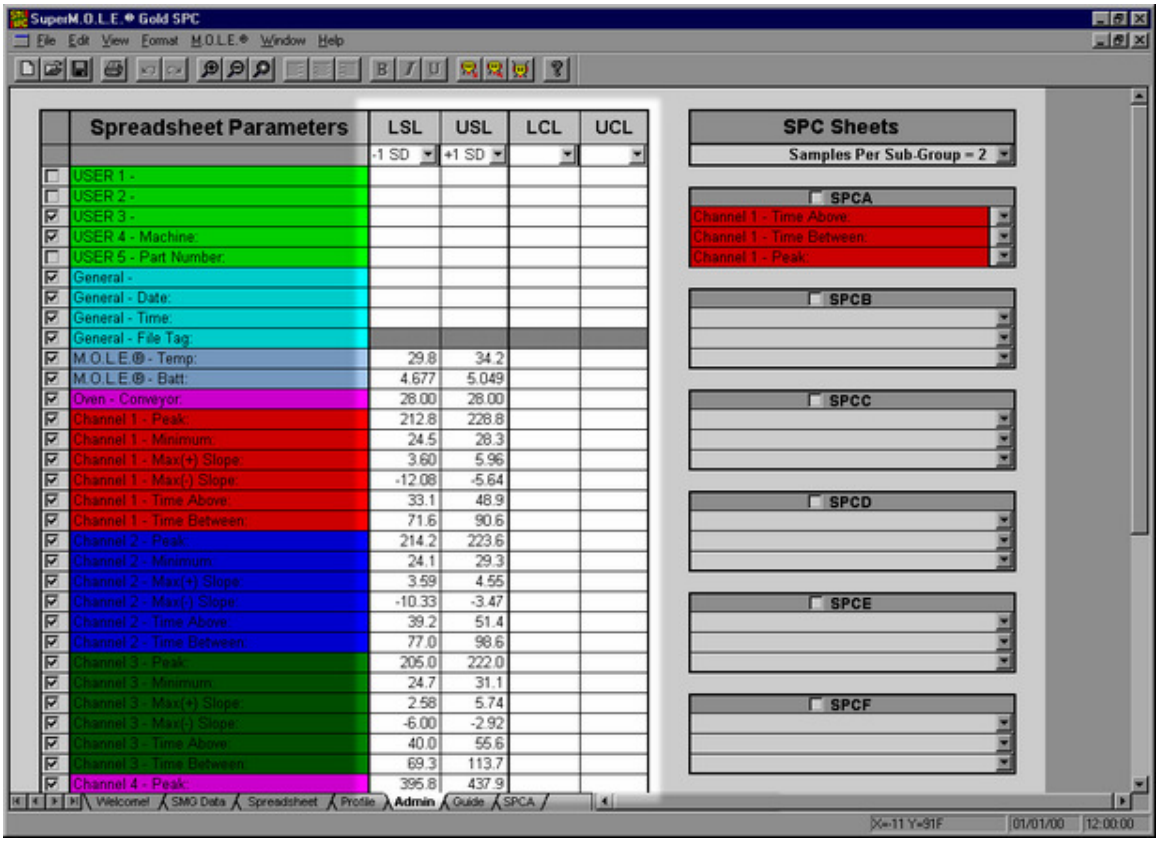


User Controlled LSL and USL

The values calculated are taken from the current data viewed on the Spreadsheet worksheet.

5.5.4.3 LCL and UCL Cells

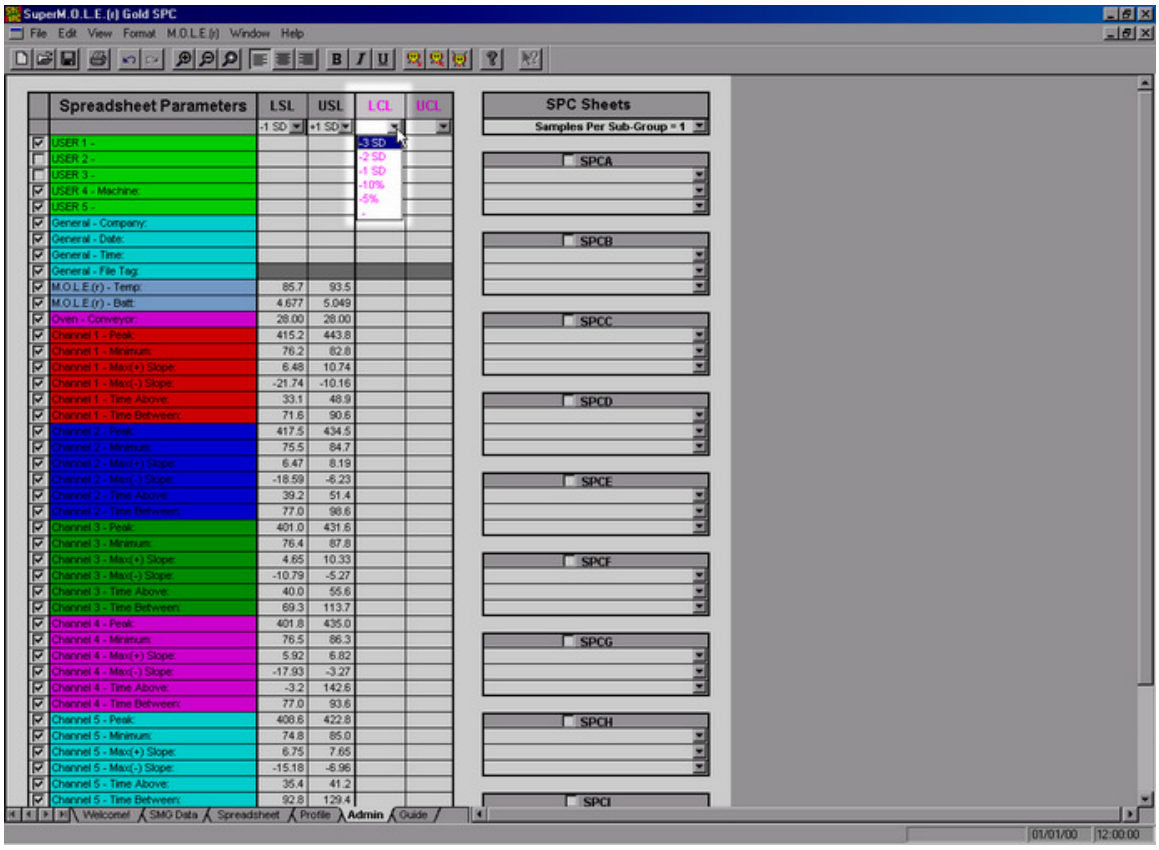
Lower and Upper control limits are automatically calculated from the Spreadsheet parameter data and displayed on the SPC control charts when an SPC worksheet is created. The LCL and UCL cells allow the user to override the calculated limits and manually set them.



User Specified Control Limits

5.5.4.4 User Controlled LCL and UCL

The user can automatically set a LCL and UCL for each parameter by using a drop down list box that contains options to set the LCL to -3, -2, -1, standard deviation or –10% and –5%. The UCL can be set to +3, +2, +1 standard deviation or +10% and +5%.

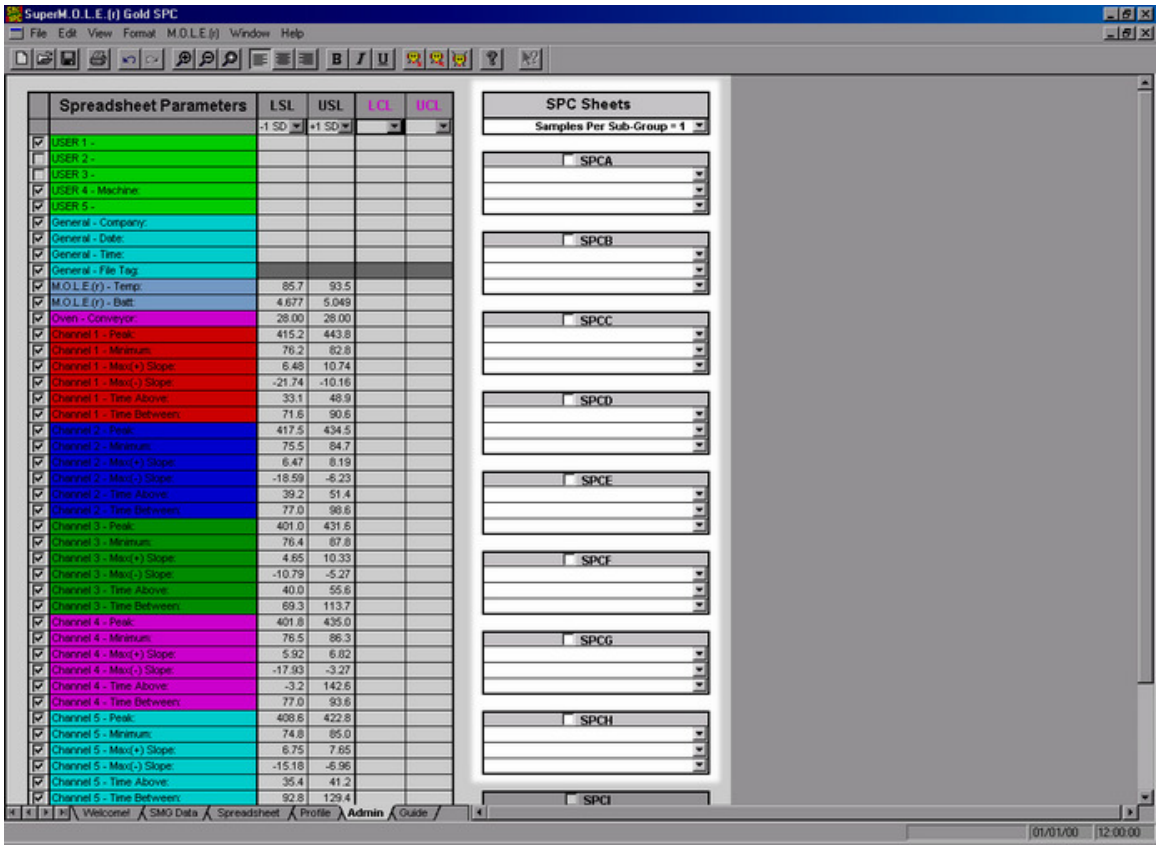


User Controlled LCL and UCL

The values calculated are taken from the current data viewed on the Spreadsheet worksheet.

5.5.5 SPC Sheet Boxes

The right side of the Admin worksheet contains nine SPC sheet boxes. These boxes are used to create the SPC worksheets.

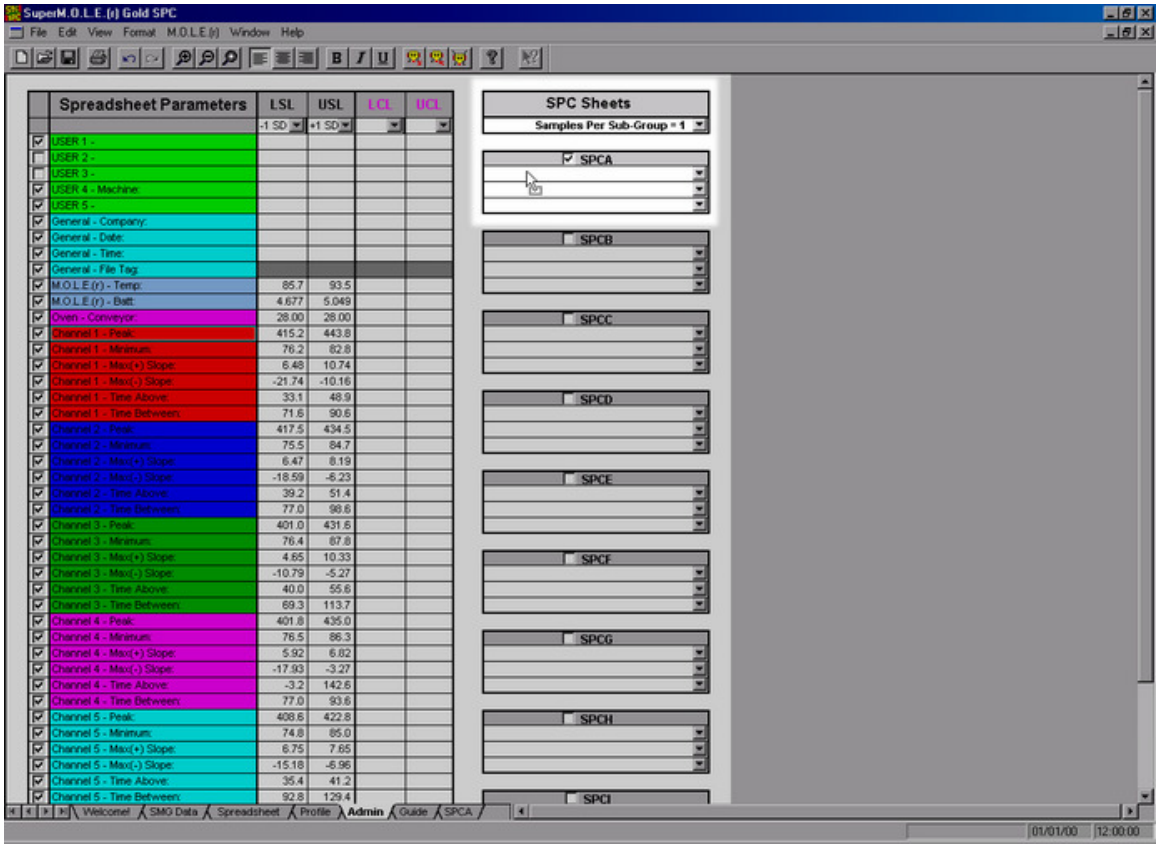


SPC Sheet Boxes

An SPC worksheet can be created by dragging and dropping a parameter or by using the drop down list box.

To create a SPC Worksheet:

- **Drag and Drop:**
  1) Select a parameter and drag it from the Spreadsheet Parameter column and drop it into a SPC Sheet cell. Up to three parameters per SPC Sheet can be selected.

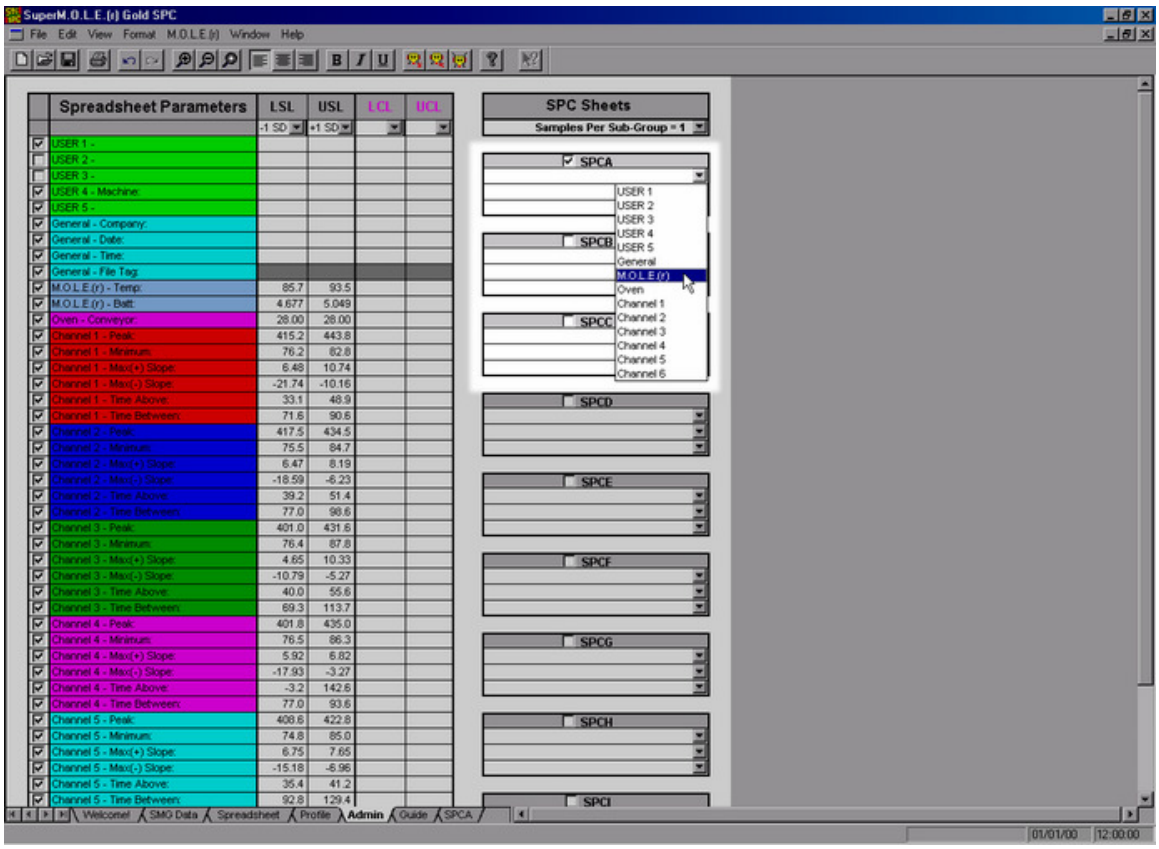


Drag and Drop Parameter

  2) When finished, click the check box in the SPC Sheet Label to activate the SPC sheet.
  3) To view the SPC Sheet, click the new SPC worksheet tab. See ***SPC Worksheet*** for more details.

- **Parameter list:**

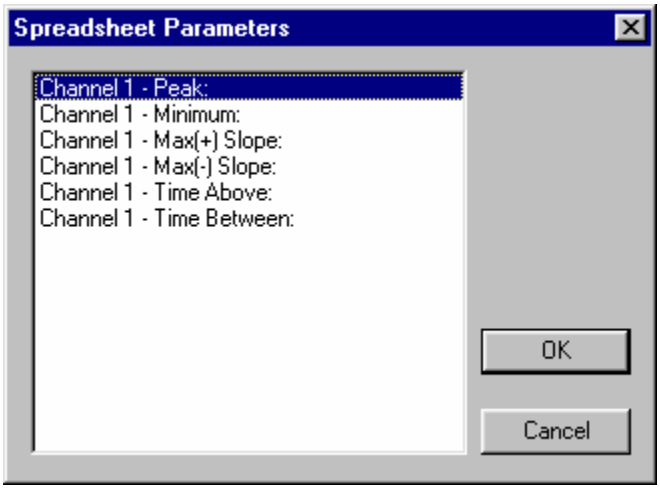
1) All of the SPC sheet boxes have drop down list boxes located on the right side of the parameter cell. To select a parameter click the drop down list box arrow button and a list of parameter groups appears.



Drop Down List Box

2) Select the group from the drop down list that includes the desired parameter. A dialog box appears listing all of the parameters in that particular group.

3) Select the desired parameter from the list and click the ***OK*** command button.



Parameter Dialog Box

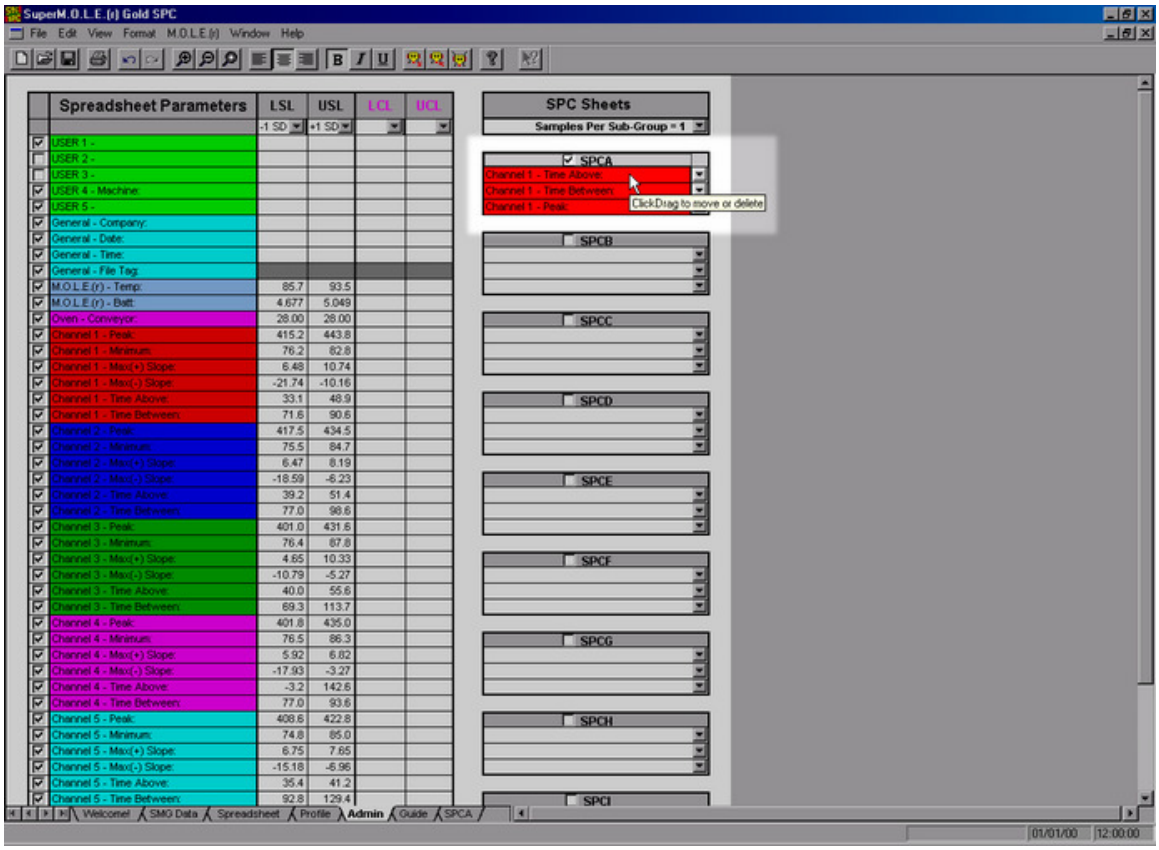
4) When finished, click the check box in the SPC Sheet Label to activate the sheet.

5) To view the SPC Sheet, click the new SPC worksheet tab. See ***SPC Worksheet*** for more details.

• **Replacing and Deleting SPC Parameters:**
To change the parameters in the SPC Sheet boxes, drag and drop a different parameter over of the existing parameter or repeat the drop down list method of selecting a parameter.

To delete a parameter:

1) Click and drag the parameter off the SPC Sheet box to remove.



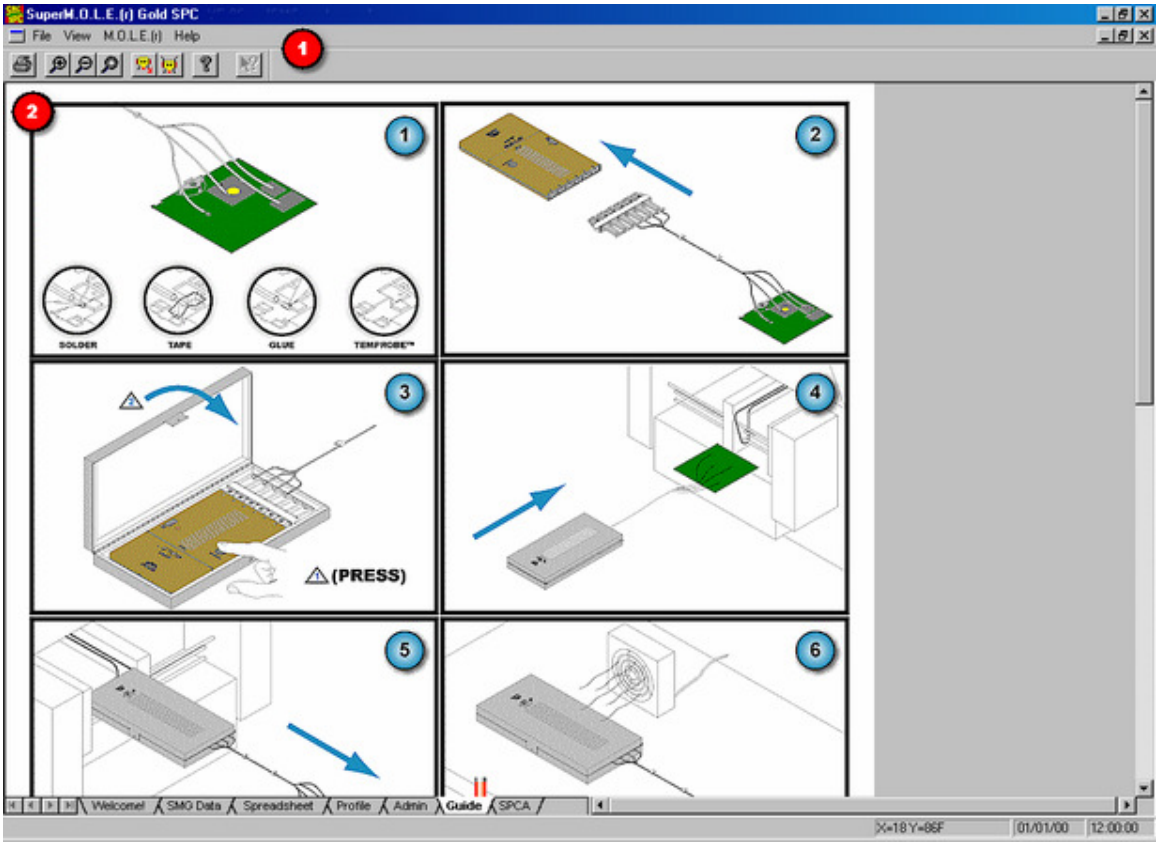
Erase Bar

5.6 Guide Worksheet

The Guide worksheet is a quick reference guide to assist new and experienced users through basic operation steps.

Guide worksheet features:

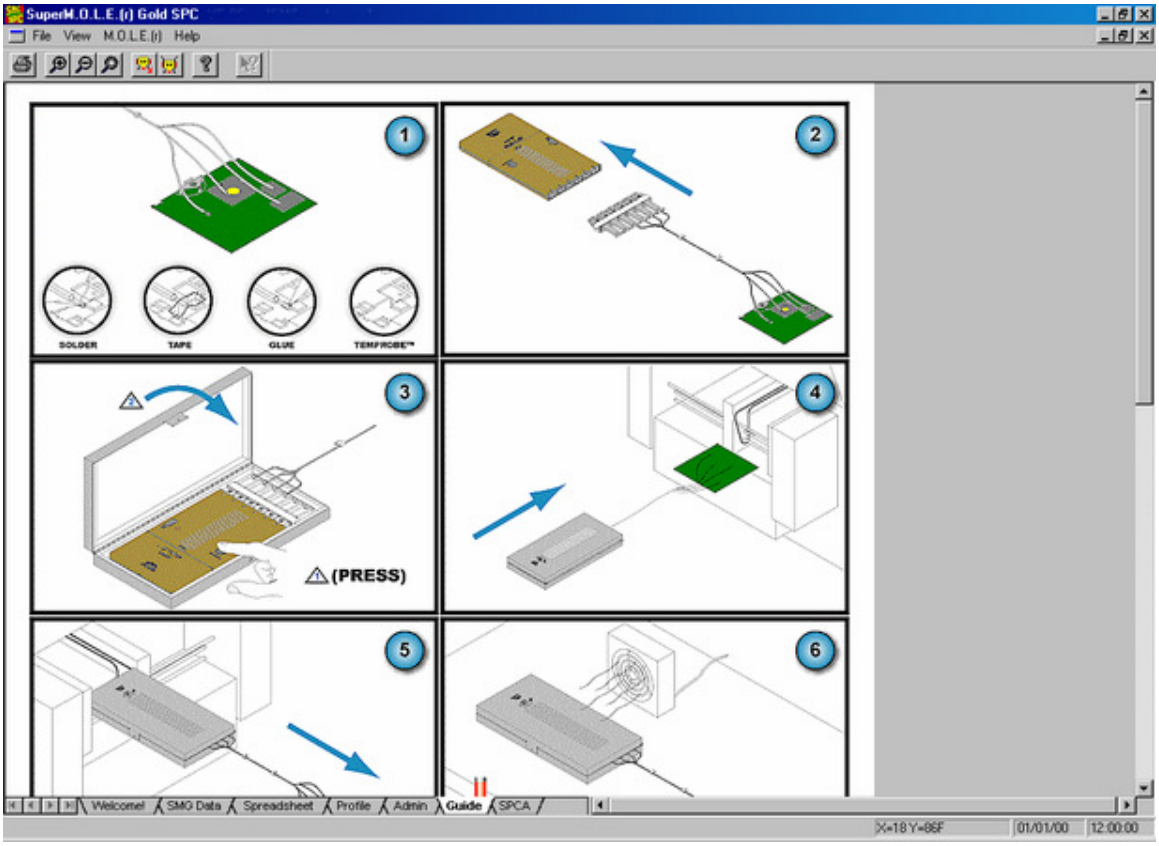
1. Menus and Toolbar buttons
2. Quick Reference Guide



Guide Worksheet

5.6.1 Guide Worksheet Menus & 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.



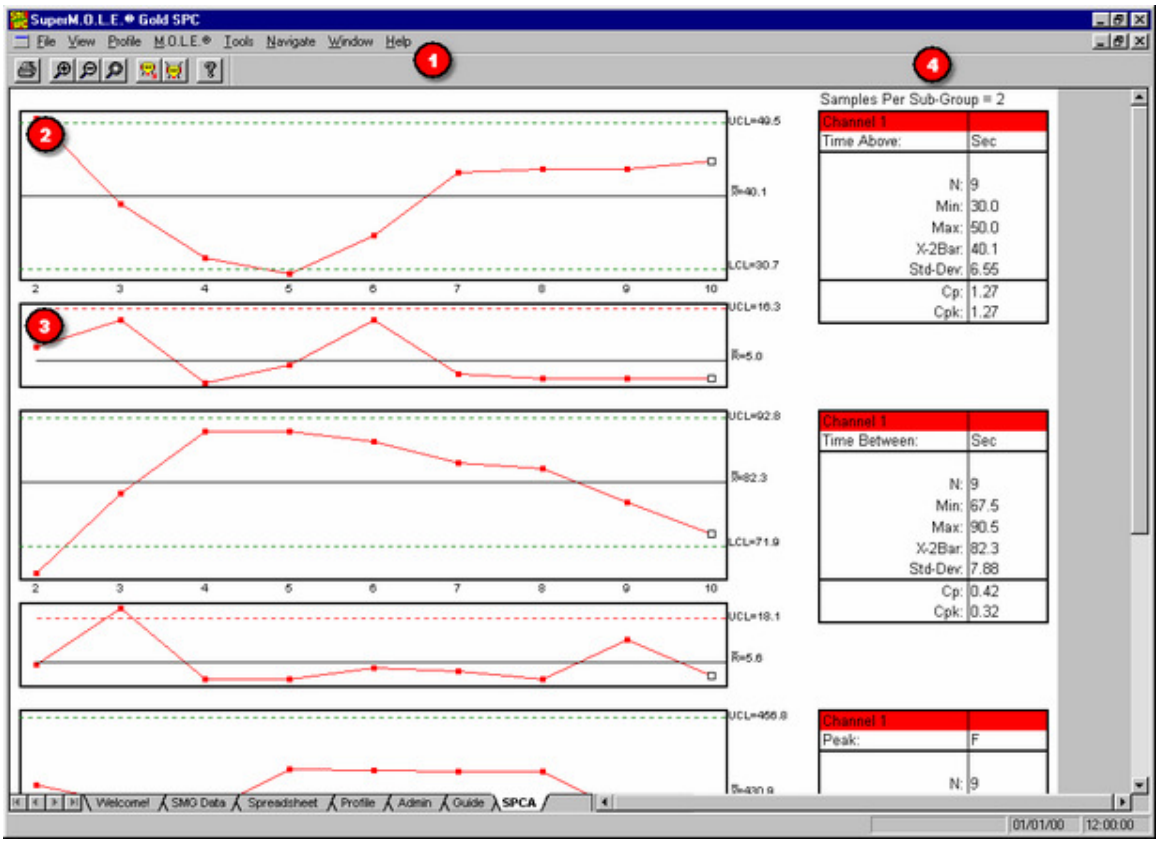
Welcome Worksheet Menus and Toolbar Buttons

5.7 SPC Worksheet

The SPC worksheets display the assembled Spreadsheet parameters using the Admin worksheet. Each SPC worksheet can display three X-bar and R charts and up to a maximum of nine SPC worksheets can be created.

SPC worksheet features:

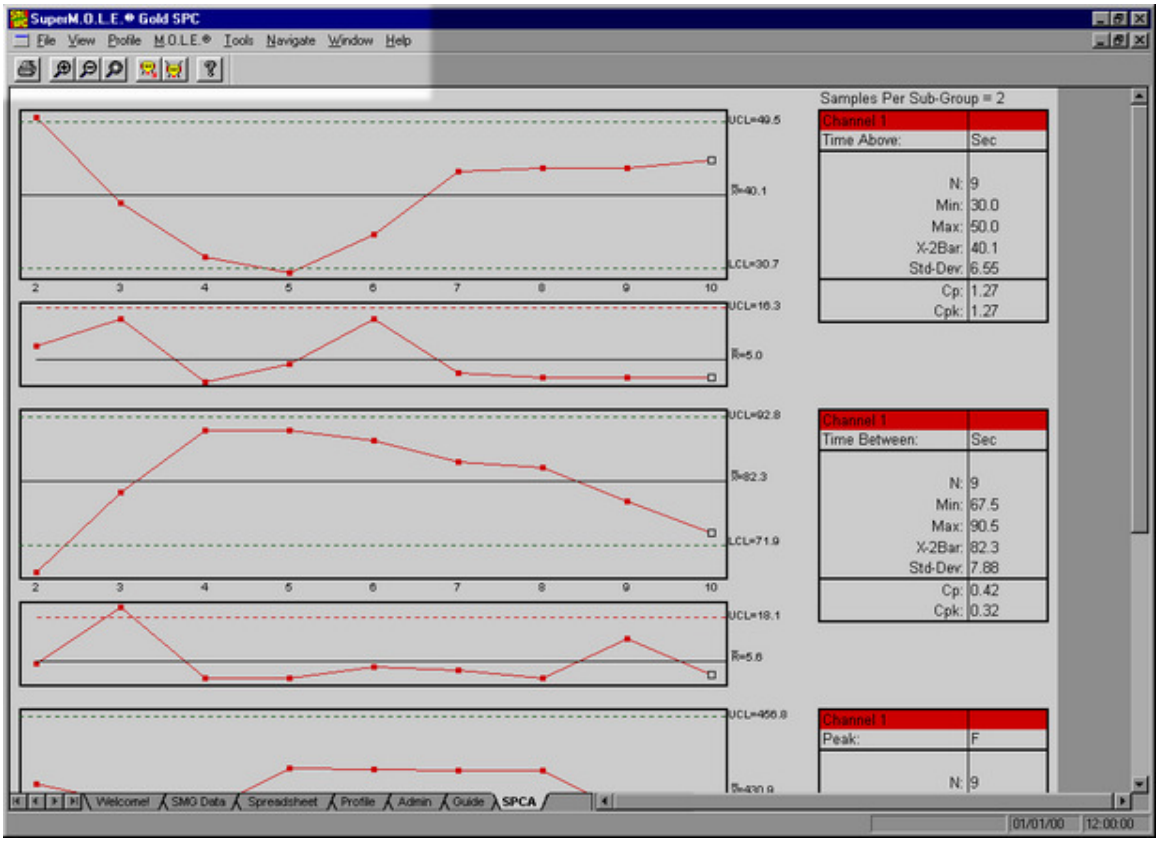
1. Menus and Toolbar buttons
2. X-Bar Chart
3. R Chart
4. Statistics box



SPC Worksheet

5.7.1 SPC Worksheet Menus & Toolbar

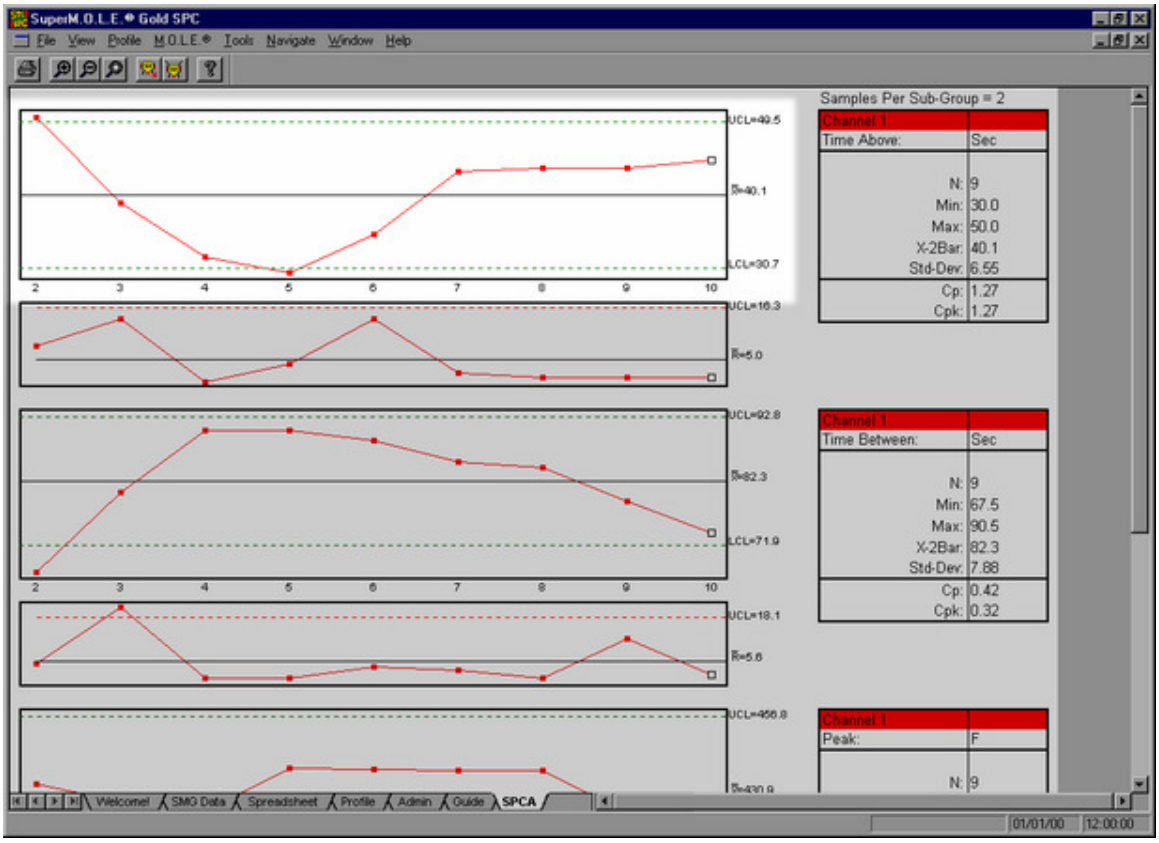
- **Menus:** File, View, Profile, M.O.L.E., Window, and Help.
- **Toolbar buttons:** Print, Zoom In, Zoom Out, 100%, Read M.O.L.E., Receive RF, and About.



