KIC 2000 User Manual
Hardware and Software

Version 3.0.0.x

KIC ®

Innovation That Works ™

KIC 2000 Hardware and Software User Manual

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Table of Contents

Congratulations!
You have the world's most sophisticated thermal profilers at your service!

KIC's Thermal Profilers

The *SlimKIC 2000* and *KIC Explorer* are real-time solder reflow process setup and optimization tools. They feature a more robust hardware configuration than any other profilers on the market. The KIC Profilers configuration guarantees a perfect profile every time by both transmitting data in real-time as it passes through the process and simultaneously recording the data internally. When *the KIC Profiler* has completed its run through the process, the internally logged profile is automatically wirelessly downloaded, filling in any gaps that may have occurred due to broken transmission of the real-time profile. The wireless download feature ensures that every profile run is a good one, and that it will never be necessary to hold up production to run a second profile.

The *KIC 2000* software features minimal initial setup and a radically simplified operator interface that eliminates tedious board mapping and oven measuring. The software is designed to be completely intuitive and require very little training. It comes with an updateable database of hundreds of popular solder pastes, which allows you to automatically select the specs for the paste you are using. A series of screens with clear explanatory graphics guides you through the profiling process from beginning to end, and if the profiling is being done with one of the selected ovens that communicate with the KIC software, the software automatically changes the oven set points to your profile.

The KIC Navigator Software Option

The KIC *Navigator* is significantly improved automated prediction tool which allows you to predict how changes to belt speed and oven set points will affect a product profile. **The KIC *Navigator* can create and evaluate *billions* of potential product profiles, automatically selecting the profile and oven setup that best fits the *Process Window*.** This automated prediction tool is exponentially more powerful and accurate than any tool currently on the market and allows you to find the optimal profile in about a minute. The automated prediction tool is designed to center the profile in your process window, and you may set the limits to fit your process.

Perhaps the most significant feature of the *KIC 2000* and the KIC *Navigator* is that it ranks your profiles using the *Process Window Index*. This allows you to compare performance between processes and, more importantly, to be assured that you have found the most robust and reliable profile for a given product that your oven can achieve.

If you did not order the KIC Navigator with your KIC Profiler, be sure to ask your KIC Representative for a demonstration of this breakthrough technology.

Auto-Focus Software Option

The KIC *Auto-Focus* is a computer simulation software option available for the *KIC 2000* software. This option eliminates the need to "guess" at an initial oven recipe; instead *Auto-Focus* calculates the ideal oven recipe allowing you to avoid conventional oven setup pitfalls. *Auto-Focus* gets smarter with every profile you run, providing you with increasingly accurate oven recipes.

Navigator and Auto-Focus Power Software Options

The *Power* option optimizes you profiles based on reduced energy usage. Studies have shown that many reflow ovens and wave machines consume more energy than required in order to process the products in spec. The *KIC Navigator* and *Auto-Focus "Power"* options identify the oven or wave solder recipes that consume the least amount of energy while processing the products in spec. The end result is improved quality at reduced energy costs.

It is recommended to read this manual entirely before attempting to run profiles of any *Application* type.

KIC Profiler Technology

KIC Profilers use different technology to complete its task of running profiles. The main difference between it and other profilers is the following:

- **Air thermocouple** – For all profiles run with the *KIC 2000* software the thermocouple plugged into the first channel on the *SlimKIC 2000 or KIC Explorer* must be the *Air TC*. This TC is positioned 1-inch in front of the leading edge of the board for all profiles run using *KIC 2000* software.

- **Trigger temperatures** – KIC Profilers use trigger temperatures to start and stop the profile. The Start temperature is defaulted to 5 degrees above the Maximum Product Start temperature. *See Global Preferences for this setting*.

- **Hardware Monitor** - The combination of the *KIC Profiler* and the *KIC 2000* software closely monitors the *KIC Profilers* battery, internal temperature and the product temperature even before you start a profile. There are built-in checks in the software to insure that the product and *KIC Profliler* are cool enough and battery voltage sufficient to complete a profile safely. As well it will offer troubleshooting suggestions if there is a problem with communication or thermocouple attachment.

- **Perfect Data** – Through patent pending technology the *KIC Profiler* (RF models only) is able to get you perfect data every time. At the completion of a profile the *KIC Profiler* wirelessly retransmits the data it has stored in its memory. This insures the integrity of the data, especially if there were any interruptions in the transmission during the profile.

Installing the KIC 2000 Software

Minimum PC Requirements

- 800 MHz processor / 256Mb RAM
- 2Gb available storage (for product history records)
- SVGA video 1024x768 resolution, 16-bit
- 1 or more available USB ports (KIC Profiler and or Software key)
- Operating system: Microsoft® XP, Vista (32-bit version only)

Languages

The *KIC 2000* software supports the following languages:

English	Japanese
German	Korean
Spanish	Simplified Chinese
	Traditional Chinese

Table 1: Software Language Support

Some of the supported languages can only be used with their respective operating systems:

- Japanese, Korean, Simplified Chinese, and Traditional Chinese can not be used with English versions of Windows operating systems.

- To run *KIC 2000* in Japanese, the operating system must be Windows-Japanese version. To run *KIC 2000* in Simplified or Traditional Chinese, the operating system must be Windows-Chinese version.

- English, German, and Spanish can be run on any of the supported Windows operating systems.

To install the software, perform the following steps:

- Insert the KIC 2000 CD into your CR-ROM drive.

- The KIC 2000 installation will automatically start.

- If the KIC 2000 software does not auto-start, go to **Windows** *Start Menu* and click on **Run**.

- Type **D:\setup** (or your CD-ROM drive letter) and press the **Enter** key on the keyboard.

- Follow the instructions for the installation program as the screens are updated.

If you have question regarding your hardware or software configuration contact KIC Tech Support.

KIC 2000 Software Optional Features

Note: All KIC software options require a software key. Once connected the KIC 2000 software automatically enable the various functions associated with each software option.

Software Tools

- *Navigator* –The *Navigator* software option automatically finds the optimal oven setup for each product you profile.

- *Auto-Focus* –Auto Focus calculates the ideal initial oven recipe allowing you to avoid conventional oven setup pitfalls.

- *Power* - Optional feature for use with *Navigator* and/or *Auto-Focus* options. *Power* optimizes your profiles and/or initial oven settings based on reduced energy savings (instead of reduced PWI value) .

- *SPC* – Displays SPC (Statistical Process Control) data, specifically CpK values for selected profiles.

- *Virtual Profiling* **–** Using MVP hardware this option calculates the products (virtual) thermal profile each time the fixture is run through the reflow oven.

Hardware Fixtures and Accessories

- *Wave Surfer* – Wave solder machine profiling fixture. A robust fixture designed with embedded thermocouples that measure the performance of the wave solder machine each time a pass is made.

- *MVP*- (Manual Virtual Profile) Solder Reflow machine profiling fixture that can calculate a products (virtual) thermal profile. Note: *This hardware option requires a software key.*

    - *MVP Expandable Carrier* **–** Used to transport the *MVP* fixture through reflow ovens that have pin and chain conveyor systems. Expands to accommodate the widths of multiple products

- *Lead Free Thermal Shield* – Optional thermal shield used with the *SlimKIC 2000* for elevated process temperatures associated with Lead Free thermal processes.

- *Thermocouples* – *KIC* offers thermocouples rated for use up to 400°C. Standard *KIC* thermocouples shipped with all *KIC* profiler are rated to 300°C.

- *KIC Carrier* – Optional accessory for the *SlimKIC 2000* that carries the *SlimKIC 2000* profiler through the oven. Used when no belt conveyor is present.

Direct Oven Communication

The *KIC 2000* can interface directly with the oven controller on selected models from leading reflow oven manufacturers. The *KIC 2000* software can load oven recipes as well as zone temperature setpoints and automatically send these setpoints to the oven, eliminating the need for separate data entry.

Below are the oven manufactures that the *KIC 2000* software is capable of interfacing with:
- BTU
- Electrovert
- Heller
- JT
- Seho
- Vitronics

Installing the Software Key (optional)

If you have purchased any software options, you will have to install a software key. The software key will be installed in the computers USB port after the *KIC 2000* software has been installed.

Do not connect the software key to the computer prior to installing the *KIC 2000* software. Install the *KIC 2000* software and then connect the software key to the computers USB port.

To install the software key:

- Connect the USB software key it to any open USB port.

To check that the software key is properly working, start the *KIC 2000* software and then select the *Hardware Status* button, the lower-left button on the *KIC 2000* main menu. In the *Software Key* field the options for the (connected) software key will be listed.

If the displayed message is "No software key found" then the *KIC 2000* software is not detecting the software key. This may be due to a problem with the USB port, the software key, or the software drivers. The software key drivers are installed during the KIC 2000 software installation so reinstallation of the KIC 2000 software will likely repair any driver related issues.

Contact *KIC* tech support for assistance, tech@kicmail.com.

Hardware

The *KIC 2000* software can be used with 2 different *KIC* profilers the *SlimKIC 2000* and the *KIC Explorer*.

Figure 1: KIC Explorer 12-Channel product kit

Figure 2: SlimKIC 2000 9-Channel product kit

The *KIC 2000* software is designed to operate the same regardless of what profiler is connected. Upon installation of the software you select the *KIC* profiler that is being used. Then the software will depict profiler-model specific text and artwork unique to each profiler.

KIC Explorer Profiler

The *KIC Explorer* comes with your choice of 7, 9, or 12 channels models. As a standard feature, the *KIC Explorer* has 12 thermocouple inputs. The miniature-TC harness design makes this possible. If you prefer to use Type-K thermocouples, the KIC Explorer is available in a standard Type-K, 7 or 9-channel models as well. See the *KIC Explorer* section for more information, page 108.

Wireless Mode
All *KIC Explorers* are data loggers that have the capability to communicate wirelessly with the *KIC 2000* software. If your *KIC Explorer* was purchased with the wireless option, the kit contents will include all of the hardware necessary to use your *KIC Explorer* in wireless.

Data Log Mode
If your *KIC Explorer* was purchased without the wireless option then the kit contents will only include the hardware necessary to use your KIC Explorer in data logger mode.

Throughout this user manual both *KIC* Profilers will be discussed. Where applicable the differences between *KIC* Profilers and there features will be outlined.

Installing or Changing the Battery in your KIC Profiler
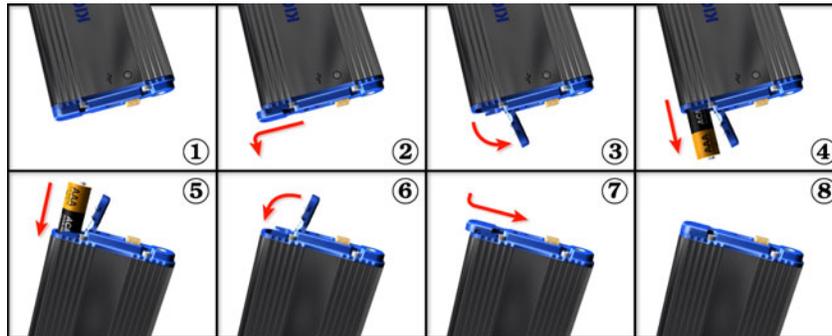
KIC Explorer:

Figure 3: KIC Explorer Battery install/replacement

The *KIC Explorer* uses 3 standard alkaline AAA sized batteries. *KIC* recommends the use of standard alkaline batteries; however you can use other types including rechargeable batteries.

If you experience negative effects using other types of batteries or discover your *KIC Explorer* is not operating properly, then switch back to standard alkaline batteries. If problems persist, contact *KIC* Technical Support: tech@kicmail.com.

Battery Life

The *KIC Explorer* is very efficient on battery usage. Independent tests show that a standard set of alkaline batteries will last more than 20 hours while operating at room temperature. Operating temperatures can affect battery performance.

Power On/Off

Power On – Press/hold the Amber colored On/Off button for 1 second (located at the back of the *KIC Explorer*). When power in on, the LED indicators will power on. The LED color/pattern will represent the current *KIC Explorer* hardware state/status.

Power Off – Press/hold the Amber colored On/Off button for 1 second (located at the back of the *KIC Explorer*). When the power is turned off, the LED indicators will be off.

LED Indicators

The *KIC Explorer* has 2 LED indicators, 1-Red and 1-Green, and can be viewed by looking at the top of the *KIC Explorer* near the On/Off button. See Figure 6. The *KIC Explorer* LED indicators will indicate the current state/status of the *KIC Explorer*. See Table 2.

KIC Explorer State/Status	LED Indicators
Initialization (Power up)	**Red and Green On** (On for 2 seconds)
State 1 - Resetting or TC(s) above profile start temp.	**Red ON**
State 2 - Ready to profile (Start Trigger)	**Red Flashing**
State 3 - (Mid Trigger) , **4** - (Stop Trigger), **6** - (Manual Mode)	**Green Flashing** (profile in progress)
State 8 - (End of Profile)	**Green and Red Flash**
State 5 - (Idle)	**Green On**
Flashing Firmware	**Green and Red On**

Table 2: KIC Explorer LED Indicator Reference Table

Hardware Configuration

Important: You must install the KIC 2000 software before connecting your KIC Explorer to the computer.

Failing to install the *KIC 20*00 software prior to connecting your *KIC Explorer* to the computer will render the *KIC Explorer* unusable.

1. Install the KIC 2000 Software.

2. Connect the KIC Explorer profiler hardware to the computer.

3. Install USB software drivers

If you have any questions or need assistance connecting your KIC hardware, contact KIC Technical Support tech@kicmail.com.

Wireless Mode

The *KIC Explorer* can communicate wirelessly with your *KIC 2000* software on your computer. Wireless communication gives you the ability to view the profile in real-time and retrieve data from *the KIC Explorer* without a cable. All *KIC Explorers* can be used in *Wireless* mode.

Note: The KIC Explorer Base Station is required in order to activate Wireless mode. The Base Station device drivers must be properly installed prior to use. See the Enabling the KIC Explorer Wireless Function section of this user manual for full details. See page 116.

Connect the *Base Station* antenna and then connect the *Base Station* to a USB port on the computer. See Figure 4, and Figure 5.

Figure 4: Connect antenna to Base Station

Figure 5: Connect Base Station to PC

Figure 6: Connect antenna to KIC Explorer

Next connect the *KIC Explorer* antenna to the *KIC Explorer*. See Figure 6

Note: Multiple Base Stations – When multiple *Base Stations* are used in the same vicinity make sure the *KIC 2000* software is not open/running on those computers. If the *KIC 2000* software is open/running the *Base Station* connected to that computer will interfere with the wireless operations of nearby *KIC Explorers*.

A 6-foot USB port extension cable is included with your *KIC Explorer* so that you can place the *Base Station* in a viewable location and remain connected to the rear USB ports.

In most cases you can simply connect the *Base Station* to a USB port and be ready to profile trouble free. In some situations you must adjust the *Base Station* location for improved or for acceptable wireless performance.