SPC Worksheet Menu Bar and Tool Buttons

5.7.2 X-Bar Chart

The X-Bar Chart is the graphical chart produced from samples of a selected parameter. The chart uses a rolling average of 2 through 6 sample points specified by the user. The X-bar is the average of the data samples and the UCL and LCL are calculated using a formula based on the Range data.



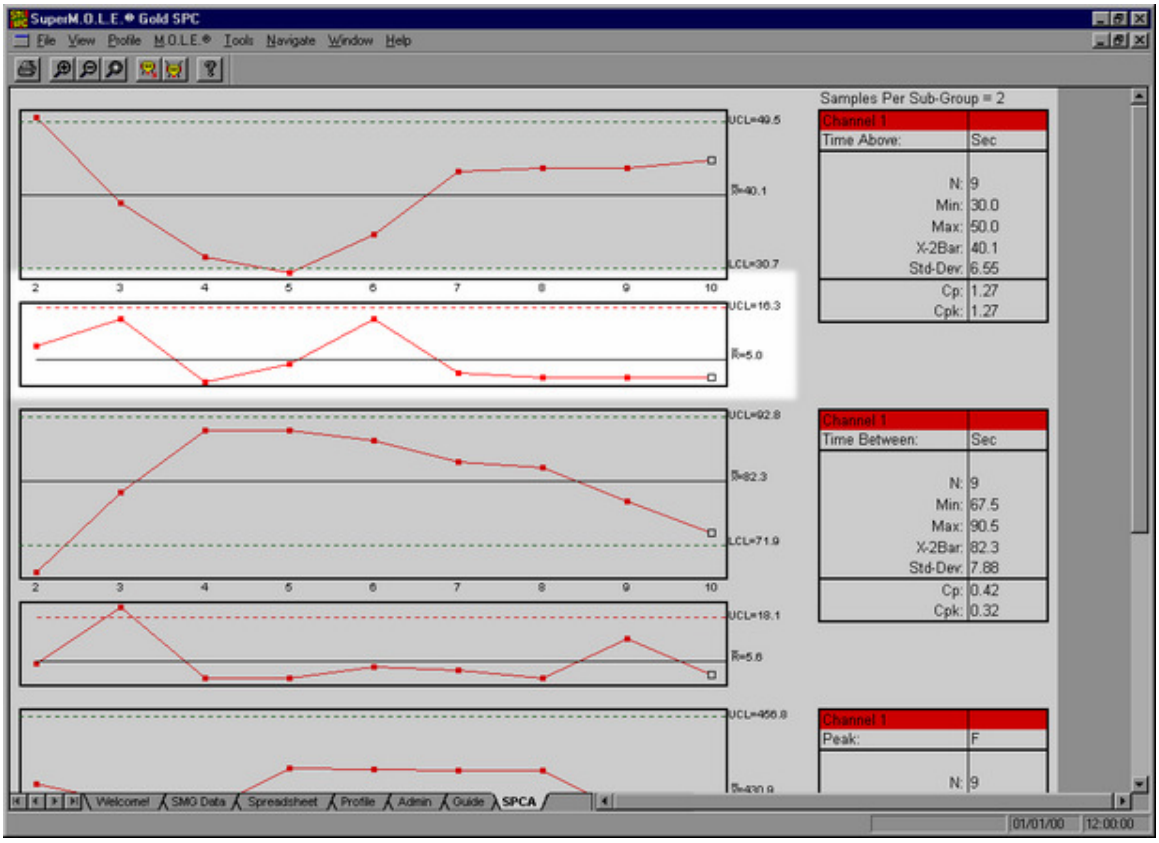
X-Bar Chart

The calculation numbers vary depending on the data in the Spreadsheet worksheet. Using the filter function or the hide command allows the user to select the specific data runs to include on the SPC chart.

5.7.3 R Chart

The R Chart is the graphical chart produced from the selected parameter. The R-Bar is the averages of the range samples.

If the Sub-Group size is set to 1, the R chart becomes a moving range (mR) chart. The moving range is the difference between a specified X value and the one preceding it.



R Chart

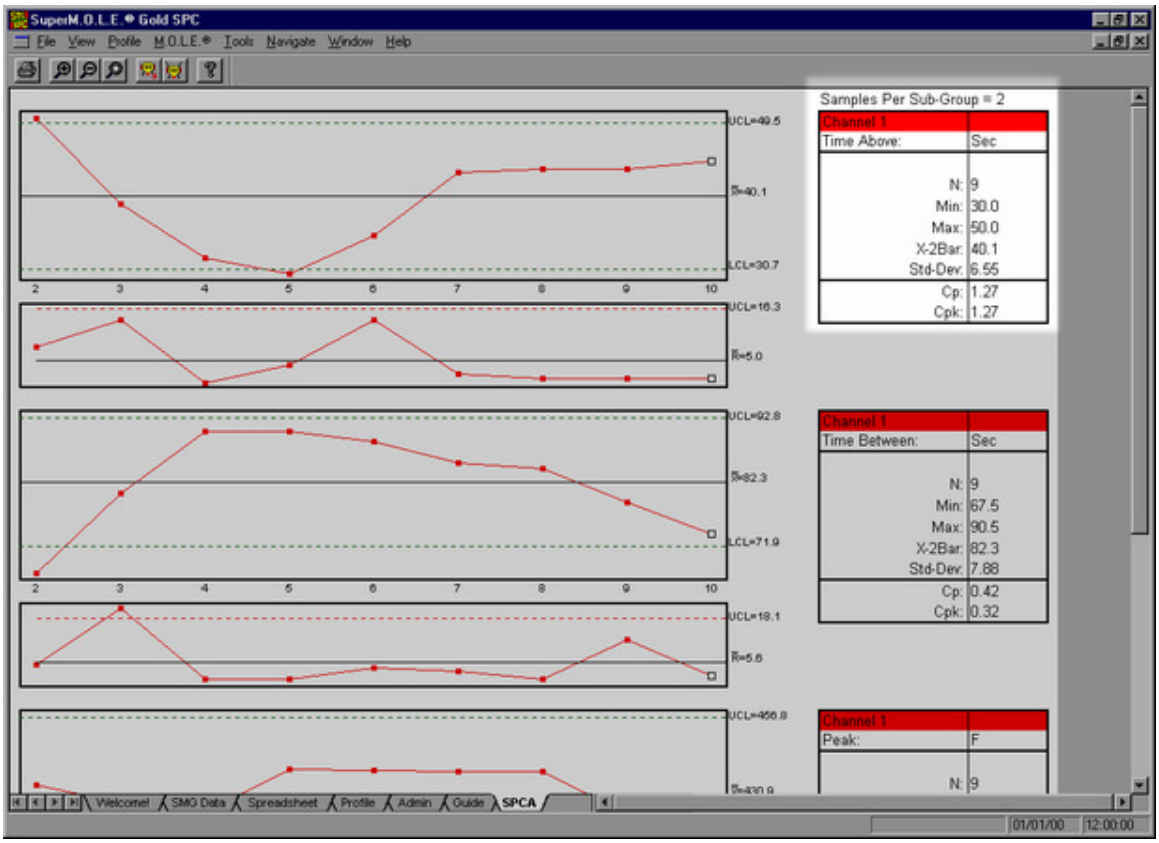
The calculation numbers vary depending on the data in the Spreadsheet worksheet. Using the filter function or the hide command allows the user to select the specific data runs to include on the SPC chart.

5.7.4 Statistics Box

The Statistics Box reflects the current SPC data from the selected, sorted and filtered data set parameter.

Statistics box data:

- ***N*** = Number of subgroups.
- ***Min.*** = The lowest data point on the graph.
- ***Max.*** = The highest data point on the graph.
- ***X-2 bar*** = The current X-Bar Bar calculation.
- ***Std. Dev.***= The Standard Deviation of the selected parameter.
- ***Cp; Cpk*** = Process capability indeces (Refer to ***Appendix B*** for more information).



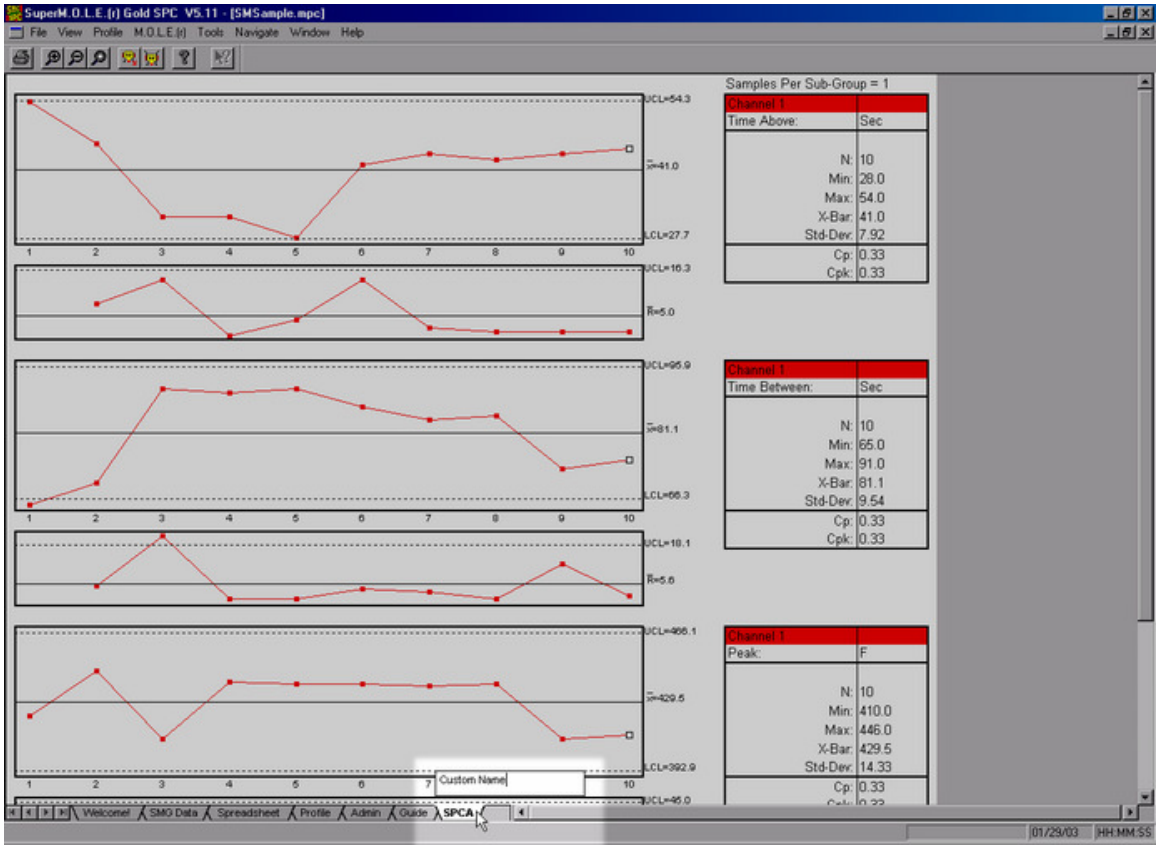
Statistics Box

5.7.5 Renaming SPC Worksheets

The user has the ability to rename all of the SPC worksheet tabs to best reflect the worksheet data.

To change a worksheet name:

1) Double-click the desired SPC worksheet tab and a pop-up text box appears above the worksheet tab.



Pop-up Text Box

2) Type a new name in the pop-up text box and hit the [***enter***] key to accept or the [***esc***] key to cancel.

6.0 Menu and Tool Commands

6.1 File Menu

This section explains how to use all of the Menu and Toolbar button commands. Each of the following sections will list all of the commands specific to each of the menus. Commands in the File menu are used to manipulate and configure workbook files.

The dimmed menu commands are used in other worksheets.

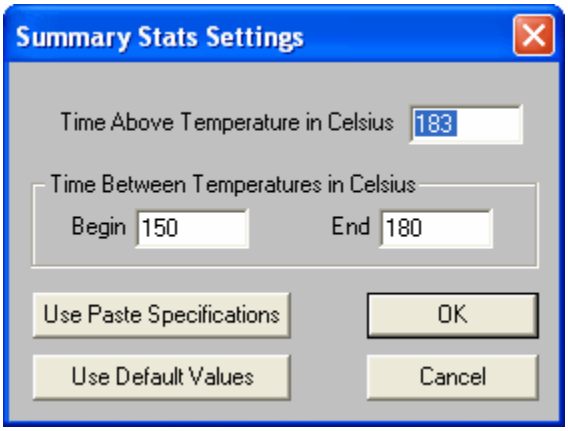
6.1.1 New Workbook

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.

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.

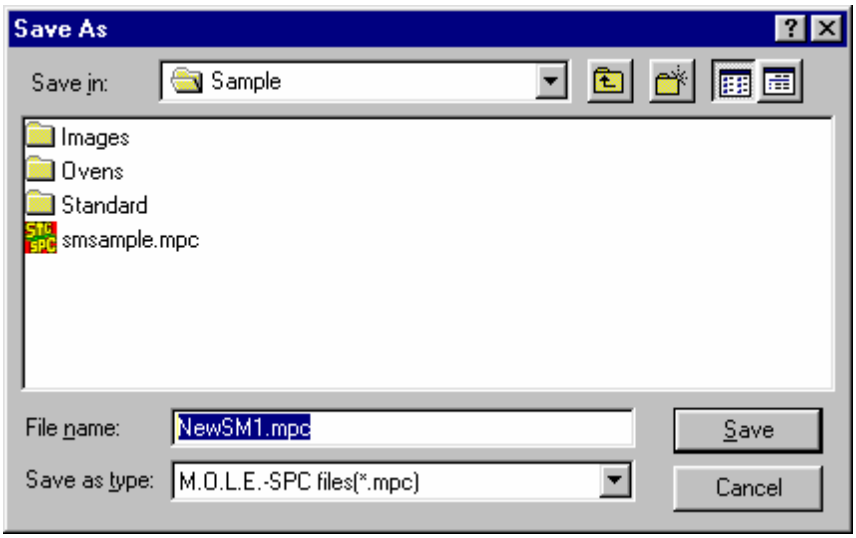
If you wish to use a Paste Specification proceed to section *Paste Specification Database* for more information.



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.

Workbook files are saved with a file extension of (.MPC), 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

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***].

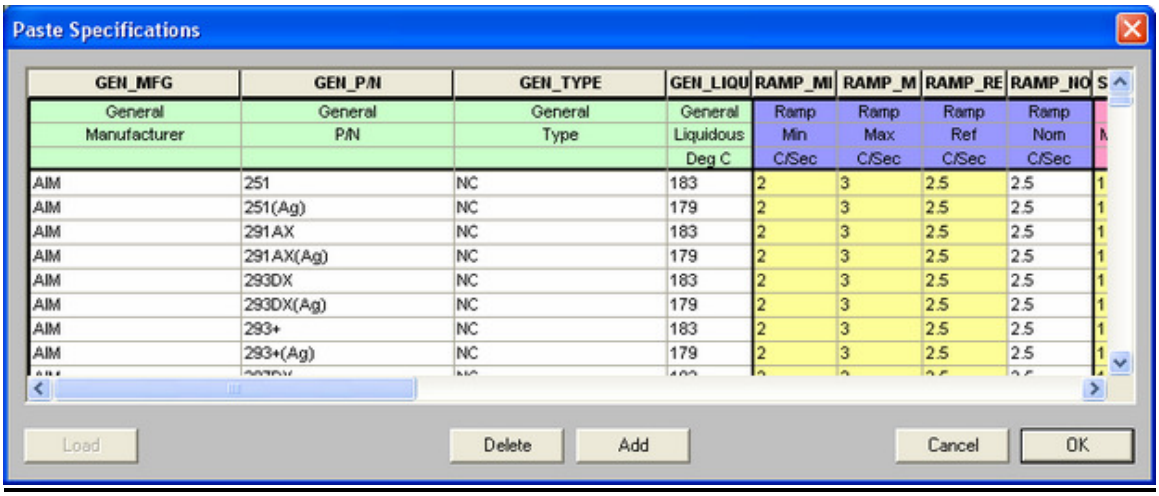
New Workbook Button

6.1.1.1 Paste Specification Database

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

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.

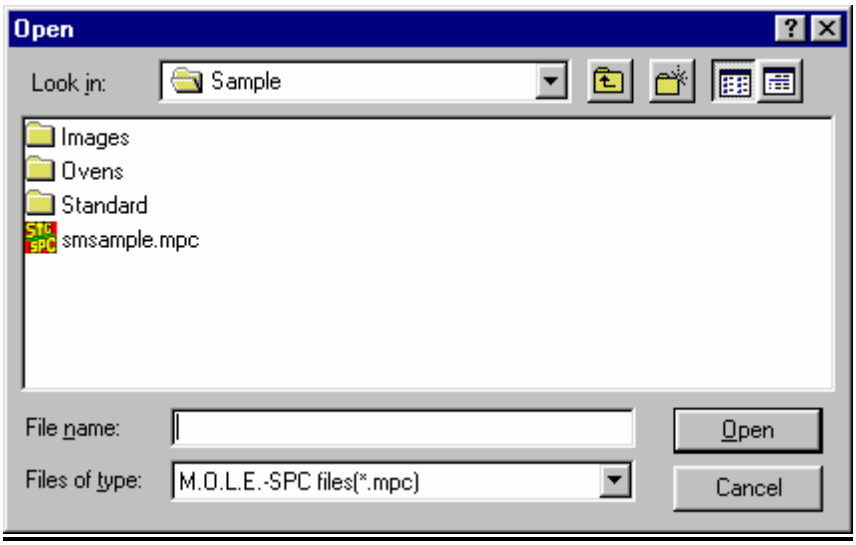
If the desired paste is not in the database, the user can add a new one using the Paste Wizard. Refer to section *Adding a Paste Specification* for more information.

6.1.2 Open Workbook

The Open Workbook command enables the user to open existing workbook files.

To open a workbook file:

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

More than one workbook file can be open at a time and can be viewed by using the commands on the Window File menu. Refer to *Window Menu* for more information.

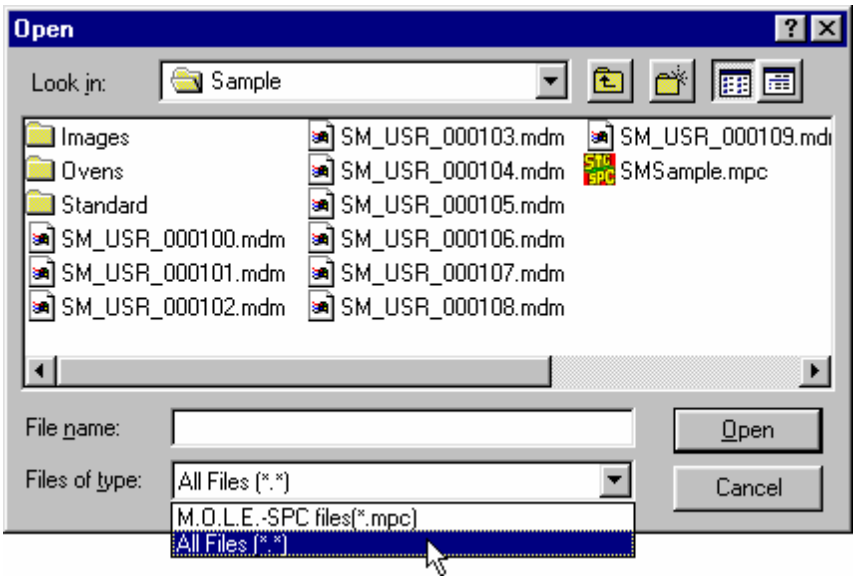
The Open Workbook command can be accessed on the Toolbars of the Spreadsheet, Profile and Admin worksheets. This command can also be used by pressing [***CTRL + O***].

Open Workbook Button

SMG SPC also allows SMFW Workbook files with the file extension (**.MPC**) to be opened using the Open command.

To open an SMFW Workbook file:

1) Select the ***Open*** command from the ***File*** menu and the Open list box appears.
2) Select to view "All Files (***.***)" from the Files of type drop down list.



Open List Box

3) Navigate to the folder where the SMFW (**.MSM**) workbook file is located and highlight it by clicking it once. (The path and file name can also be typed in the ***File of type*** text box).
4) Click the ***Open*** command button to open or ***Cancel*** to return to the current worksheet.
5) The SMFW Workbook file can now be saved in the SMG SPC format (***.MPC**). Refer to ***Save*** and ***Save Workbook As*** for more information.

6.1.3 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.

6.1.4 Import

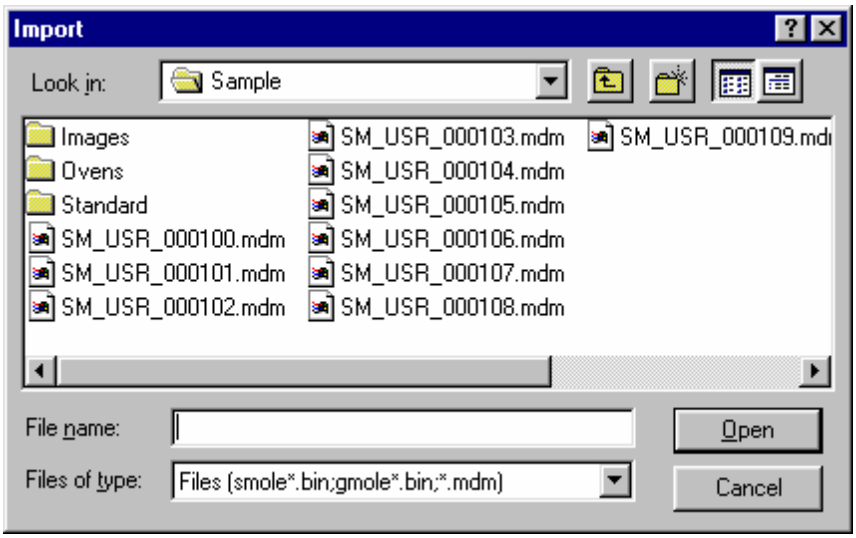
The Import command imports existing SM.O.L.E. (.bin) GM.O.L.E. (.bin) and SMFW (.mdm), files into the Spreadsheet worksheet. This process will copy all documentation information (i.e. part, process) from the file being imported, into the user definable cells on the Spreadsheet worksheet. The data can now be saved in the new format as described under the ***Save*** and ***Save As*** menu commands.

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.

6.1.5 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.

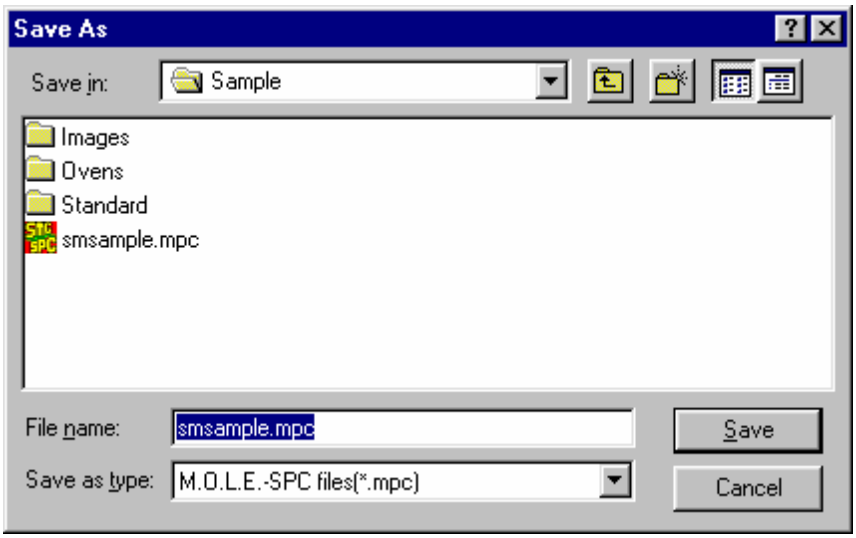
The Save Workbook command can be accessed on the Toolbars of the Spreadsheet, Profile, and Admin worksheets. This command can also be used by pressing [***CTRL + S***].

 **Save Button**

6.1.6 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

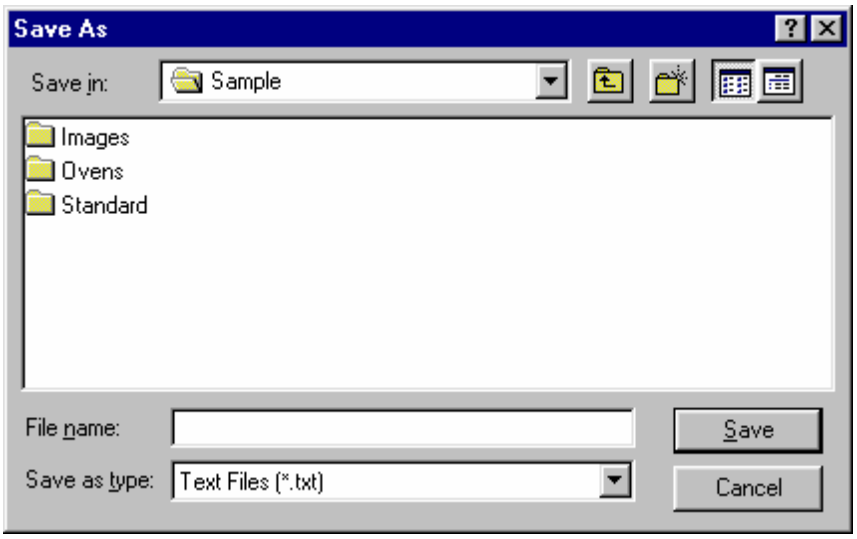
The Save Workbook As command can also be used to save selected data runs out of a worksheet that includes a large data set. When unwanted data runs are filtered out of a large data set and then the Save Workbook As command is used, the selected data runs are saved in a new workbook file along with the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

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

6.1.7 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.

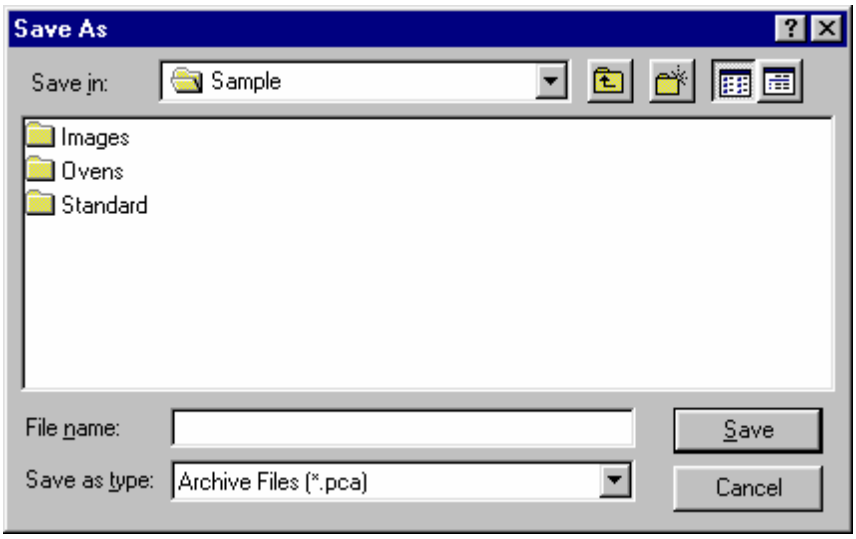


Save As Text Dialog Box

6.1.8 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.

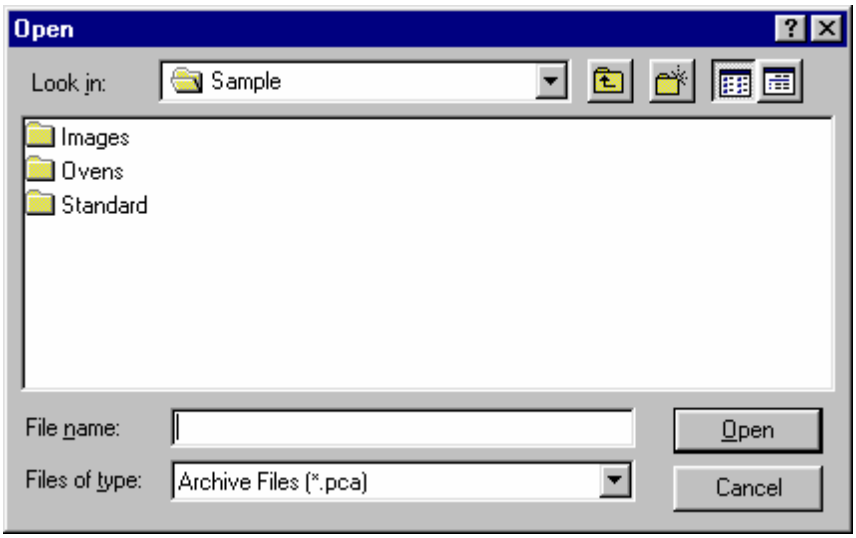


Save As Text Archive List Box

6.1.9 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.

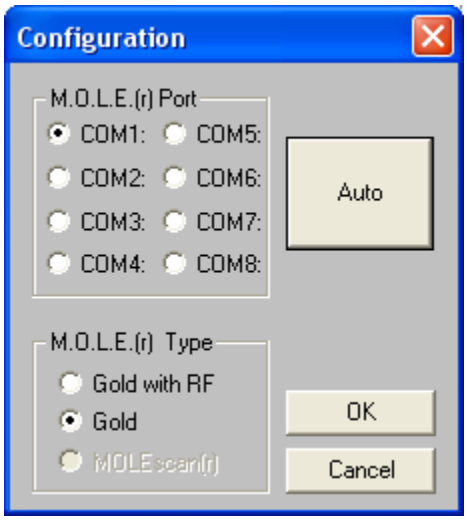
6.1.10 Configuration

The Configuration command is used to set a communication (COM) port so the PC and the M.O.L.E. can communicate. This command is very important when the software is first installed or PC hardware configurations have changed.

This Software is designed to be used with the SuperM.O.L.E. Gold and SuperM.O.L.E. Gold with RF Option only. SuperM.O.L.E. Thinline profilers will need to be used with the ECD SMFW Software.

To configure a COM port:

1) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
2) Select the Admin worksheet.
3) On the ***File*** menu, select ***Configuration*** and the Configuration dialog box appears.

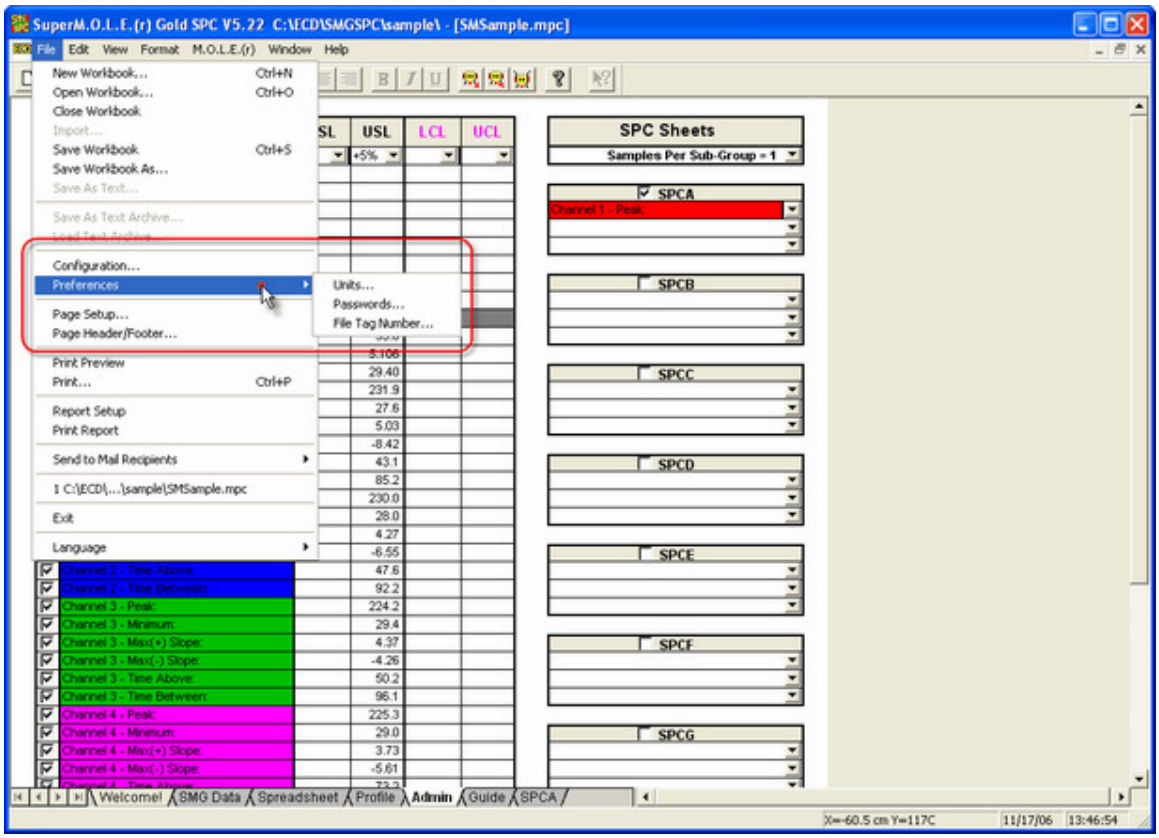


Port Configuration Dialog Box

4) 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.
5) 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.
6) Click the ***OK*** command button accept or ***Cancel*** to exit without changing.

6.1.11 Preferences

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



Preferences Menu

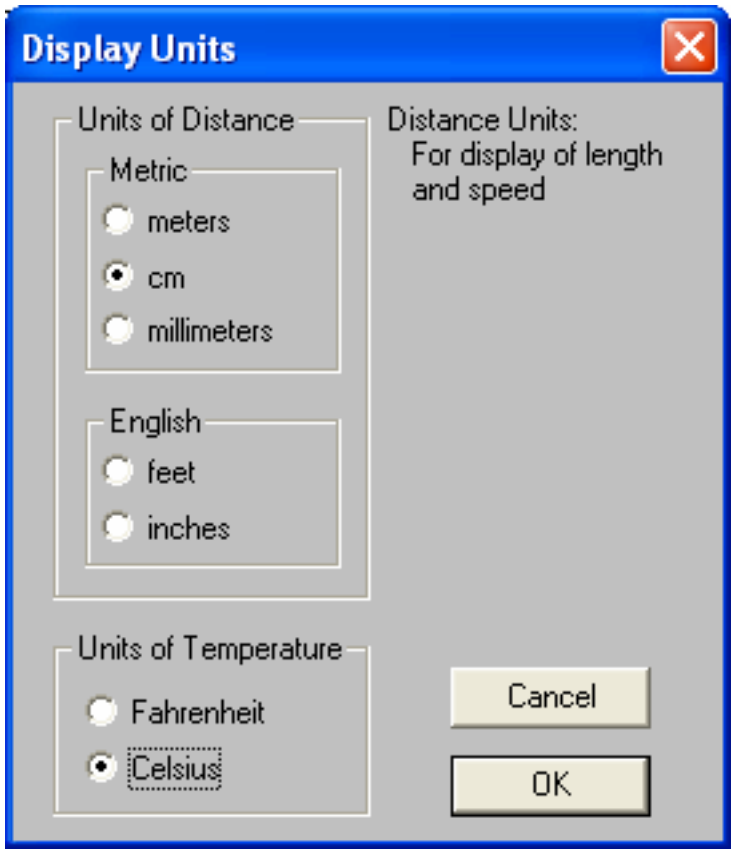
6.1.11.1 Units

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 ***Admin*** 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

6.1.11.2 Passwords

The software has a password protection feature that uses case-sensitive text for securing access to a worksheet. When a worksheet is password protected, the worksheet tab will be highlighted in yellow and the user will not be able to access the protected worksheet without proper password privileges.

If there are worksheets password protected, the password protect command will not affect data when uploading from the M.O.L.E.. The protected worksheets just cannot be viewed without the password.

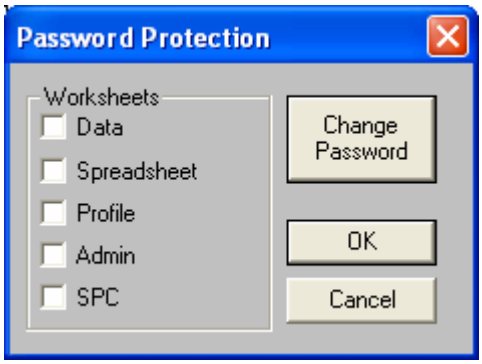
Once the user opens a workbook and uses the Passwords command to gain access to a protected worksheet all of the worksheets remain unprotected until that workbook is closed.

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

The software has a default password Admin. This password will be needed the first time the password is changed or to password protect a worksheet. When the password is changed it is very important to remember the password or write it down.

To password protect worksheets:

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



Password Protection Dialog Box

3) Select which worksheet(s) to password protected by clicking the corresponding check box.
4) Click the ***OK*** command button to accept or ***Cancel*** to return to the worksheet without password protecting any worksheet(s).

If the ***OK*** command button has been selected, a dialog box appears prompting the user to enter the current password.

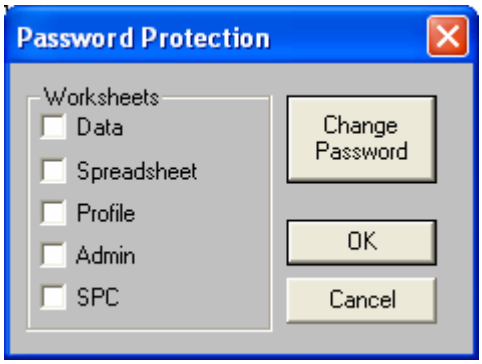
If the default password has not been changed, the current password is Admin.

Enter Password Dialog box

5) Enter the current password in the text box and click the ***OK*** command button to accept or ***Cancel*** to return to the worksheet without password protecting the selected worksheet(s).

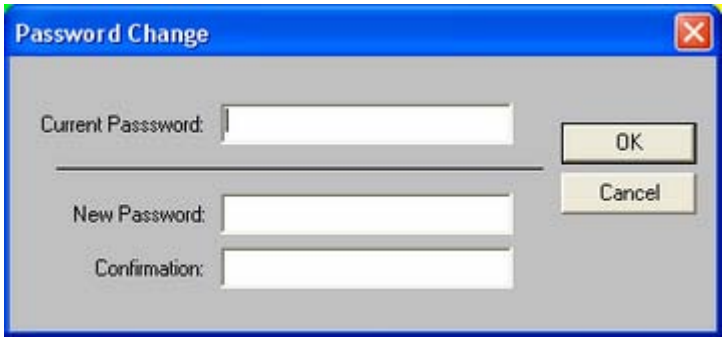
To change a password:

1) Select the ***Admin*** 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.

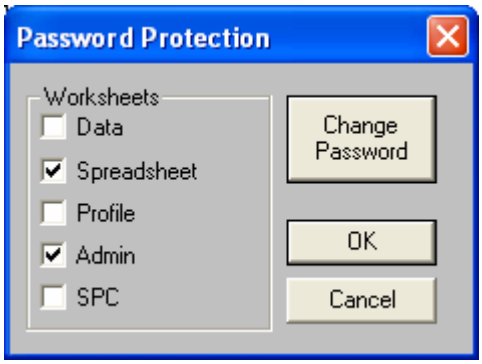
4) Enter current password in the ***Current*** Password text box.
5) Enter a new password in the ***New*** Password text box.