Base Station LED Indicators

Red = Data received from KIC Explorer
Green = A wireless signal is detected
Orange = Data Sent from Base Station to KIC Explorer

Data Log Mode

The standard mode of communication for the *KIC Explorer* is Data Log mode. The *KIC Explorer* USB communication cable is used to transfer data to and from the *KIC 2000* software computer from your *KIC Explorer*. For Firmware upgrades, Data Log mode is required.

Connect the *KIC Explorer* USB communication cable to the computer. See Figure 7.

Figure 7: Connect USB cable to PC

Connect the other end of the *KIC Explorer* communication cable to the KIC Explorer. See Figure 8.

Figure 8: Connect USB cable to KIC Explorer

The *KIC Explorer* is connected to the computer via USB cable. See Figure 9.

Figure 9: KIC Explorer direct connect to PC via USB cable

Note: When connecting the *KIC Explorer* to laptop computers that utilize a floating ground connection (2-prong power plug); you will be required to manually ground the laptop prior to connecting the *KIC Explorer*. This procedure will prevent unwanted electrical interference that may distort the temperature data collected by the *KIC Explorer*. Contact *KIC* Technical Support for assistance, tech@kicmail.com.

Connecting your KIC Explorer to the Computer

Important: You must install the KIC 2000 software before connecting your KIC Explorer to the computer.

The *KIC Explorer* communicates through the USB port on the computer. Depending on your model *KIC Explorer* you will connect either the *KIC Explorer* communication cable (data log mode) or the *KIC Explorer Base Station (wireless mode)* to your computers USB port.

 In the event that there are no available USB ports, a standard 2-8 port USB-hub can be used to add more USB ports to the computer.

After successful *KIC 2000* software installation and installation of the batteries in your *KIC Explorer* you are ready to connect your *KIC Explorer* profiler to your computer.

1. Turn on the *KIC Explorer*. Turn the power on by pressing the *On* button.

2. Connect the USB communication cable to the *KIC Explorer* and the other end to the computers USB port. If your *KIC Explorer* came with the *Wireless* hardware option connect the *Base Station* to the USB port.

Note: Do not connect the Base Station to the computer while the KIC Explorer is powered on and connected to the USB communication cable.

3. Whether you connect the *KIC Explorer* or *KIC Explorer Base Station*, Windows will recognize the USB device and the "Found New Hardware Wizard" will appear. Select the "Install the software automatically (recommended) option then select the "Next" button. See Figure 10.

Note: The "Found New Hardware Wizard" USB driver installation will run each time a KIC Explorer or KIC Explorer Base Station is connected to your computers USB port(s).

4. Next, Windows will prompt you regarding "Windows compatibility". Select the "Continue Anyway" button. See Figure 11.

Figure 10: Windows Found New Hardware Wizard

Figure 11: Windows Hardware Installation Compatibility

5. Windows will begin installing the USB software drivers. When complete a finished message will appear. Select the "Finish" button. See Figure 12.

Your *KIC Explorer* USB drivers are now installed and your *KIC Explorer* is ready to communicate with the *KIC 2000* software.

Figure 12: Completing Windows Found New Hardware Wizard

Connection Messages

Once the USB driver installation is complete and whenever the *KIC Explorer* or *KIC Explorer Base Station* is connected to the computers USB port(s) a *KIC* message will appear telling you that the *KIC Explorer* or *KIC Explorer Base Station* is connected to the computer. See Figure 13 and Figure 15.
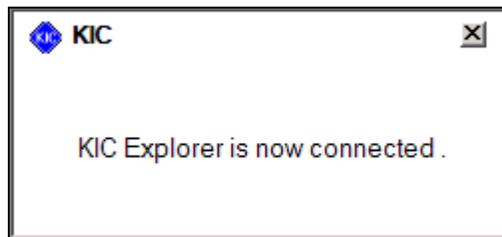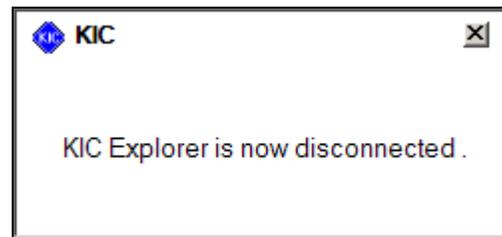

Figure 13: Explorer connected status

Figure 14: Explorer disconnected status

Figure 15: Base Station connected status

Figure 16: Base Station disconnected status

Whenever the *KIC Explorer* or *KIC Explorer Base Station* is disconnected form the computers USB port a *KIC* Message will appear telling you that *the KIC Explorer* is now disconnected.
See Figure 14 and Figure 16.

Thermal Shields

KIC offers 2 models of *KIC Explorer* thermal shields:

- **Cool Touch** – The *Cool Touch-KIC Explorer* thermal shield is standard and is included with all standard *KIC Explorer* profiling kits. The *Cool Touch* shield can be handled without gloves, however gloves are recommended whenever heat is present. The *Cool Touch* thermal shield also allows the *KIC Explorer* longer duration at given temperatures during use.

- **Stainless Steel** – The *Stainless Steel -KIC Explorer* thermal shield is optional accessory for the *KIC Explorer*. The *Stainless Steel* thermal shield has no outer insulation and measures 1/8" lower in Height than the *Cool Touch* shield model.

Loading the KIC Explorer into the Thermal Shield

12-Channel -*KIC Explorer* – Place the *KIC Explorer* into bottom half of the *KIC Explorer* thermal shield.

- The M*ini-TC* harnesses should rest flat on the metal block inside the shield.

- The thermocouple wires should exit from the front of the thermal shield.

- The *KIC Explorer* antenna should extend fully, and exit from the back of the thermal shield. See Figure 17.
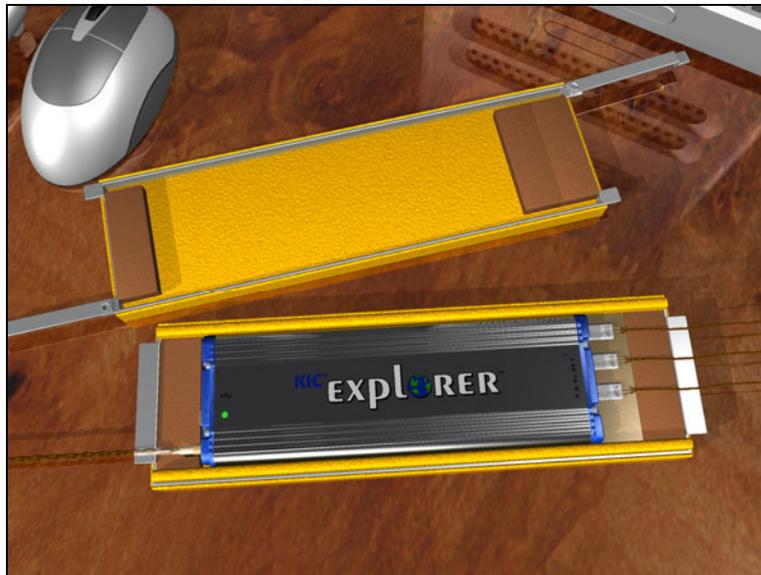

Figure 17: 12 Channel KIC Explorer aligned in thermal shield

7- and 9-Channel KIC Explorers –
Place the *KIC Explorer* into bottom half
of the *KIC Explorer* thermal shield.

- The thermocouples should rest
  flat on the bottom of the inside
  the shield.

- The thermocouple wires should
  exit from the front of the
  thermal shield.

- The *KIC Explorer* antenna
  should extend fully, and exit
  from the back of the thermal
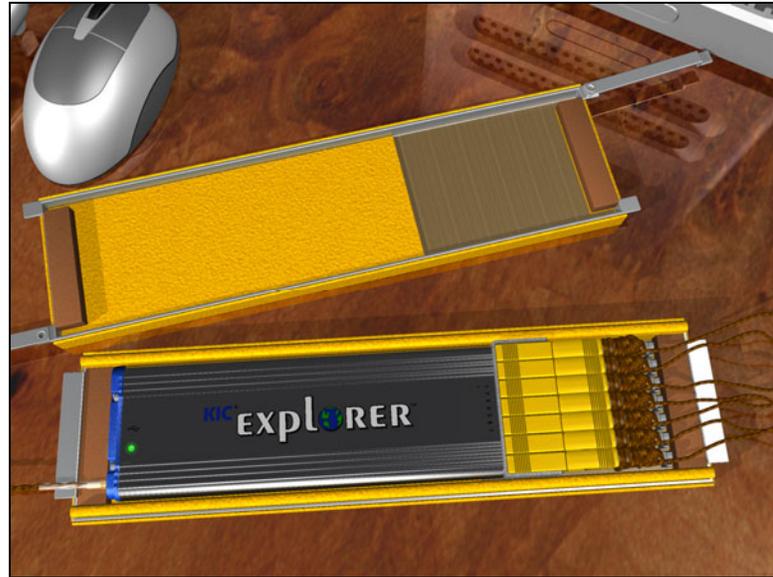 shield. (Wireless models only)
  See Figure 18.

Once the *KIC Explorer* is set inside the
bottom half of the thermal shield and the
thermocouple wires and antenna are
properly routed, verify the *KIC Explorer*
is on by viewing the LED near the *On/Off* button. See Figure 18.

Figure 18: 7 Channel KIC Explorer aligned in thermal shield

Next place the top-half of the *KIC Explorer* over the bottom half and then swing the latching mechanisms into the
closed positions at each end. See Figure 19. Be careful not to damage the thermocouple wires or *KIC Explorer*
antenna. (RF models only)

Figure 19: KIC Explorer Cool Touch Thermal Shield Latching Mechanism

Contact *KIC* Technical Support if you need any assistance with your *KIC Explorer*: tech@kicmail.com
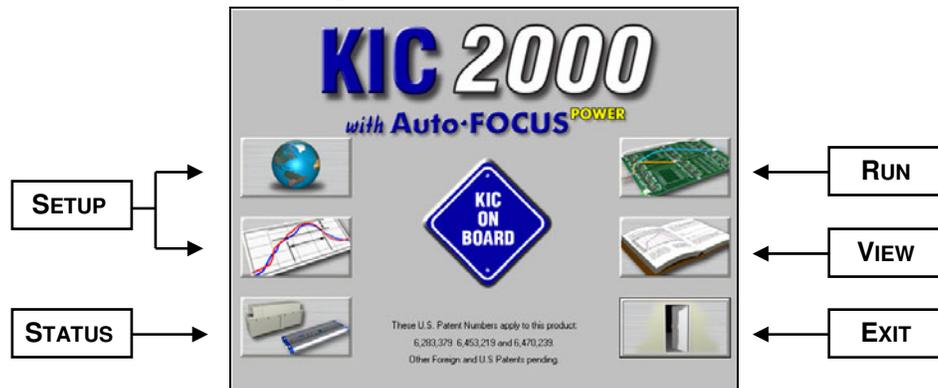
Starting the KIC 2000 Software

Figure 20: KIC 2000 Main Screen

The installation automatically adds a *KIC* folder to main Windows Start Menu. Click on the *Windows Start* and scroll up to the *KIC* folder. Then click on the *KIC 2000* software icon. The *KIC 2000 Main Menu* should say "with **NAVIGATOR**" if you have purchased the *Navigator* option and installed the software key correctly, and "with **Auto-Focus**" if you purchased the *Auto-Focus* option.

If you have purchased the *Power* option(s), the *KIC 2000 Main Menu* should say "with **NAVIGATOR Power**" if you purchased only the *Navigator* and *Power* options, and "with **Auto-Focus Power**" If you have purchased the *Auto-Focus* and *Powe*r options or the *Auto-Focus*, *Navigator* and *Power* options. See Figure 20.

There are six buttons on the *KIC 2000 Main Menu*. The buttons on the Left are for setup and status; the buttons on the Right are for running and viewing profiles and exiting the software. See the descriptions of the function for each button below.

Global Preferences

Set units of measure, Maximum product start temperature, Oven name, Password.
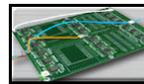
Run a Profile

Begins the step-by-step procedure for running a product profile.
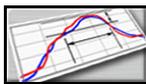
Define/Edit Process Window

Create or edit *Process Window* files for solder paste and profile specifications.

Profile Explorer

Filing system used to manage and view all profiles run using the KIC 2000 software.

Hardware Status

Show status of the Oven controller (if applicable), SlimKIC 2000 or KIC Explorer, and optional software key.

Exit

Exits the KIC 2000 software.

Global Preferences

Global Tab

Figure 21: Preferences – Global Tab

- **Units of Measure** – There are two drop down menus to choose units for Conveyor Speed and Distance, and weight. (Weight is Auto-Focus Specific)

- **Product Start Temperature** – The temperature of all the thermocouples attached to the product and *SlimKIC 2000* must be below this temperature to start a profile. This will insure that a profile is not started while the board is still to hot. Input value in the field or use Slider bar.

- **Profiling Hardware** –Select *SlimKIC 2000* or *KIC Explorer* 7, 9, or 12 channel model. The *SlimKIC 2000 or KIC Explorer* you purchased will be either a *Transmitter* (*Wireless*) capable or *Data log* capable. Select the appropriate option.

- If you are running on an oven with communication compatibility with the *KIC 2000 software*, there will also be a field to input the ***oven name***. This *oven name* will be saved with the profile and can be sorted on in the *Profile Explore*r.

- **Languages –** Select the language that you wish to run the software. See important information about Languages on page 3.

- **Engineer Password** – By checking this and entering a password you can control access to certain menus in the *KIC 2000* software. See Figure 22.

Items protected by password

Figure 22: Preferences – Password Protection

- *Global Preferences* button on the main screen. See Figure 22.