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.

To disable a password:

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



Password Protection Dialog Box

3) The current password protected worksheet(s) will have a check mark in the corresponding check box. Click the check box to remove the check mark to unprotect the worksheet.
4) Click the ***OK*** command button and a dialog box appears asking the user to enter the current password.

Enter Password Dialog box

The software has the default case-sensitive password Admin. When password protection is removed from a worksheet and the preset password has not changed, Admin will need to be entered in the password text box.

5) The current password must now be entered in the text box. When finished click the ***OK*** command button or ***Cancel*** to keep the current password protection.

6.1.11.3 File Tag Number

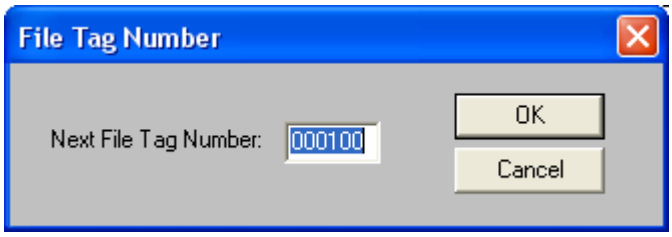
When data is uploaded from the M.O.L.E., the (***.MDM**) portion of the data run is automatically assigned a special File Tag number. The first two characters are automatically assigned **SM**. The next nine characters are the first nine characters from the User/Computer login name and the remaining 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 "**SM_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. SM_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

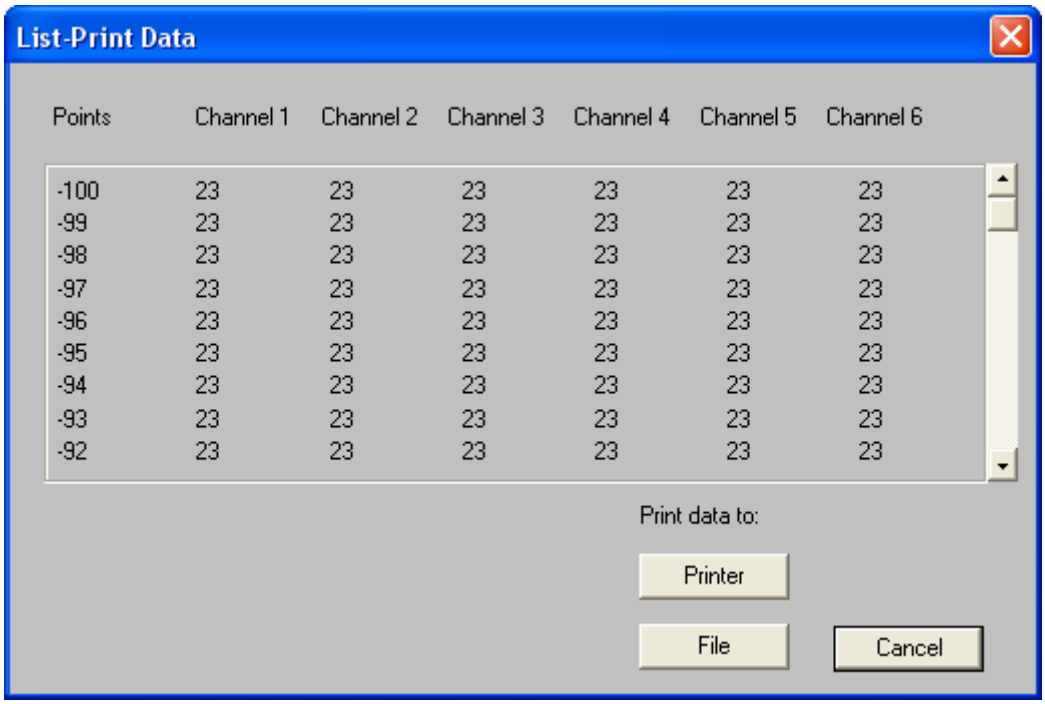
4) Click the ***OK*** command button to set the File Tag Number or click ***Cancel*** to close the window without changing the number.

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

6.1.12 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 ℉ or ℃, depending on the currently set units.



List Print Data Dialog Box

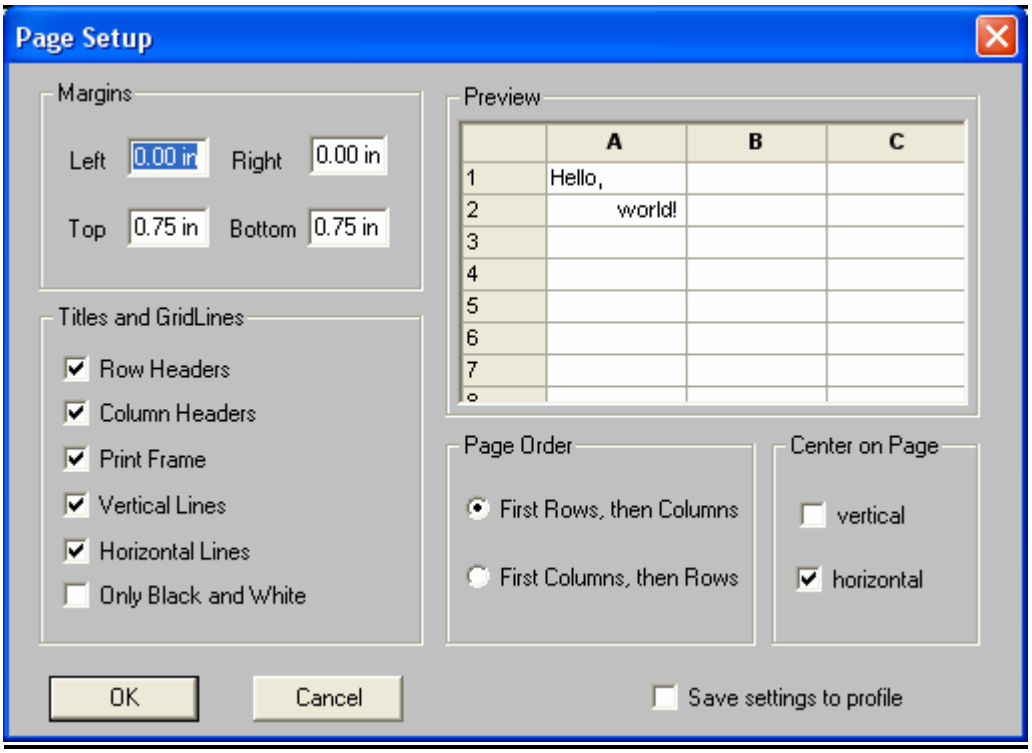
All or parts of the data can be List Printed by selecting a limited range of data to print. To do this, use the Magnify command from the Tools menu along with the List-Print command. Refer to ***Magnify Tool*** for details.

6.1.13 Page Setup

The Page Setup command sets page parameters for the Spreadsheet and Admin worksheets.

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.

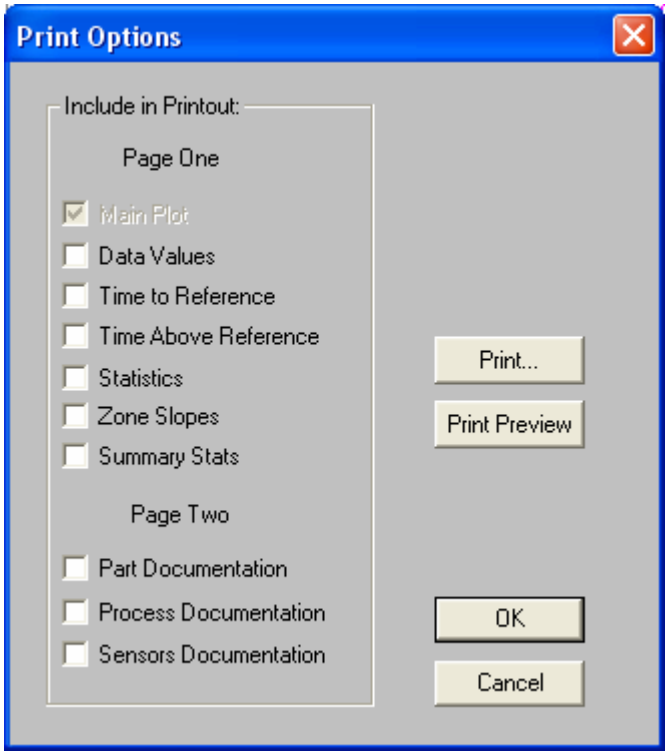
Selections made using the *Page Setup* command will not be visible on the worksheet it is only used for print formatting. To view the selections, use the *Print Preview* command described in *Print Preview*.

6.1.14 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.

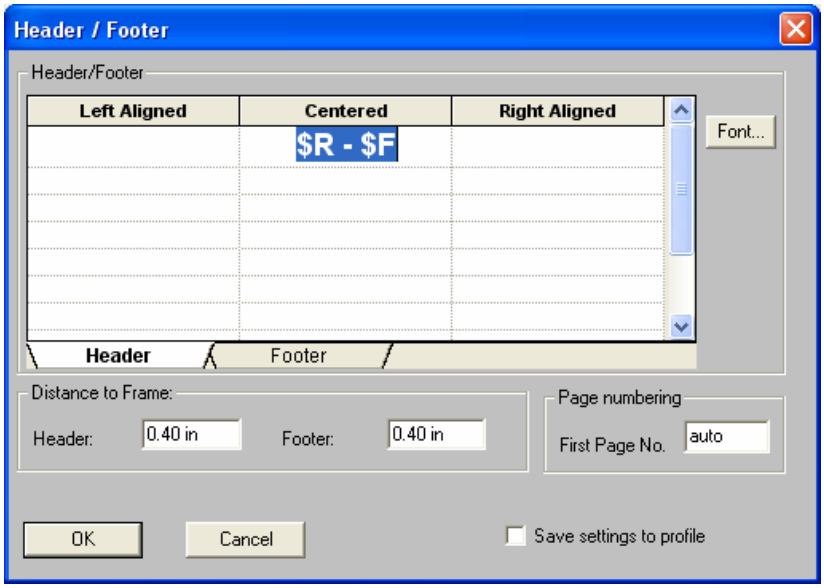
6.1.15 Page Header / Footer

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.

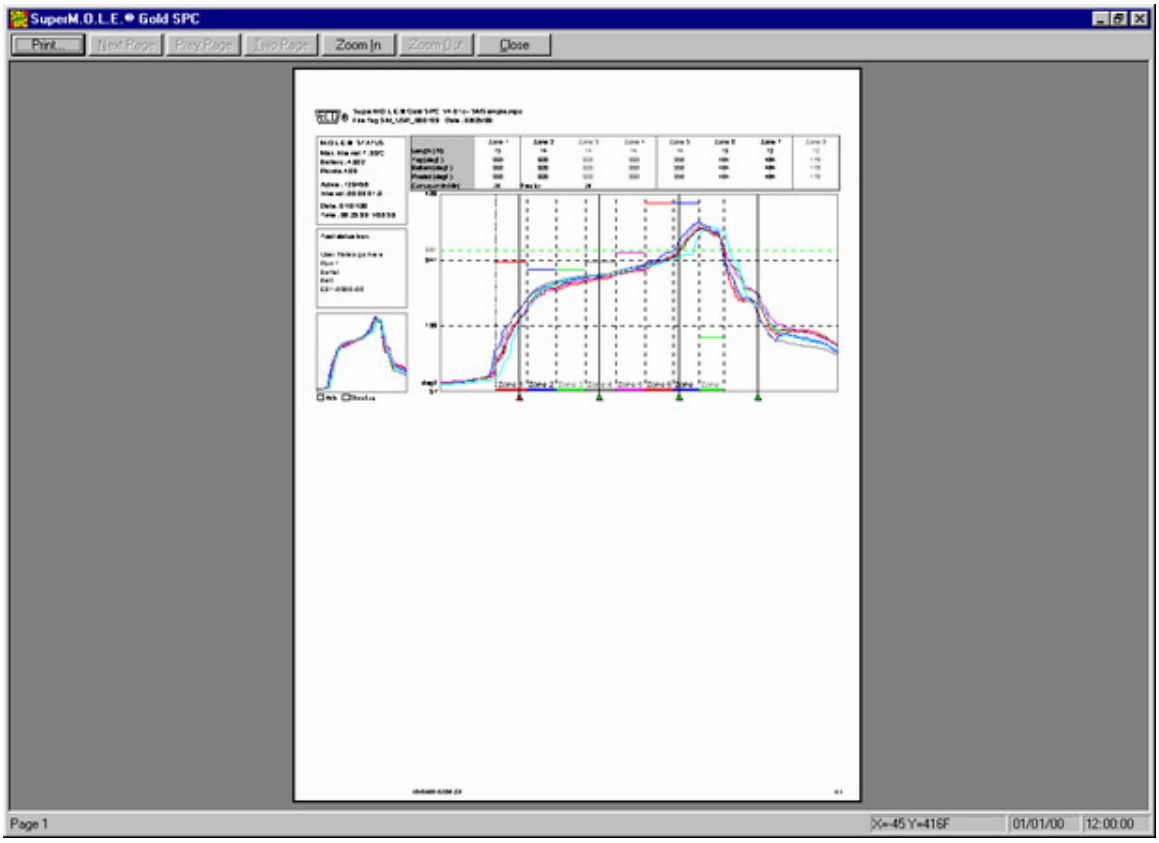
The Header / Footer information will not be visible on the worksheet. It is only used for printing. To view the Header / Footer information, use the Print Preview command. Refer to *Print Preview* for more information.

6.1.16 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.

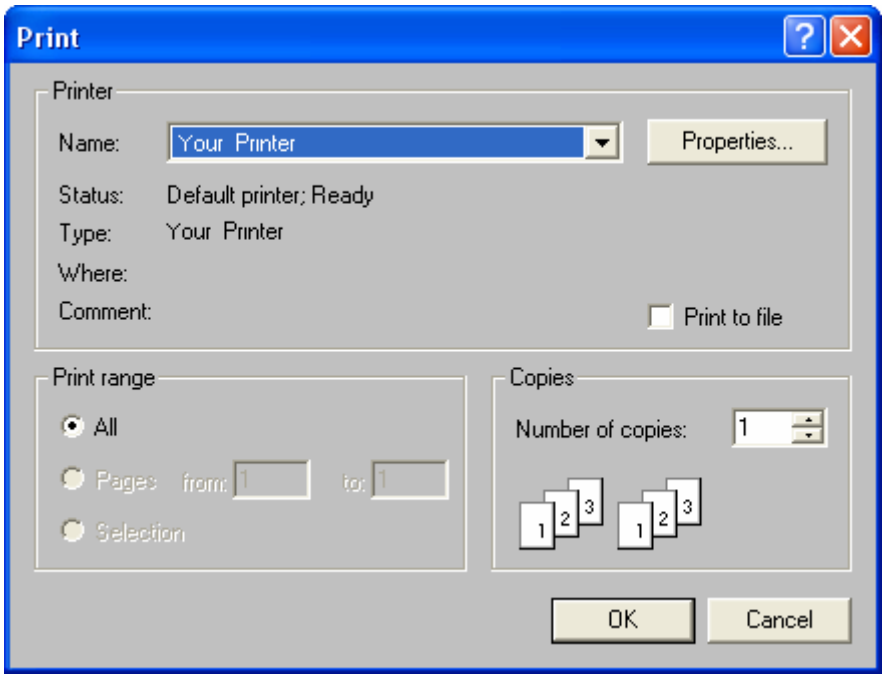
6) Click the ***Close*** command button to close the Print Preview window.

6.1.17 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**

6.1.18 File Viewer

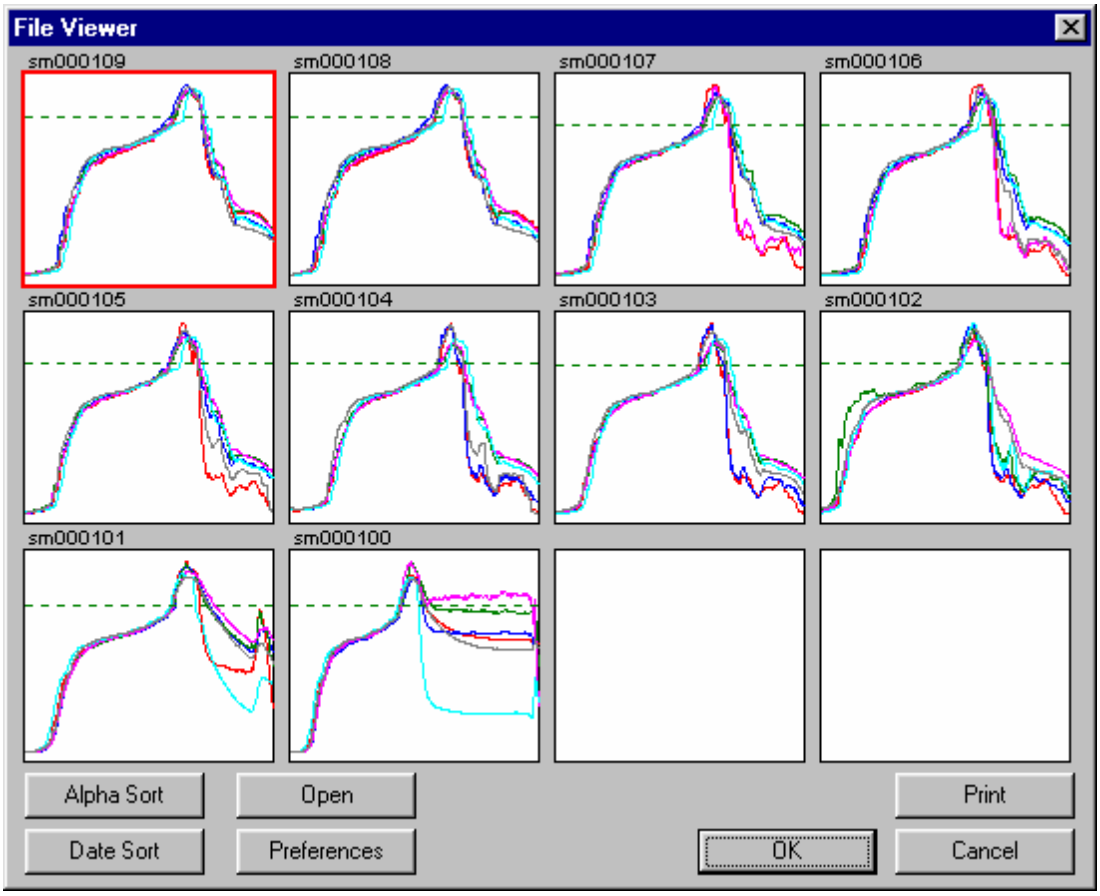
The File Viewer dialog box displays small thumbnail views of the graphical contents of up to 120 (***.MDM**) Profiles at one time.

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.



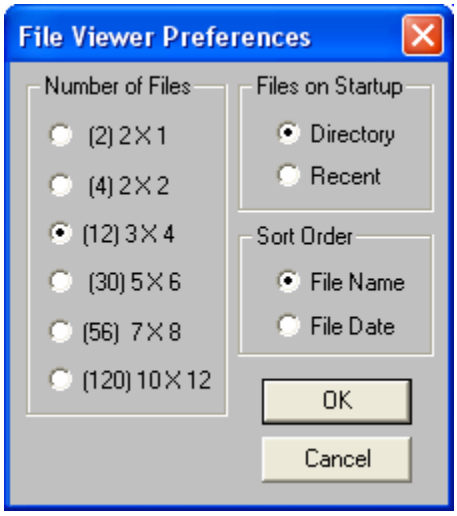
File Viewer Window

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.

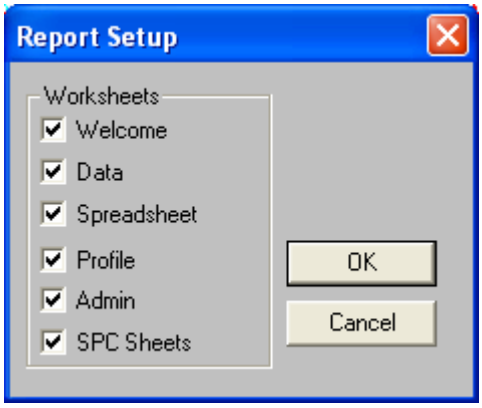
When new selections have been made, use the ***Set*** command button to save the preferences as default before pressing the ***OK*** command button.

6.1.19 Report Setup

Select the ***Print Report*** command from the ***File*** menu to print the selected worksheets from the Report worksheet as discussed in section Print Preview.

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.

6.1.20 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***.

6.1.21 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:

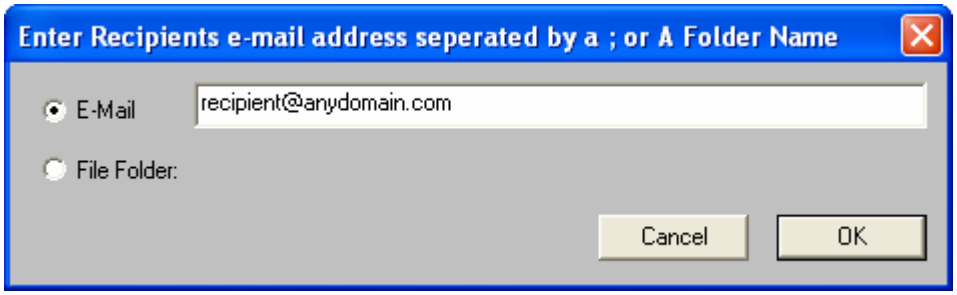
1) Launch an email program (i.e. Outlook, Firefox, Endora).
2) Select the desired email command described below:

- 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.

6.1.22 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.

6.1.23 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.

6.1.24 Language

All of the menus and commands have been translated in different languages.

To select a language:

1) On the ***File*** menu, point to ***Languages*** and then select a different language.

6.2 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.

6.2.1 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**

6.2.2 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**

6.2.3 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***].

6.2.4 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***].

6.2.5 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.

6.2.6 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.

6.3. View Menu

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

6.3.1 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.

6.3.2 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.

6.3.3 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

6.3.4 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.

6.3.5 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**

6.3.6 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**

6.3.7 100%

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**

6.4 Format Menu

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

6.4.1 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.

Bold Button

6.4.2 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.

Italic Button

6.4.3 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

6.4.4 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*)

6.5 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.

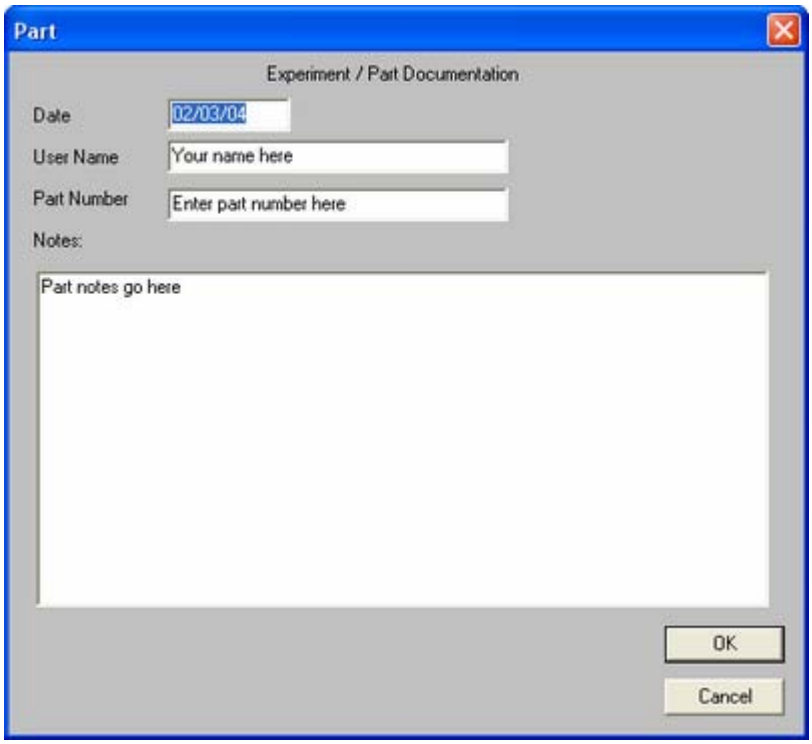
6.5.1 Part

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.

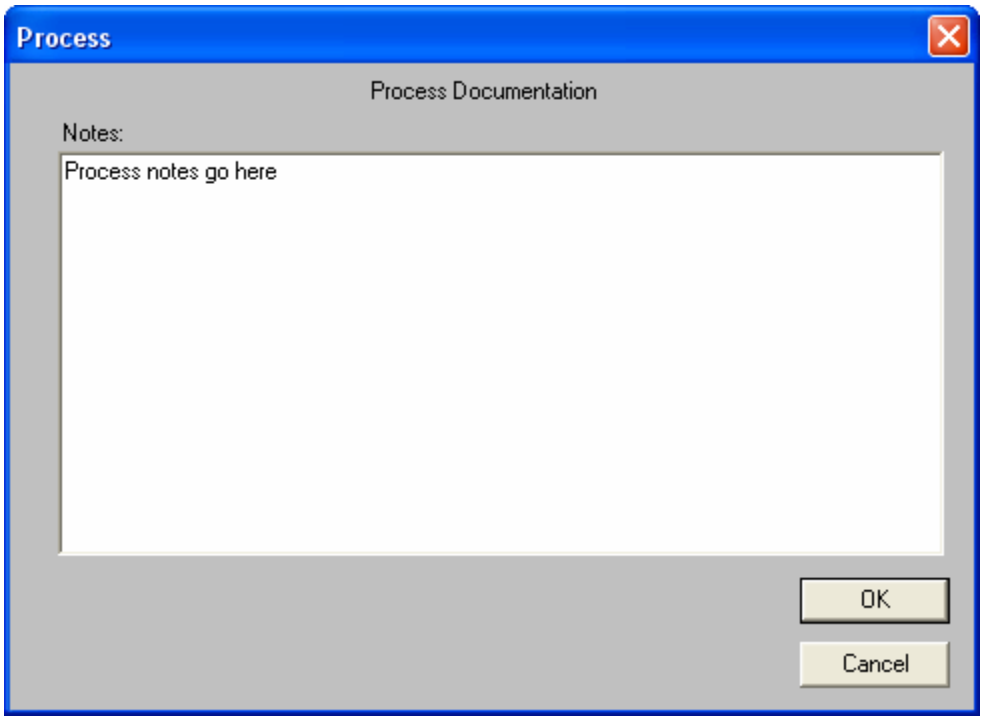


Part Dialog Box

6.5.2 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.

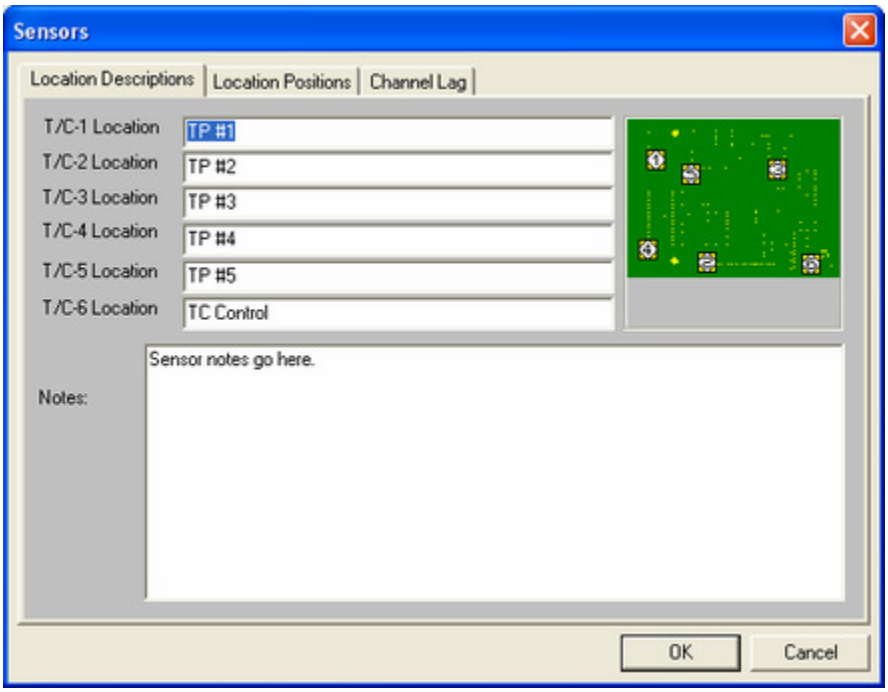


Process Dialog Box

6.5.3 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.

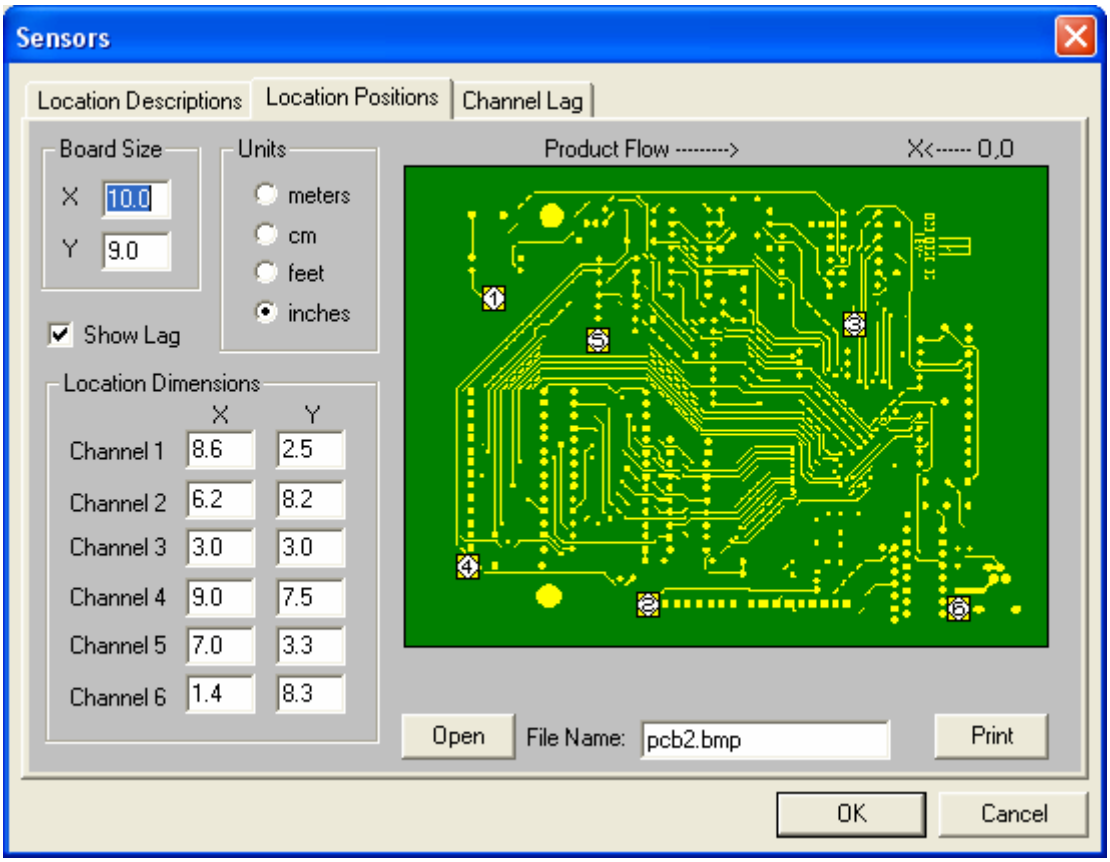
   Location dimensions can also be entered in a number of unit types. Locations can be entered by typing in dimensions, or by dragging the sensor locations around on the image. Note that X-dimensions are measured from the leading (right) edge or the first edge to enter the process, and Y dimensions are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

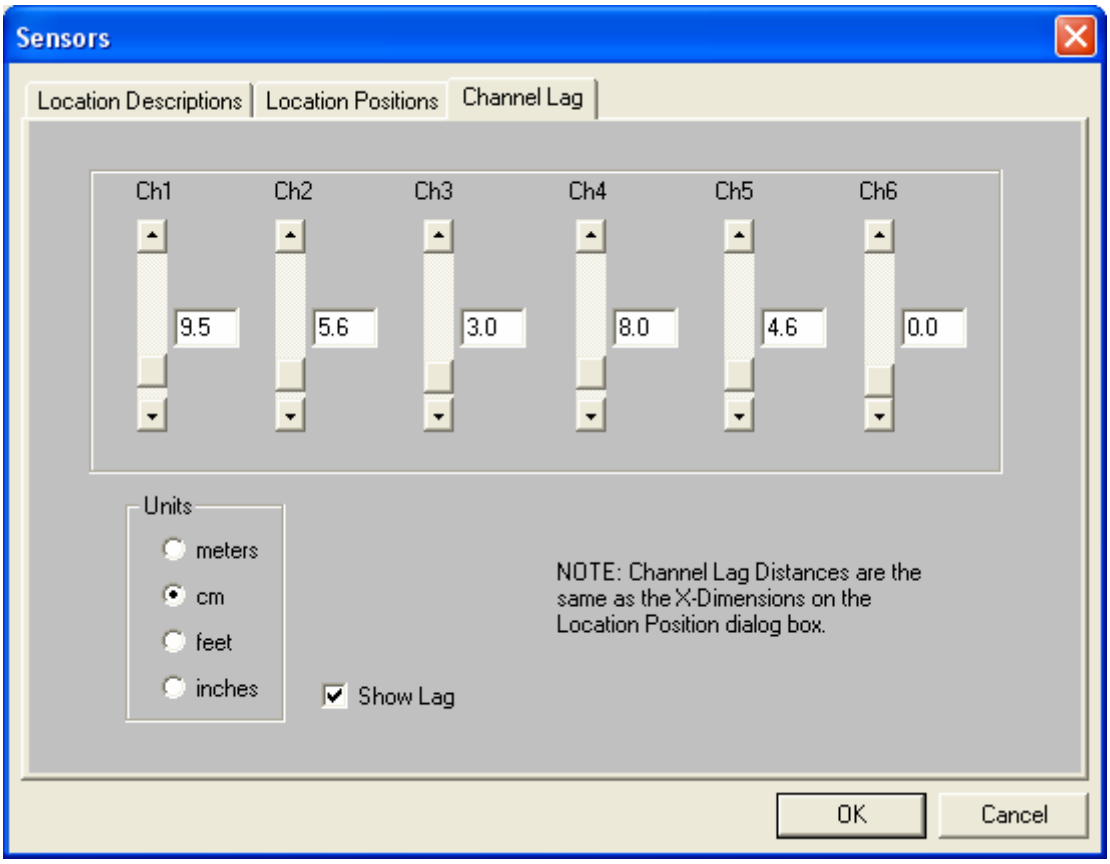
2) Click the ***OK*** command button to accept the additions/changes or click ***Cancel*** to return to the Profile worksheet without making any additions/changes.

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

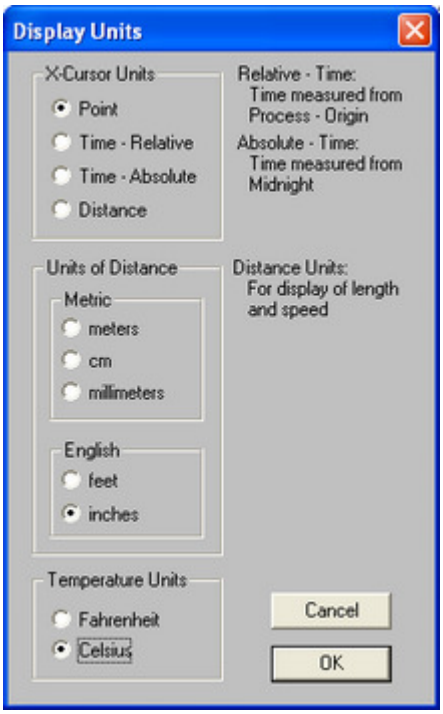
4) Click the ***OK*** command button to return to the Profile worksheet using the new settings or ***Cancel*** to return making no changes.

6.5.4 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.

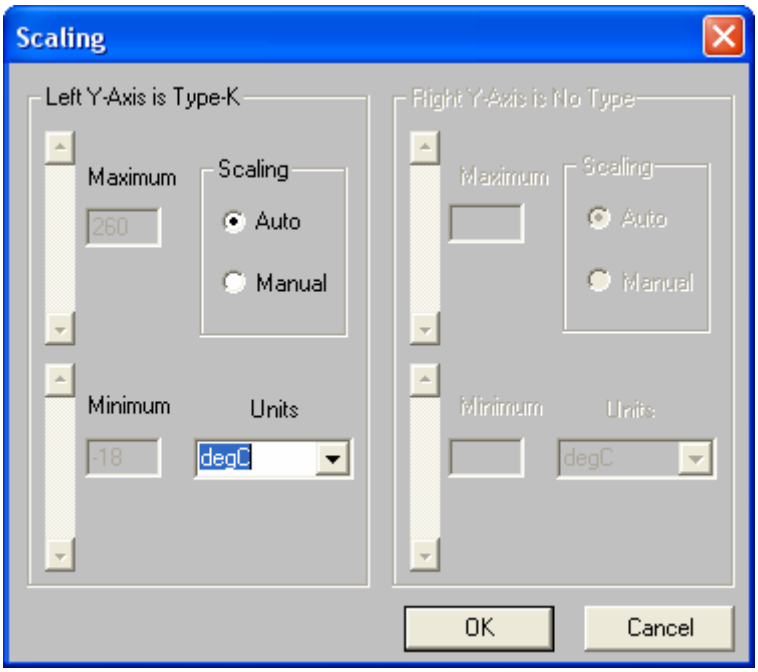
6.5.5 Scaling

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

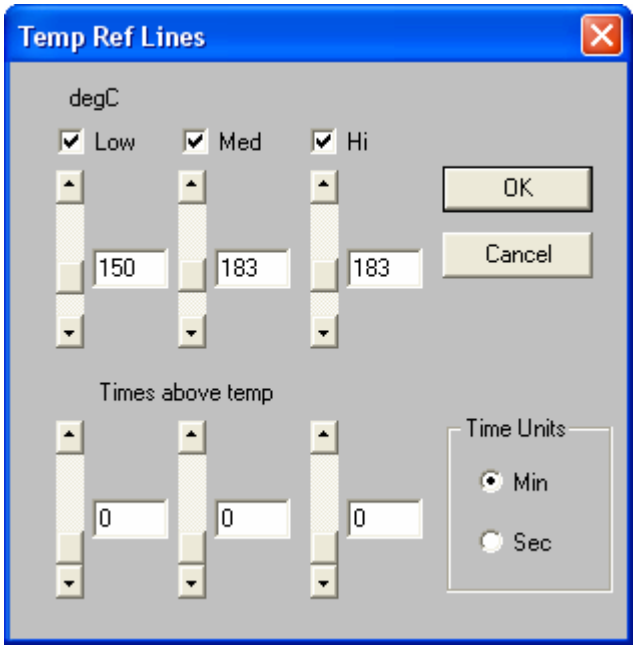
3) Click the ***OK*** command button to use the new settings or ***Cancel*** to return to the Profile worksheet with no changes.

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

6.5.6 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 graph using the ***Temp Ref Lines*** command in the ***Profile*** menu.

Temperature Reference Lines are used for analysis when the T Above Ref (Time above the Reference Line) statistic is active. Refer to ***T Above Ref*** for more information.



Temp Ref Lines Dialog Box

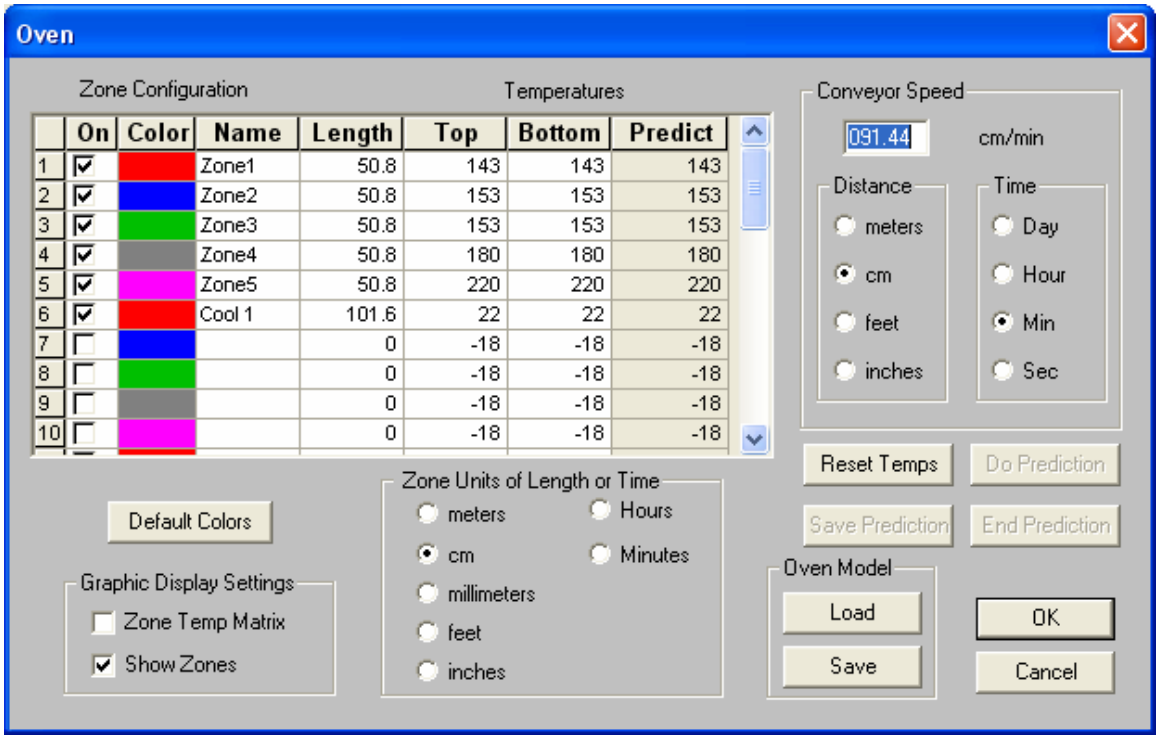
The Temp Ref Lines dialog box identifies the units of the Y-axis and the current values of any Temperature reference lines in the Data Graph. Temperature reference lines can be added or changed at any time and must be created before the T Above Ref statistic will produce valid data in the Data Table.

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.

6.5.7 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 compare to experimental conditions.

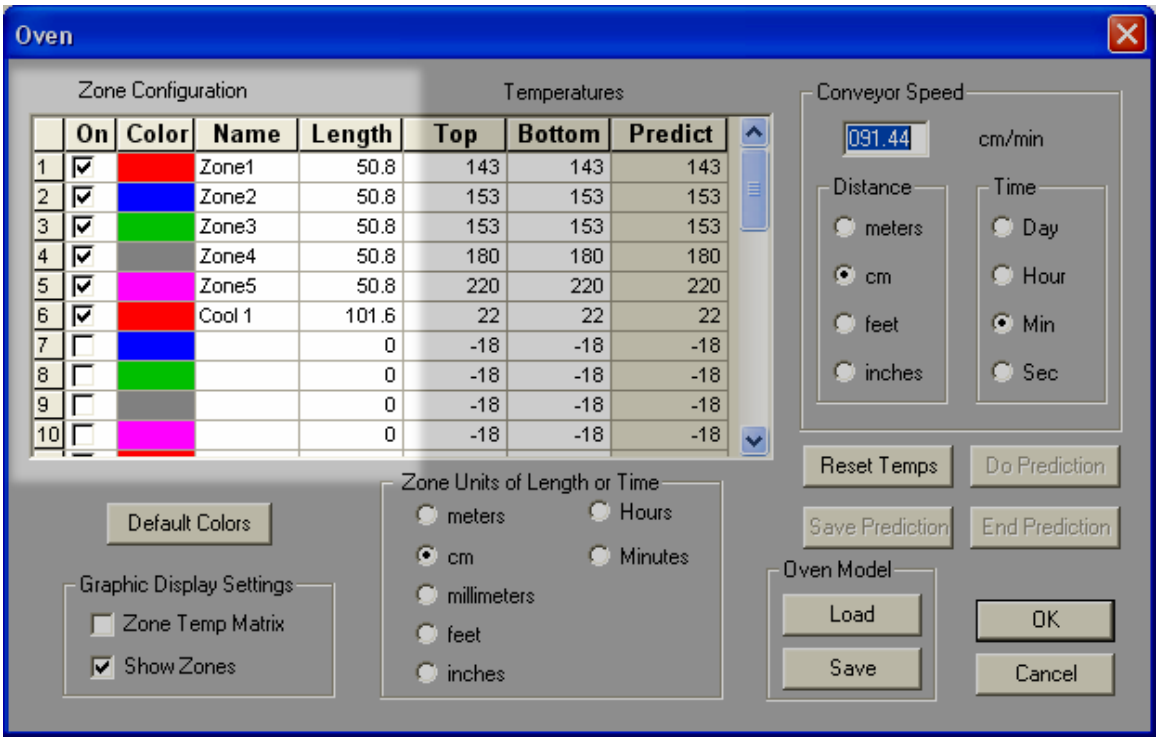


Oven Configure Dialog Box

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

6.5.7.1 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.

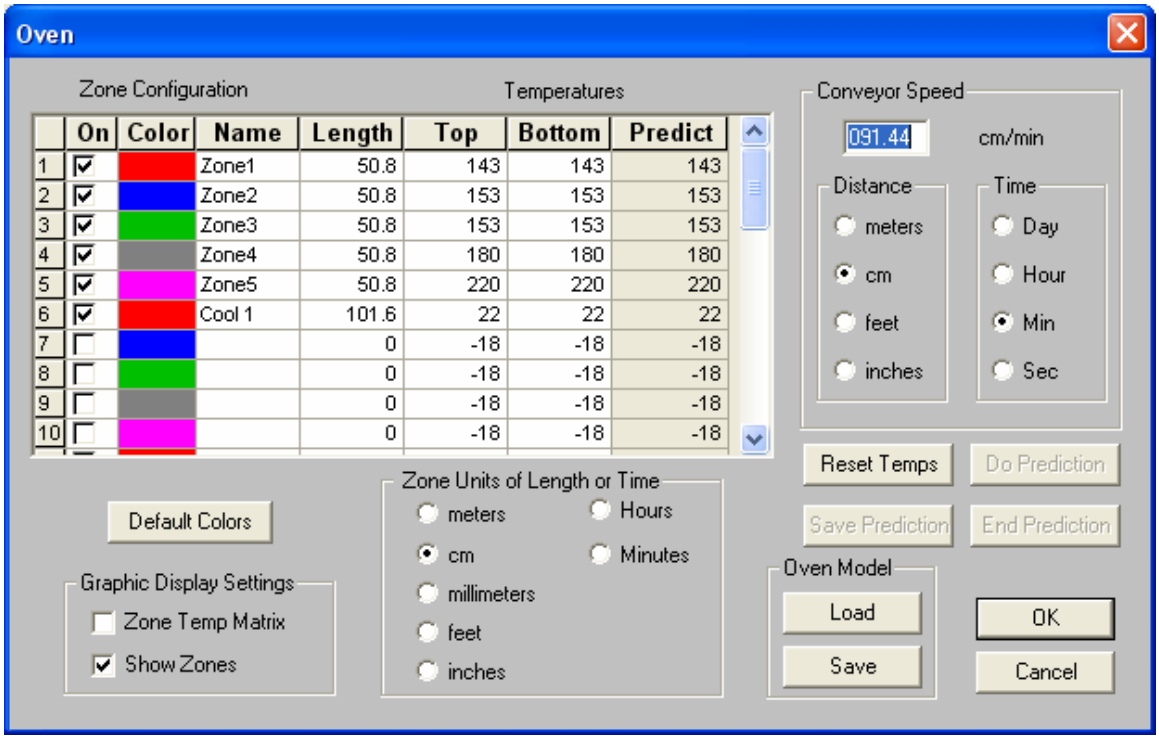


Zone Configuration Options

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***.

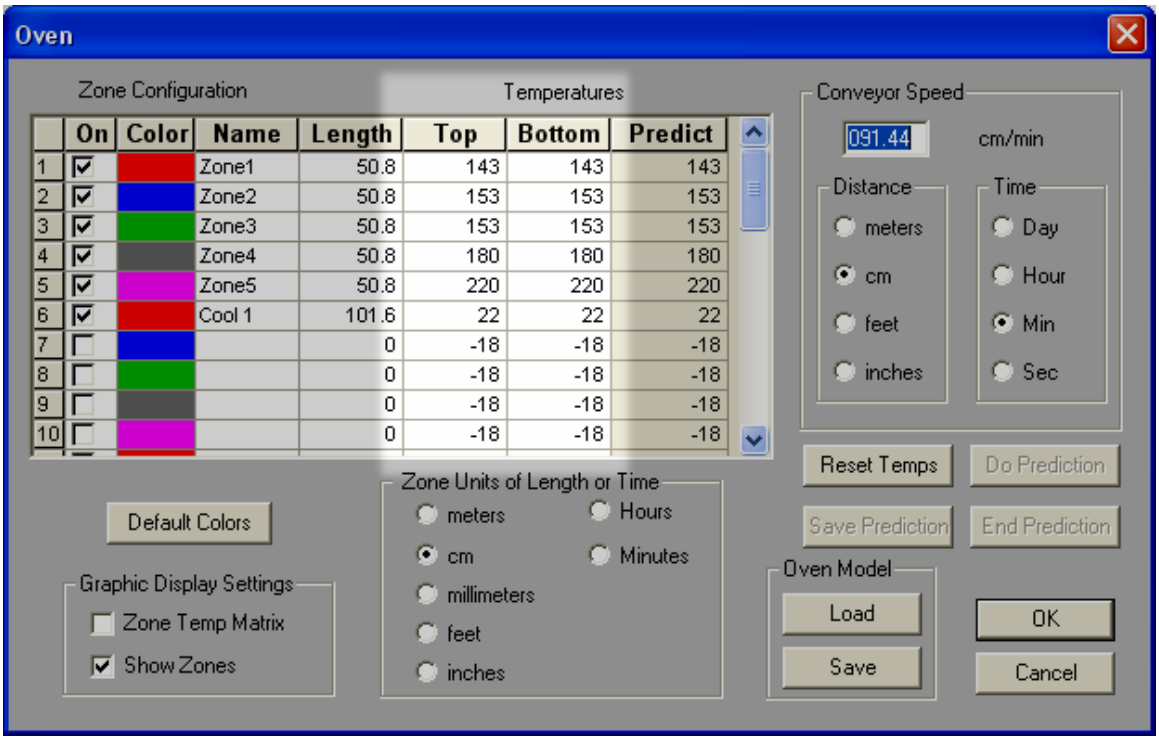


Oven Configure Dialog Box

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.

6.5.7.2 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

Use actual oven settings for each zone to use the Prediction tool.

To set zone temperatures:

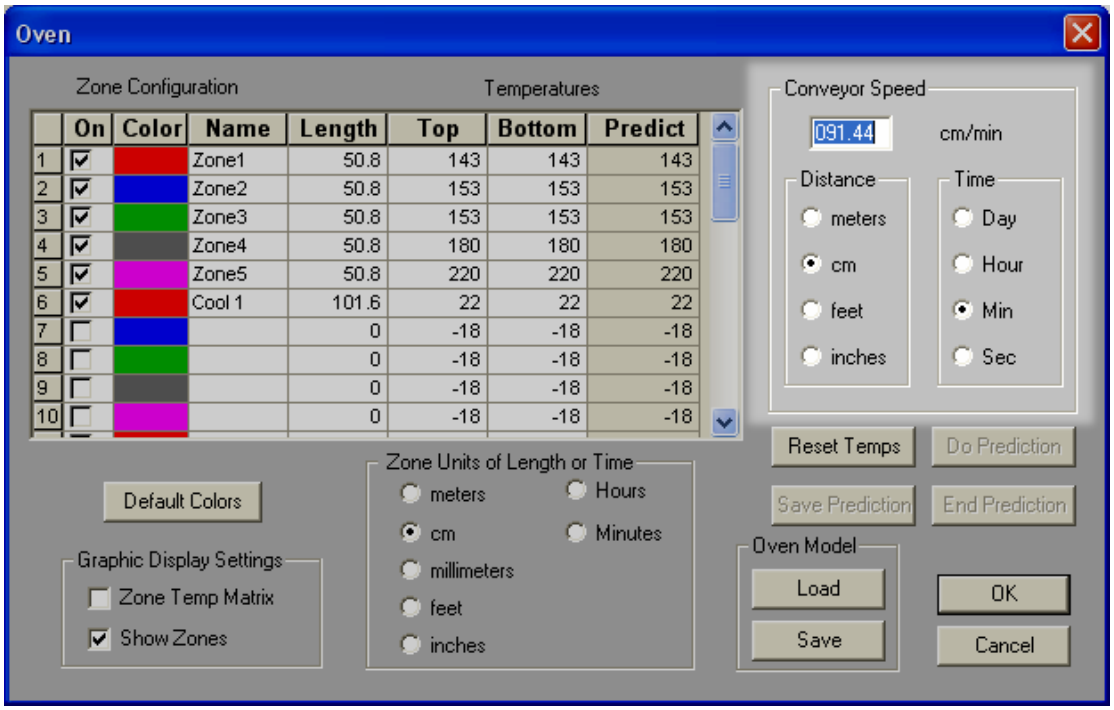
1) On the ***Profile*** menu, select ***Oven Configure***.
2) Click the top and bottom text field(s) to enter upper and lower zone temperatures as a colored line for each zone of the Data Graph. The upper zone temperatures appear as solid lines and the lower zones appear as dotted lines.

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.

6.5.7.3 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) Select the ***Oven Configure*** command from the ***Profile*** menu.
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.

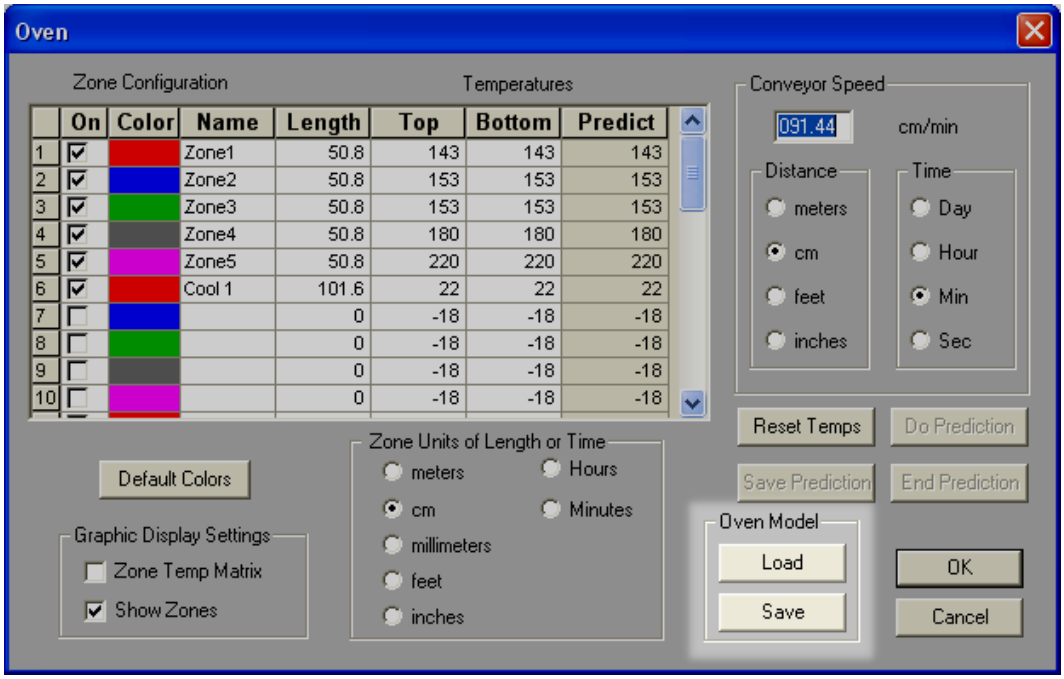
Set conveyor speed to zero for batch processes where time units is selected for zone sizes.

6.5.7.4 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.

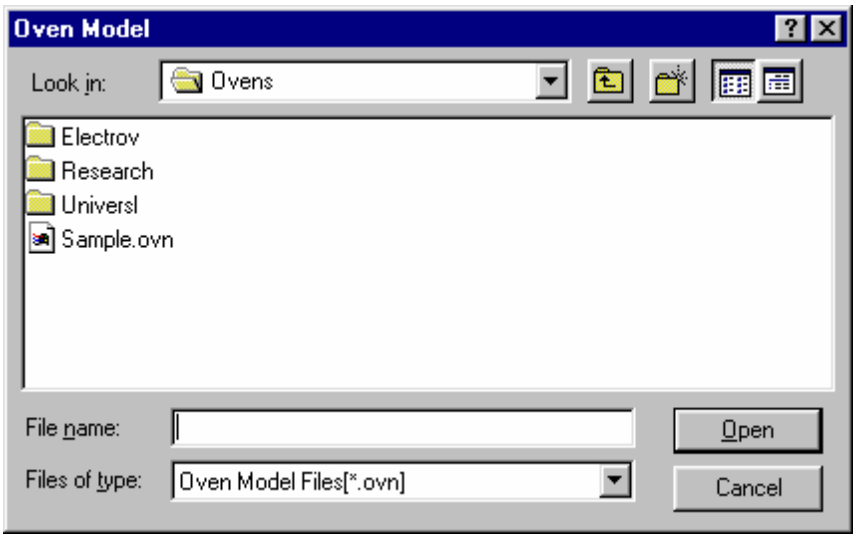
To load an Oven Model:

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



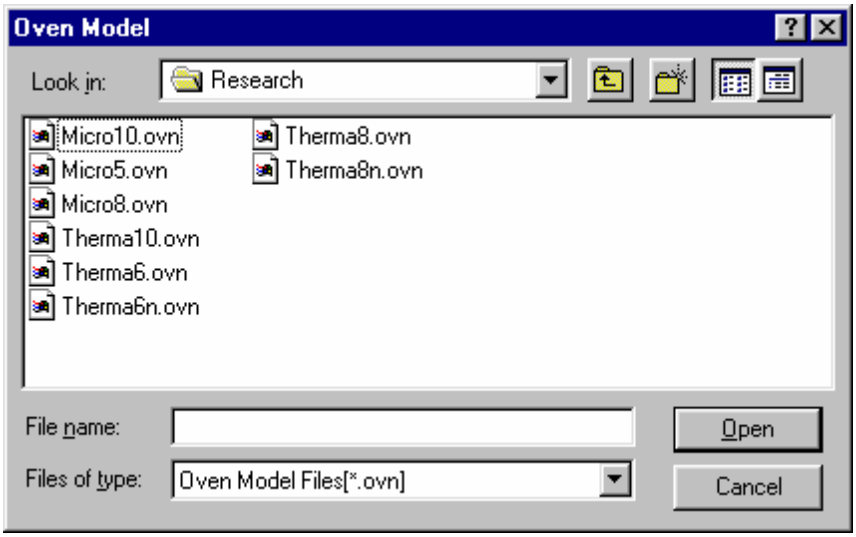
Oven Model Commands

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.

6.5.8 Zone Matrix

To view the Zone Matrix:

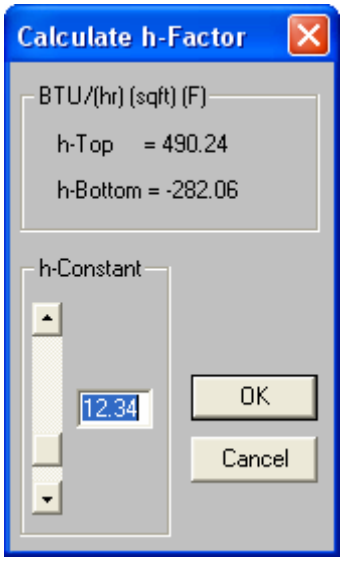
1) On the ***Profile*** menu, select ***Zone Matrix***. A check mark appears beside it which indicates that the Zone Matrix is activated. When the Zone Matrix is turned "ON", it is located above the Data Graph.

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

 **Zone Matrix Button**

6.5.9 Calculate h-Factor

The ***h-Factor*** command is used along with an optional h-Factor module to measure an oven's ability to heat items passing through it. It is most useful in processes where constant, uniform temperatures are desirable.



Calculate h-Factor Dialog Box

Cure Factor Setup:

1) Attach the optional h-Factor module to the M.O.L.E. thermocouple input channels 1 through 4.

If the wrong h-Constant is used, the resulting readout is incorrect.

2) On the ***Profile*** menu, select ***Calculate h-factor***.
3) Use the options on the dialog box to set the h-Constant, this is the calibration constant for that module.
4) Click ***OK*** to return to the Data Graph using the new settings or ***Cancel*** to return to the Data Graph with no changes.

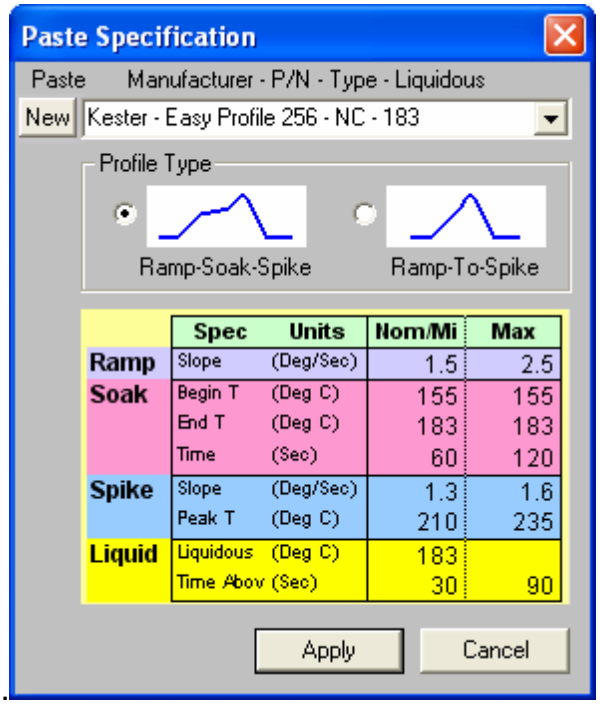
6.5.10 Paste Selection

The Paste Selection command displays a selected paste from the database on the Data Graph.

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.

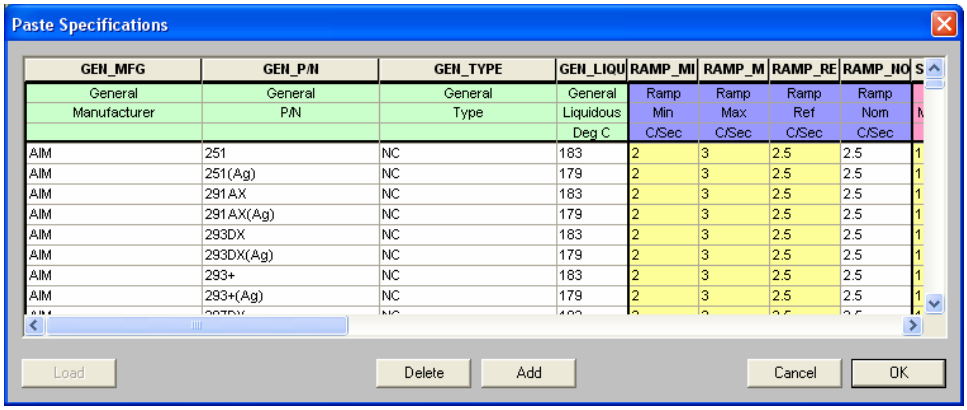
6.5.10.1 Adding a Paste Specification

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

To add a paste:

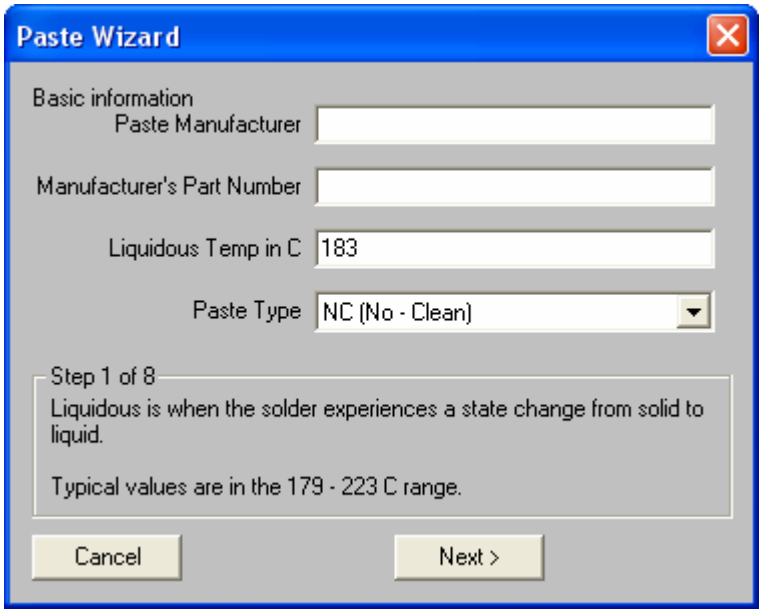
Included on the bottom of each Step is a brief guideline of industry values related to each specification.

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



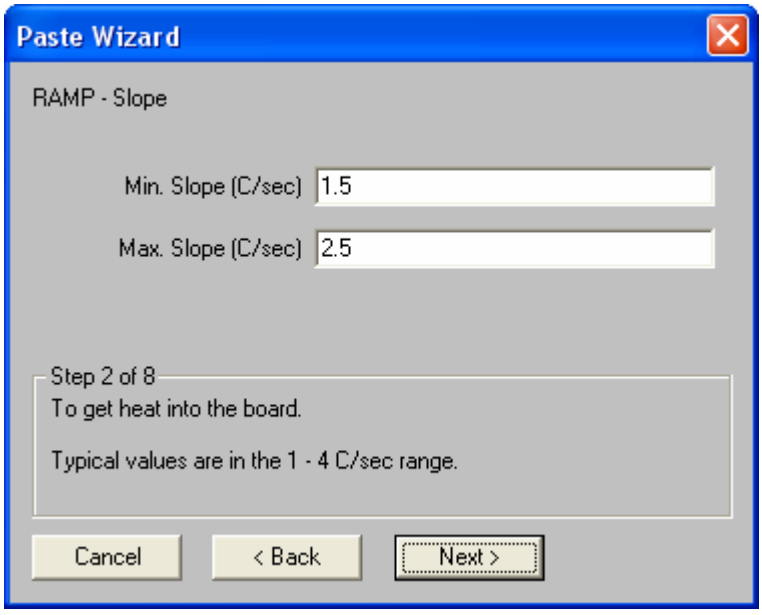
Paste Specification Dialog Box

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



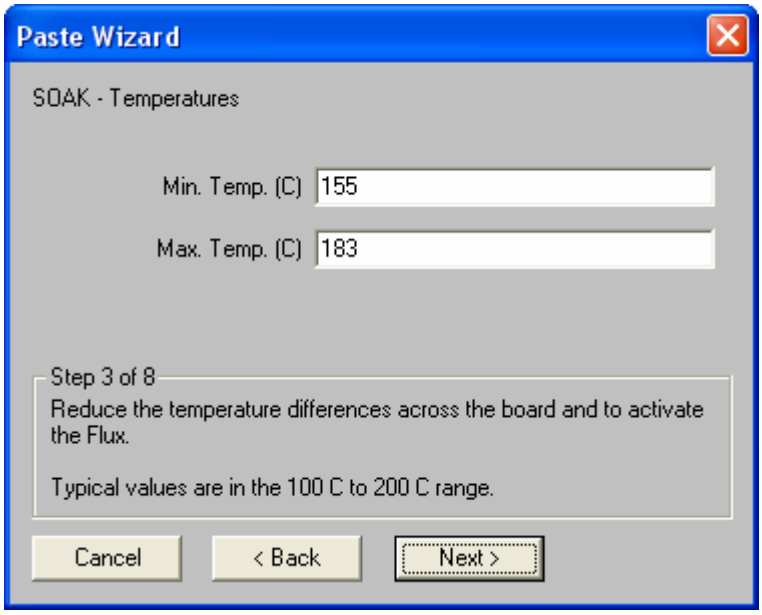
Paste Wizard Step 1

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



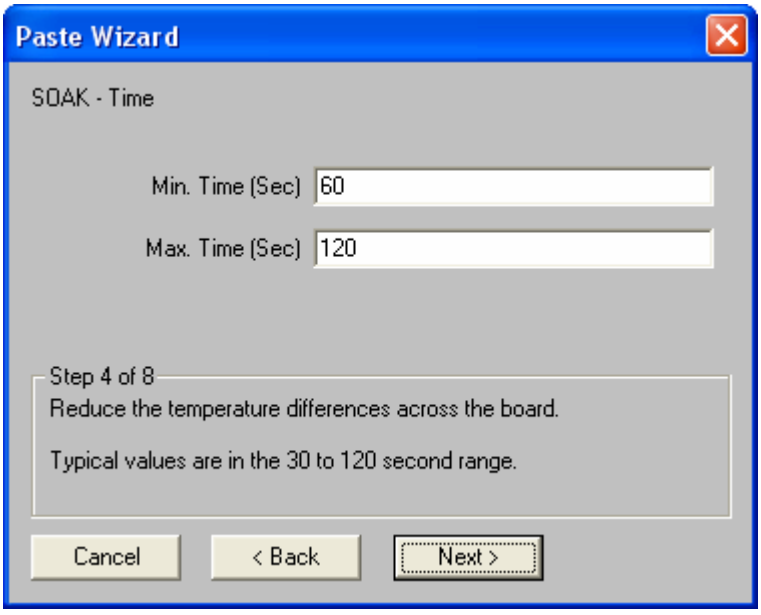
Profile Wizard Step 2

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



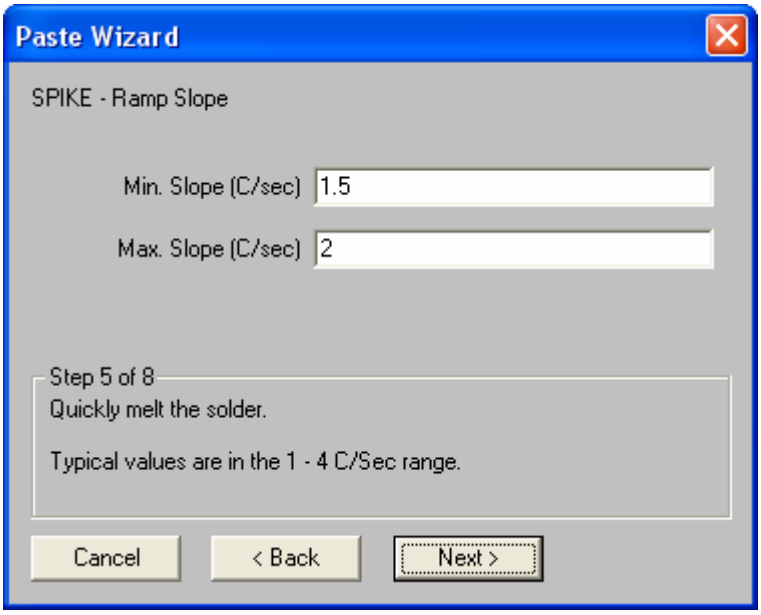
Profile Wizard Step 3

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.

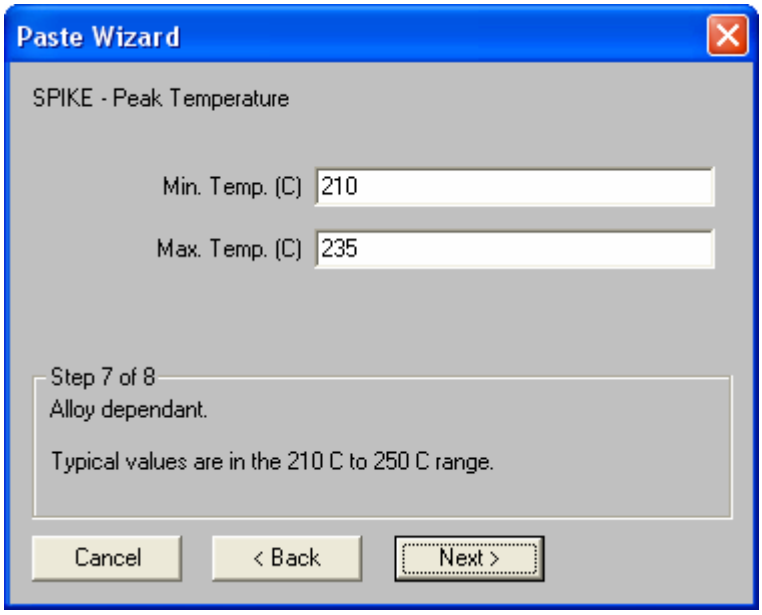


Profile Wizard Step 5

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

Profile Wizard Step 6

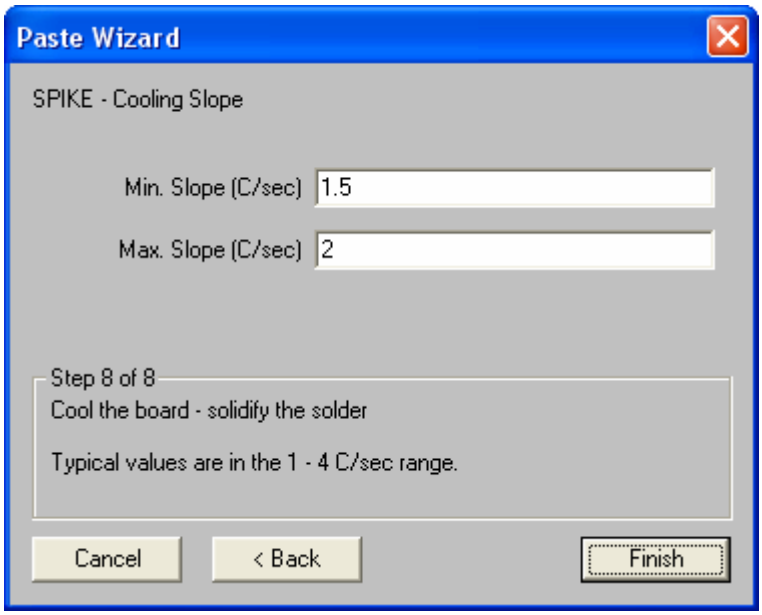
8) Enter the SPIKE – Peak Temperature information and select the ***Next*** button.



Profile Wizard Step 7

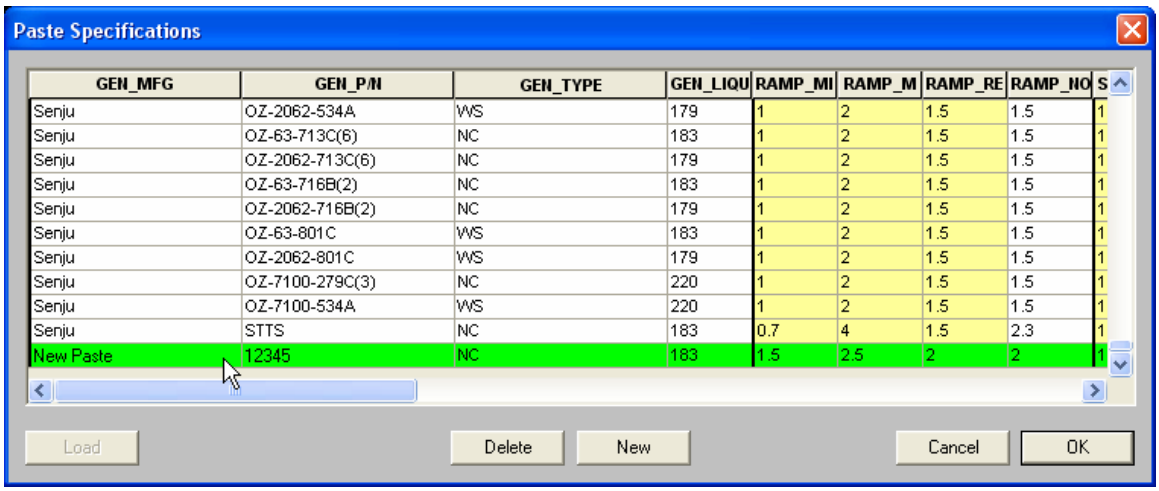
9) Enter the SPIKE – Cooling Slope information and select the ***Finish*** button to create the new paste and return to the Paste Specification database dialog box.

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).



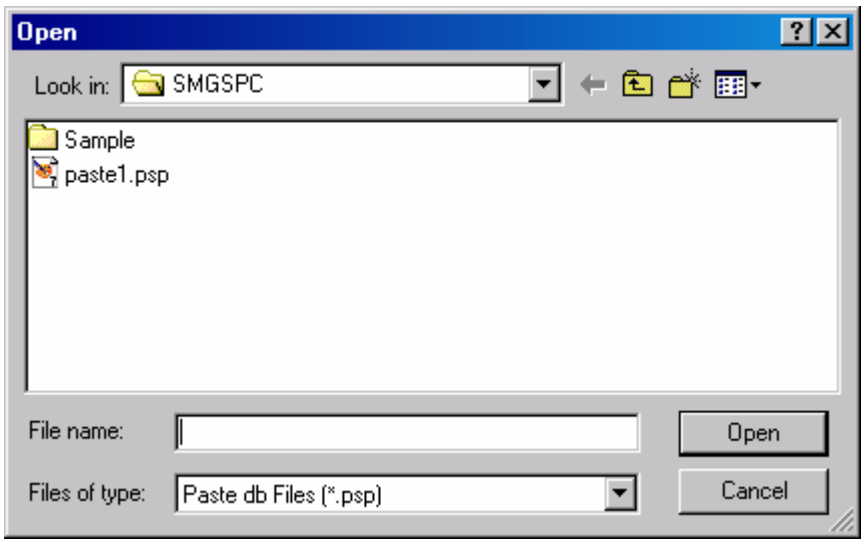
Created Paste Selection

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

The user can also load a different paste database using the ***Load*** command button on the Paste Specification database dialog box.