- In the *Process Window* Screen – Saving or deleting *Process Windows* or changes to *Process Windows*

- In the *Run a Profile* first screen – Remove Oven

- In the *Profile Explorer* – Delete a profile

- In the *Profile Graph* and Statistics screen – Access to the *Optimization* tab

Auto Focus tab

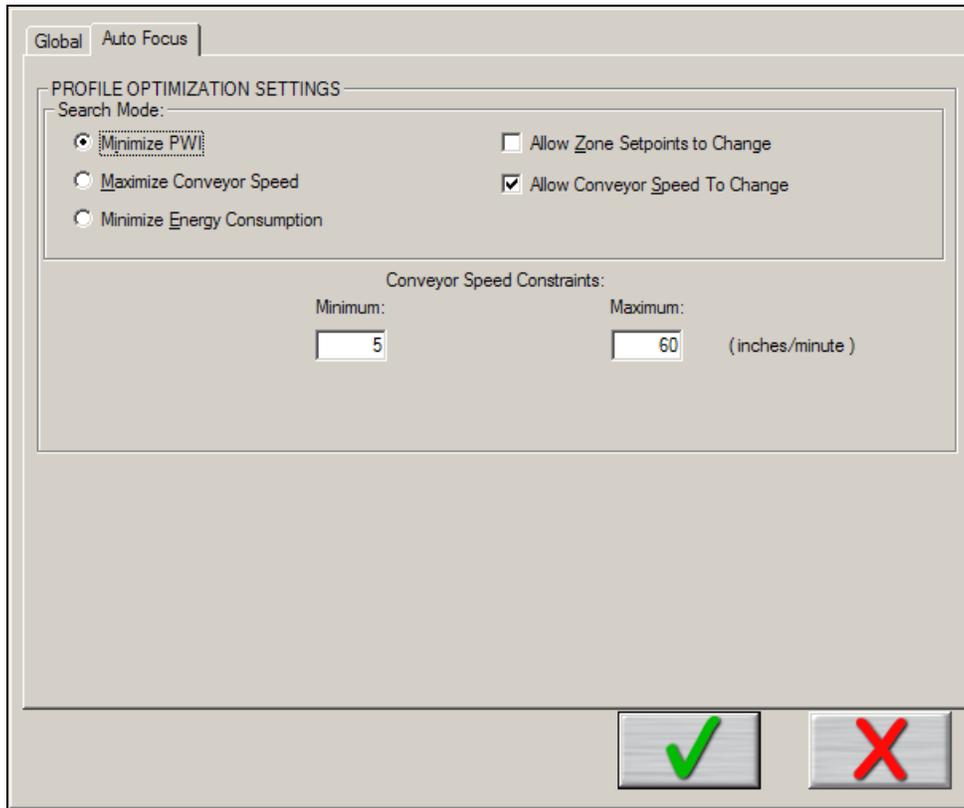Figure 23: Global Preferences – Auto Focus Tab

Profile Optimization Settings

Search Mode for Auto-Focus

- **Minimize PWI** – Search for the combination of set point temperatures and conveyor speed that will minimize the *Process Window Index* (PWI).

- **Allow Zone Set points to Change –** This option will determine if Auto-*Focus* will include zone set point changes when predicting new solutions.

- **Allow Conveyor Speed to Change -** Choose whether to allow *Auto-Focus* to vary the conveyor speed. If you choose *Allow to Vary* you can set the minimum and maximum.

- **Maximize Conveyor Speed** – Search for the set point temperatures that will maximize conveyor speed.

- **Minimize Energy Consumption** – Optional *Power* feature; Search for the oven settings that will minimize the power consumpotion of the oven by finding set point solucitons with slower conveyor speeds and lower temperature settings.

Conveyor Speed Constraints

Low – Select the minimum conveyor speed you would like *Auto-Focus* to recommend for new products.

High - Select the maximum conveyor speed you would like *Auto-Focus* to recommend for new products.
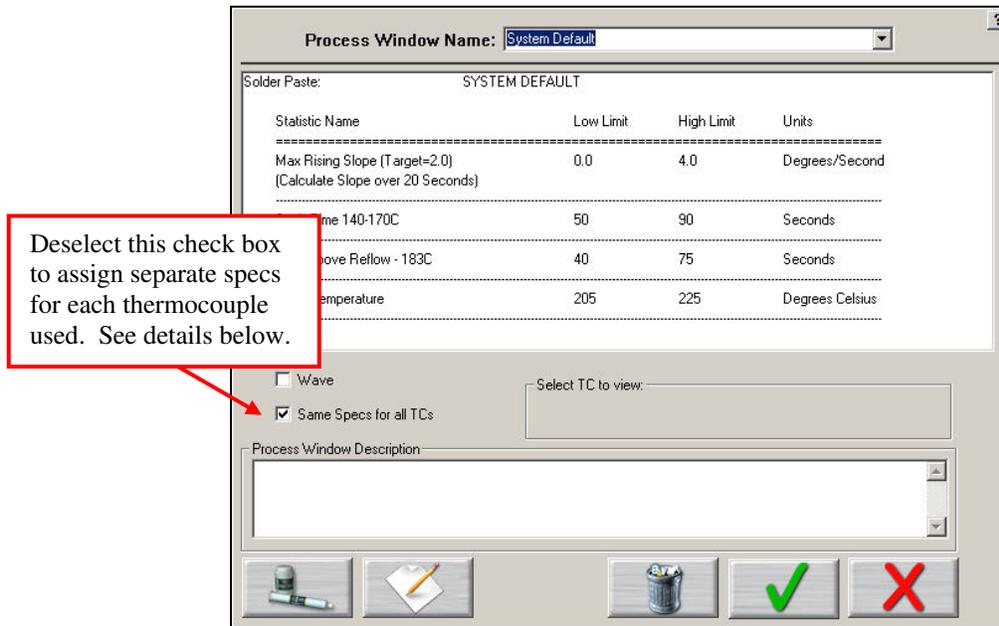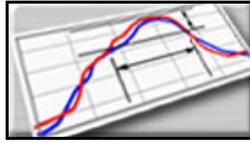
Process Window Setup

Figure 24: Process Window Setup

Process Window Name – Name of the *KIC Process Window* file that includes the statistics chosen and limits for those statistics, along with whatever text is typed in the *Description* field. See Figure 24.

- **Solder Paste Menu** - A read only library list of numerous solder pastes along with the statistics and limits suggested by the paste mfg., also included is a *User-Defined* option in the list which allows you to create a spec. of your own. See below for additional details.
- **Edit Specs** – Screen allowing you to edit or choose statistics and limits for a chosen solder paste or define your own specs
- **Wave** – This radio button switches between the process specs and the *Wave* process specs for the selected *Process Window*. Set up a *Process Window* specific to *Wave* TCs for Wave Solder profiling.
- **Read only text box** – Shows the paste name, statistics name, and limits for a Process Window chosen, edited, or saved by you. To edit select the *Edit Specs* button.
- **Same Specs for all TC's –** By deselecting this checkbox, you can assign separate specifications for each individual thermocouple you are using. After deselecting the checkbox, you'll need to click on the *Edit Specs* button to choose which statistics will be used and what spec limits will be set for each thermocouple used. This option would be used if you had component specific specifications that differ from the general solder paste specs. Another use for this would be if you wanted to monitor the actual board temperature as well as component temps. You would then only select the statistics for that TC that are relevant. If you wish to use the same specifications for all thermocouples, put a check mark in the box.
- **Select TC to View –** This dialog box will appear only if the *Same Specs for all TC's* checkbox is <u>deselected</u>. By clicking on the dropdown menu, you can view the specifications that have been defined for that number thermocouple. If a description was included, it will be displayed next to *Label*.
- **Process Window Description** – Field allowing for freehand notes for a particular *Process Window*.

Solder Paste Menu

Solder Paste Menu

Choose a Solder Paste from the List:

```
Define Your Own Spec
SYSTEM DEFAULT
AIM 209DX Sn62Pb36Ag2 NC Air or N
AIM 209DX Sn63Pb37 NC Air or N
AIM 291AX Sn62Pb36Ag2 (RSS) NC Air or N
AIM 291AX Sn62Pb36Ag2 (RTS) NC Air or N
AIM 291AX Sn63Pb37 (RSS) NC Air or N
AIM 291AX Sn63Pb37 (RTS) NC Air or N
AIM 291AXB Sn62Pb36Ag2 NC Air or N
AIM 291AXB Sn63Pb37 NC Air or N
AIM 293+ CASTIN (AG03A) NC Air or N
AIM 293+ Sn43Pb43Bi14 NC Air or N
AIM 293+ Sn62Pb36Ag2 (RSS) NC Air or N
AIM 293+ Sn62Pb36Ag2 (RTS) NC Air or N
AIM 293+ Sn63Pb37 (RSS) NC Air or N
AIM 293+ Sn63Pb37 (RTS) NC Air or N
AIM 293+ Sn96.5Ag3.5 NC Air or N
AIM 293+ SnAg3-4Cu.5-1 NC Air or N
AIM 293DX2B Sn62Pb36Ag2 (RSS) NC Air or N
AIM 293DX2B Sn62Pb36Ag2 (RTS) NC Air or N
AIM 293DX2B Sn63Pb37 (RSS) NC Air or N
AIM 293DX2B Sn63Pb37 (RTS) NC Air or N
AIM 297DX CASTIN (AG03A) NC Air or N
AIM 297DX Sn43Pb43Bi14 NC Air or N
AIM 297DX Sn62Pb36Ag2 (LSP) NC Air or N
AIM 297DX Sn62Pb36Ag2 (RSS) NC Air or N
```
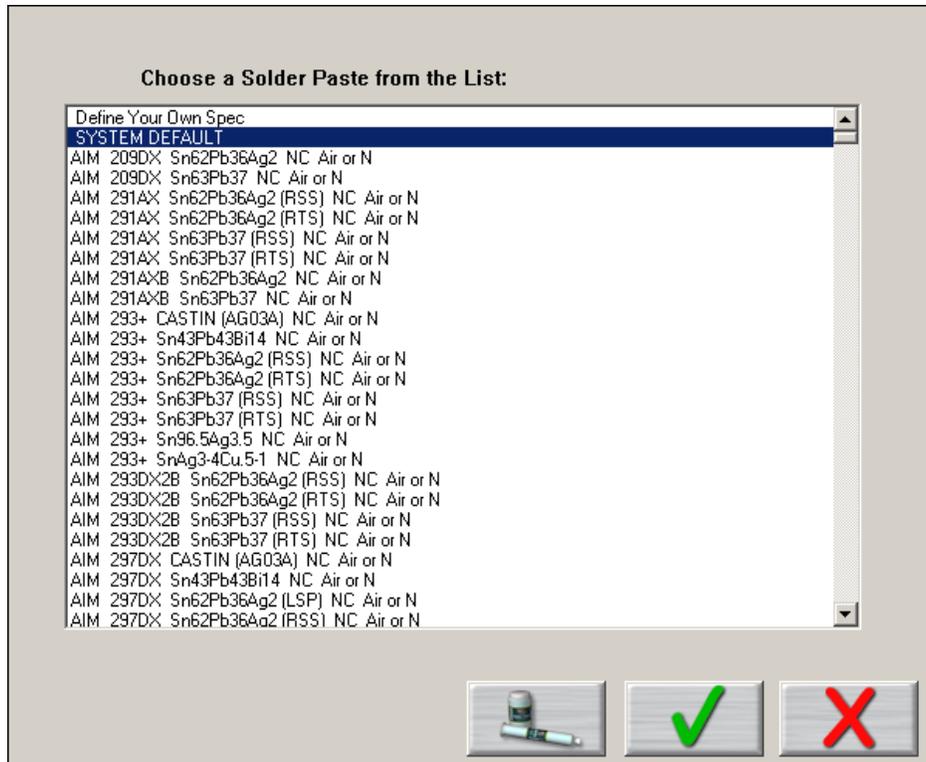
Figure 25: Solder Paste List

Solder Paste Menu - Once you have clicked on the *Solder Paste Menu* you will have a list of pastes to choose from. Use the scroll bar on the right to find your paste, and then click on the paste in the list. See Figure 25.

- Clicking on the **Green Check** will accept that paste and load its specs automatically. You will then return to the *Process Window* screen, after being presented disclaimer information.

- Clicking on the picture of the **paste jar and tube** will give you technical support information for the solder paste Mfg. that you chose.

- Clicking on the **Red X** will cancel your selection and return you to *the Process Window* screen without making any changes.

KIC updates the solder paste list on a regular basis, check KIC on the Internet for updates, www.kicthermal.com
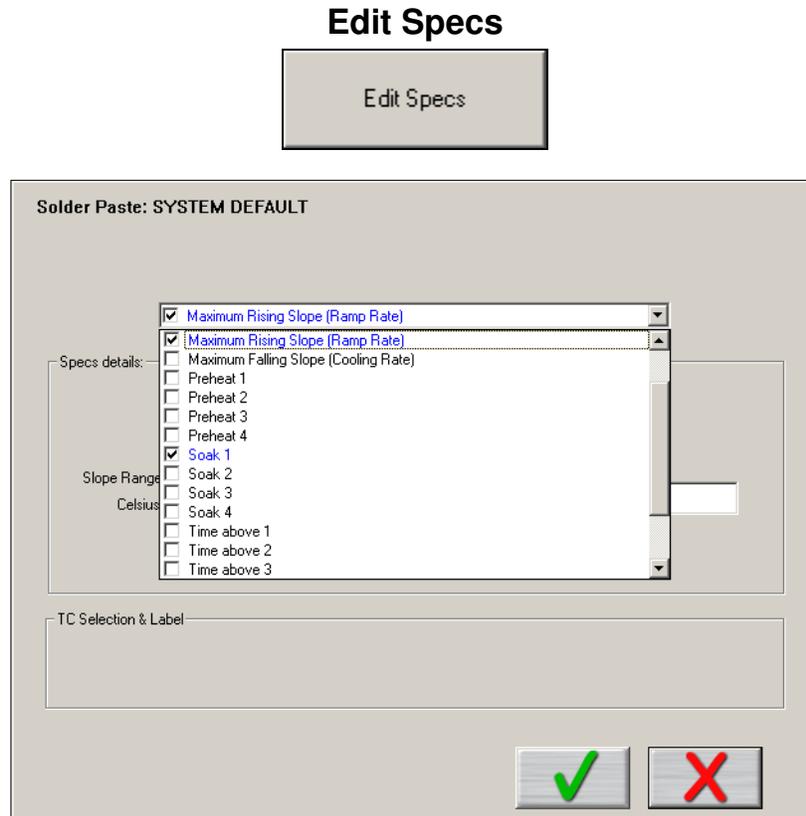
Edit Specs

Figure 26: Process Window – Edit Specs

Process Window name is listed at the top of the screen. See Figure 26.

There is a single drop down list at the top that contains all of the available specifications that can be applied to your *Process Window*. These specifications are specific limits or a group of limits that define the overall *Process Window* for your product. These specifications include Slope, Preheat, Soak, Peak temperatures, and Time above temperatures.

Spec Details – The Spec Details coincide with the selected Specification. For each Specification selected, enter the Temperature, and Time limits. These limits are usually dictated by the solder paste used. The *KIC 2000* software uses the limits to measure the profile *PWI*.

Changes made within this screen will have a direct effect on the profile PWI value

Once you have completed all spec modifications you can click on the **Green check "DONE"** button and your changes will be applied. Clicking on the **Red X "CANCEL"** button will cancel your changes and exit.

Separate Specs

Figure 27: Process Window – Separate Specs

TC Selection & Label

If you choose to assign separate specs for each TC, click the *Edit Specs* button and the screen will now appear with an additional area for *TC Selection & Label*. See Figure 27.

- **Select** - Use the Select drop-down menu to select the TC whose specifications you wish to view/edit. The Spec Details for the selected TC is displayed.
- **TC Label –** This area will allow you to type in a description or label to identify that particular TC. If left blank, the TC's will simply be identified as TC2, TC3, etc.

When separate specs are being used, this is the only place where you can select or deselect which TC's will be used for a profile.

Once you have completed all edits of the specs you can click on the *Green Check button* and your changes will be applied. Clicking on the *Red X* (Cancel) button will cancel your changes and exit. See Figure 27.
If you are having trouble defining your process specifications, contact KIC and we will try to help.
tech@kicmail.com

Figure 28: Process Window – Separate Specs – Select TC's

Select TC to View – Drop-down menu containing the TC's that have already been defined. (Previous step) See Figure 28.
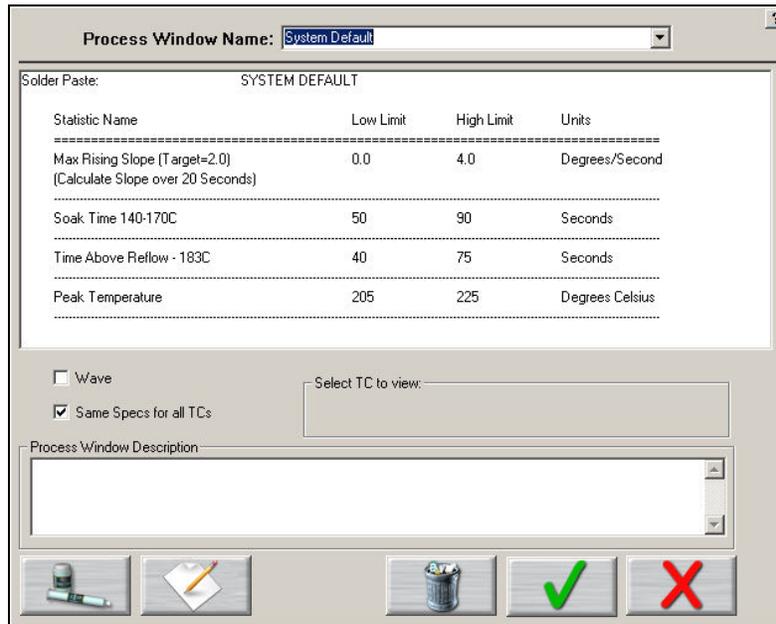
Saving - Process Window

Figure 29: Save Process Window

To create a *Process Window,* follow these steps:

1. **Choose a solder paste** from *the Solder Paste Menu*.

2. **Edit the specs** if necessary. See Page 21 for details.

3. **Enter a name the Process Window**

4. **Save** the Process Window

To save - Click on the **Green check (Save and Exit)** button. A dialog box will appear asking if you want to save the changes to the *new Process Window file*. See Figure 30.
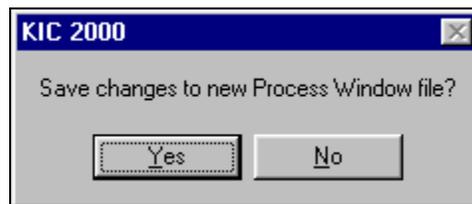

Figure 30

Clicking on *yes* will save it and exit to the main screen. You can click on No and click on the **Red X "Cancel button"** to exit without accepting or saving any changes.
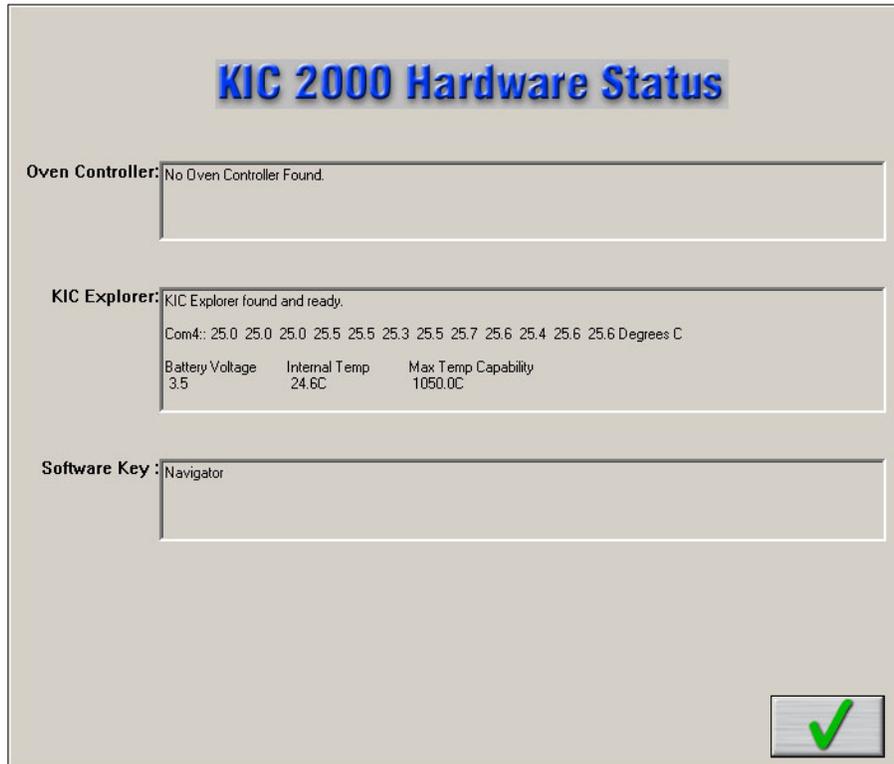
Hardware Status

Figure 31: Hardware Status

Oven controller – Shows the status of the connection between the *KIC 2000* software and any connected oven. Contact KIC for details about connecting your reflow oven.

SlimKIC 2000/KIC Explorer – Shows the status of the *SlimKIC 2000 or KIC Explorer* Profilers. This box displays the following information:

- *SlimKIC 2000/KIC Explorer* communication status
- COM port – when connected.
- Temperature display – for all connected thermocouples.
- Battery Voltage.
- Internal Temperature – of *KIC Profiler*.
- Maximum Temperature Capability – This value determines the maximum temperature the *SlimKIC 2000 or KIC Explorer* can read. This value can be changed if needed (*SlimKIC 2000* only). See the *SlimKIC 2000* calibration procedure for details page 107.

Software key – Shows the status of any software key that is connected. Displays the functions associated with the software key.

Note: Only one software key can be connected at any given time. The KIC 2000 software will not detect multiple software keys. If you have purchased new software options that require an additional software key, contact KIC Technical Support, tech@kicmail.com*.*

Run a Profile
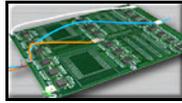
The *Run a Profile* button will guide you through a series of screens, which will finish at a completed and graphed profile. To move through these screens you can use the *Back*, *Next*, or *Cancel* buttons located at the bottom of the screen.

Figure 32: Run a Profile Screen #1

Name Product and Select Process Window

- o **Product Name** – Enter in a unique product name (long file names are acceptable) or choose an existing product name from the drop down list.

- o **Process Window** – Choose a *Process Window* from the drop down list. These *Process Windows* are created in the *Define/Edit Process Window* screen which is accessed from the *KIC 2000* main screen.

- o **Application** – Select your *Application* type/profiling fixture from the drop down list.

- o **Sample Rate** - Select the number of samples per second from the drop down list for each product.

- o **Set Trigger** – Manually set the *Middle*, and profile *End* temperature triggers for each product.

  - • Note: The Profile start temperature trigger is determined by the *Maximum Product Temperature at Start of Profile* setting in the *Global Preferences* screen. The start trigger value is always 2ºC above this value.

  - • Note: For Temperature vs. Time profiling, trigger temperatures are not used. Instead a Profile Stop button is displayed in the bottom-Right hand corner of the profile graph screen.

- o **Oven Name** – Enter a unique oven name or choose an existing oven from the drop down list. The oven will have information about the number of zones saved with it as well as other zone information. This is entered on the next screen.

- o *Remove Oven* button will delete the oven name currently displayed in the field.

  - • If you are running the software on an oven controller computer that is communication compatible with the *KIC 2000* software the number of zones is already known and the oven name will be entered in the *Global Preferences* screen, not on this screen. In addition, the *Entering Oven Recipe* screen is skipped because the *KIC 2000* software already has the recipe information from the oven controller.

- o **Enable Auto-Focus** – Enables or disables the Auto Focus tool for the current profile (requires software key).

- o **Profile Description** – Allows for freehand typing of any notes you may want to include with this profile.

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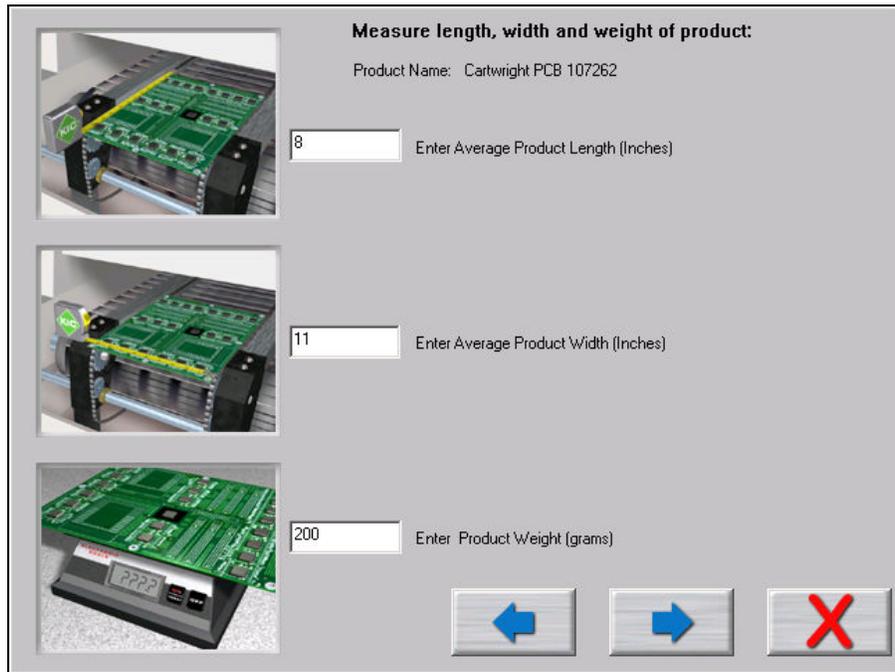E
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C**

Auto-Focus, Product Dimensions

Figure 33: Run a Profile – Auto Focus screen #1

If you have purchased the *Auto-Focus* software option, this screen will appear. Enter the Length, Width, and weight of your product, and then choose the *Forward Arrow* button. See Figure 33.

- This product will be included in the Auto-Focus library from this point forward.
- Make sure to measure using the correct units of measurement.

Auto-Focus, Confirm

This screen is displayed in order to confirm the product measurements as entered by you. See Figure 34.

You have two options:

1. *Use current Oven Recipe* – use the most recent oven recipe setting for this product.
    The next screen will display the most recent set points and conveyor speed for this product.

2. Use Auto-Focus to find an in-spec Oven Recipe – This will initiate the Auto-Focus option for this product.
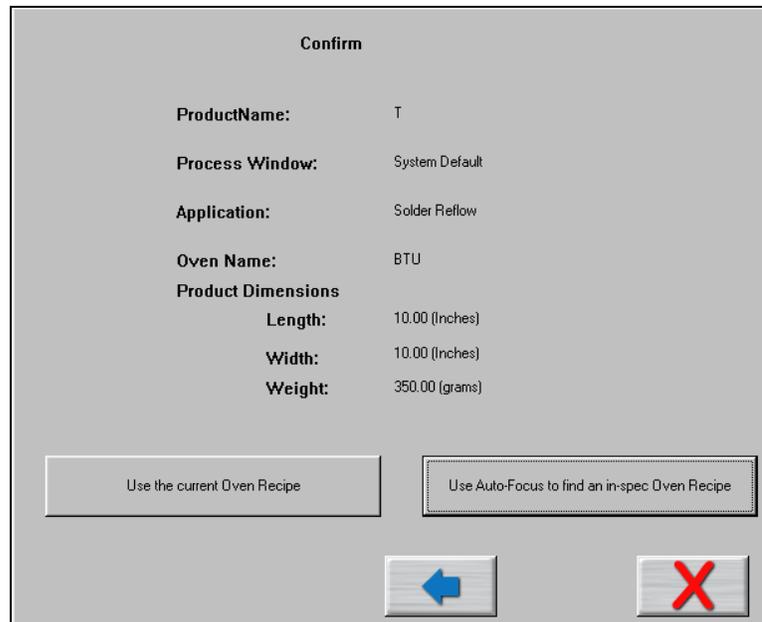

Figure 34: Run a Profile – Auto Focus screen #2

If the *Use Auto-Focus…* button is selected and no matching product is found, this dialog box will appear, choose the *OK* button. See Figure 35.

Figure 35

You will be returned to the *Confirm* screen. Select the *Use Current Oven Recipe* button and enter the oven set points and conveyor speed you want to start with.

If the *Use Auto-Focus…* button is selected, but there are not enough products in the database to confidently give an expected PWI, this dialog box will appear. See Figure 36.

Figure 36

If you select **Yes**, the next dialog box shows the *Auto-Focus–First Guess* recipe in order for you to confirm.

If **No**, you will be returned to the Confirm screen. Select the *Use Current Oven Recipe* button and enter the oven set points and conveyor speed you want to start with.

If the Use *Auto-Focus…* button is selected and there are a sufficient number of boards in the data base, the following dialog box will appear: See Figure 37.

Figure 37

If you select **Yes**, the next dialog box shows the *Auto-Focus –First Guess* recipe in order for you to confirm.

If **No**, you will be returned to the *Confirm* screen. Select the *Use Current Oven Recipe* button and enter the oven set points and conveyor speed you want to start with.