To load a database:

1) Select the ***Load*** command from the ***Paste Specifications*** database dialog box. A list box with the filtered extension of (**.PSP**) appears.



Paste Database List Box

2) Navigate to the desired paste database file location and highlight the desired file.

3) Select the ***Open*** command button to load, or ***Cancel*** to return to the Paste Specification database dialog box.

The Load feature is useful when the user wishes to share a single paste database with other installations.

6.5.11 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.

6.6 M.O.L.E. Menu

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

The M.O.L.E. must be connected to a PC and the proper communication port must be configured to properly use the M.O.L.E. menu commands.

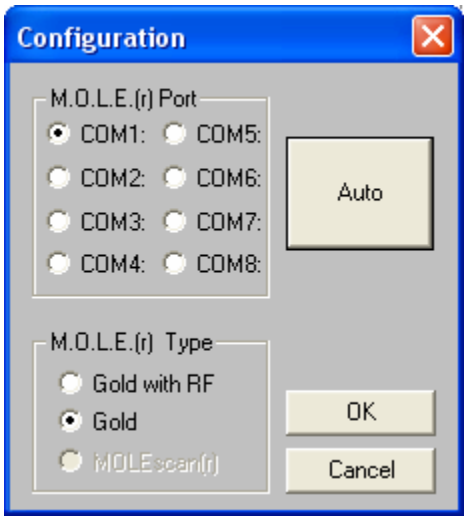
6.6.1 Configuration Wizard

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) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
2) On the ***M.O.L.E.*** menu, select ***Configuration Wizard*** and the Configuration dialog box appears.



Wizard Step 1 – Configuration

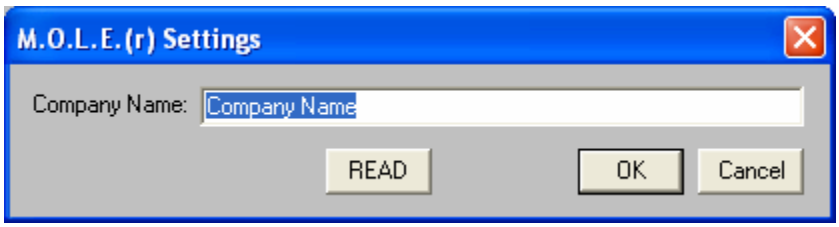
3) Click the option button next to a COM port which the PC is set up for RS-232 communications or the Auto command button to have the software automatically find the COM port the M.O.L.E. is connected.

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.

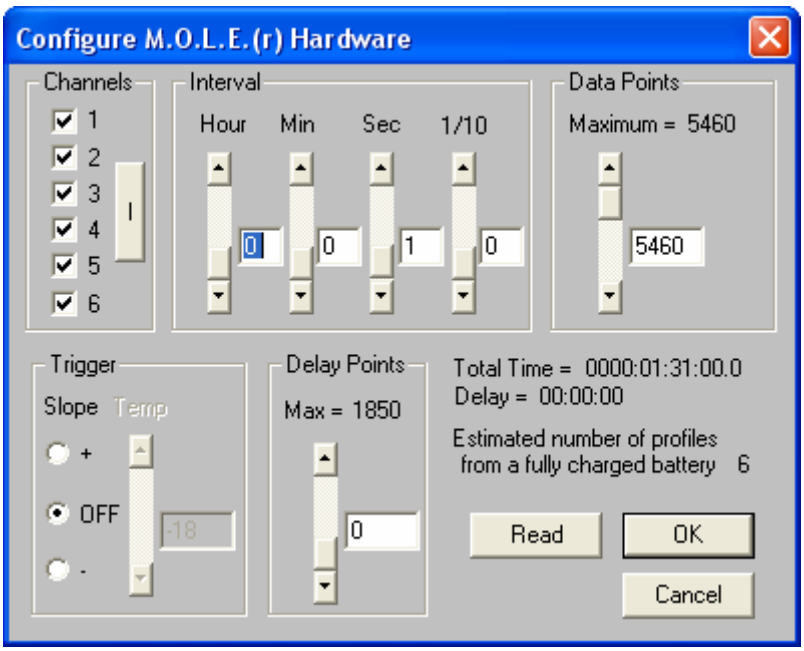
6) Type a company, operator, or machine name in the text box.



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.

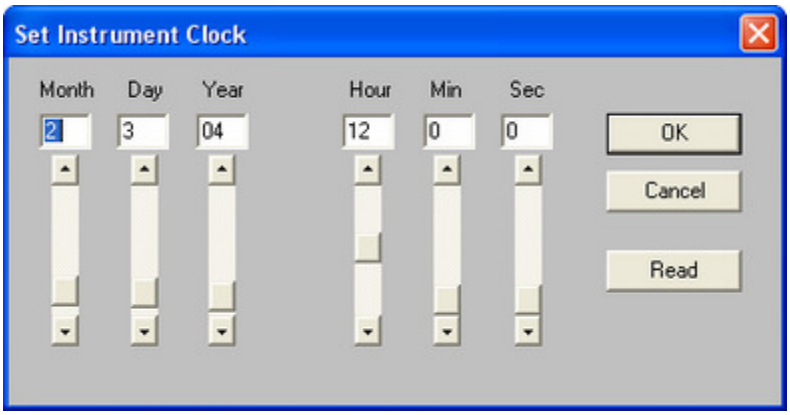
When M.O.L.E. configure options are modified, the data is calculated and then amount of profiles the user can expect from the power pack battery (based on a fully-charged power pack battery) is displayed in the lower right corner next to the Profiles Per Battery line.

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

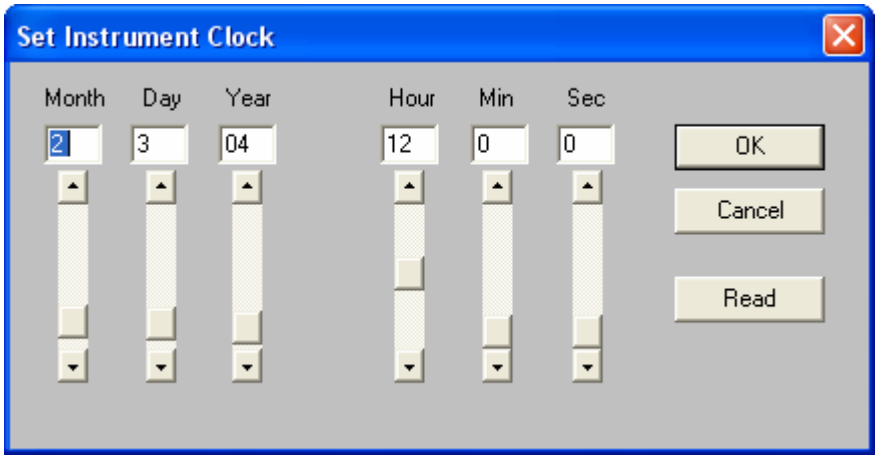
When the Set Instrument Clock dialog box appears the current computer clock setting is automatically entered in the text boxes.

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

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

6.6.2 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) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
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:

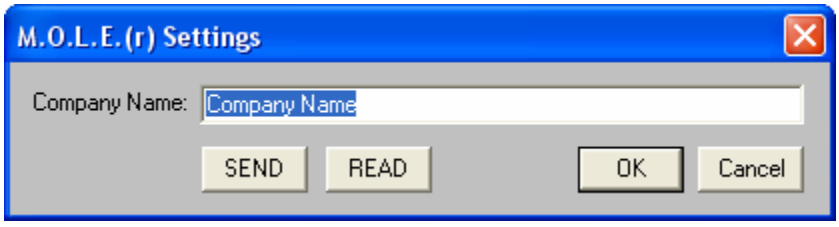
1) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
2) On the ***M.O.L.E.*** menu, select ***Set M.O.L.E. Clock***.
3) Click the ***Read*** command button to display the current date and time from the M.O.L.E.. If the clock is set wrong, the date or time will be incorrect.

6.6.3 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) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
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.



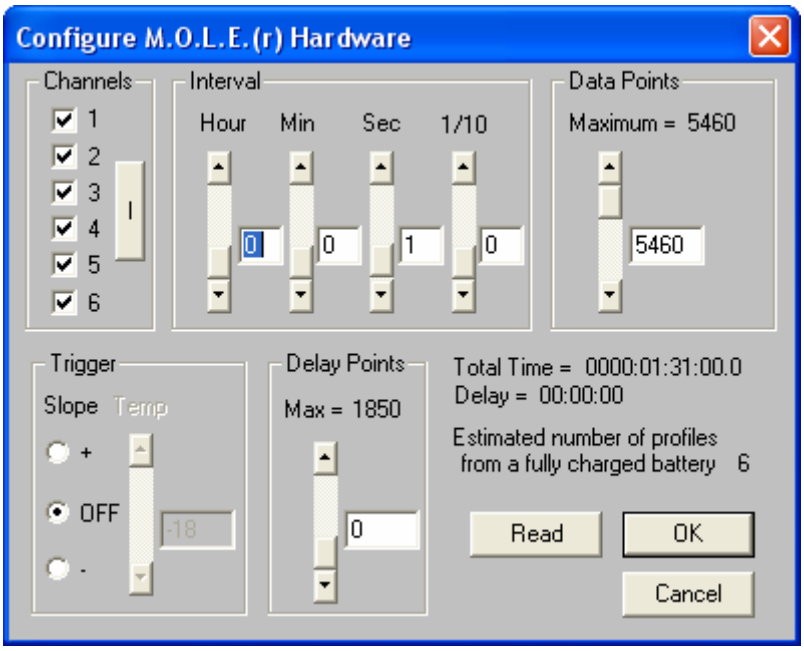
M.O.L.E. Settings

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.

6.6.4 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) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
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, Profile and Admin worksheets.

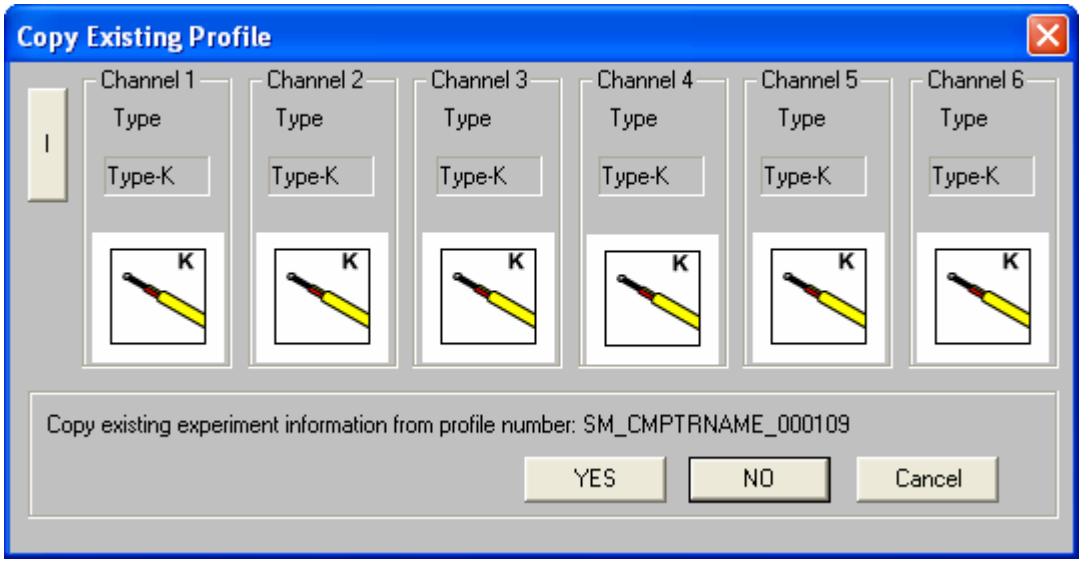
Configure M.O.L.E. Button

6.6.5 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:

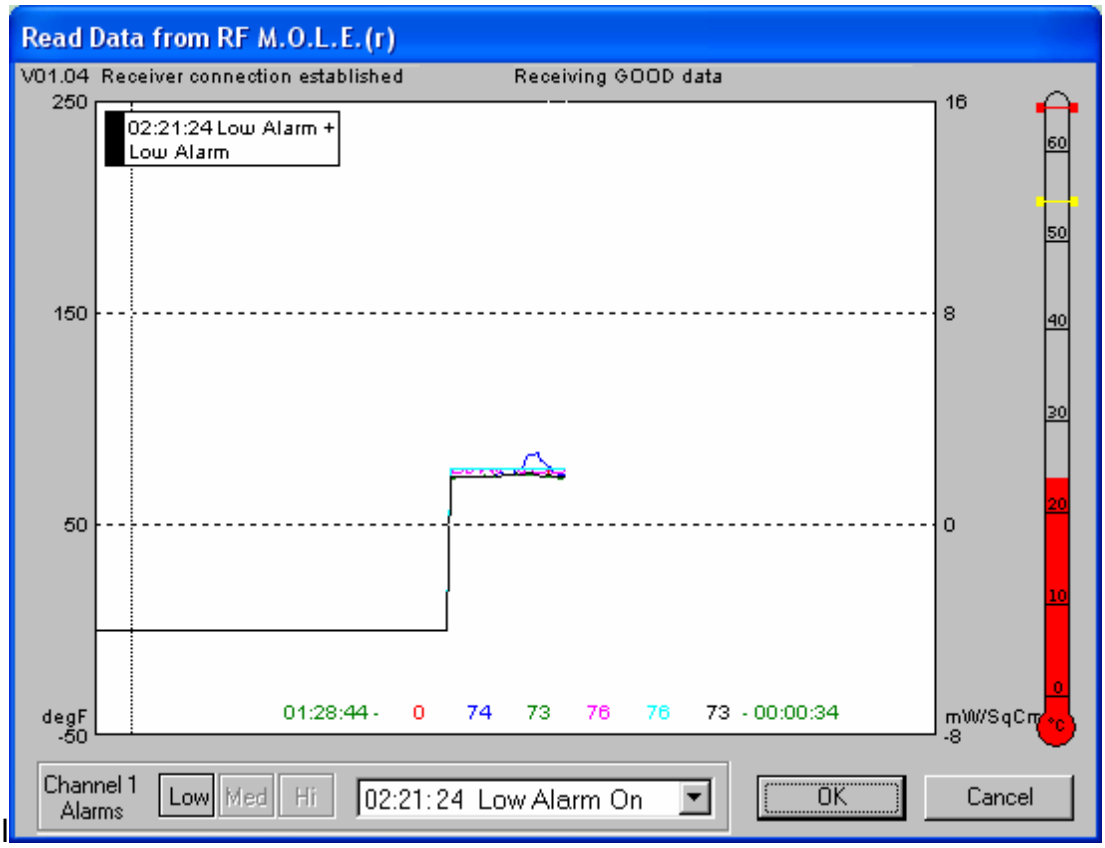
1) Connect the RF Receiver to the PC using the PC interface cable supplied. Refer to ***Communications Setup*** for more information.
2) Using the ***Configuration Wizard***, set the COM port and configure the software to accept RF M.O.L.E. Data. Refer to ***Configuration Wizard*** for more information.
3) On the ***M.O.L.E.*** menu, select ***RF M.O.L.E. Data***. A dialog box appears asking the user if they want to copy the existing experiment information from the currently displayed profile on the Profile worksheet.



Copy Existing Profile information

- Click the ***Yes*** command button to start the new data run using the settings from the selected profile.
- Click the ***No*** command button to start the new data run using the default settings.
- Click the ***Cancel*** command button to return to the worksheet without uploading the data run.
- Click the input sensors configuration (“***I***”) button to select a different sensor for any of the channels.

4) 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.

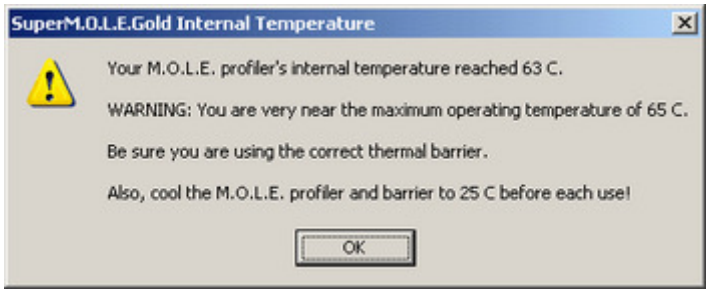


RF Dialog Box

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.

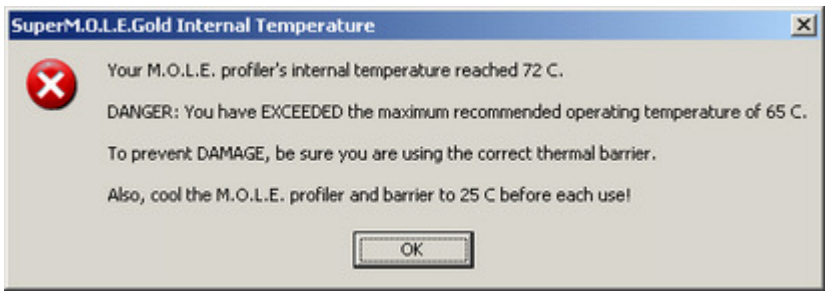
5) When finished collecting transmitted data click the ***OK*** command button. The data run will automatically be inserted into a data run row on the Spreadsheet worksheet and the software will return to the worksheet where the where the command was activated.

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℃-64.9℃ 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.



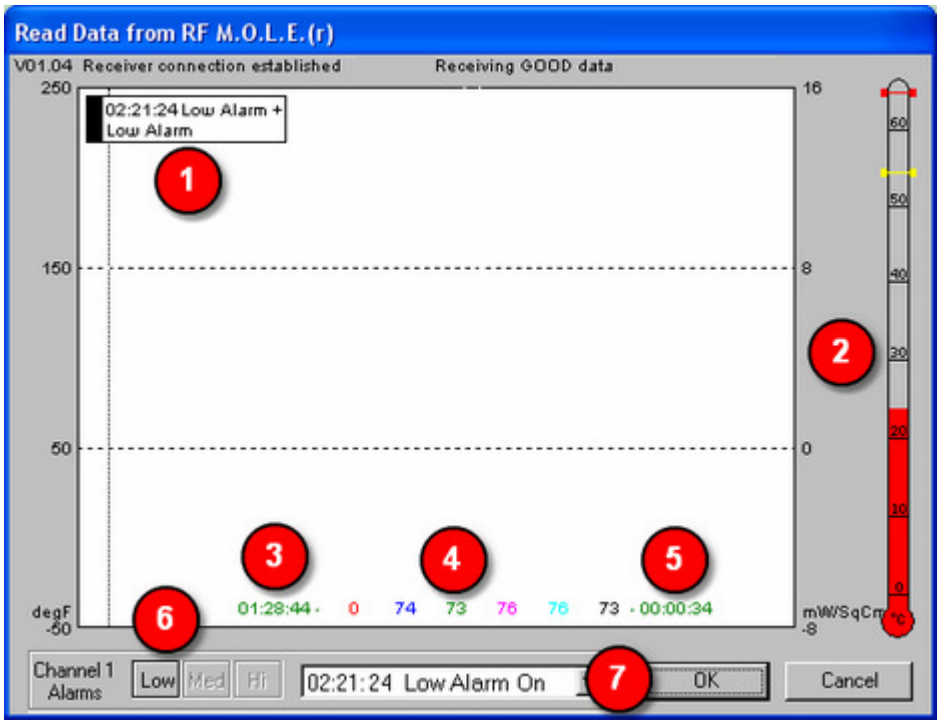
Maximum Recommended Operating Temperature Warning

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

RF M.O.L.E. Data Button

6.6.5.1 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.

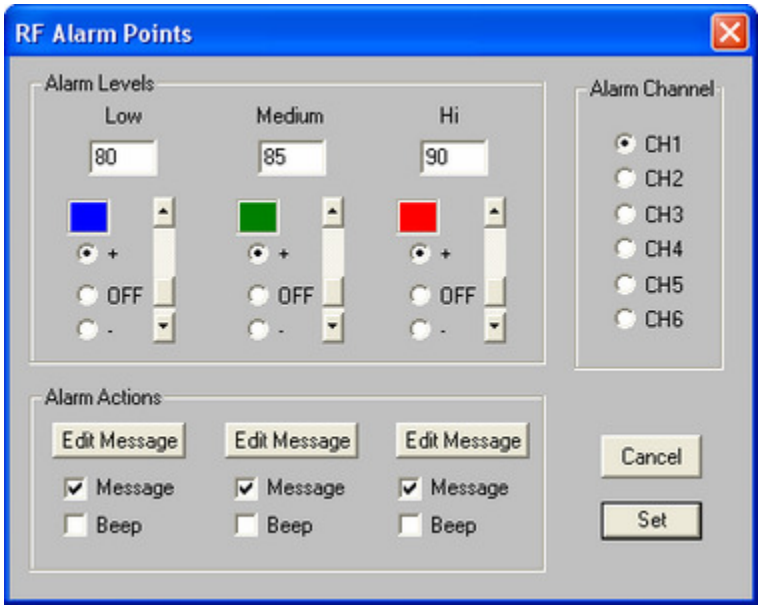
❼ **Alarm Log:** This is a drop down list box that logs the time and channel that has been breached during the current profile.

6.6.5.2 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.

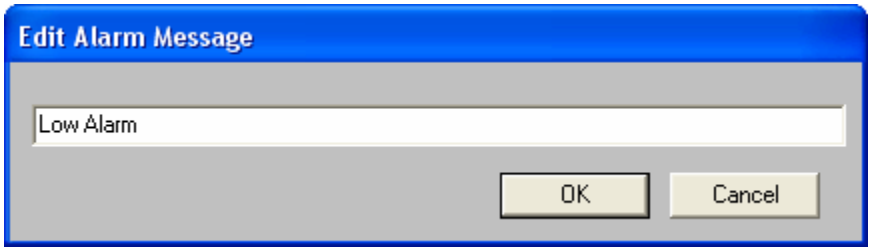


RF Alarm Dialog Box

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:

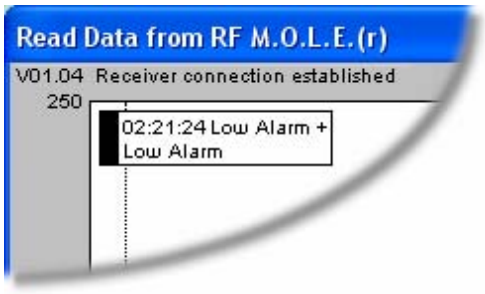
1) Click an ***Edit Message*** command button.



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.



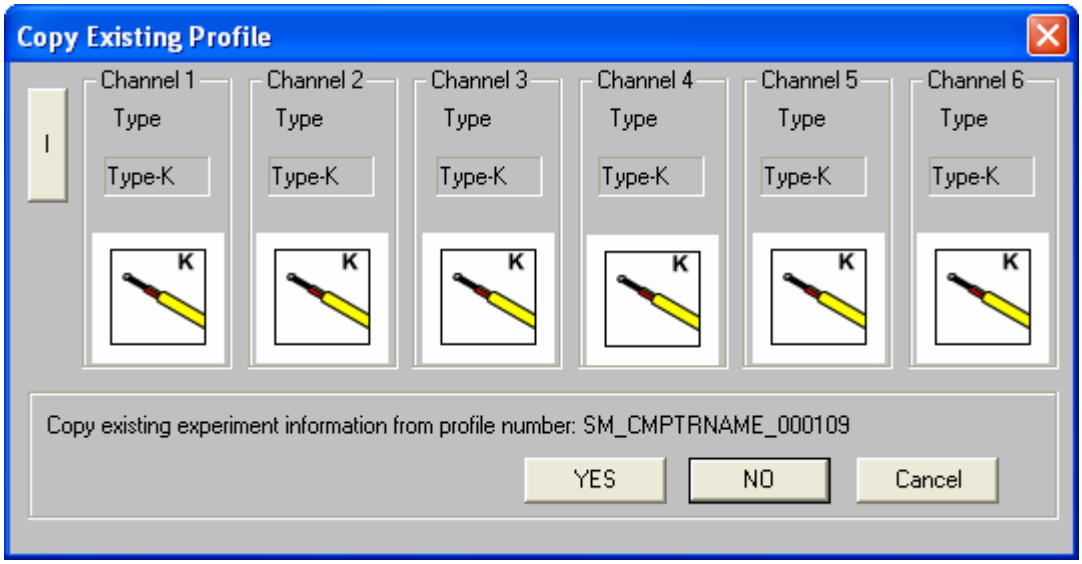
Alarm Message Box

6.6.6 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) Connect the M.O.L.E. to the PC. Refer to ***Communications Setup*** for more information.
2) Select a desired Workbook file to upload the collected data.
3) On the ***M.O.L.E.*** menu, select ***Read M.O.L.E. Data***. A dialog box appears asking the user if they want to copy the existing experiment information from the currently displayed profile on the Profile worksheet.

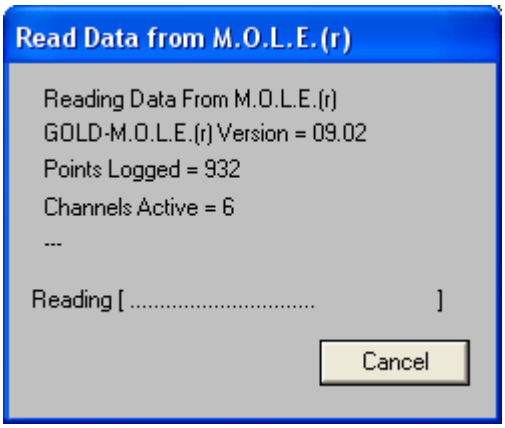


Copy Existing Profile information

- Click the ***Yes*** command button to start the new data run using the settings from the selected profile.
- Click the ***No*** command button to start the new data run using the default settings.
- Click the ***Cancel*** command button to return to the worksheet without uploading the data run.
- Click the input sensors configuration ("***I***") button to select a different sensor for any of the channels.

If the AutoM.O.L.E. Feature is installed on the computer, a dialog box will appear asking the user if they wish to have AutoM.O.L.E to load the oven settings?

4) 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.

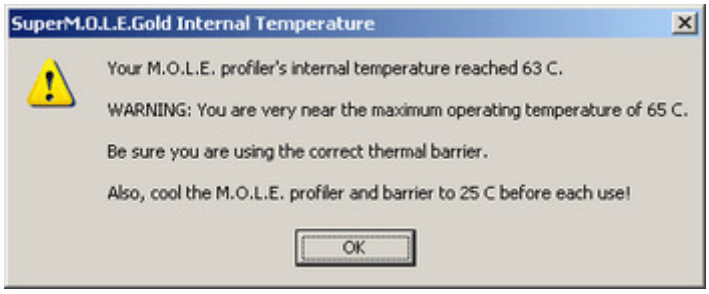


Read M.O.L.E. Data Status Box

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).

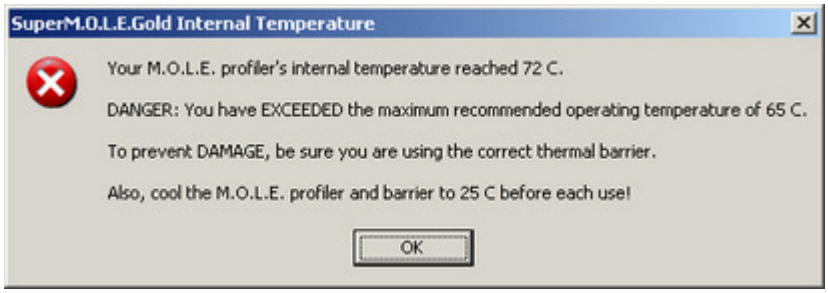
5) When the data transfer is complete the status box will disappear and the data run will automatically be inserted into a data run row on Spreadsheet worksheet. The software will then return to the worksheet where the where the command was activated.

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℃-64.9℃ 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 information is automatically saved and the experiment data can now be analyzed with the software.

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

6.6.7 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.

6.7 Tools Menu

Options in this menu help you manipulate and analyze the profile data.

6.7.1 Magnify Tool

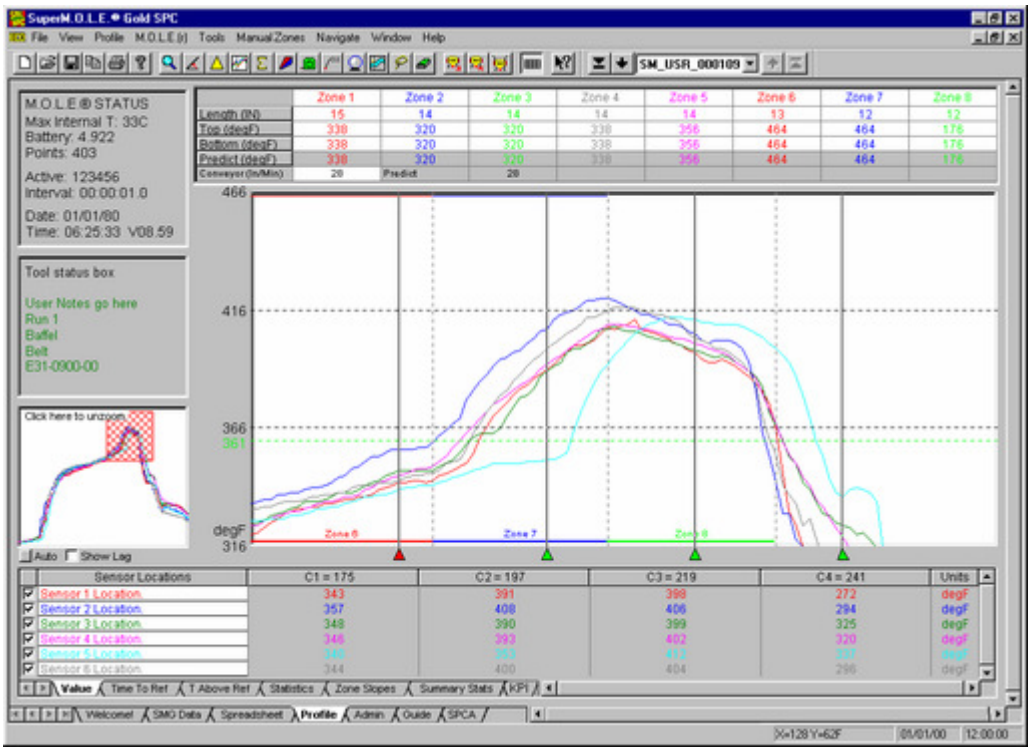
The Magnify tool enlarges any selected area of the data graph for easy visual examination.

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.

• Magnify Applications

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.

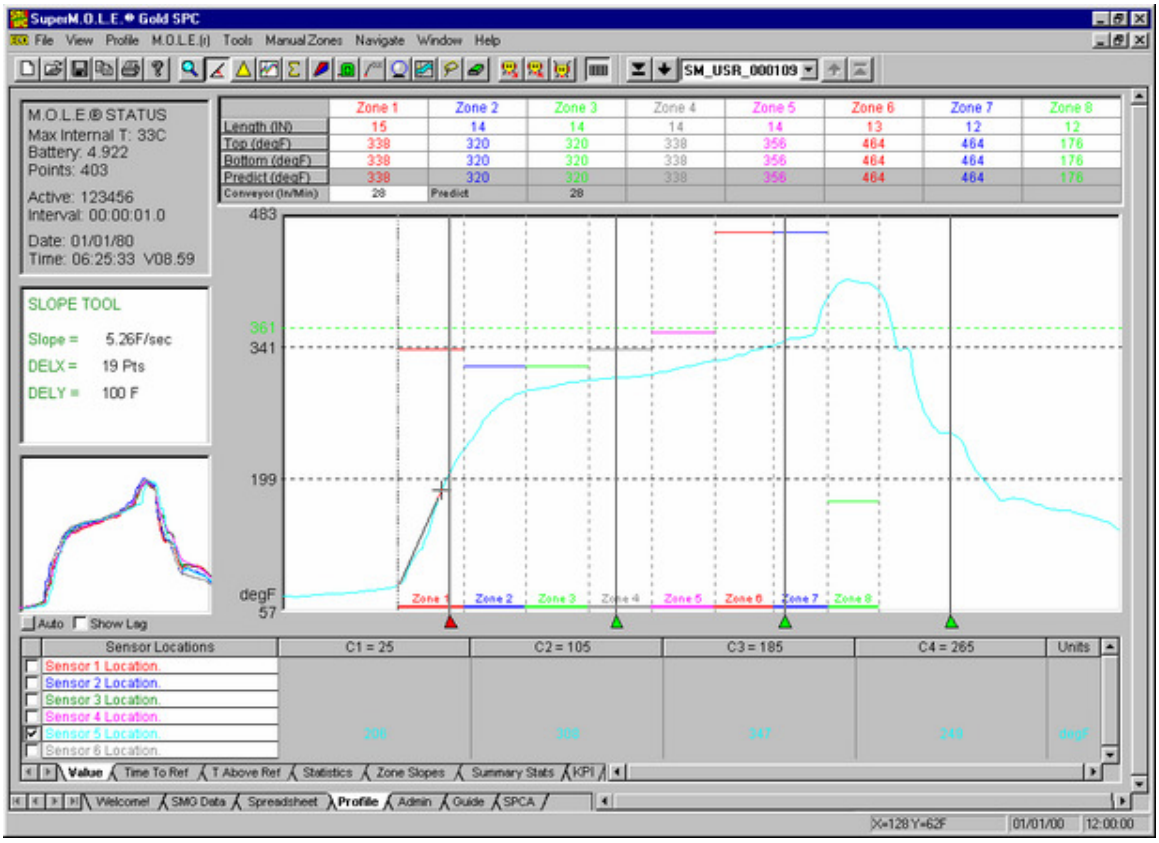
	**Magnify Button**

6.7.2 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**

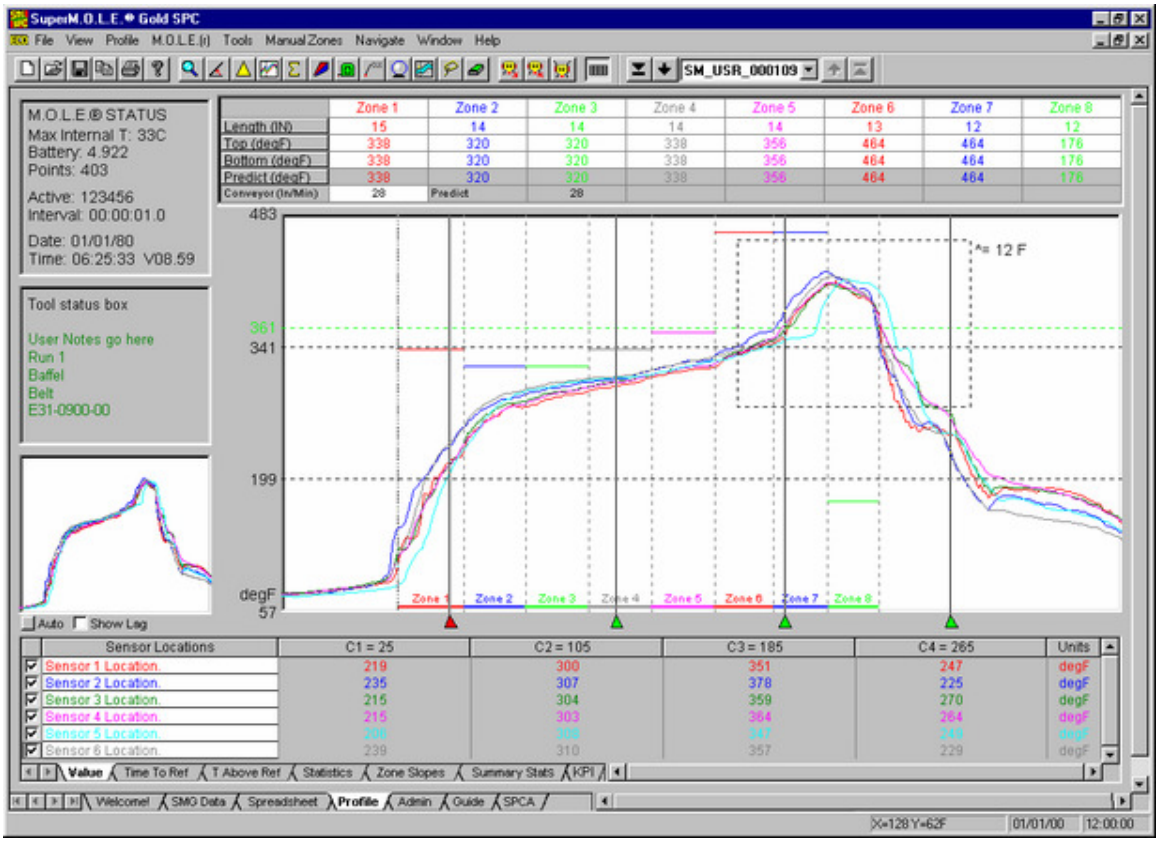
6.7.3 Peak Difference Tool

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**

6.7.4 Overlay Tool

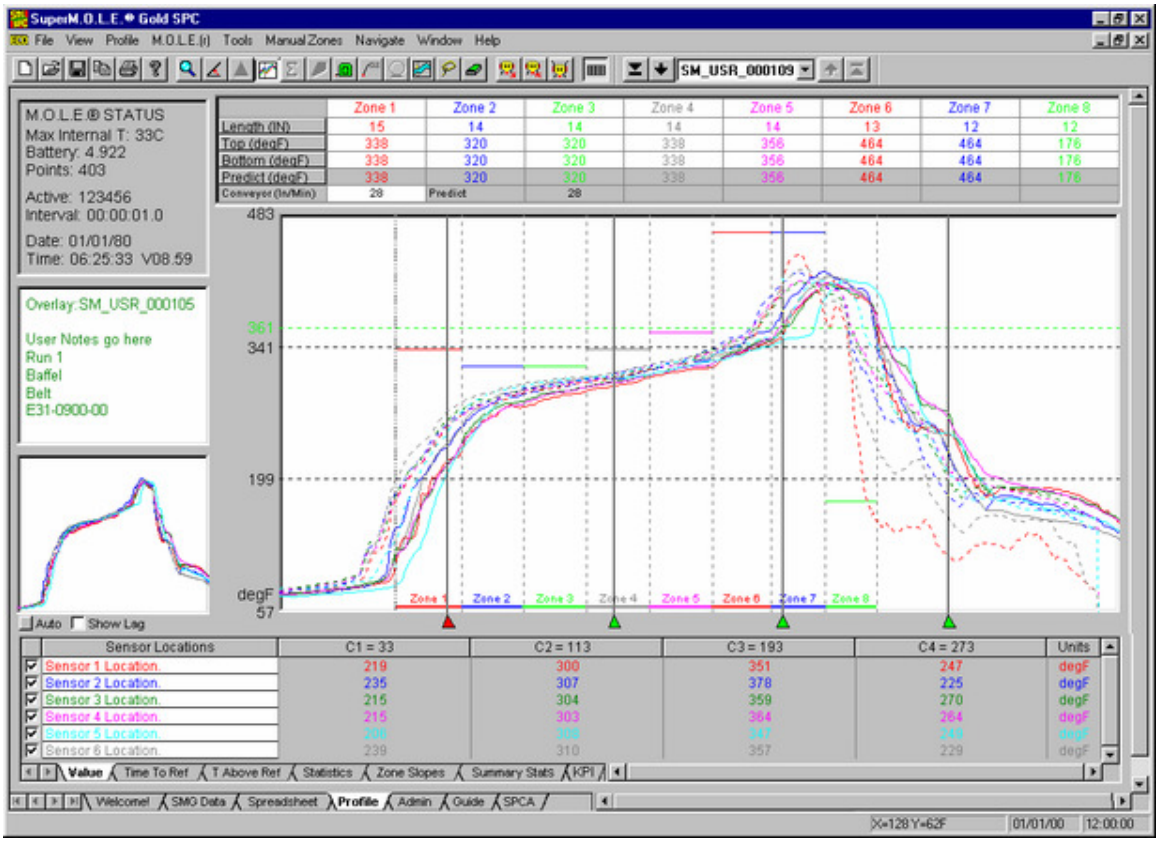
The Overlay tool displays a second data run profile over the currently displayed profile for comparison.

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**

6.7.5 Total Heat Tool

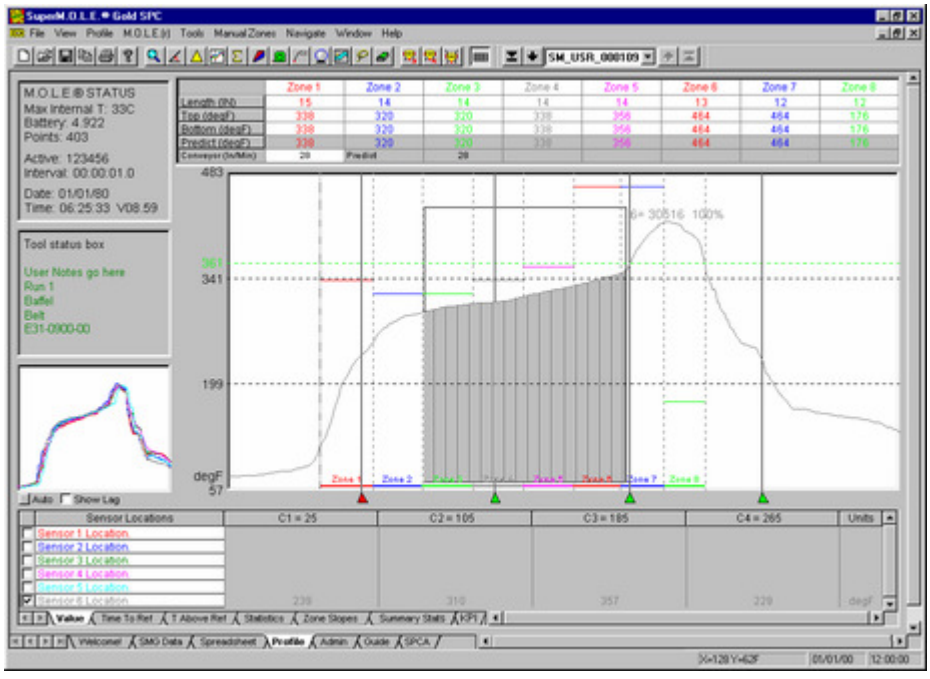
The Total Heat tool computes the area between the Data Plot curves and the bottom border of the selected Total Heat area. This can be used for easy evaluation of heat input.

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.

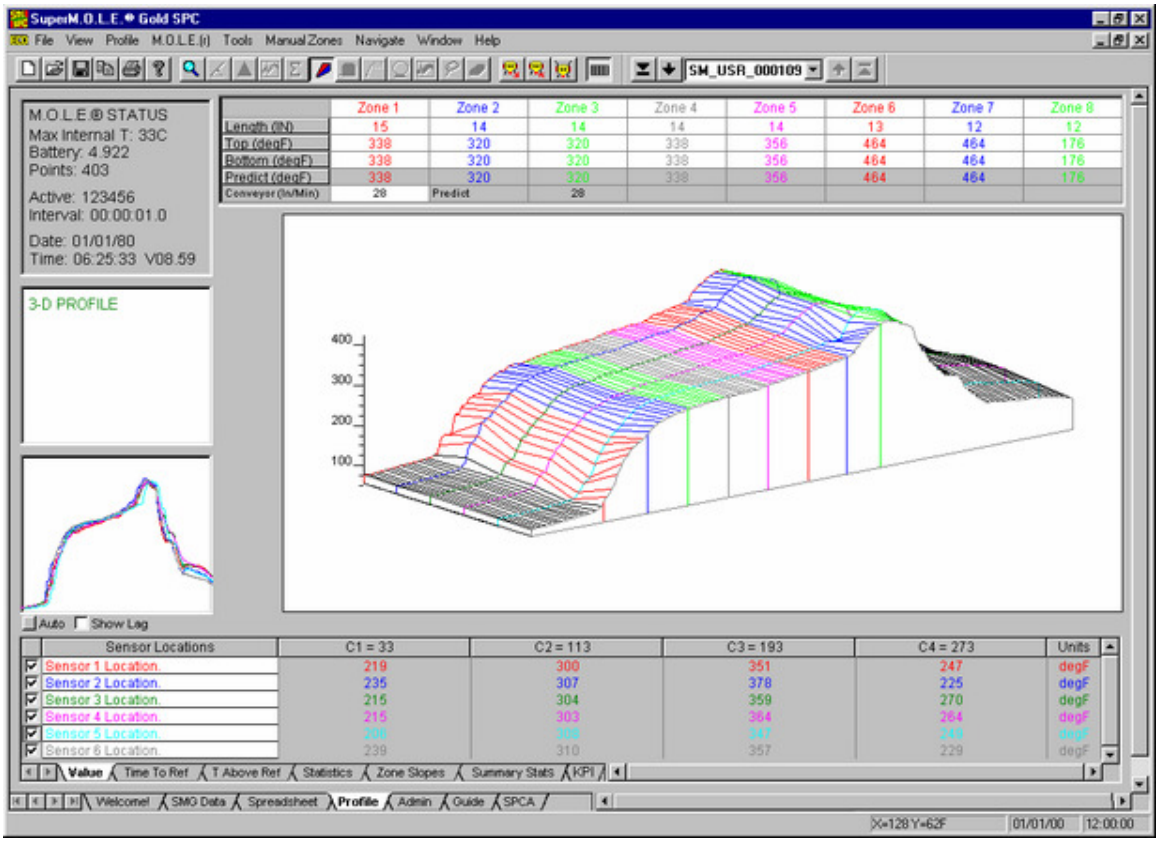
The Total Heat tool can be accessed on the Profile worksheet Toolbar.

Total Heat Button

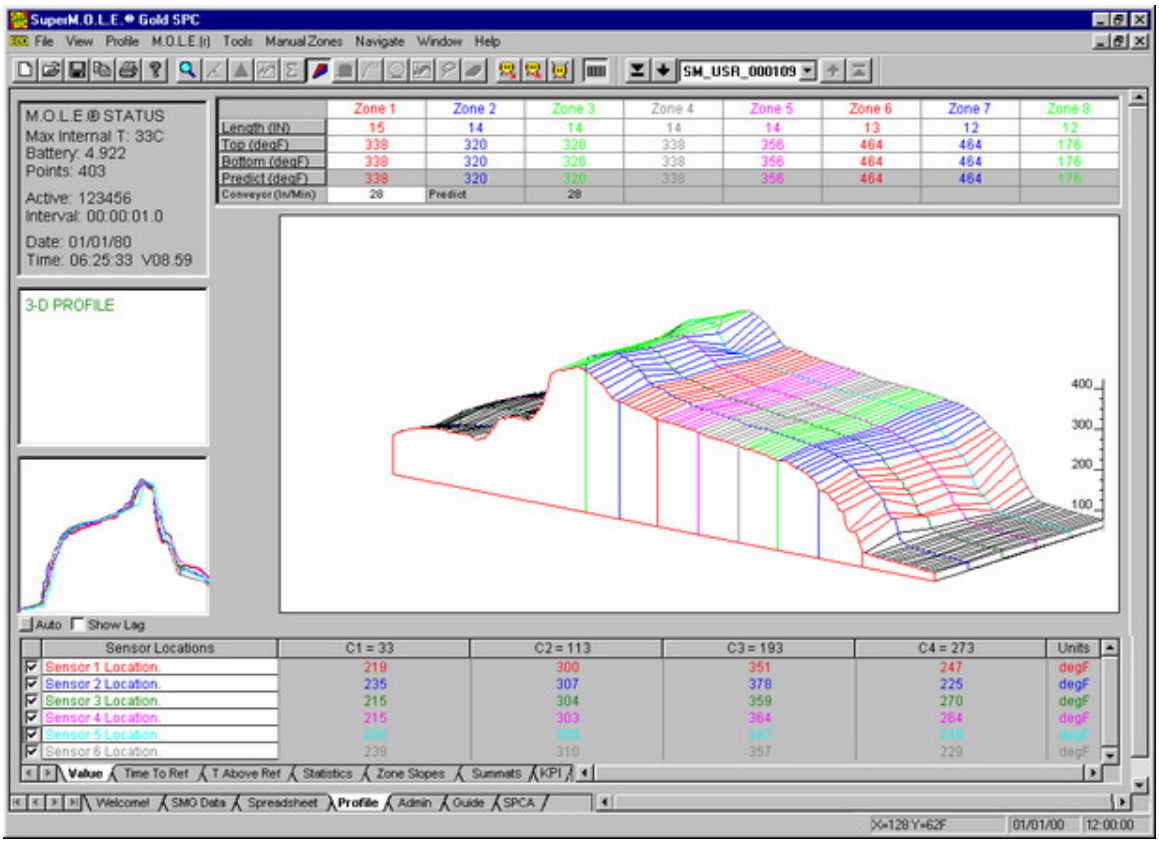
6.7.6 3-D Tool

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

To remove the 3-D profile:

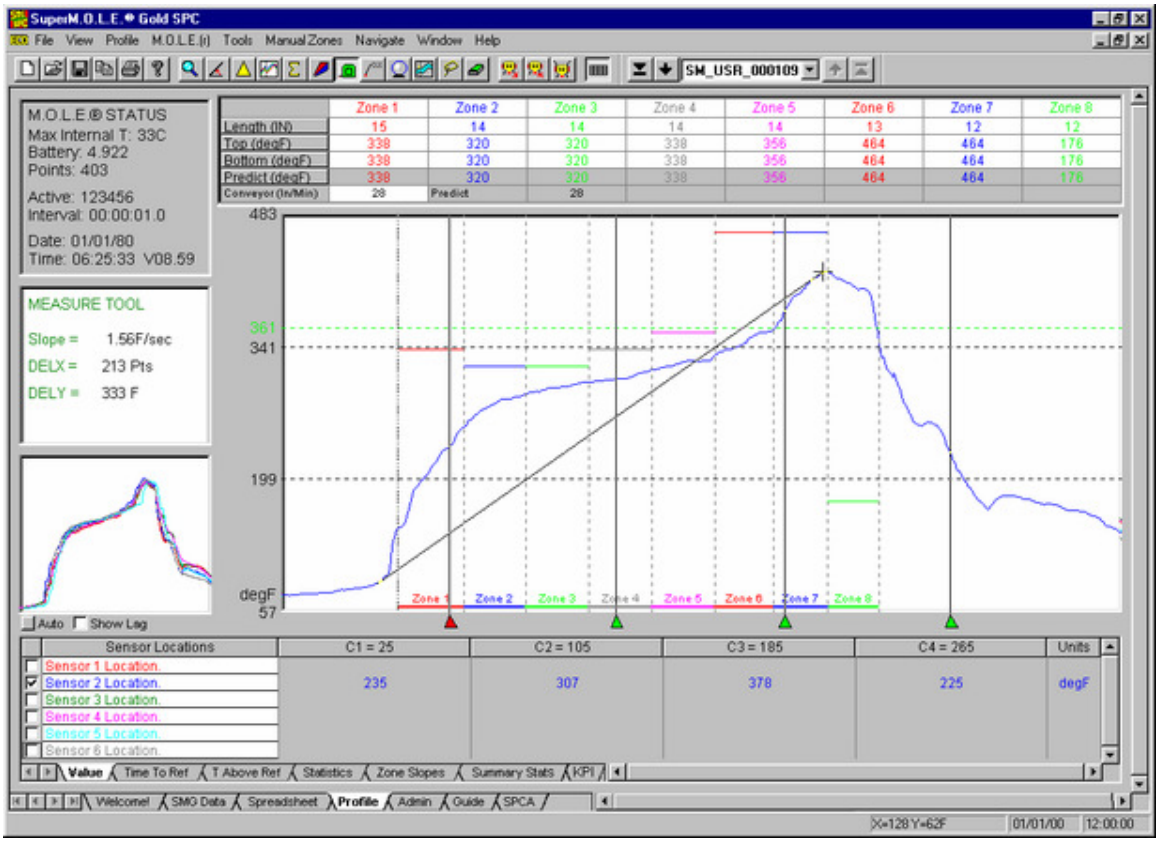
1) Click the 3D tool or click the right mouse button.

The 3-D tool can be accessed on the Profile worksheet Toolbar.

	**3-D Button**

6.7.7 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

<u>To find the distance between two points:</u>

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**

6.7.8 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**

6.7.9 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.

Model a process:

1) Complete a data run in an oven with a test assembly to establish a baseline for the process.
2) Enter zone sizes in the length fields for each zone. This is the length of each heating, soaking, or cooling zone within the oven.

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.

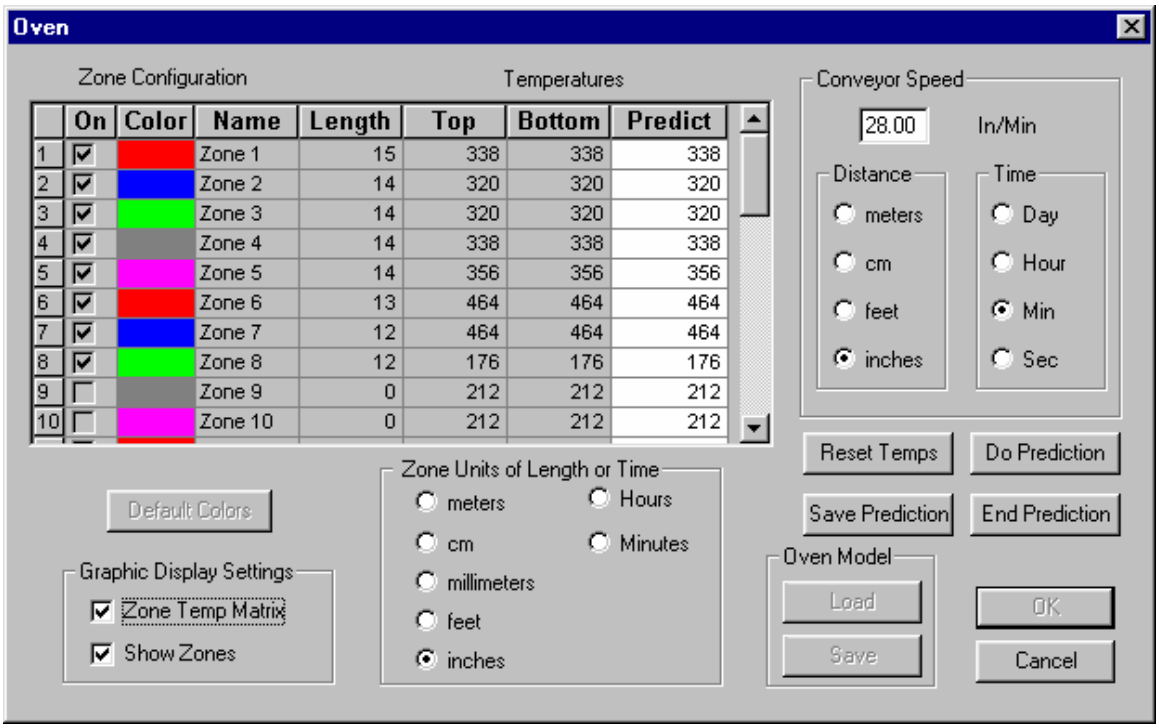
The units for the X-Cursor should be set to *Distance*. To set the units to distance, select the *Units* command from the *Profile* menu.

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.

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.

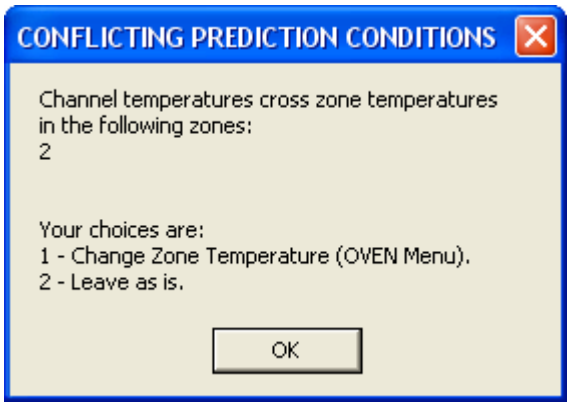


Oven Dialog Box

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.

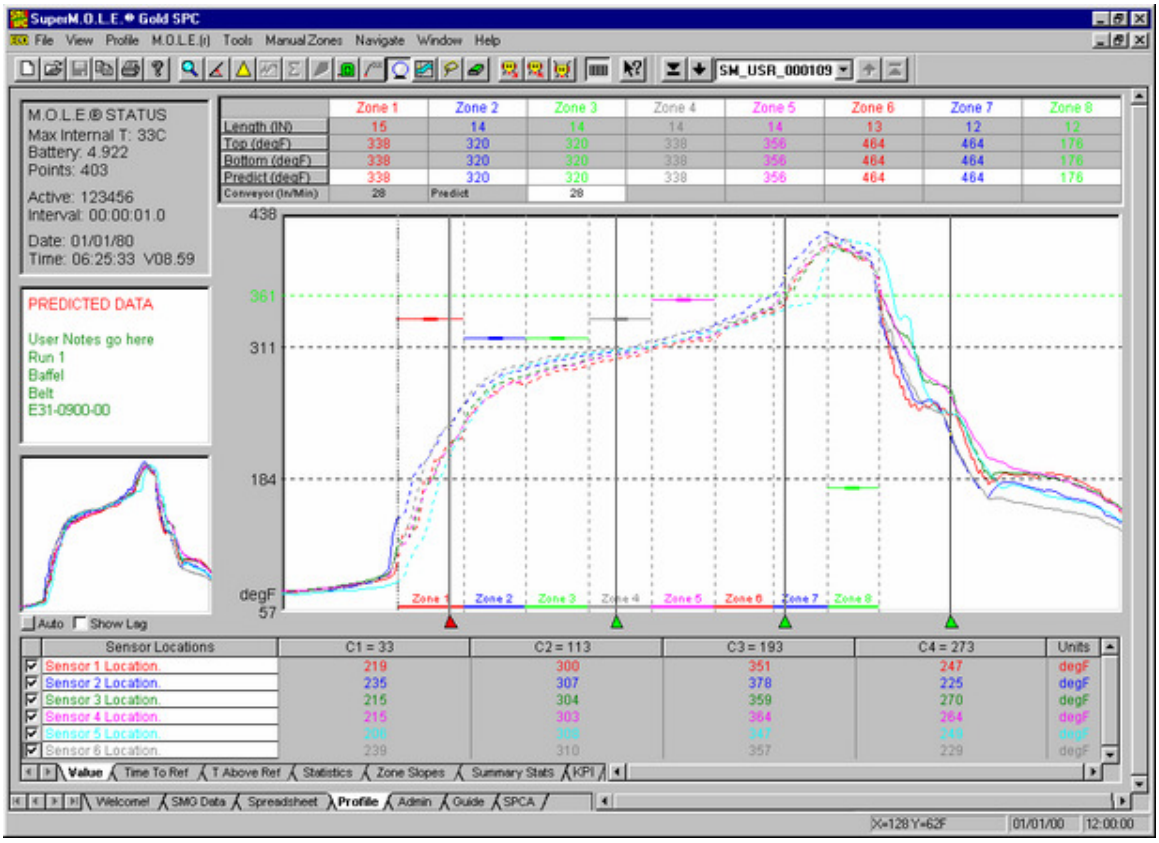
If sensor temperatures inconsistent with zone temperature settings are detected, a message box with an explanation appears. The explanation appears only once for all zones, each time Prediction is used. After that, the software assumes the user is aware of the potential problem.



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.

The Prediction tool can be accessed on the Profile worksheet Toolbar.

	**Prediction Button**

6.7.9.1 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	G	H	I	J	K
1	USER 1	USER 2	USER 3	USER 4	USER 5	General	General	General	M.O.L.E.®	M.O.L.E.®
2				Machine:		Date:	Time:	File Tag:	Temp:	Batt:
3									F	Volts
Filter Reset	All	All	All	All	All	All	All	All	All	All
11	**User Notes go here**	**Run 1**	**Baffel**	**Belt**	**E31-0900-00**	**Predict**	**SM_USR_000109**	**SM_USR_000110**	**91.4**	**4.922**
10	User Notes go here	Run 1	Baffel	Belt	E31-0900-00	01/01/1998	06:25:33	SM_USR_000109	91.4	4.922
9	User Notes go here	Run 2	Baffel	Belt	E31-0900-00	01/01/1998	06:05:41	SM_USR_000108	89.6	4.922
8	User Notes go here	Run 3	Baffel	Belt	E31-0900-00	01/01/1998	05:39:34	SM_USR_000107	89.6	4.922
7	User Notes go here	Run 4	Baffel	Belt	E31-0900-00	01/01/1998	05:09:21	SM_USR_000106	86.0	4.922
6	User Notes go here	Run 5	Baffel	Belt	E31-0900-00	01/01/1998	04:37:36	SM_USR_000105	80.6	4.922

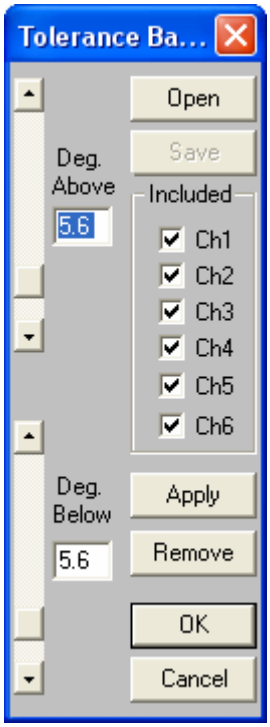
Saved Prediction

6.7.10 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.

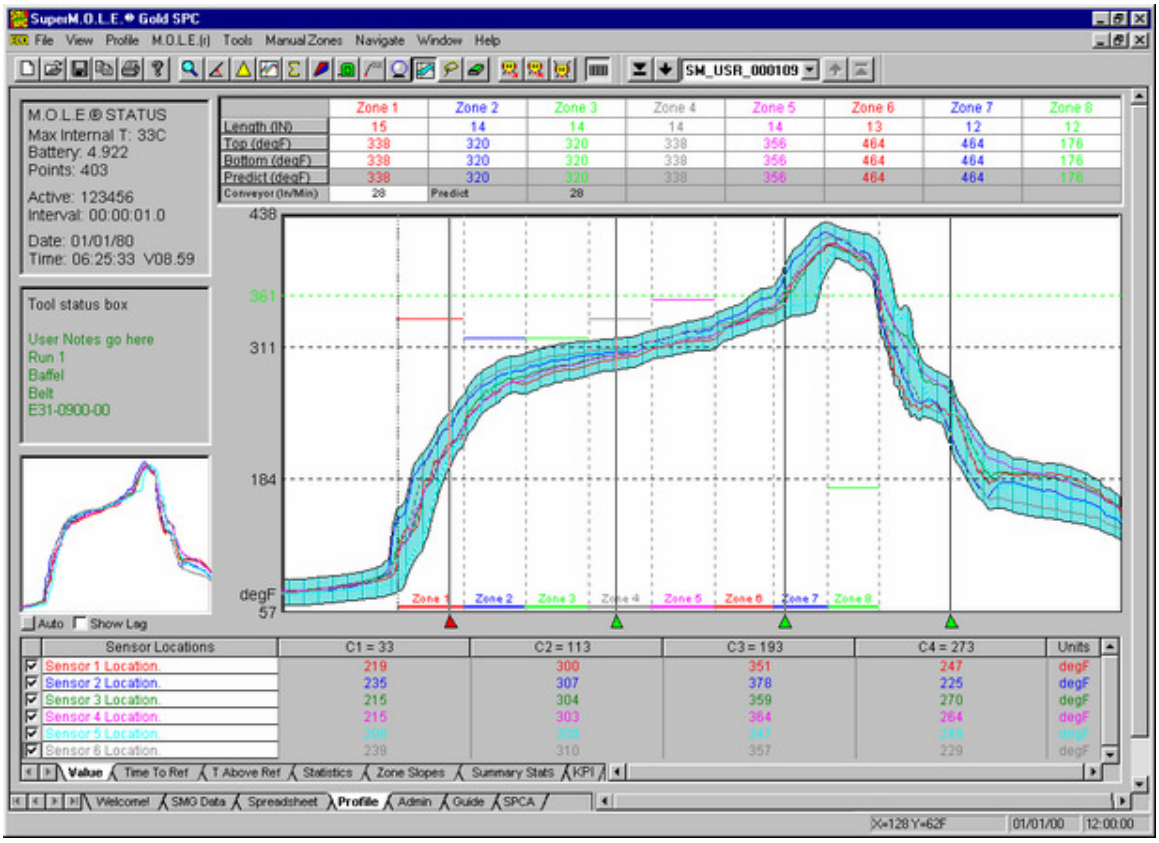
Only active channels will be enabled.

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

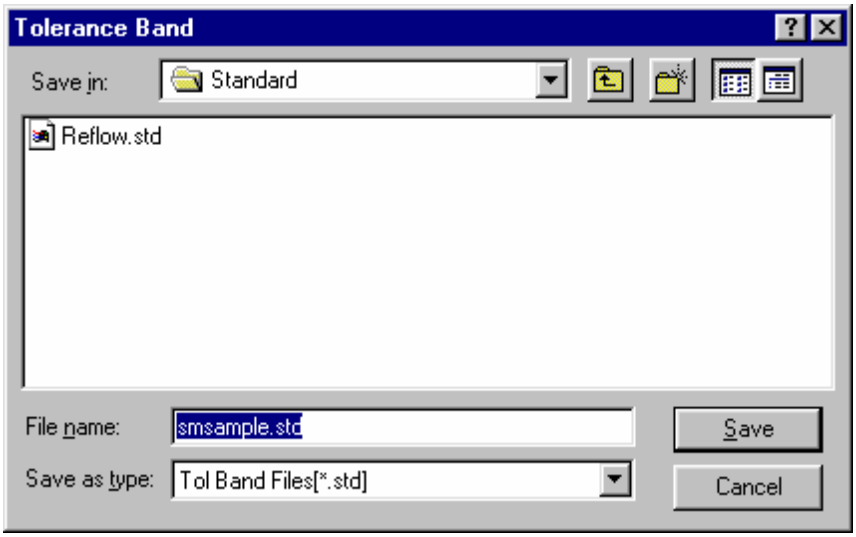
6) Click the Remove command button to remove the Tolerance Band from the Data Graph.

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**

6.7.11 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

6.7.12 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

6.8 Manual Zones Menu

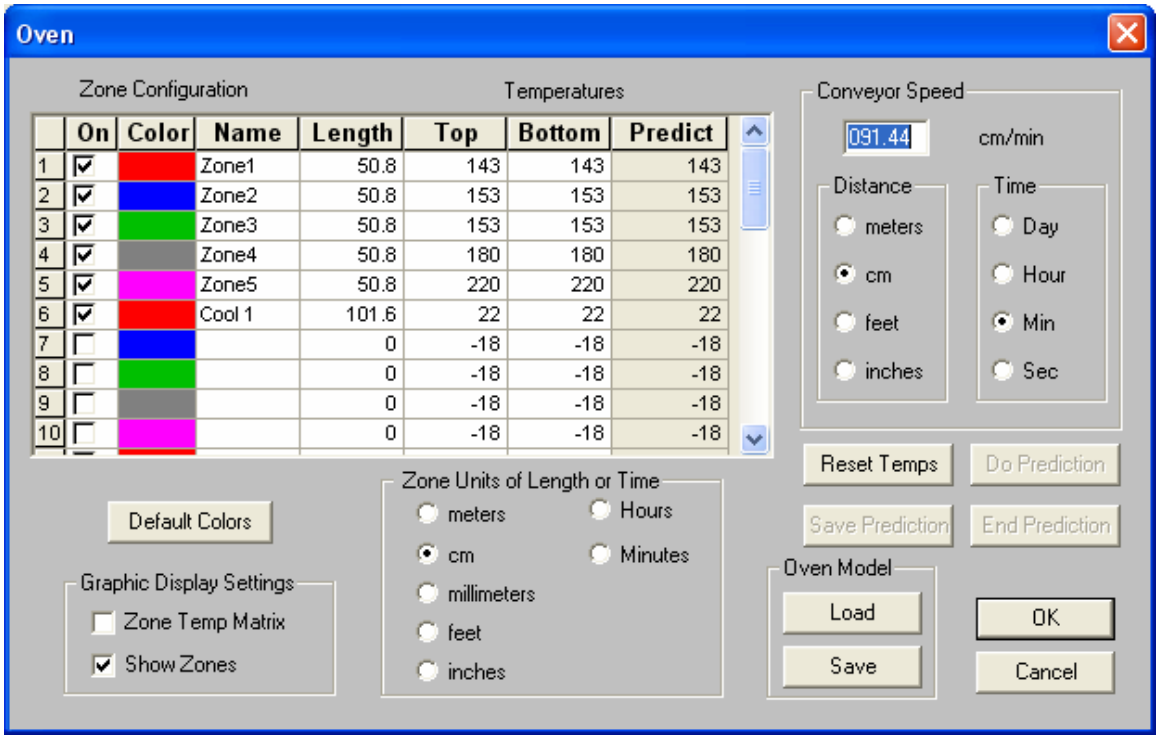
The commands on the ***Manual Zones*** menu sets zone boundaries in the oven up and creates a model of ideal processes that the software can use to compare experimental conditions.

6.8.1 Manual Zone Definition

The Manual Zone Definition command allows the user define the number of zones activated, color, name and length.

To activate Manual Zones:

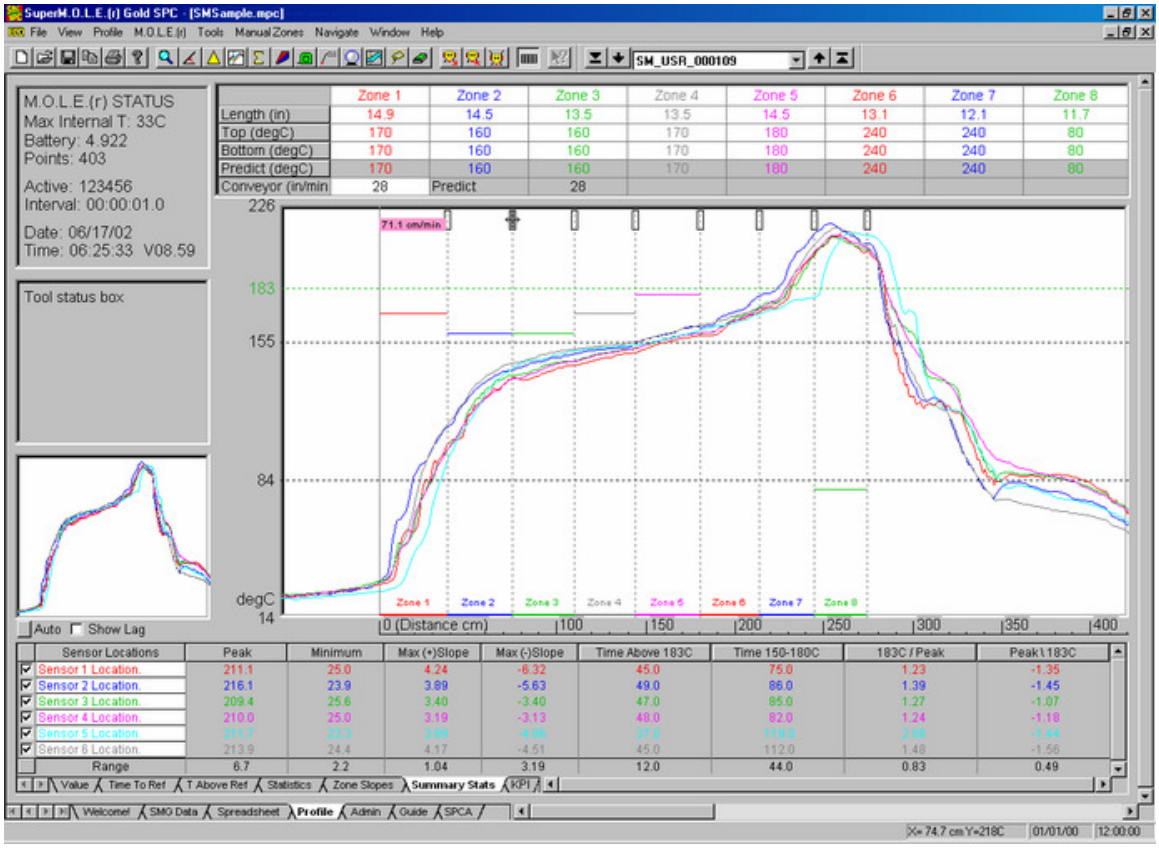
1) On the ***Manual Zones*** menu, select ***Manual Zone Definition*** to activate. A check mark appears to the left indicating the software is in Manual Zone Definition mode. The Oven Dialog box appears where the user can define the number of zones activated, color, name and length. Refer to ***Setup Zones*** for more information.



Oven Settings

2) Once the settings are acceptable, click the ***OK*** command button to return to the Profile worksheet to view.

3) Fine tune the oven settings by adjusting process origin, values in the Zone Matrix or manually moving the Zone Boundary handles.



Manual Zone Detection

4) Lock the settings by selecting the ***Manual Zone Definition command*** again. This removes the check mark next to the command indicating the software is not in Manual Zone Definition mode.

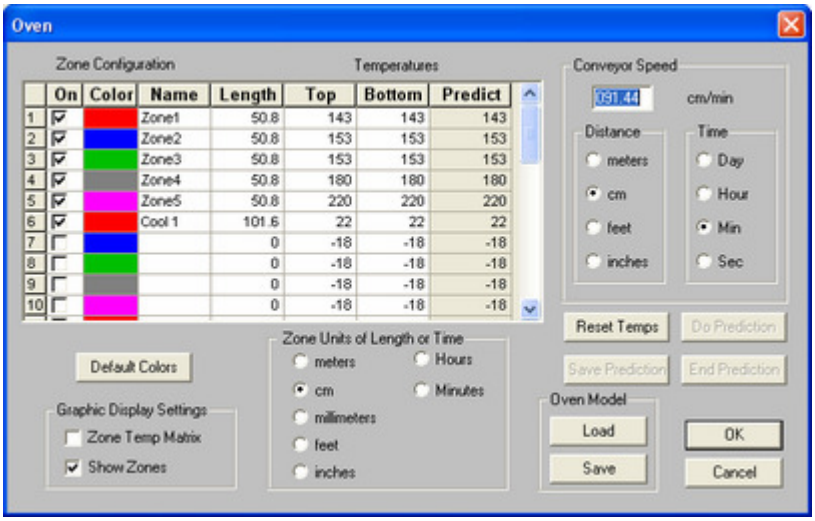
These new settings can be saved as an oven model. Refer to *Oven Models* for more information.

6.8.2 Setup Zones

The Setup Zones command sets the conveyor speed, zone colors, displays zone boundaries in the Data Graph and saves or loads oven settings.

To setup zones:

1) On the ***Manual Zones*** menu, select ***Setup Zones*** and the Oven dialog box appears.



Manual Zones Dialog Box

2) Click the corresponding check box beside a zone to activate or deactivate it.

3) Click the corresponding ***Color*** field to select a different color for that zone. Click the ***Default Colors*** command button to restore.

4) Click the corresponding ***Name*** field to enter a custom zone name if desired.

5) Click the option button beside the appropriate units of length or time for the process. Select between units of length.

6) Click the corresponding ***Length*** field to enter a specific zone length for each zone.

7) Enter the conveyor speed to identify the actual speed of the conveyor when the M.O.L.E. was recording data. The software uses this value to calculate the X-axis values when you choose the Distance option for the X-axis units.

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

8) Click the ***OK*** command button to accept the current setup or to create new zone(s) and oven settings or ***Cancel*** to quit without making any changes to the zones.

6.8.3 Zone Matrix

To view the Zone Matrix:

1) On the ***Manual Zones*** menu, select ***Zone Matrix*** and check mark appears beside it to indicate that the Zone Matrix is activated. When the Zone Matrix is turned "ON", it is located above the Data Graph.

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

 **Zone Matrix Button**

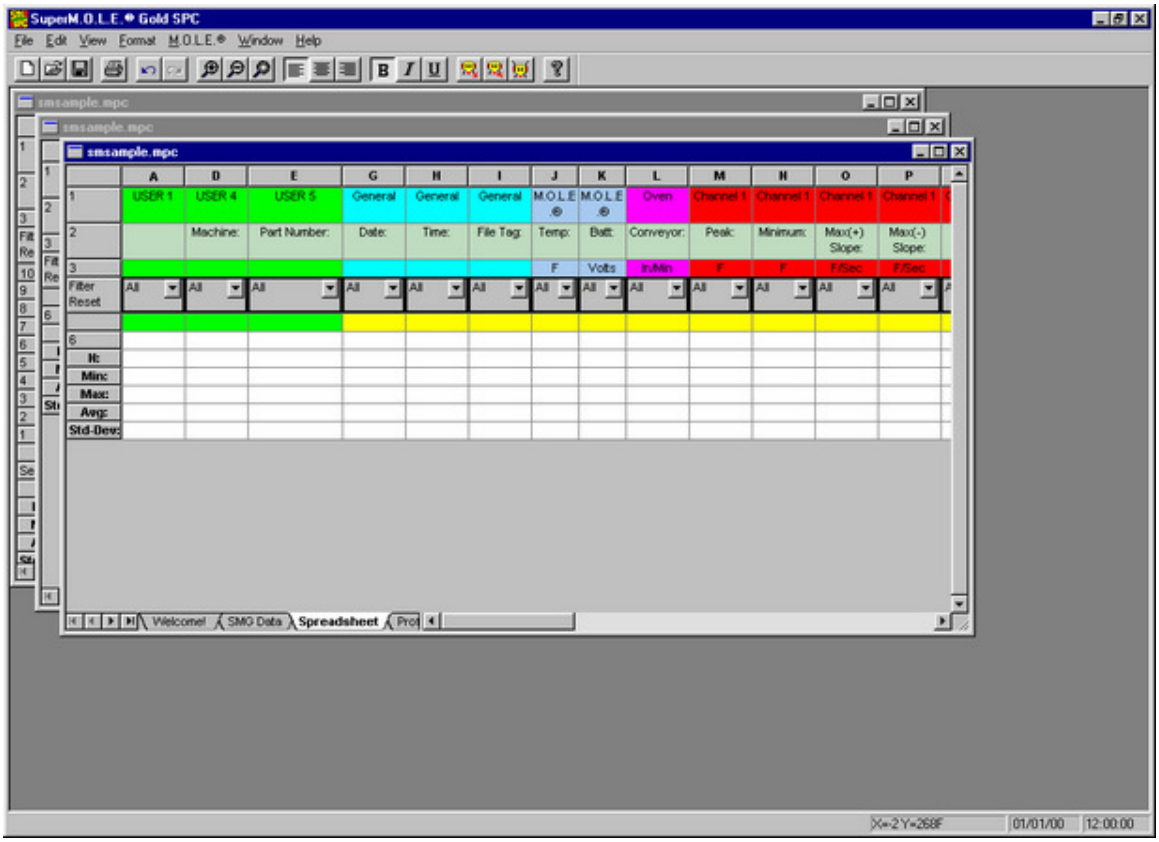
6.9 Window Menu

The Window menu arranges opened workbook files for viewing and quick access.