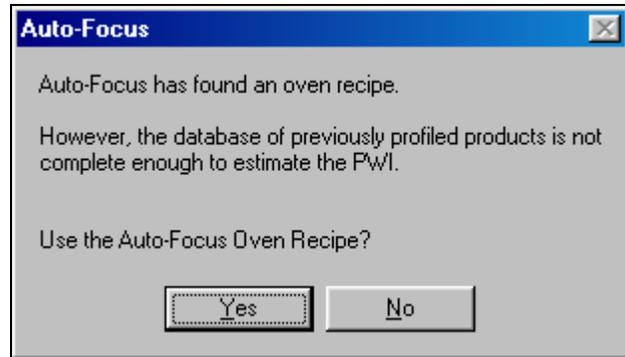AUTO-FOCUS SPECIFIC

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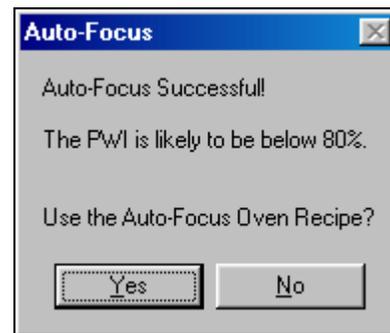
If you select **YES**, you will be prompted to *Confirm the First Guess Recipe.* See Figure 38.
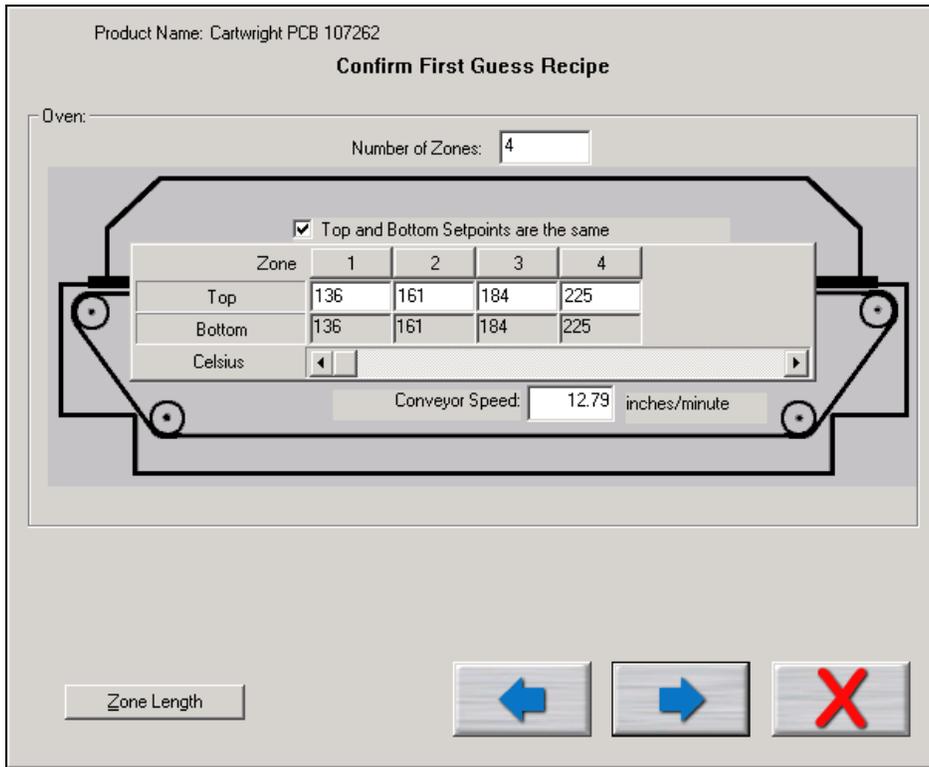

Figure 38: Run a Profile – Auto Focus screen #3

Confirm the recipe and select the *Forward Arrow* button. If there is no communication with the oven controller, the following dialog box appears: You must manually enter the recipe information on the oven. See Figure 39.
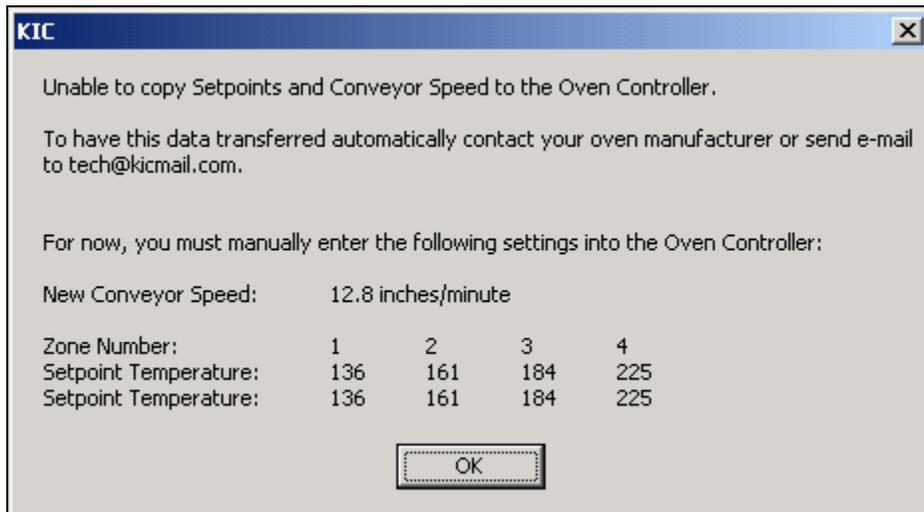

Figure 39

If there is communication with the oven, then the recipe is copied directly to the oven.

Zone Length and Minimum/Maximum Temperature Settings

Figure 40: Run a Profile screen #3

By defualt the *KIC 2000* software assumes each temperature zone in your oven is the same length. For better profile display and profile prediction capabilities (*Navigator*) you can manually enter the correct zone lengths. See Figure 40.

Minimum and Maximum Set point Temperatures

This setting is used by the *Navigator* option as limits for it's prediction results. The *KIC 2000* softawre uses default settings of: 70ºC min, and 300ºC max.

Enter the *Minimum and Maximum* temperature settings that your oven can control to. See Figure 40. This will help the *Navigator* option maximize it's prediction results.

Zone lengths – Deselct the chcek box if your zone lengths are not the same. Enter the acutal length for each zone.
   If your oven has non-uniform sized zones or has a large gap between some of your zones you will need to edit
   the lengths to increase the accuracy of the predictions of the KIC 2000 software.

Oven Initialization File

For every oven you create a name for in the software an initialization file is created. This file is given the name that you give your oven with a `.kiccfg` extension. This file will be located in `C:\KIC Profiler 2000\Ovens`

This file holds information about the zones in your oven, for the use by the *KIC 2000* prediction algorithm.

By default the software will start with the following assumptions unless changed by you:

*   The zones are uniform and consecutive with no large gaps between them.

*   The maximum rising temperature difference between any two consecutive heated zones is 50 degrees Celsius.

*   The maximum falling temperature difference between any two consecutive heated zones is 20 degrees Celsius.The maximum valley temperature difference between any 3 consecutive heated zones is 20 degrees.

Entering Oven Recipe

Figure 41: Run a Profile screen #2

This screen does not appear when the *KIC 2000* is communicating with the oven controller.

The recipe information is:

Number of Zones – Enter in number of heated zones in your oven.

Top and Bottom Set points are the Same – If your settings always have the top and bottom set points the same, check this. The bottom set point will automatically be entered as you enter the top set point.

Different top and bottom set points
The software gives you the ability to enter separate top and bottom zone set points, and have them displayed on the graph. When used with the *Navigator*, it will maintain the top and bottom offset in its prediction. During the *Run a Profile* routine, when you get to the screen where you enter in the zone set points, there is a check box for *Top and Bottom Set points are the same*. Deselect that checkbox if you are running different top and bottom set points. Either way, using the same or different top and bottom set points, the graph will always display a top and bottom set point values.

Zone Temperature fields – You will have a field for input of the temperature setting for each zone based on the *Number of Zones* you enter at the top. For more than six zones you will have to scroll over to enter the temperatures.

Conveyor Speed – Enter the Conveyor speed that your oven is curretnly set at.

Zone Length – See page 29 for details.

Instructions on attaching TC's

The next few screens, *Run a Profile Screens* # 4-6, visually demonstrate attaching the thermocouples to the board.

It is very important that you attach the first thermocouple (*Air TC*) so it extends 1-inch in front of the leading edge of the board.

This Air Thermocouple MUST be plugged into the first channel on the SlimKIC 2000 or KIC Explorer.

Attach the rest of the thremocouples and plug them into the *SlimKIC 2000 or KIC Explorer*. Order is not important, unless you plan on labeling where they are attached.

Depending on the selected *Application* type and or *KIC profiler*, the displayed graphics may differ. In any case, always follow the on-screen directions. Contact *KIC* Technical support for assistance, tech@kicmail.com.

Example of *KIC Explorer*-12 Channel Model -*Solder Reflow, Cure*, and *Wave Off - Application* type specific graphics:
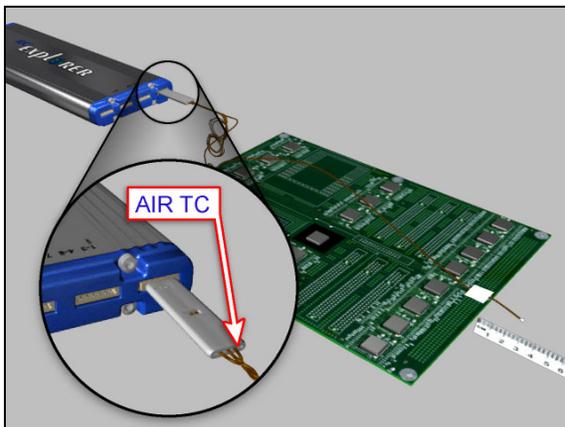

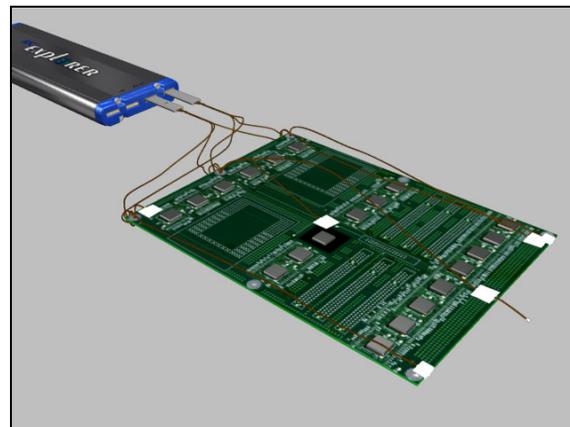Figure 42: Run a Profile screen #4

Figure 43: Run a Profile screen #5

Example of KIC Explorer – 9 Channel Model - *Solder Reflow, Cure*, and *Wave Off - Application* type

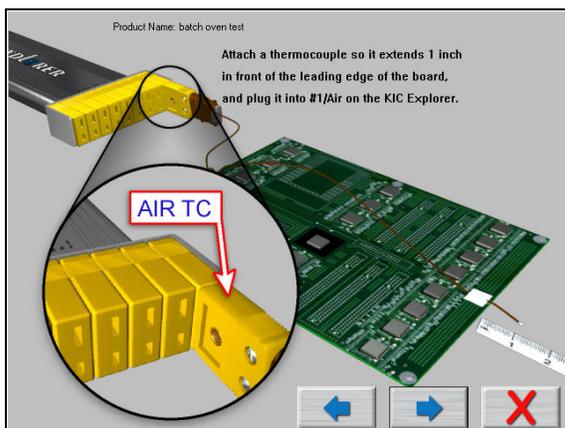Figure 44: Run a Profile screen #4
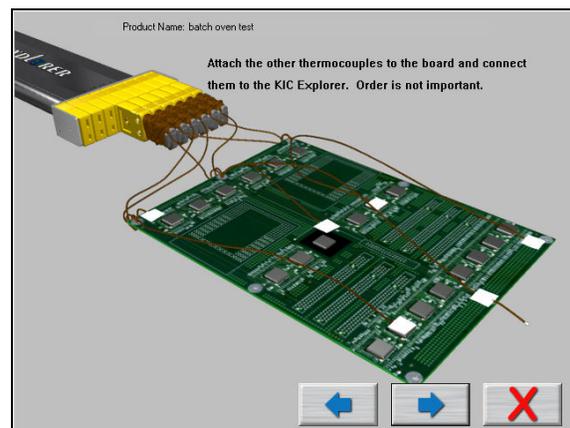
Figure 45: Run a Profile screen #5

Example of *SlimKIC 2000 -Solder Reflow, Cure*, and *Wave Off - Application* type specific graphics:
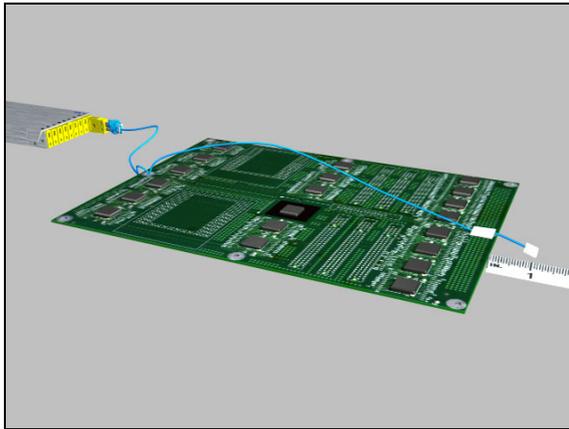
Figure 46: Run a Profile screen #4
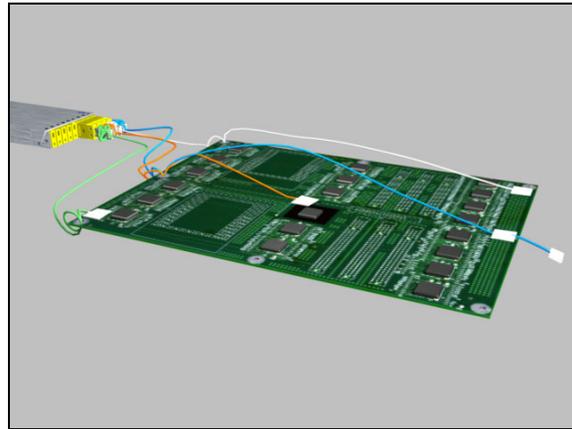
Figure 47: Run a Profile screen #5

Example of *SlimKIC 2000 Semiconductor - Application* type specific graphics:

Figure 48: Run a Profile screen #4
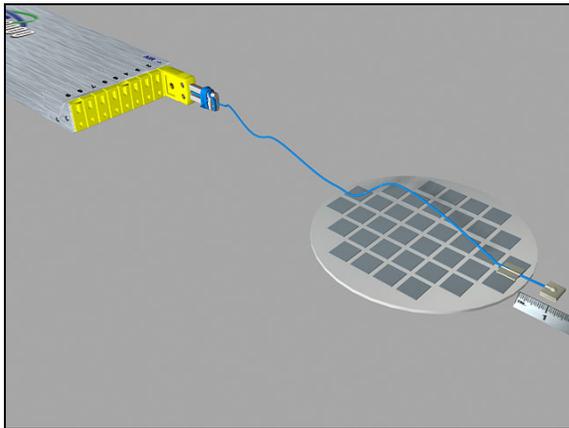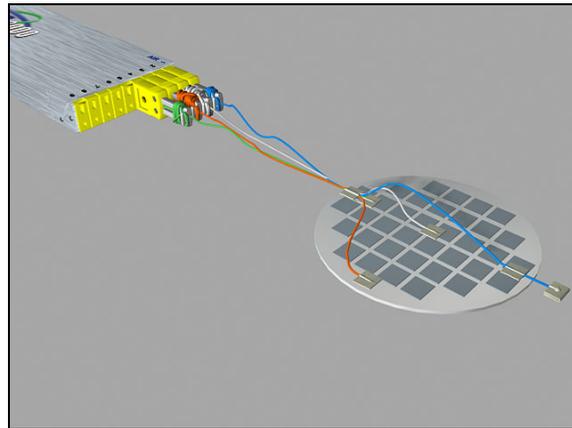

Figure 49: Run a Profile screen #5

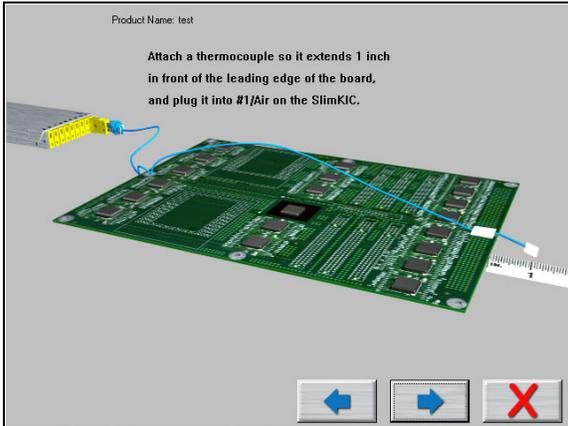Example of Wave Solder-Wave On – Application type specific graphics

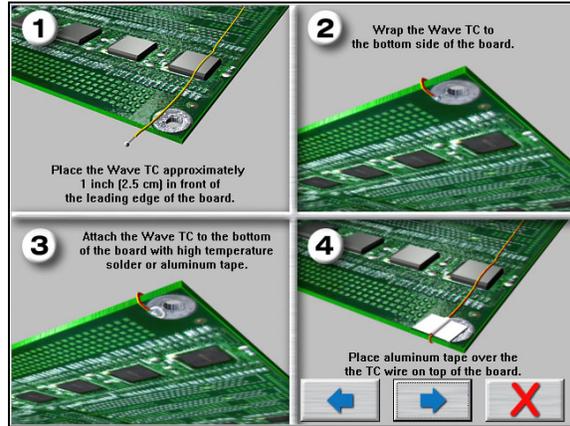Figure 50: Run a Profile screen #4

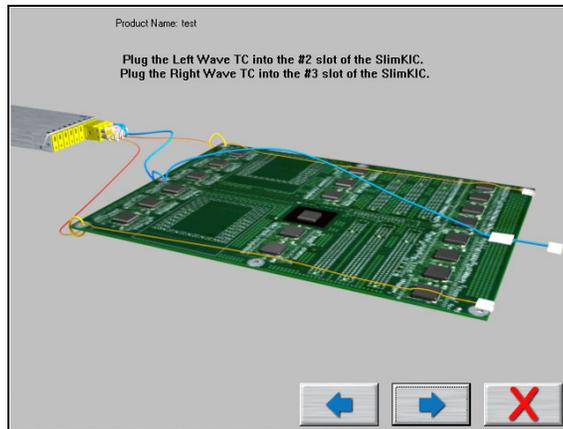
Figure 51: Run a Profile screen #5

Figure 52: Run a Profile screen #6

Please see the Appendix for using the Aluminum tape to attach your thermocouples.