6.9.1 Cascade

To Cascade workbook files:

1) On the ***Window*** menu, select ***Cascade*** to cascade opened workbook files from the upper left corner overlapping the workbooks downward so each workbook Title bar is visible.

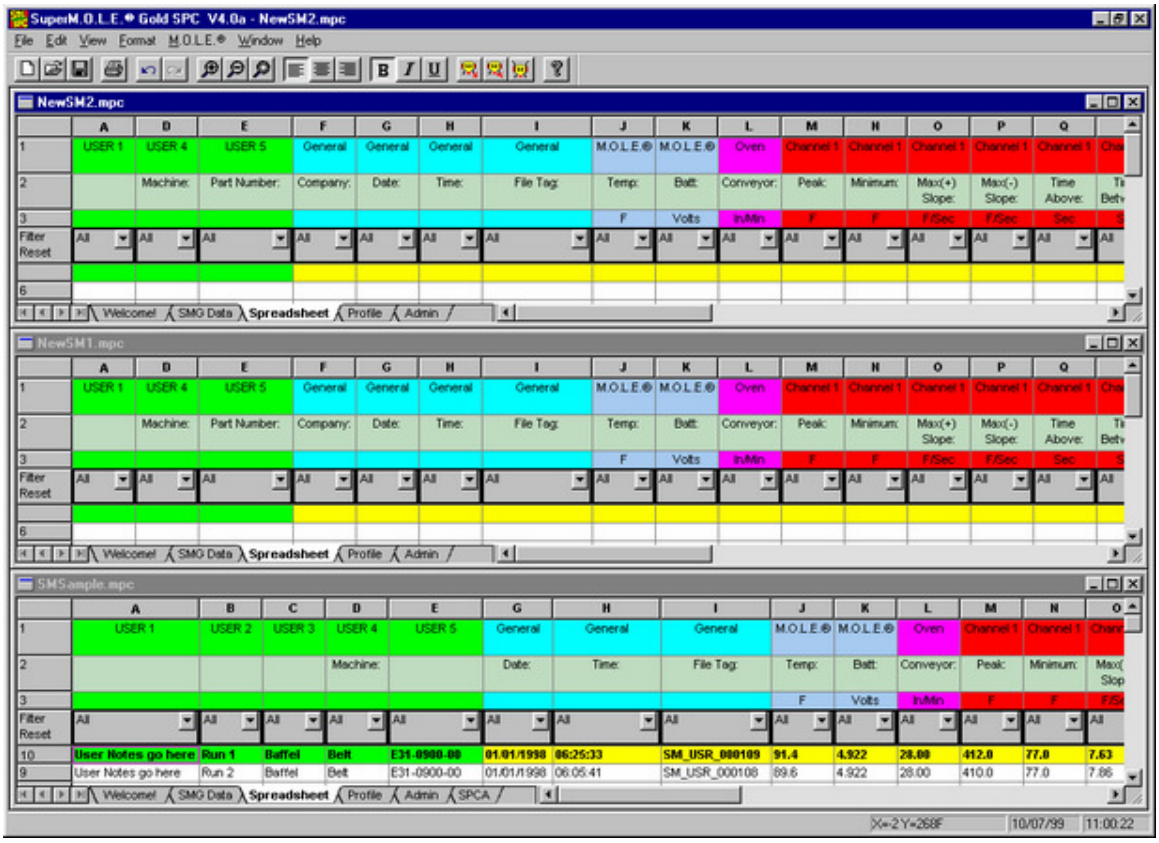


Cascaded Workbooks

6.9.2 Tile

To Tile opened workbook files:

1) On the ***Window*** menu, select ***Tile*** to arrange the open workbook files in a rectangular fashion dividing the workbook files into smaller sizes arranged so they fit next to each other on the display.



Tiled Workbooks

6.9.3 Open File

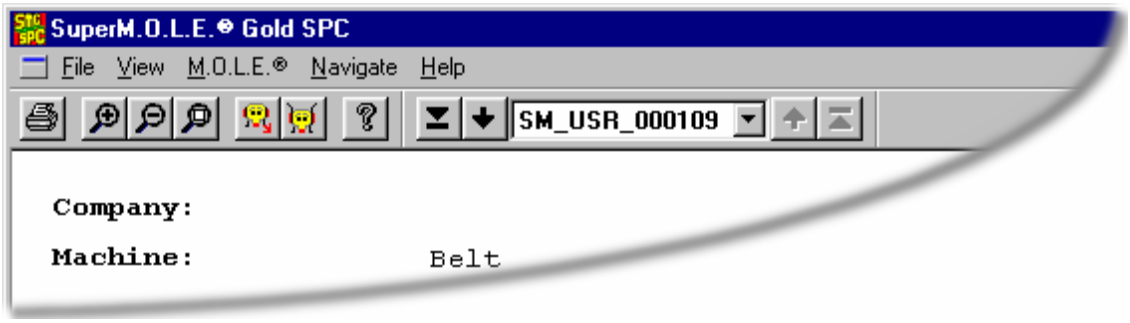
This section of the Window menu shows the currently opened workbook files. This allows quick access to all of the opened workbook files. Selecting a workbook file name to bring it to the front of the opened workbooks and make it active.

6.10 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 SMG Data, and Profile worksheet Toolbars.



Navigate Tool Buttons

6.11 Help Menu

The Help menu commands are useful when information is needed quickly or when this Users guide is not available.

6.11.1 Help

The Help Index is a complete reference tool that can be used at any time.

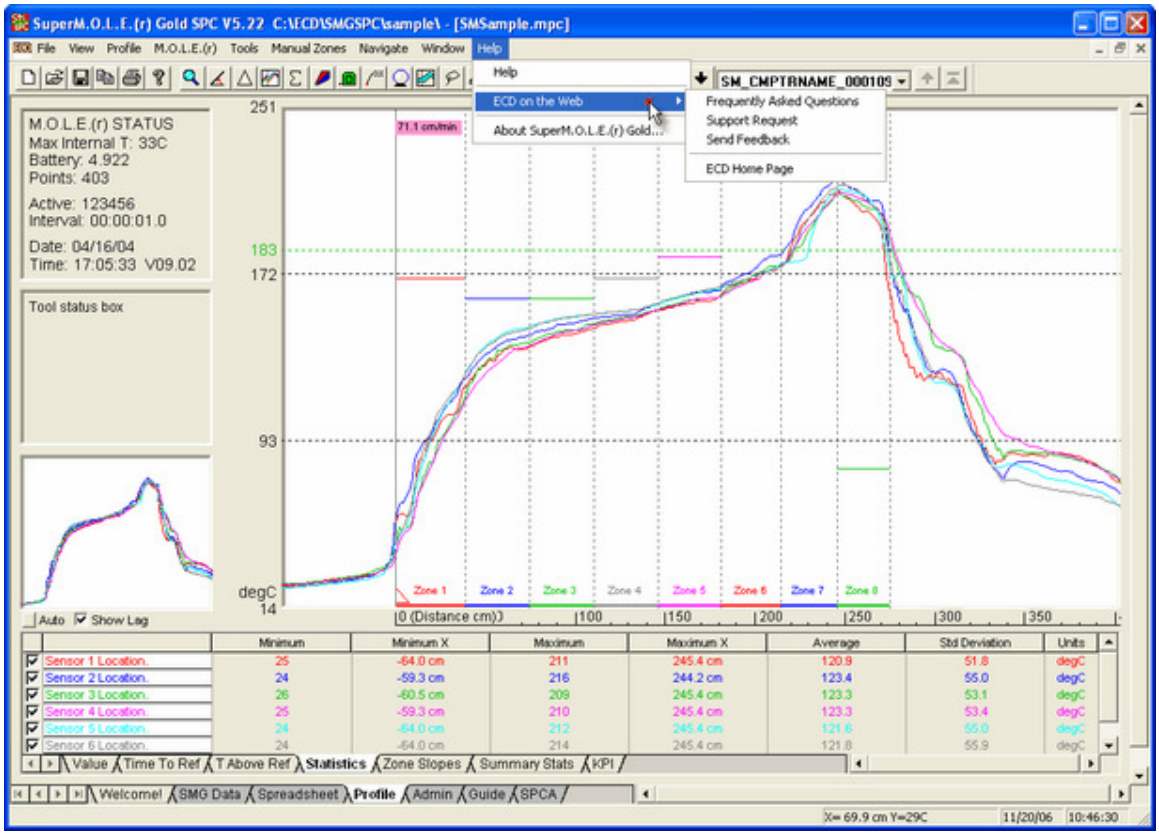
To launch the help system:

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.

6.11.2 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

6.11.3 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 SMG SPC Dialog Box

The About command can be accessed on all of the worksheet Toolbars.

	**About Button**

7.0 Service and Troubleshooting

7.1 General Service Information

This section covers maintaining and troubleshooting the SuperM.O.L.E. Gold, Thermocouples, Power Pack battery, Software, Wiring, and other parts of the 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.

7.2 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***.

7.3 SuperM.O.L.E. Gold Troubleshooting Steps

This section describes problems that can occur with M.O.L.E. hardware.

SuperM.O.L.E. GOLD HARDWARE PROBLEMS:

Wrong or erratic temperature readings:

- **Open or intermittent thermocouple, cable, or connector:** Individual channels being detected as “Open” on the profile plot will indicate this. Check thermocouple wires and insulation. Also, check the connectors visually for damage or loose connections. Tighten all the connections and check with an ohmmeter or millivolt meter if available or substitute a thermocouple that you know works properly.
- **Shorted thermocouple, cable, or connector:** This is harder to find. A shorted thermocouple connector or cable creates a new thermocouple junction at the location of the short; therefore, actual temperatures are recorded, but not the ones desired. If the short is intermittent, the recorded temperatures may jump between that of the thermocouple and that of the shorted location. Visually check for shorts inside of connectors and for damaged insulation on the wires. Repair or replace any suspicious components.
- **Wrong type thermocouple, connector, or wire:** Wrong thermocouple types will give consistently wrong readings, either always high or always low. Wrong connectors or wrong wire types (used as an extension) create extra thermocouple junctions and uncontrolled temperature offsets. Use only Type K thermocouple wires, and connectors.
- **Thermocouple connector wired backwards:** Typically causes high temperatures to read as negative (e.g., -150°F.). Should be Yellow=Ch, Red=Al.
- **Low power pack charge:** Charge the power pack.
- **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.
- **Incorrect calibration:** If the recorded temperatures for all of the active channels 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.

- **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 absolute maximum warranteed internal temperature may cause permanent, irreparable damage to your Super M.O.L.E. Gold.**
- **M.O.L.E. never turns on, but the software can read and write the hardware configuration:** The start switch is possibly defective, return to ECD for service.
- **LED stays on steady (no flashing) when power pack is replaced:**

1) Try a fully charged Power Pack battery.
2) Try removing the Power Pack waiting a minute before plugging it in again. If the problem is still there, the start switch is probably damaged. Contact ECD to request an RMA (Return Merchandise Authorization) to return the M.O.L.E. for service. Refer to ***How to Get Additional Help*** for contact information.

- **The M.O.L.E. clock resets itself:** Calendar/clock battery discharged. Replace the calendar/clock battery.

7.4 Communications Problems

"Super M.O.L.E. Gold not responding" error message:

- Try triggering the M.O.L.E. with the switch. (Doing this will erase the data in memory so do this as a last resort). If you cannot get the light to flash, you have a hardware problem with the M.O.L.E. itself.

If you can activate the Super M.O.L.E. Gold with the switch, check for the following:

- **Wrong PC port:** Cable must be connected to which is selected using the Configuration command in the SMG SPC Software.
- **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.
- **PC Interface cable defective:** Order spare or replacement cables from ECD, refer to ***How to Get Additional Help*** for contact information.

7.5 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. Refer to section ***Charging the Power Pack Battery***.

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)**

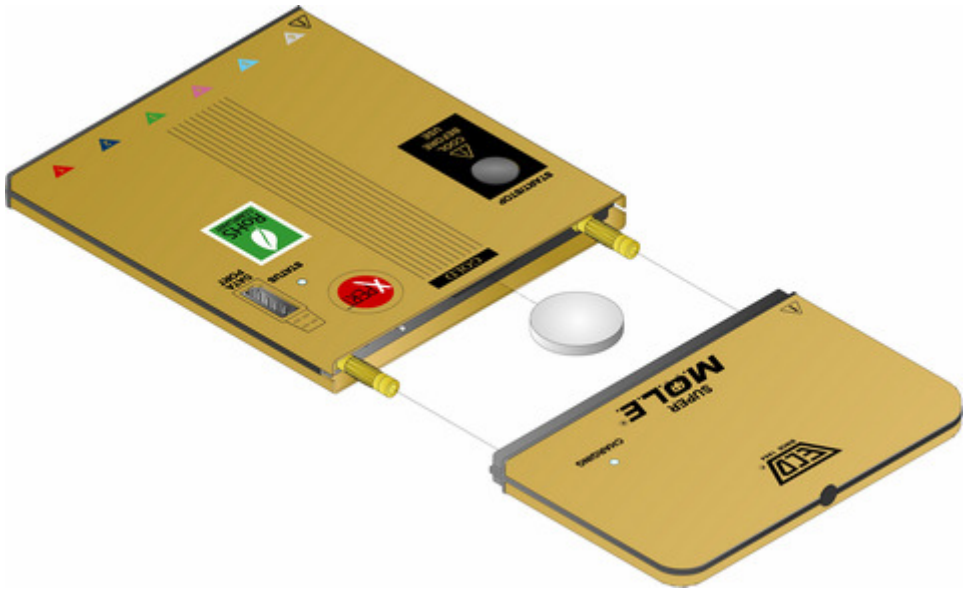
7.6 Changing the Calendar/Clock Battery

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. Refer to ***Communications Setup*** for more information).

7.7 Constructing a Thermocouple

The following procedures describe how to construct a thermocouple and a shorting plug.

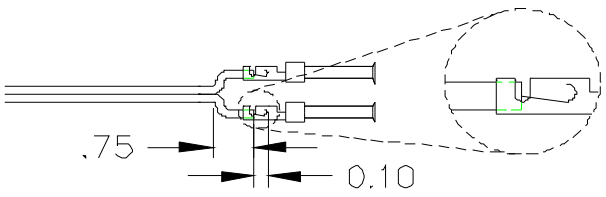
Thermocouple construction:

The following items will be needed to construct a Thermocouple:

- Thermocouple assembly which includes: 1 Thermocouple housing, 3 Hardware Screws and 2 female pins (one marked with a green dot and one marked with a white dot).
- A Thermocouple consisting of one yellow and one red wire. (Maximum T/C wire size 24 gauge).
- Thermocouple crimping tool
- Phillips (Crosshead) Screwdriver

Construct a thermocouple as follows:

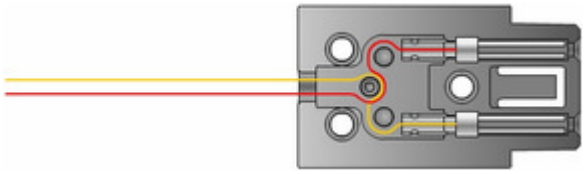
1) Disassemble the Thermocouple housing by unscrewing the 3 Hardware screws.
2) Separate the wires on the stripped lead end (opposite junction end) about ¾".
3) Prep the Red (-) T/C wire stripping the wire casing about 0.10" and curling the bare wire into a U-shape. Place it into the T/C pin with the green dot and crimp with the T/C crimping tool. Make sure that the wire covering is clear through the first set of shoulders and crimped by them. Also, be sure that only wire is crimped by the second shoulders.



T/C Crimping

4) Repeat Step 3 for the Yellow (+) wire by placing it into the T/C pin with the white dot.

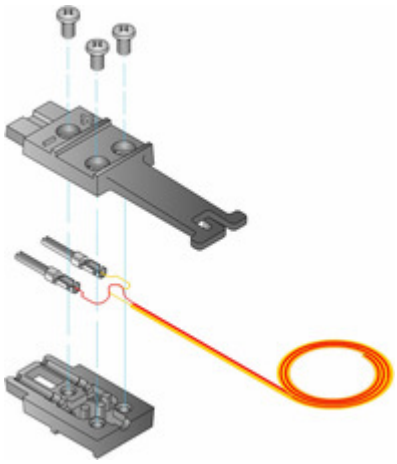
5) Place the female pins in the bottom (smaller) half of the Thermocouple housing. Be careful to place the pins in the proper pin location.



T/C Strain Relief

6) Wrap the red and yellow wires around the strain relief posts as shown in the Figure above.

7) Carefully place the two halves of the Thermocouple housing together. Verify that the wires are not pinched and that the pin and wire positions are correct.



T/C Assembly

8) Replace the 3 Hardware screws.

Shorting plug construction

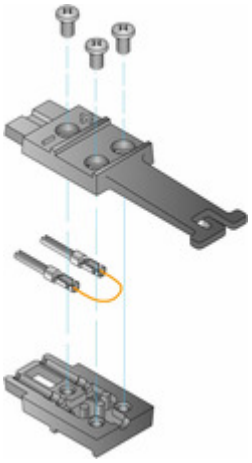
If fewer than six sensors are used in your application, a shorting plug may be used for each of the unused M.O.L.E. channels.

The following items will be needed to construct a Thermocouple:

- Thermocouple assembly, which includes: Thermocouple housing, 3 Hardware Screws and 2 female pins (one marked with a green dot and one marked with a white dot).
- A 1" bare copper buss wire. (Maximum wire size 24 gauge).
- Thermocouple crimping tool.
- Phillips (Crosshead) Screwdriver

Construct a shorting plug as follows:

1) Disassemble the Thermocouple housing by unscrewing the 3 Hardware screws.
2) Place one end of the copper wire into the T/C pin with the green dot and the other end into the T/C pin with the white dot. Now crimp both pins with the T/C crimping tool
3) Place the female pins in the bottom (smaller) half of the Thermocouple housing. Be careful to place the pins in the proper pin locations as shown in the Figure below.
4) Carefully place the two halves of the Thermocouple housing together. Verify that the wire is not pinched and that the pin positions are correct.



T/C Shorting Plug

5) Replace the 3 Hardware screws.

7.8 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, Thermocouples).
- Product Serial Number.
- Software Version (i.e. **5.22c**).

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
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

Rechargeable Power Pack 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).

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

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.

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 SMG SPC 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 where this information may be obtained.

Reflow and Wave Solder 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 SMG SPC 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 SMG SPC 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.

There are several basic short run SPC techniques:

1. Nominals Charts
2. Individuals/Moving Range Charts
3. Moving Average/Moving Range Charts
4. Standardized Formula Charts

The Moving Average/Moving Range Chart technique is particularly well suited for situations where control information is desired as soon as possible and there is a relatively long time between sample collections. After considering the nature of solder operations and the machine sampling process, the Moving Average/Moving Range Chart technique was incorporated into SMG SPC.

Moving Average/Moving Range Chart Technique:

SMG SPC utilizes the standard Moving Average/Moving Range Charting technique with a subgroup size of 2-6 that is selected by the user. The following steps and figure illustrates the Moving Average/Moving Range calculations (using a group size of two) that are used to construct the SPC chart.

Steps for Creating a Moving Average Moving Range Control Chart:

1. Select the key variable to monitor.
2. Select the moving average group size. (We will use two in our example.)
3. Obtain your first sample and record it as sample 1 (X1).
4. Obtain your second sample and record it as sample 2 (X2).
5. Determine the x-bar and R values.

Moving Average formulas:

$$\overline{X} = \frac{X_1 + X_2}{2} \qquad (\text{Range}) R = X_H - X_L$$

6. Plot this value on the chart as subgroup 1.
7. Carry forward sample 2 into subgroup 2's calculation. Obtain your third sample and record it as sample 3. The averages of sample 2 and sample 3 form subgroup 2.
8. Plot this value on the chart as subgroup 2.
9. Repeat for all the samples.
10. Calculate control limits using standard x-bar and R formulas for the appropriate sample sizes. SMG SPC uses range-based calculations for LCL and UCL.
11. Continue monitoring the process.

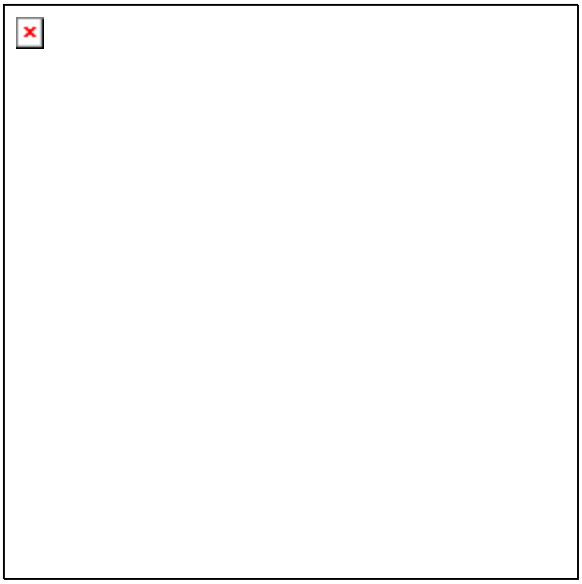
SAMPLE #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
SAMPLE MEASUREMENTS	3	4	5	3	2	9	5	2	6	8	4	8	5	6	3	3
SUBGROUP VALUE	x	3.5	4.5	4	2.5	5.5	7	3.5	4	7	6	6	6.5	5.5	4.5	3
	R	1	1	2	1	7	4	3	4	2	4	4	3	1	3	0

Moving Average/Moving Range Subgroup Size 2 Calculations Chart

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.

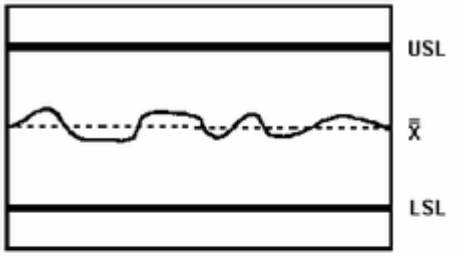
Two common capability indicators are Cp and Cpk. These values are shown in the Statistics Box on each SPC Worksheet.



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).

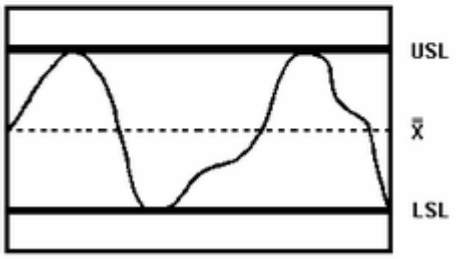
The charts on the next page give a graphical representation of the concept of Cp and Cpk. Notice that in each graph, the same upper and lower specification limits (USL, LSL) are used. The values of Cp and Cpk will differ according to the data that is compared with those specifications.

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.



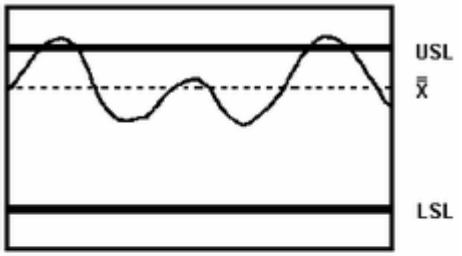
Cp ≥ 1.33: Data tightly distributed.

Cpk ≥ 1.33: Data well inside spec limits.



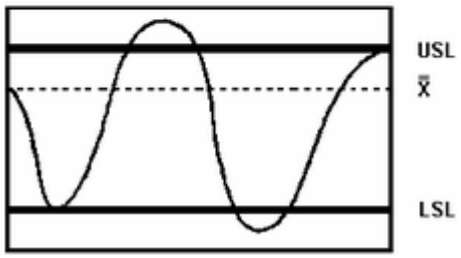
Cp = 1.00: Data fills entire spec range.

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:

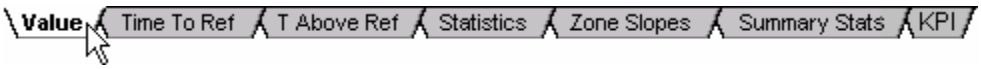
$$\overline{X} = \frac{X_1 + X_2}{2}$$

$$(\text{Range})R = X_H - X_L \quad \text{OR} \quad Cpk = \frac{\bar{\bar{x}} - LSL}{3 * (Std.Dev.)}$$, 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.

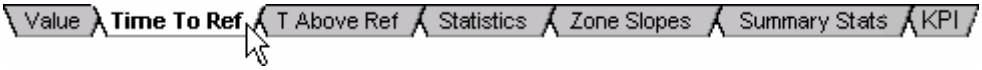
Cpk compares the widest half of the data distribution to the appropriate specification limit. It indicates whether the process is capable of meeting the specification as indicated by the “worst half” of the measurements. Unlike Cp, the Cpk index measures process capability without assuming the data is well-centered.

ValueTab



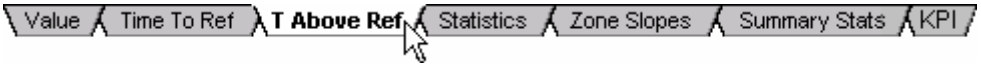
C1, **C2**, **C3**, **C4** indicate the point, time relative, time absolute, or distance (depending on the Units setting) on the X axis where the vertical cursors are set, respectively. The values below are the measured values for each channel at that position.

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)

$$Cp = \frac{USL - LSL}{6 * (Std.Dev.)}$$

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:

$$Cpk = \frac{USL - \overline{\overline{x}}}{3 * (Std.Dev.)}$$

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:

$$Cpk = \frac{\overline{\overline{x}} - LSL}{3 * (Std.Dev.)}$$

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.

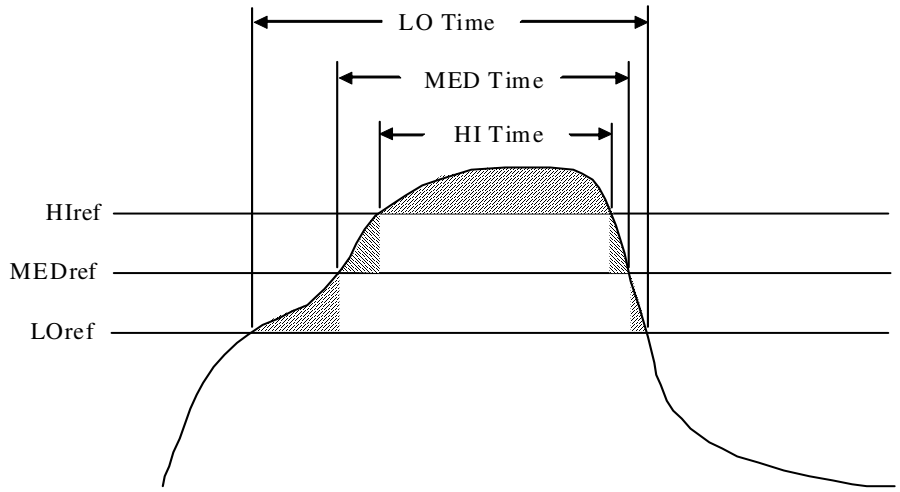
Zone Slopes

Zone Slopes tab

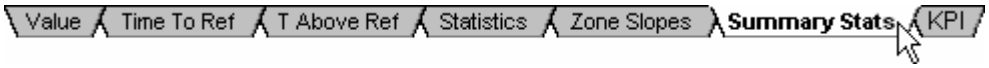
Zone 1, **Zone 2**, **Zone3**, … are the zones that correspond to the zone parameters entered in the Oven Configure dialog box. Up to 30 zones can be represented. The values below are the slopes within each zone for each channel using the following equation:

(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.

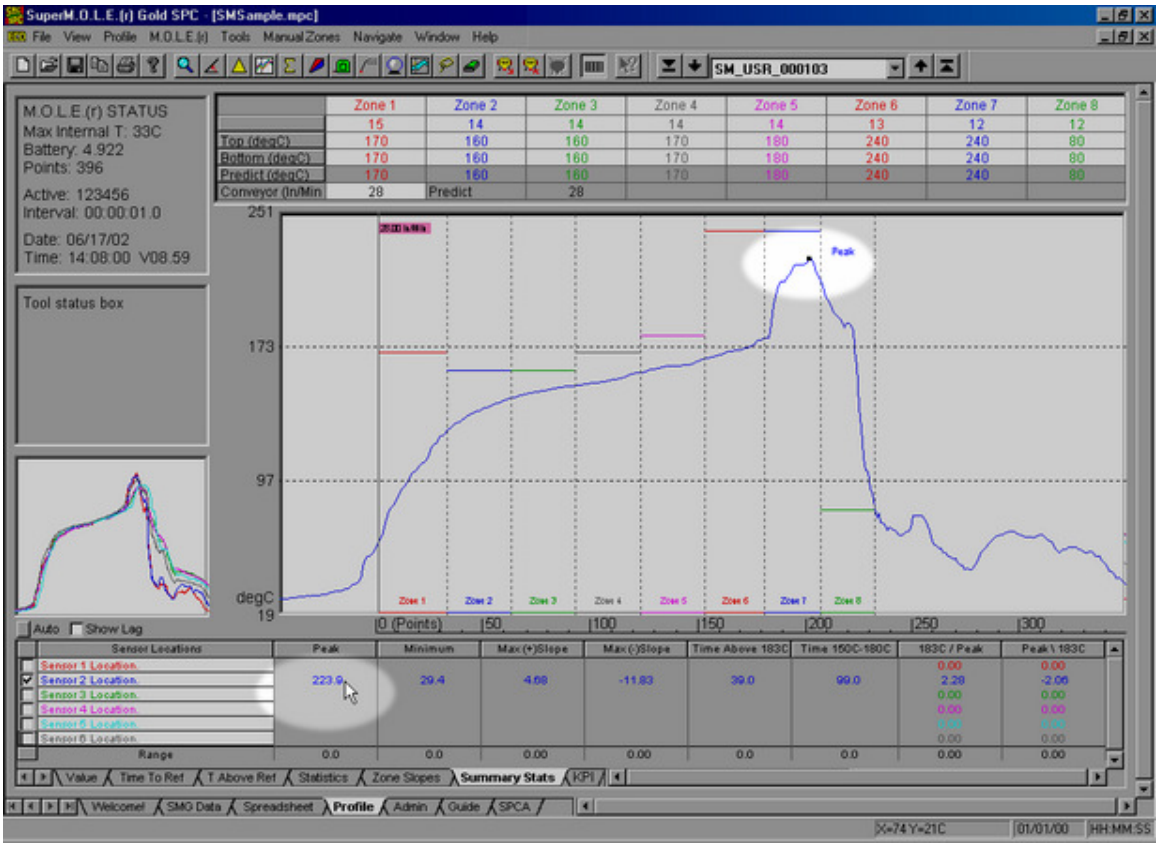


Summary Stats Tab



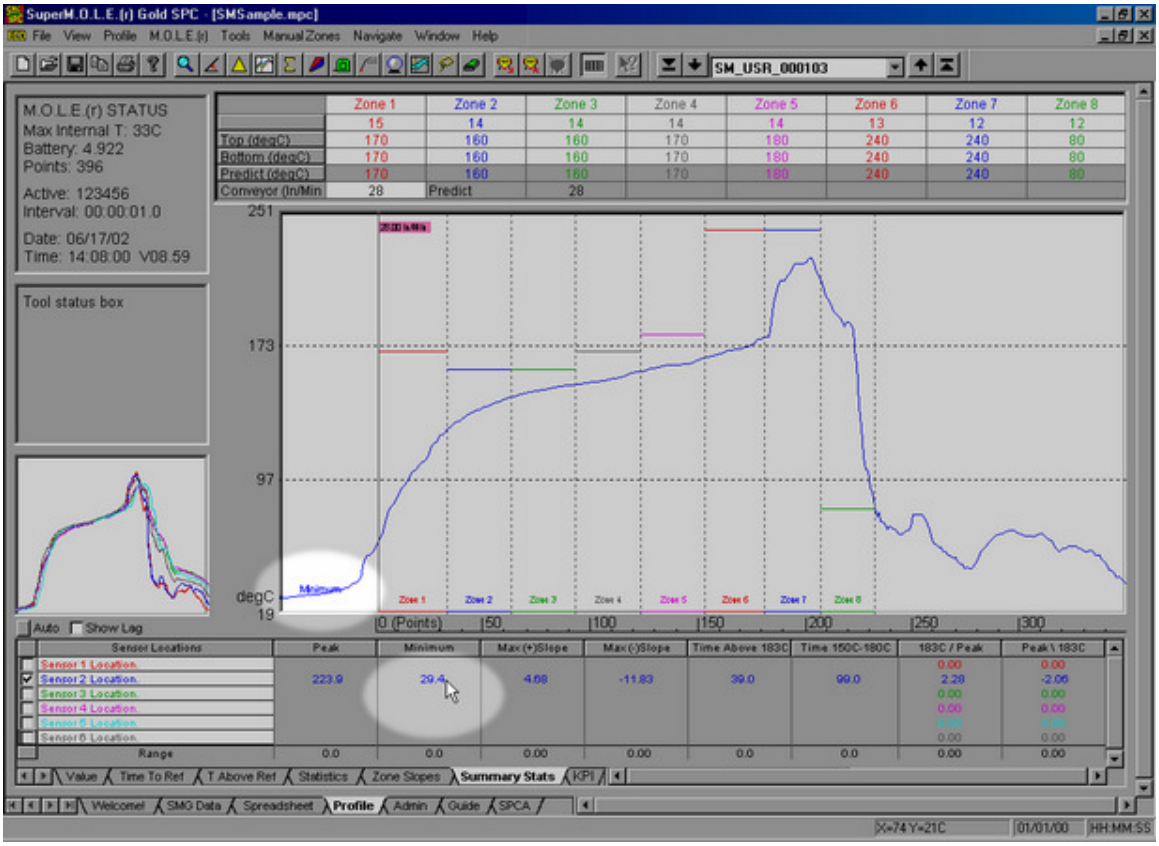
Values shown in this tab are taken from the intire graph regardless of its level of magnification.

Peak Temperature 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.



Peak Temp

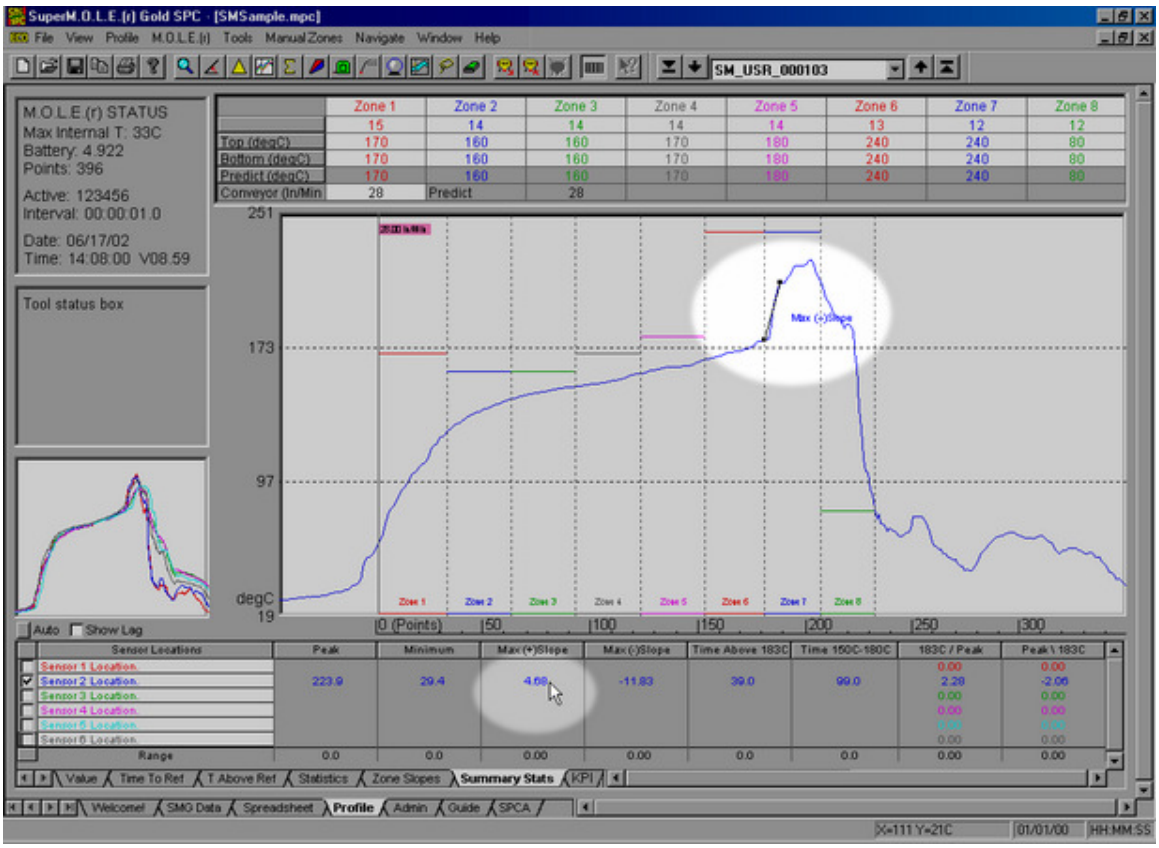
Minimum Temperature is the smallest measured value. Values below are the smallest value recorded for that channel. Typically, these are the starting values, unless there is active cooling employed. It is best if starting temperature values are close to the same. This will allow a consistent starting point for other measurements.



Minimum Temp

Maximum **(+) Slope** is 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)

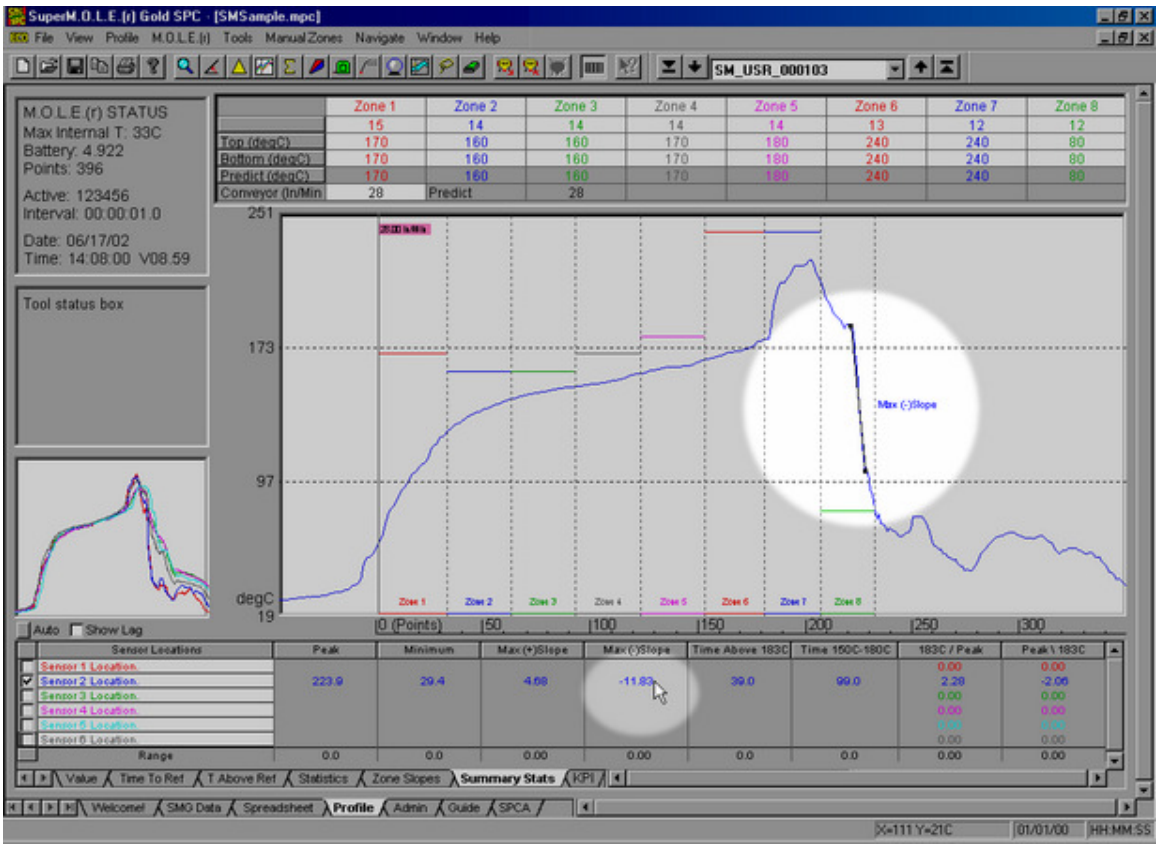


Max (+) Slope

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** is 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:

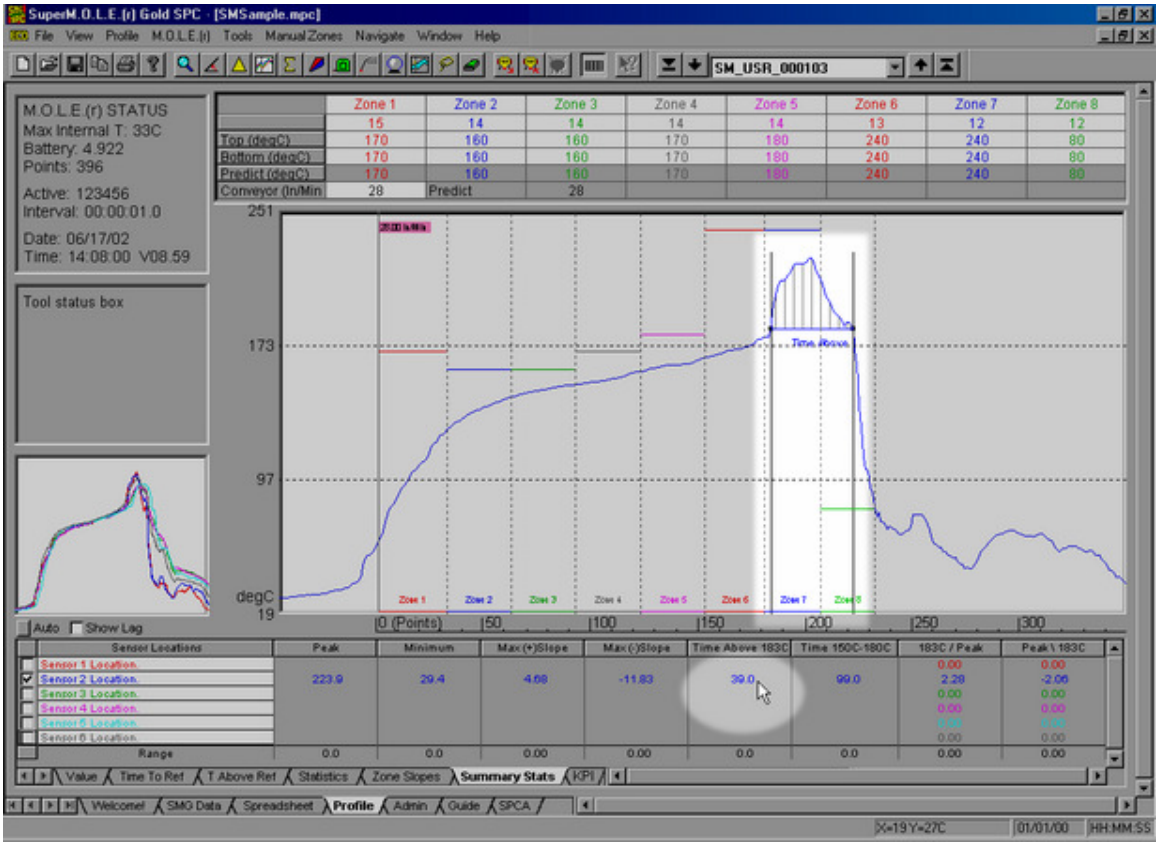
Slope at point n = (Value at point (n + 10) – Value at point n) / (10 * Log interval in seconds)



Max (-) Slope

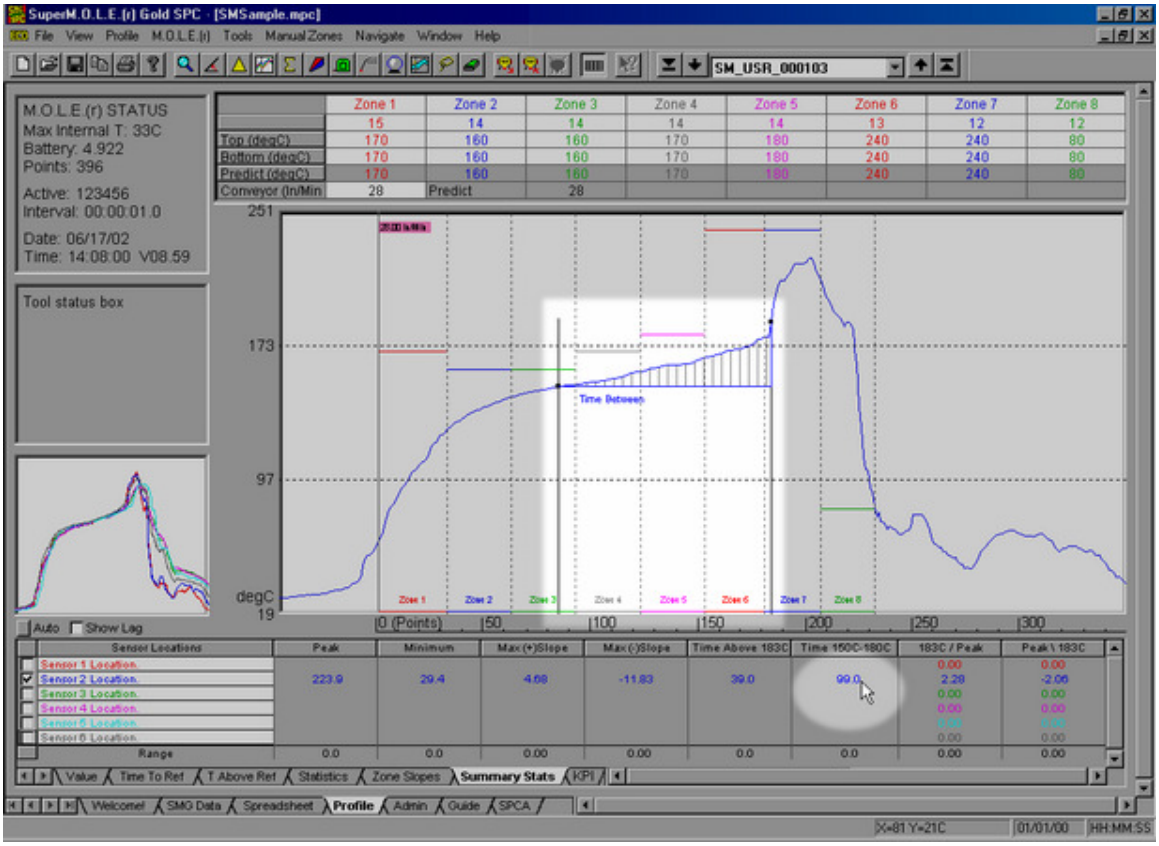
The values below are the largest negative slope values calculated for each channel. The larger the slope, the faster the temperature is falling (cooling).

Time above Temperature is 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.



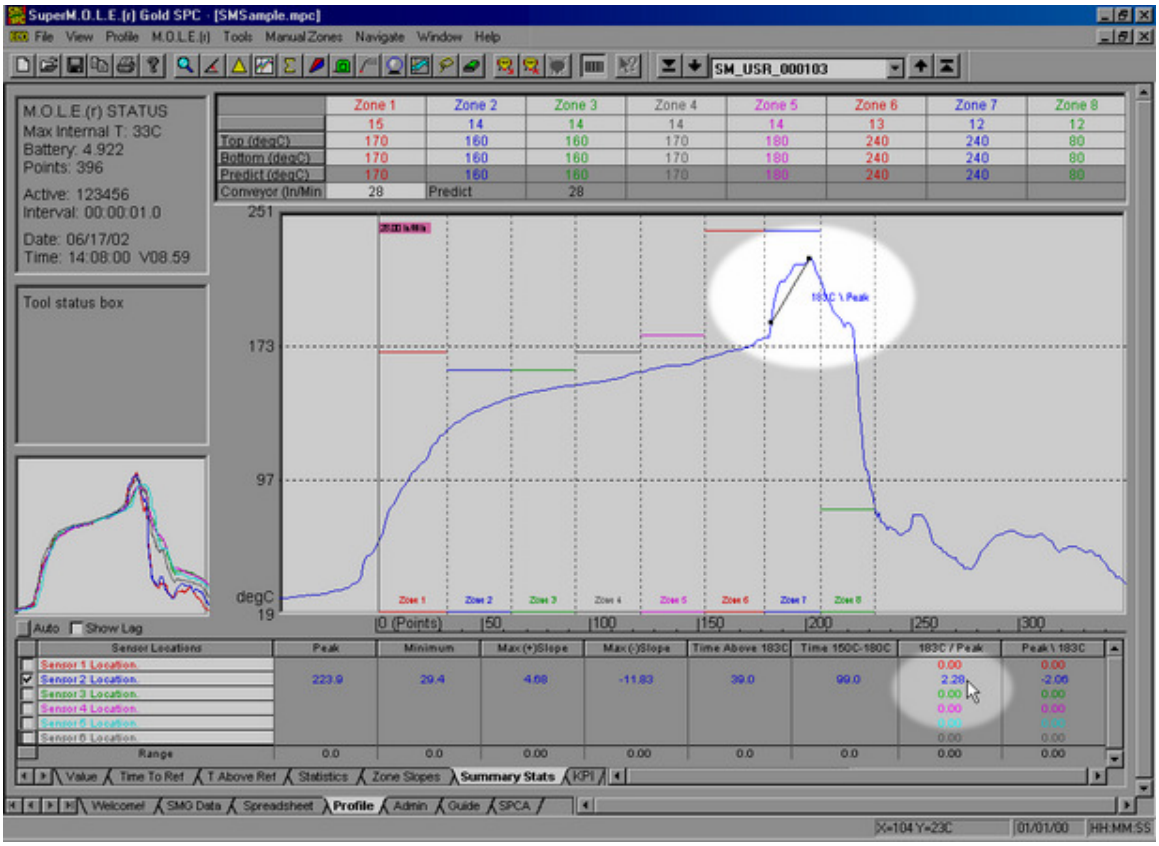
Time above 183C

Time between Temperatures is 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.



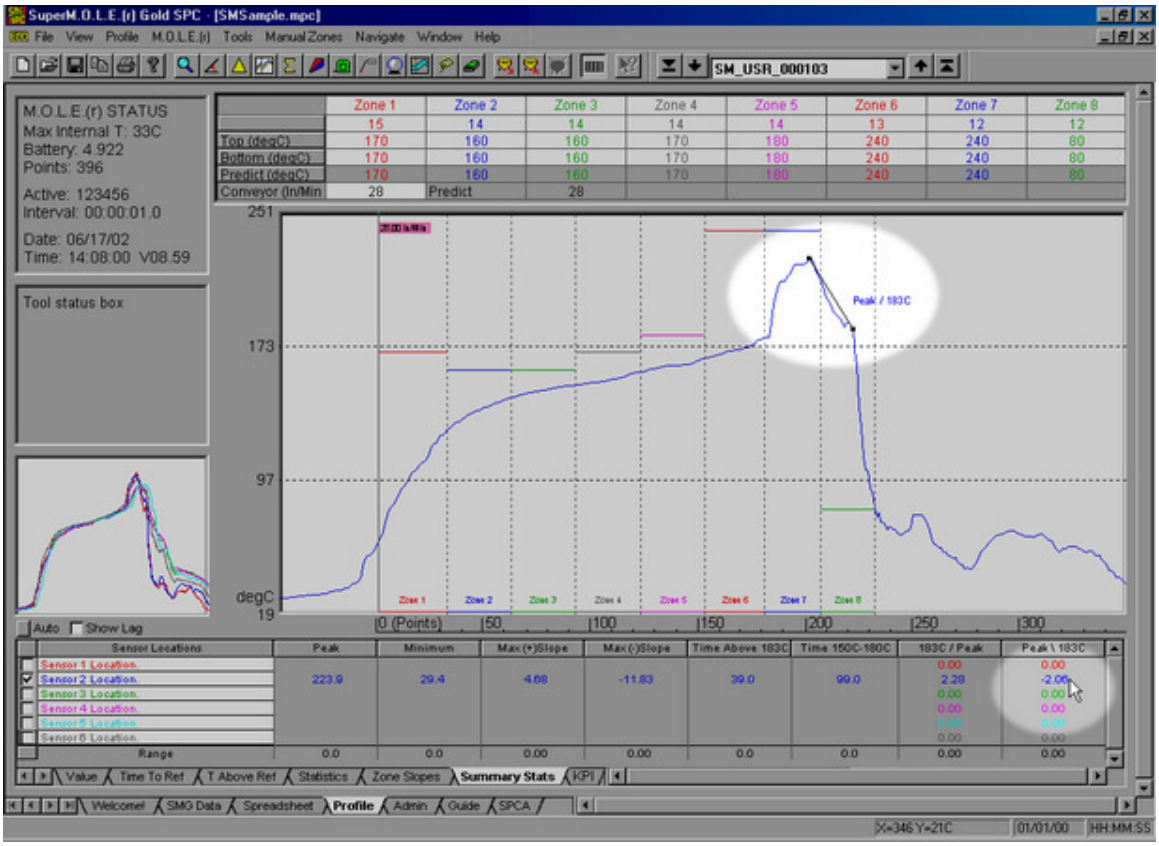
Time 150C - 180C

Time above Temperature / **Peak Slope** is 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** is 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.

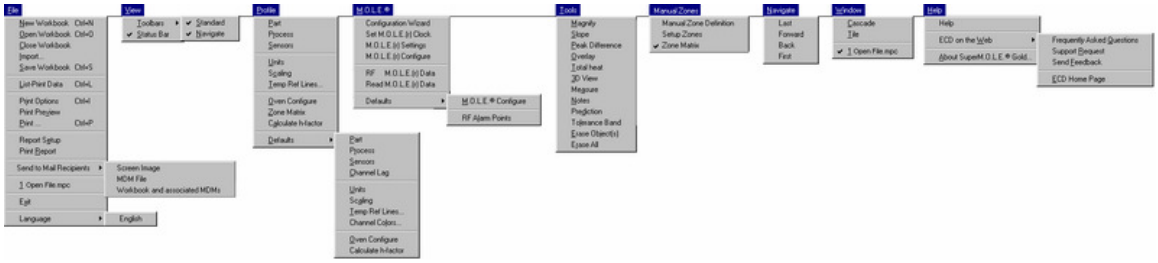
D: Pull Down Menus & Toolbar Buttons

The dimmed menu commands are used in other worksheets.

Active menus for the Welcome, SMG Data Worksheets & Guide Worksheets:

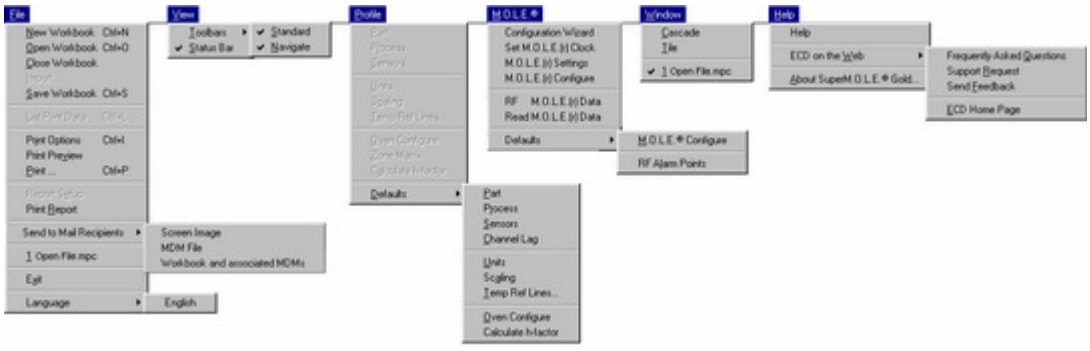
Active menus for the Spreadsheet Worksheet

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

E: Optional Accessories

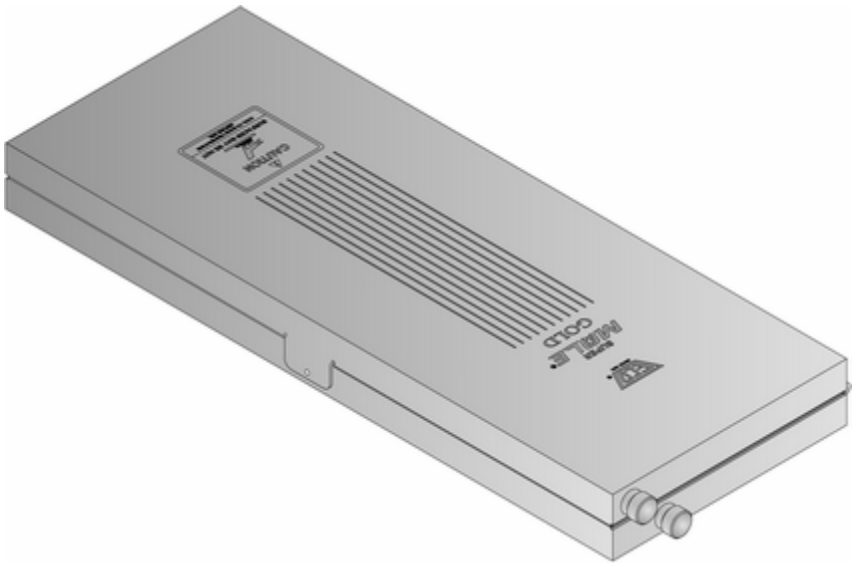
This section covers optional accessories that ECD offers to enhance the use of the SuuperM.O.L.E. Gold. Contact ECD for complete ordering options and current pricing. You can also visit the ECD web site for additional information.

Here is how to contact ECD:

Telephone: (800) 323-4548
(503) 659-6100
FAX: (503) 654-4422
Email: ecd@ecd.com
Internet: http://www.ecd.com

Thermal Barriers:

The Lead-Free process barriers provide different protection features for the M.O.L.E.. Refer to the ***Armor Chart*** at the end of this section to determine which is best for your process.



1.0” Uni-barrier

Part Number: E42-0901-80

Dimensions, Inches: 1.0” 4.1” x 10.62”

Dimensions, Millimeters: 25.4 x 104 x 269.7mm

Weight: 1lb 15oz (0.88kg)

1.0" Uni-Barrier w/Yellow Jacket

Part Number: E44-0944-80

Dimensions, Inches: 1.28” x 4.53” x 11.28”

Dimensions, Millimeters: 32.5 x 115 x 286.5 mm

Weight: 2.1lbs (0.95kg)

BB-45 Hinged Hot Box

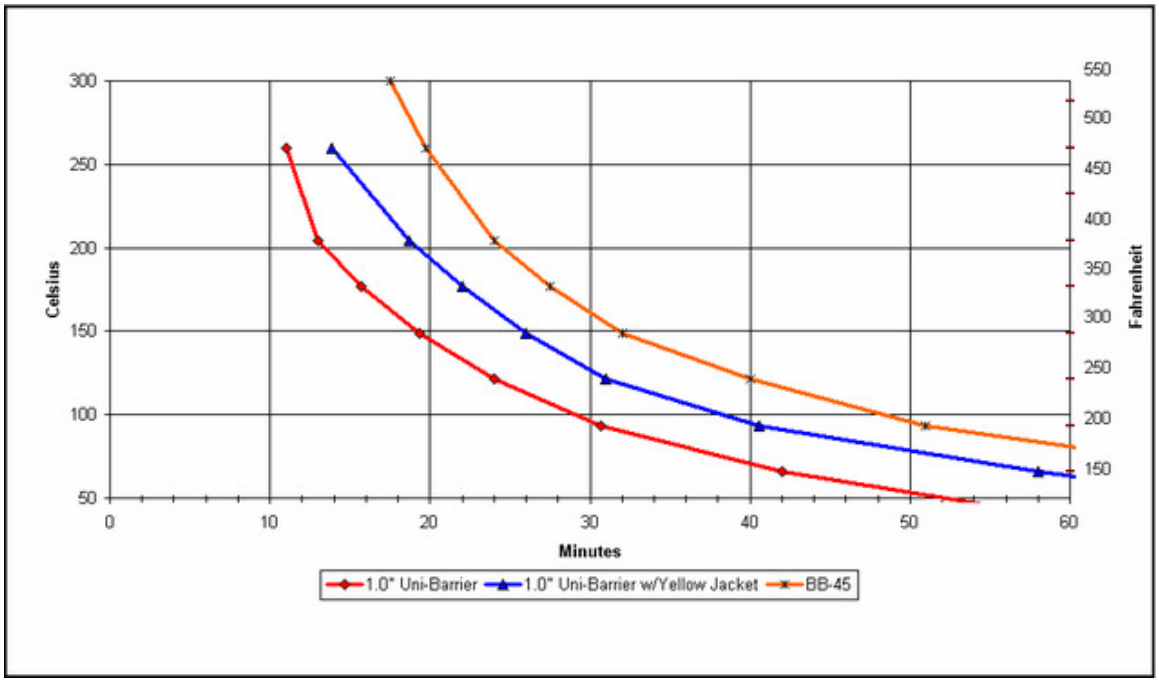
Part Number: E44-4245-80

Dimensions, Inches: 1.75” x 4.6” x 9.9”

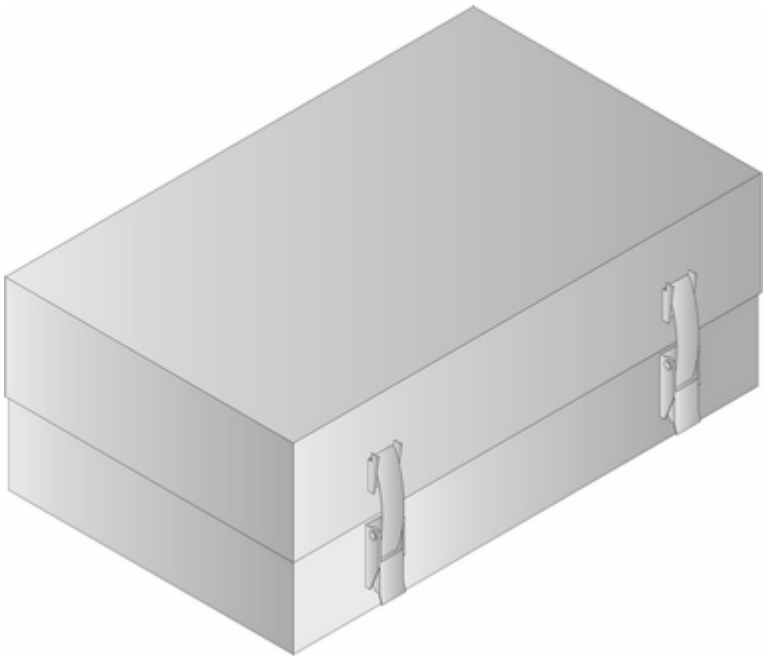
Dimensions, Millimeters: 44.5 x 116.8 x 251.5mm

Weight: 3lbs 9oz (1.62kg)

Lead-Free Process Thermal Barriers - Armor Chart



Alternate Thermal Barriers:



Super HOT BOX (For 450°F 40 minute oven profiling)

Part Number: E29-2686-90

Dimensions, Inches: 5.25" x 7.9" x 13.0"

Dimensions, Millimeters: 133.4 x 200.7 x 330.2mm

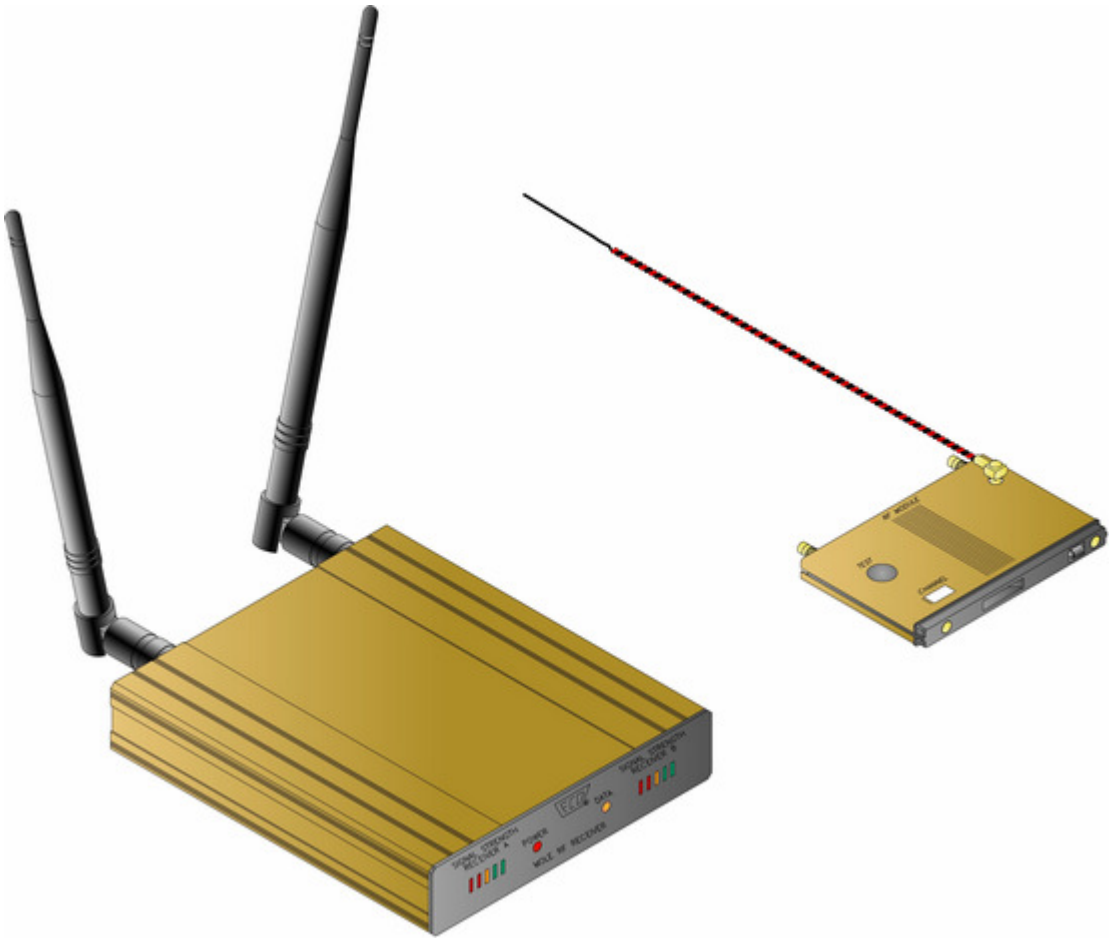
Weight: 11lbs 11oz (5.30kg)

Optional Products

ECD offers optional products that enable the SuperM.O.L.E. Gold® ability to monitor Temperature, perform Wave Solder and Reflow Analysis. This platform approach ensures the longevity of your initial investment in a SuperM.O.L.E. Gold®, giving you great flexibility while minimizing training time. The following section briefly describes the products that can be used in conjunction with the SuperM.O.L.E. Gold® to monitor and document manufacturing processes. Refer to the beginning of this section for contact information.

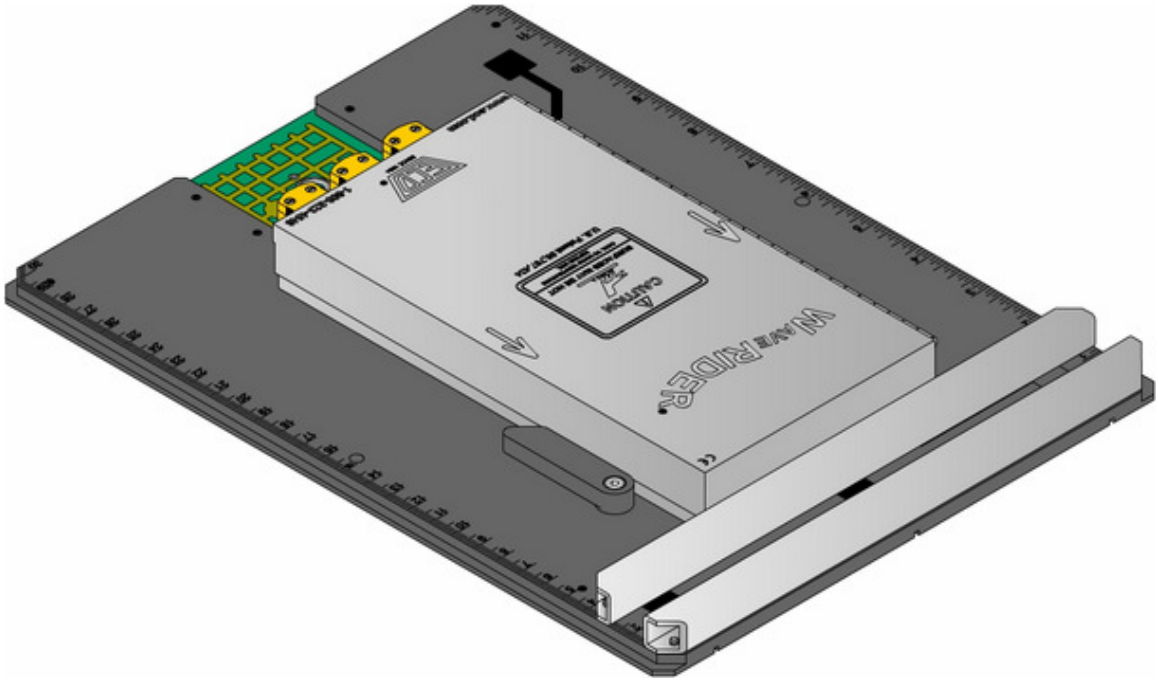
RF M.O.L.E.®

The RF M.O.L.E. Option is FCC accepted and produces real time profiles fast for immediate data collection and transmission to a PC. The RF M.O.L.E. uses a transmission frequency in the 900mhz band for clear data reception. The Transmitter is an add-on component that connects between the SuperM.O.L.E. Gold and the Power Pack battery. The RF Receiver is connects to a PC to receive the “Real time” data.



WaveRIDER® NL

The WaveRIDER® NL is a self-contained system designed to give the user critical data on Wave Solder Machine setup and performance parameters. The WaveRIDER® comes in several standard sizes and is available in custom widths.



Comprehensive SPC software is included featuring:

- X-bar-bar and R SPC Charting
- Measure and track conveyor speed
- Parallelism of the Solder Wave(s)
- Preheat Slopes and Solder depth

OvenRIDER® NL

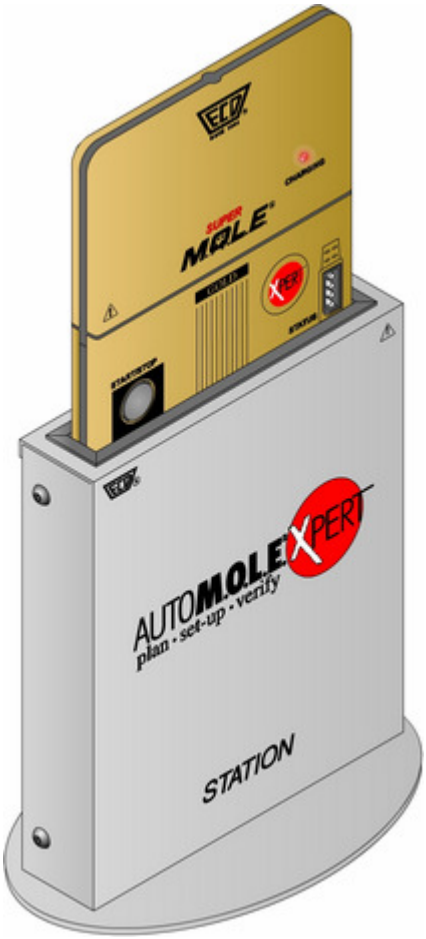
The OvenRIDER® NL is designed exclusively for Reflow solder ovens and provides the most accurate, easy-to-use monitoring available. Perform diagnostic checks on an oven process in just minutes with the OvenRIDER®. Reduce scrap and maximize yields through improved process control. The OvenRIDER® comes in several standard sizes and is available in custom widths.

Comprehensive SPC software is included featuring:

- X-bar-bar and R SPC Charting
- Measure and track conveyor speed
- Side to Side thermal evenness and heat flow per zone

AutoM.O.L.E.® Xpert3

The AutoM.O.L.E.® Xpert3 saves you from the laborious, time consuming iterations of reflow process development that deprive the oven from manufacturing. Instead, work right at your desk to create a robust lead-free process and oven recipe before actually running a profile. New, flexible oven Signature creation makes Xpert3 compatible with virtually any oven, freeing the program from the confines of machine, PC and software compatibility.



Thermal Protective Enclosures:

Model	Dimensions	Part Number
BB-45 Hinged Hot Box	1.75" x 4.6" x 9.9"	E44-4245-80
Super Hot Box	5.25" x 7.9" x 13.0"	E29-2686-90
1.0" Uni-Barrier	1.0" x 4.1" x 10.6"	E42-0901-80
1.0" Uni-Barrier w/Yellow Jacket	1.28" x 4.53" x 11.28"	E44-0944-80

Contact ECD for more Thermal barrier options.

Accessories and Value Added Options:	Part Number
RF (Radio Frequency) Transmitter & Receiver retrofit • Includes Gold Survivor RF Thermal Barrier • (Call ECD, older units may req. return to factory for retrofit)	E31-0900-17
Additional RF Transmitter	E31-0900-10
Additional RF Receiver	E31-0900-90
Extended warranty, 1 year, includes 1 calibration	A10-0900-00
Rechargeable Power Pack (RoHS Compliant)	E45-7647-30
Power Pack Charger, 110V	E31-0900-25
Power Pack Charger, 220V	E31-0900-21
Calendar/Clock Battery	F30-0041-00
EZ Rider for transporting M.O.L.E. thru Wave solder	E40-0307-00
Side Rider for transporting M.O.L.E. thru Ovens	E42-7433-00
Reflow Rider for transporting M.O.L.E. thru Ovens	E40-0077-00
Board Carrier, Standard (for small boards w/ Temprobes™)	E40-0229-00
Board Carrier, Long	E40-0229-10
SuperM.O.L.E. Gold to PC Interface Cable	Y20-2848-04
USB Port Replicator	E45-7678-40
AutoM.O.L.E. Software Suite (CD)	Y50-0909-53

3 foot/915mm length Color-Indexed Type	**Part Number:**
Glass set of 6 Color-Indexed 36-gauge [.005”/.127mm] 900F/482C	E44-0944-85
Glass set of 6 Color-Indexed 30-gauge [.010”/.254mm] 900F/482C	E44-0944-81
Glass Lead-Free T/C Adapter Set [Miniature to Micro] 900F/482C	E44-0944-64
PFE Color-Indexed set of 6 36-gauge [.005”/.127mm dia.] 500F/260C	E43-0900-65
PFE Color-Indexed set of 6 30-gauge [.010”/.254mm dia.] 500F/260C	E43-0900-61
PFE Thermocouple Adapter Set [Miniature to Micro] 500F/260C	E31-0900-64

Non Color-Indexed K-Type Thermocouple Sets for Gold	**Part Number:**
Thermocouples, six, .010”, 6 feet, micro connector	E31-0900-62
Thermocouples, six, .005”, 7 feet, micro connector	E31-0900-66
Thermocouples, six, .010”, 7 feet, micro connector	E31-0900-71
Thermocouples, six, .010”, 12 feet, Color-Indexed, micro connector	E44-2253-71
Thermocouples, six, .021”, 3 feet, SSOB, micro connector	E31-0900-86
Thermocouples, six, .021”, 6 feet, SSOB, micro connector	E31-0900-87
Thermocouples, six, .005”, 3 feet, brown, glass (900F/482C), micro	E43-0900-85
Thermocouples, six, .010”, 3 feet, brown, glass (900F/482C), micro	E43-0900-89
Temprobe NL 5.5” Clip-on non-invasive K-Type Probe	E45-0764-78

Thermocouple Accessories:	**Part Number**
Adapter set (6) Standard K-to-Micro	E31-0900-64
Organizer Clip	M45-0900-60
Connector Set (Micro size)	E31-0900-60
Connector Single (Micro size)	E31-0900-68
Connector Crimping Tool	Y25-0312-10
Clear instant adhesive	G10-0107-00
Adhesive spray accelerator	G10-0108-00
Polyimide Film Tape, 1/4" x 1" strips (20/sheet)	M30-2686-64
Aluminum Tape, 1/2" x 1" strips (10/sheet)	M30-2686-74
Polyimide Film Tape, (36 yard roll)	G10-0021-00
Hi Temp Solder, SN10, 6 feet	G10-0041-00