Select Thermocouples and Start Profile

Figure 53: Run a Profile screen #7 – Select TC's

Include Thermocouple (TC) Labels (20 char. Max) – Checking this will display a field below each TC that is checked. Up to 20 characters can be used to describe the placement or location of that TC.

TC Number Check Box – Place a check next to each TC channel that is going to be used for this profile. TC number 1 is always used for the *AIR TC*. You must have at least one other TC being used.

If the selected Process Window has Separate Specs for TC's, then you must return to *the Process Window-Edit Specs* screen in order select/deselect TC's or change their text labels.

Live Reading – When the SlimKIC 2000 or *KIC Explorer* are on and either plugged into the download cable for data logging or transmitting to the receiver which is plugged in, you will see live temperature updates for the TC's plugged into the *KIC Profiler*. The TC checkbox must be checked as well to get the temperature updates. If you do not see live temperature readings recheck all the cable and or computer connections.

Battery Voltage – This displays a live reading of the *SlimKIC 2000 or KIC Explorer* battery voltage. The software will recognize if your battery voltage is too low to complete the profile and not allow you to start a profile until the batteries have been replaced.

SlimKIC 2000/KIC Explorer Internal Temperature – This displays the internal temperature of the *SlimKIC 2000 or KIC Explorer* profilers. If the temperature is too high to complete the profile and stay under the maximum temperature rating for the unit, it will not allow you to start the profile. You must wait until the *KIC Profiler* is cool enough. The software will let you know what temperature you will have to drop below.

Starting the Profile

Make sure your KIC Profiler is powered on and ready to profile.

Once the oven has stabilized and you are ready to load the profiler and profile board into the oven select the Green Traffic Light button.

- Depending on the settings in the *SlimKIC 2000 or KIC Explorer* and in the software you may have to initialize the profiler at times. The *KIC 2000* software will let you know when this is necessary. This is done by attaching the cable from the receiver to the back of the *SlimKIC 2000* or by connecting the communication cable direclty to the *KIC Explorer*. Click on *OK* when it gives the message that the initialization was successful. You will then be able to continue as normal.

- After you select on the *Profile Start* button the software will ask if all the oven control thermocouples are within 2 degrees of the set point value. See Figure 54.
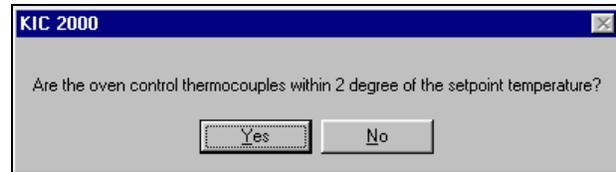
If you choose Yes, you will proceed to the next profile sequence screen.

If you choose NO, it will ask you to let the oven stabilize. If the oven has stabilized and it still is not within 2 degrees of the set values, your oven is not able to control to those oven settings. Set the control temperatures it can control, return to the *Main Screen* and start the profile over. See Figure 55.
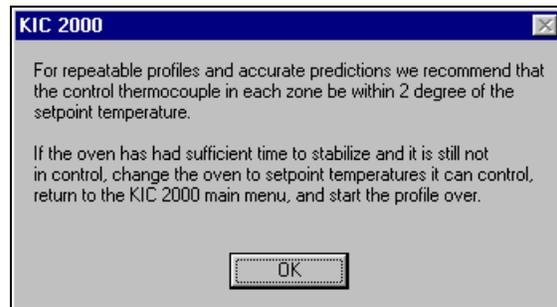
Follow the on-screen instructions for best results

If your answer is YES it will prompt you to place the *KIC Profiler and profile board* into the oven. See Figure 56.

Figure 54

Figure 55

The maximum operating temperature for the *SlimKIC 2000* profiler is **105°C/220°F**. If your process temperatures will cause the *SlimKIC* to exceed this limit then **DO NOT** place the profiler into the oven.	The maximum operating temperature for the *KIC Explorer* profiler is **85°C/185°F**. If your process temperatures will cause the *KIC Explorer* to exceed this limit then **DO NOT** place the profiler into the oven.

Trailing Wire Profiling

The *SlimKIC 2000 and KIC Explorer* profilers can be used with elongated thermocouples or a thermocouple extension long enough to pass through the process. This is especially useful for low clearance processes or higher temperature processes that would normally cause a *KIC* profiler to overheat while inside the oven.

If you plan to keep the *SlimKIC 2000* or *KIC Explorer* connected during the profile, ignore any message to unplug the download cable from the profiler. At the end of the profile, be sure and leave the product TC's connected long enough to achieve the profile-stop trigger value, 110°C, otherwise the profile will not complete. Leave the product TC's connected until the download has completed and the *KIC 200*0 asks you to turn off the *KIC* profiler.
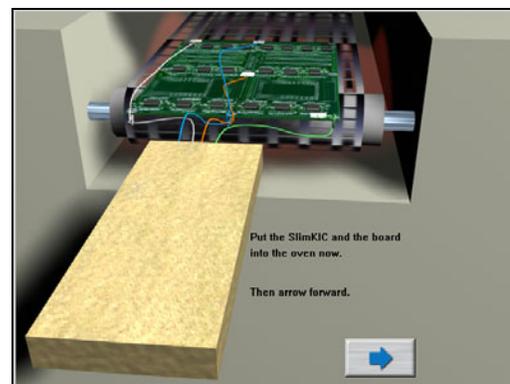
Figure 56

Live Profile Graph

Figure 57: Live Profile Graph Display

The Live Graph screen shows the real-time plot of the product going through the oven. This will only appear for the *KIC profiler-RF models* or for *Temp vs. Time* profiles. See Figure 57. During the live profile all of the tabs on the screen are inaccessible. The only action that you can take at this point is to cancel the profile by clicking on the RED X button or the *Profile Stop* button for *Temp vs. Time*.

The Live Profile Graph display will remain on your screen until the *KIC Profiler* has achieved the trigger temperature that determines the profile end.

Profile Status

The bottom part of the screen will keep you apprised of the progress of the profile in reference to the *KIC Profiler* hardware status.

- Waiting for the Air TC to exceed the start trigger temperature.

- Profile started- Waiting for the Air TC to exceed the midpoint trigger temperature.

- Profile will stop when all thermocouples drop below 80 Celsius.

- SlimKIC currently retransmitting.

- SlimKIC retransmission successful!

During the Live Profile:

- The live profile is plotted on the graph, *KIC Profiler*s with wireless only.

- The current temperatures for each thermocouple and the Delta between them are displayed in a small window in the upper-Left hand corner of the profile graph. The elapsed time is also displayed, *KIC profiler* Transmitter models only.

- The current oven temperature set points and conveyor speed for this profile is displayed beneath the *Statistics table*.

KIC 2000 Profile Retransmission

For users of the *SlimKIC 2000* or *KIC Explorer* thermal profilers with Wireless capability.

While the *KIC Profiler* transmits the live profile data to the *KIC 2000* software; it simultaneously stores the profile data in its memory. Once the *KIC profiler* detects that all of the thermocouples have cooled below the profile-end trigger value, it will begin retransmitting the profile data to the *KIC 2000 software via the SlimKIC 2000* receiver or *KIC Explorer Base Station*. When retransmission begins, the *KIC profiler* will send the profile in data packets. The retransmission status is displayed at the bottom of the screen. See Figure 58.

SlimKIC 2000 Profile In Progress
SlimKIC currently retransmitting 28 packets of profile data.
Packets Received= 1 2 3 4 5 6 7 8 9 10 ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ ✕ (10)

Figure 58: Retransmission of Profile Data, RF Profilers only

When all of the data packets have been received, the software will display a message asking you to turn the *SlimKIC 2000* or the *KIC Explorer* off, choose OK. **Failing to turn the KIC profiler off will drain the batteries.**

Next, the *KIC 2000* software will automatically analyze the profile data and presents the profile and statistics. If you purchased the *Navigator* option, the predicted oven settings will be displayed as well.
See Figure 59 through Figure 62.
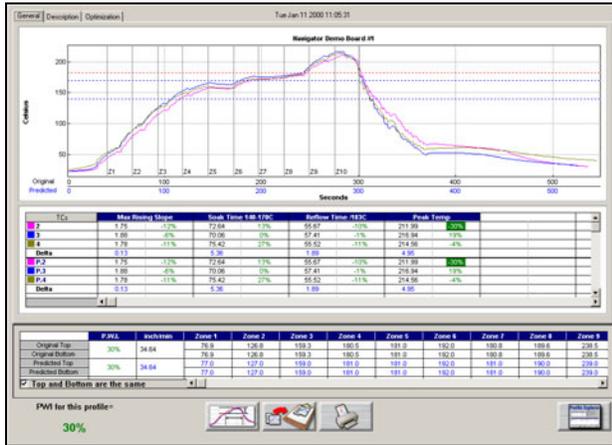
Viewing the profile and statistics

Figure 59
General Tab – Shows graph, statistics, and recipe
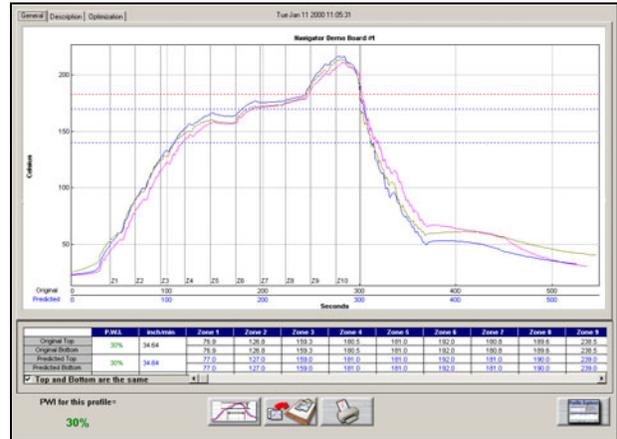

Figure 60
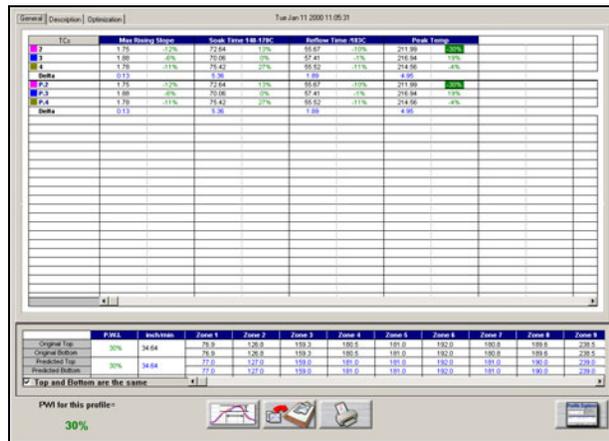***General Tab*** – Graph view (double-click on graph)

Figure 61
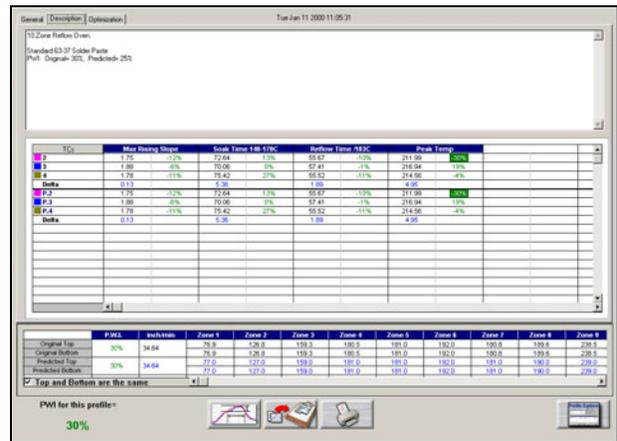***General Tab*** – Statistic view (double-click on stats table)

Figure 62
Description Tab – Shows Description notes, statistics, and recipe

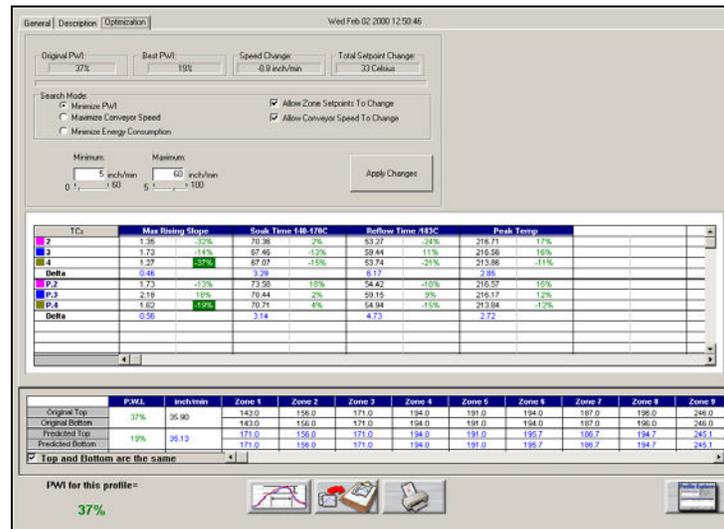# Profile Optimization with the KIC Navigator Option

Figure 63: Optimization Tab

The *Optimization* Tab allows you to set the search functions of the *Navigator* Option.   The *Navigator* will search through millions of set point and conveyor speed combinations to find the optimal setting for each product. This optimization is based on what options you select in this tab.

Original PWI – The *Process Window Index* for the original profile

Best PWI – The best *Process Window Index* that can be found based on the oven recipe optimization constraints selected.

Speed Change – The total change to the conveyor speed for the best oven recipe found.

Total Set point Change – The sum of all set point changes for the best oven recipe found.
Search Mode for Optimization

- **Minimize PWI** – Search for the combination of set point temperatures and conveyor speed that will minimize the *Process Window Index.*

- **Allow Zone Set points to Change –** This option will determine if *Navigator* will include zone set point changes when predicting new solutions.

- **Allow Conveyor Speed to Change -** Choose whether to allow N*avigator* to vary the conveyor speed. If you choose this feature, you can set the minimum and maximum speeds.

- **Maximize Conveyor Speed** – Search for the set point temperatures that will maximize conveyor speed.

- **Minimize Energy Consumption** – Optional *Power* Feature; Search for the oven settings that will minimize the power consumption of the oven by finding set point solutions with slower conveyor speeds and lower temperature settings.

Conveyor Speed Constraints

As long as the *Allow Conveyor Speed to Change* feature is selected, these options will be available.
   Low – Select the minimum conveyor speed you would like N*avigator* to recommend for new products.
   High - Select the maximum conveyor speed you would like N*avigator* to recommend for new products.

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Manual Profile Prediction

The *KIC 2000* software has automatic (*Navigator*), and *Manual Prediction* capabilities. The standard *KIC 2000* software installation includes *Manual Prediction* capabilities.

Manual Prediction gives you the flexibility to easily predict changes to the oven settings (temperature settings, conveyor speed), and view the results without having to spend the time actually running the profile. This feature is very helpful to minimizing the time spent fine tuning or developing a thermal profile.

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	47%	49.2	220.0	260.0	290.0
Predicted Bottom			220.0	260.0	260.0

Figure 64: Original/Predicted set points – Manual Prediction

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	28%	49.2	220.7	256.1	284.5
Predicted Bottom			220.7	256.1	254.5

Figure 65: Original/Predicted set points – Navigator (Optional)

This is an example of how the *KIC 2000* software (*standard* and with *Navigator*) lists the *PWI*, and oven settings for the profile. This table is divided into the *original* section (top), and the *Predicted* section (bottom). See Figure 64.

The *original* values represent the oven settings at the time the profile was run. The *predicted* values represent the prediction results as determined by the *Navigator* software. See Figure 65.

If you purchased the *Navigator* software option, the *KIC 2000* software will automatically generate results that are best suited for the selected *Process Window*. In the event you wish to modify the prediction results of the *Navigator*, you can do so. See Figure 66.

To predict changes to the oven settings, or modify the *Navigator* prediction results, click on the zone you wish to change. In the example below, zone 1 has been selected. See Figure 66.

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	47%	49.2	230	260.0	290.0
Predicted Bottom			220.0	260.0	260.0

Figure 66

Type the new temperature setting, and then press *Enter*. The *Navigator* will predict the results of that change, and then automatically update the PWI, *predicted Statistics*, and the profile graph. The new predicted results will be displayed on the graph in a dotted-line format. This format enables you to easily determine the difference between the *original* and *predicted* profiles. See Figure 67.
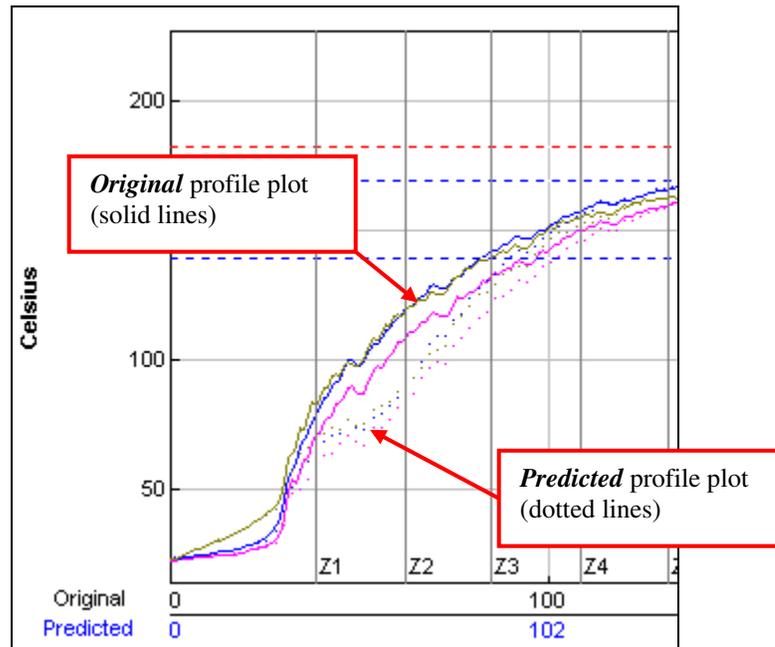
Profile Graph Display

Figure 67: Graph Display

The *PWI* for the profile is displayed in the bottom-Left corner of this screen. If the measured *PWI* is below 100%, the value will be displayed in a Green font. See Figure 67. If the measured *PWI* is 100% or higher, the value will be displayed in a Red font. See Figure 68.
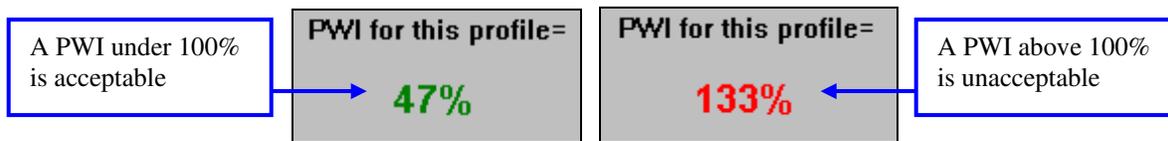

Figure 68: Profile PWI

This display method enables you to easily identify whether the profile is in- or out-of-spec.

Graph Controller

The *Graph Controller* allows you to modify the view of the *KIC 2000*-profile graph. To open the *Graph Controller*, Left-click on the *TC* column header in the *Statistics* table or Double-Left-click, anywhere just outside the profile graph.

Auto Scale – The *Auto Scale* feature will automatically adjust the X, and Y axis scales to fit all of the data in the profile graph. When the *Auto Scale* feature is disabled, you must manually input the minimum and maximum scale settings for the X, and Y axis scale of the profile graph.

Selecting Thermocouples to View
The TC's section is a list of the thermocouples used for the profile. By selecting *All* you are selecting that all the thermocouples used for the original profile will be displayed on the profile graph. In the event that you wish to view the profile without a particular or multiple thermocouples, you can deselect individual thermocouples, or deselect the *All* check box, and choose only the thermocouples you wish to view.
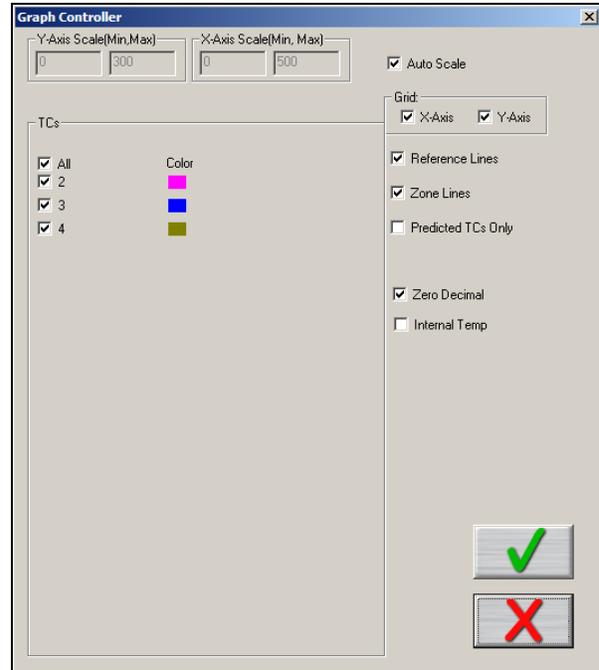
Figure 69: Graph Controller

Deselecting Thermocouples
If a thermocouple has become disconnected during the profile, the profile results (PWI) may be affected to due above normal peak temperatures and such. This situation may cause the profile PWI value to be artificially inflated due to bad data. In the event a single or multiple thermocouples become disconnected from the product during the profile, you can deselect the affected thermocouple(s). The *KIC 2000* software will recalculate the PWI, and update the profile statistics based on the remaining thermocouples selected. You must select at least one product thermocouple.

Grid – Enables/disables the view of the X, and Y-Axis scales.

Reference Lines – Enables the view of *Reference Lines* displayed on the profile graph. These lines represent any temperatures referenced in the selected *Process Window*.

Zone Lines – Enables the view for the oven zone lines on the profile graph.

Predicted TCs Only – Removes the Original profile plot form view, displaying only the prediction profile plot on the graph.

Zero Decimal – When viewing the Pointer tool, this setting enables or disables the decimal display. When unchecked, the software will display one decimal point.

Internal Temp – Enables the view of the *KIC profiler's* internal temperature profile plot on the graph.

Profile Analysis Tools

Graph Option Menu

To view the Graph Option Menu, right-click anywhere within the profile graph area. See Figure 70.

Figure 70: Graph Options

Examine Line

The Examine Line feature displays the temperature for the location of the pointer on the profile graph. See Figure 71.

Wherever the pointer is moved across the profile, the following data will be displayed:

- The first column is the actual temperature for each TC.

- The second column is the temperature of the predicted profile data – based on set point or belt speed changes.

- The Delta T for both actual and predicted TC data.

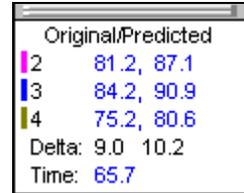- The time during the profile at which the pointer is placed

To disable the *Examine view*, Right-click on the graph and deselect *Examine*.

Figure 71: Graph Pointer

Zoom

You can also view the profile by zooming in to get a better view of a particular area of the profile display. Right-click on the graph, this will bring up a menu. See Figure 72. Select the *Zoom In* and a chart will appear on the left side of the graph. See Figure 73.
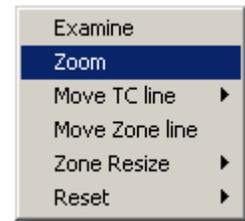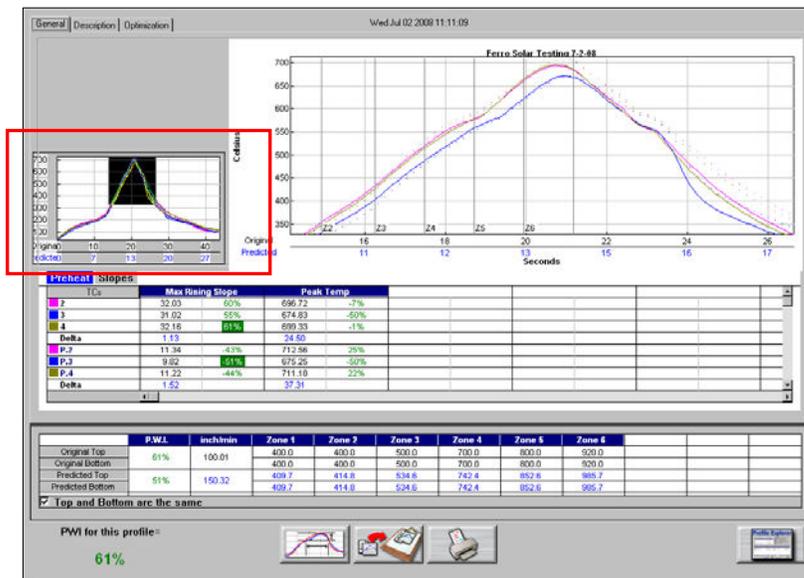

Figure 72: Zoom Option

Figure 73: Graph Option Menu - Zoom

Using your mouse pointer, click and drag the view window in the graph over the area you wish to *Zoom* in to.
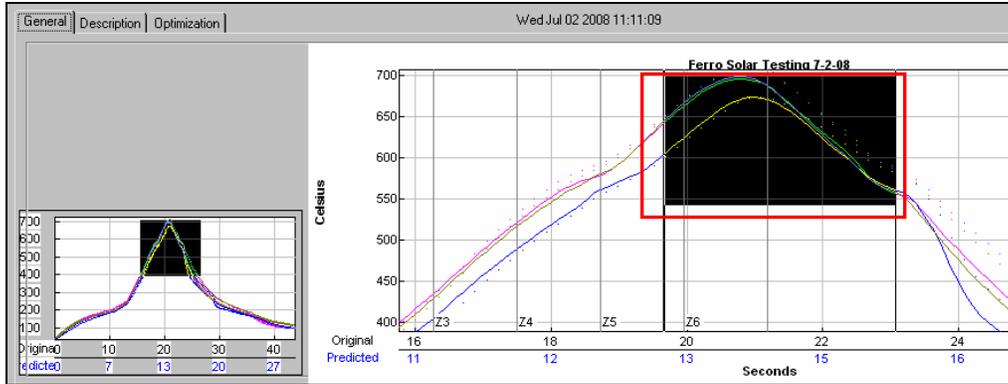
Figure 74: Graph Option Menu - Zoom

To disable the *Zoom In view*, Right-click on the graph and deselect *Zoom In*.

Move TC Line
The *Move TC Line* feature allows the user to manually move the thermocouple plot on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display the plot. See Figure 75.

Select the thermocouple you wish to move and then click and drag the highlighted plot and move it to the desired location on the profile graph.   See Figure 76.
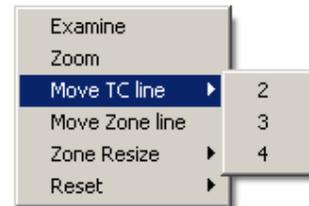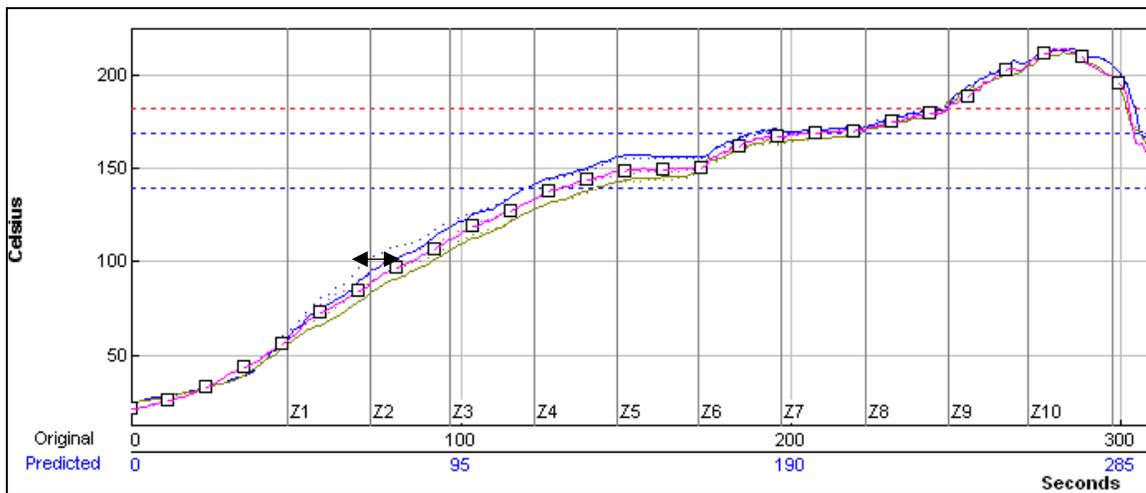

Figure 75: Move TC Line

Figure 76: Move TC Line

Move Zone Line
The *Move Zone Line* feature allows the user to manually move the zone separation lines on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display the zones.
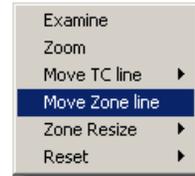
Figure 77: Zone Resize
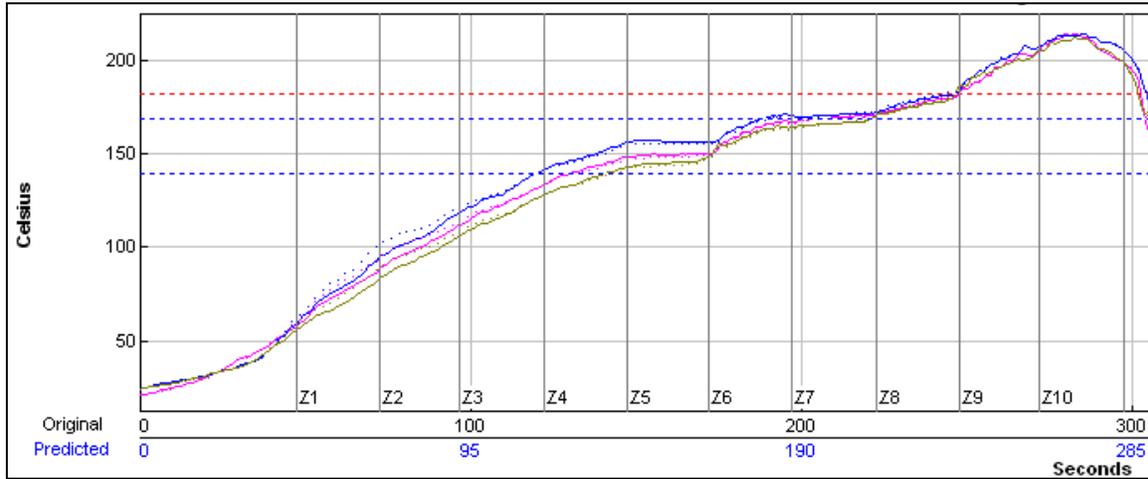
Figure 78: Move Zone Line

Zone Resize
Select to move the first line (Zone beginning) or the Last line (Zone ending) and then click and drag it to the desired location on the profile graph.   See Figure 79.

Figure 79: Zone Resize

Reset
The *Reset* feature will reset the profile and undo any changes you have made to the graph using the *Graph Option Menu*. Select the *TC Line,* or *Zone Line* option. See Figure 80.
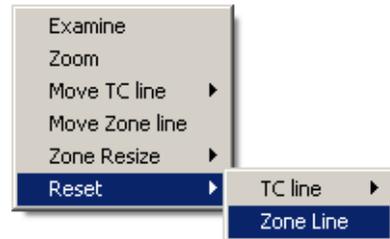
Figure 80: Reset

Profile Screen Buttons
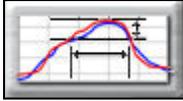
There are four buttons at the bottom of the profile screen.

 Edit/Define Process Window – Choose this button to either view or edit the process specification(s) for the product used in this profile.

 Copy to clipboard – Choose this button to copy the profile data to the windows clipboard. You can then paste the data to a different application.

 Print – Choose this button to print a copy of the profile that is currently on your screen.

 Main Menu– When finished viewing or analyzing the profile select this button to either run another profile with this product or return to the *KIC 2000* main menu. You will be returned to the *Profile Explorer* if the profile was opened from there.

Upon Exiting the Graph screen

Do you wan to run another profile with this product? See Figure 81.

If you select **No**, you will be returned to the *KIC 2000* main screen or the *Profile Explorer* if the profile was originally opened from there.

If you select **Yes**, you will need to choose from the *Original*, or *Predicted* recipe settings. See Figure 82.

Original – The same recipe settings used when this profile was originally run.

Predicted - The recipe settings as predicted by the *Navigator* option, or a standard prediction manually input by you.
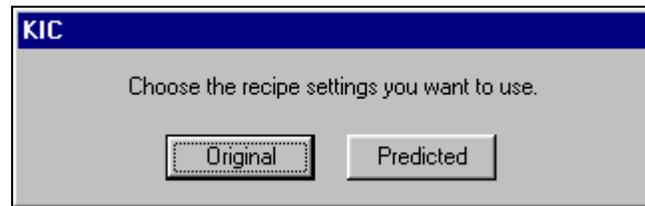

Figure 81

Figure 82

For both the *original* and *predicted* recipe settings, the software will automatically send the selected recipe information to the oven controller. If there is no communication between the *KIC 2000* software and the Oven controller, the *KIC 2000* will display a dialog box showing the recipe information. You must manually enter this recipe information in the oven control software. See Figure 83.
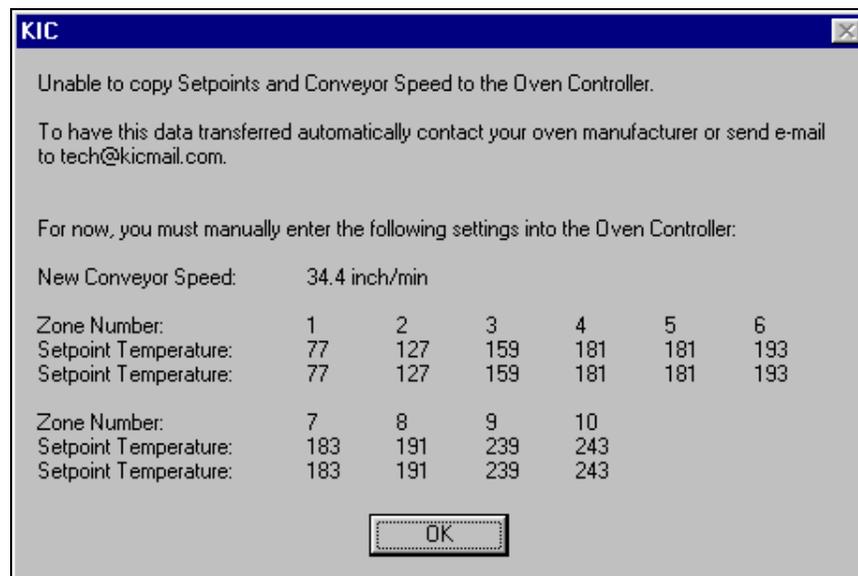

Figure 83

KIC 2000 software will automatically apply the changes to the *Run a Profile –Enter Set points screen*. You will exit to the *Run a Profile –Enter Set points screen*. If you are running on the oven controller PC, and the oven is compatible with the *KIC 2000* software the oven recipe will automatically be updated.

Saving changes to the profile:
Any changes to the *Description Notes* or the *Process Window* can be saved with the profile. See Figure 84. This will permanently update this profile with the changes. Changes to the *Process Window* saved here only save the changes with the profile. To save the changes to *Process Window* file see next dialog box. See Figure 85.
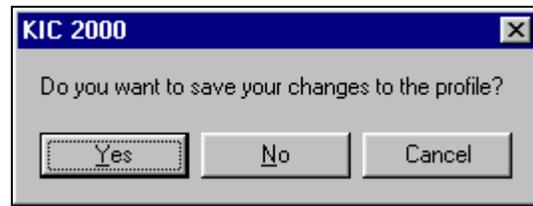
Figure 84

Saving changes to the *Process Window:*
If you have made changes to the *Process Window* from the Graph screen you can save these changes when you exit the graph screen. The *Process Window* will permanently have these changes whenever it is used to profile from this point forward.

The *KIC 2000* software will take you to the *Edit Process Window* screen in order to save the changes that you have made.
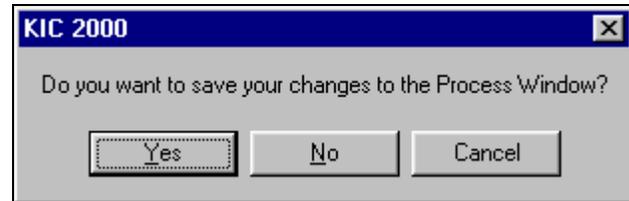
Figure 85

The first dialog – "Do you want to run a profile with this product?" will appear each time you exit the graph screen. Click on **No** if you do not wish to profile.

You will be sent back to the *KIC 2000* Main menu if you had just completed running a profile. If you opened the profile from the *Profile Explorer* you will be returned to the *Profile Explorer*. The other two dialogs will only appear if changes are made to the *Description* notes or *Process Window*.

KIC 2000 Profile Explorer
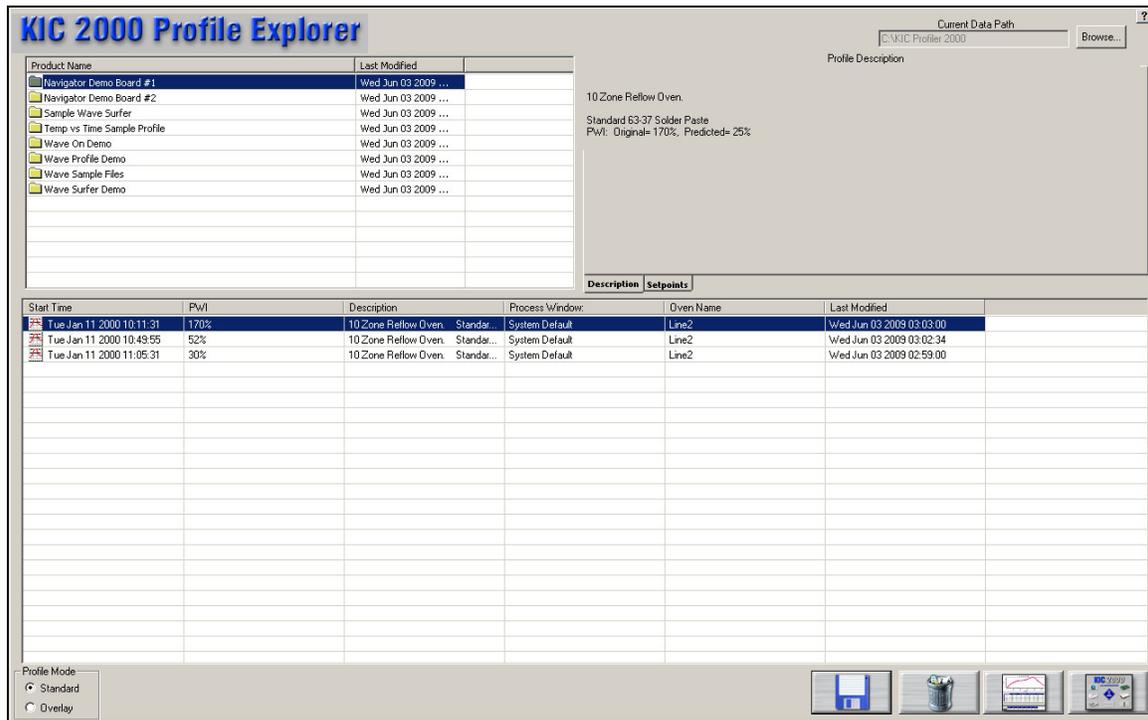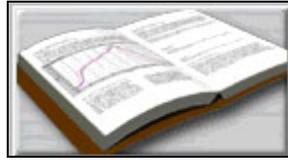
Figure 86: Profile Explorer

The KIC *Profile Explorer* is a powerful and simple data file management tool. For each unique product name you use when profiling, the *KIC 2000* software will create a folder with the same name. Under that folder all the profiles for that product are saved. See Figure 86.

- **The list of product folders is in the upper left of the *Profile Explorer*.** Click on a folder to display the profiles in the profile section at the bottom.

- **The profile section can be sorted by click on any of the column headers**. Single clicking on a profile will display the *Profile Description* in the upper-Right corner.

- Double clicking on a profile will display the graph and statistics for that profile.

- Clicking on the *Display Graph…* button will also display the profile. .

The default data path can be changed, see page 138 for details.

Profile Explorer Screen Buttons

Save button – Blue floppy disk allows you to save a profile to another folder or to a floppy disk.

Delete button (trashcan) – Allows you to delete the selected profile.
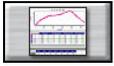
Display Profile button – displays the profile for viewing or analysis.

Main Menu button – In the lower right corner returns you to the **Main Menu**.

Optional Buttons (Only displayed if software key is detected)

Product Dimensions button (Tape measure) – For *Auto-Focus* users, allows you to edit the length, width, and weight of the selected product. Whenever the product dimensions are changed in the *Profile Explorer*, all the profiles in the directory will be updated automatically.

MVP - Virtual Profile – Select this button to run a Virtual Profile using the MVP profiling fixture.

SPC – Display Charts – Select this button to display the SPC charts for the selected profiles in the SPC Column.

Profile Mode

Select the display views in the lower-Left corner of the *Profiler Explorer* screen. You can choose between Standard, and Overlay profile types.

- **Standard** – When selected, only *Standard* profiles are displayed. *Standard* profiles are profiles that have been run using a *KIC* profiler.
- **Overlay** –. *Overlay* is a profile analysis tool that displays and compares multiple profiles simultaneously. *Overlay* tools allows you to overlay or compare up to 3 profiles. *Overlay* profiles can be saved for future use.

Profile Overlay

Overlay Mode
Select the display mode for the *Overlay* feature.

- **Show Profiles** – Displays only the profiles that can be selected to overlay (compare). Users have the option of saving *Overlay* profiles upon exiting the graph screen.

- **Show Saved Overlay Profiles** – Displays only the (previously) saved *Overlay* profiles.

Viewing an Overlay Profile
The *KIC 2000* software can display up to 3 profiles simultaneously. Use the mouse to select the profiles you wish to display and/or compare in the *Profile Overlay* column. Then select the *Overlay* button to display the selected profiles.

Target Profile
The highlighted profile (as seen below in dark Blue) will become the *Target* profile from which the selected profile(s) will be compared against. The last profile to be selected will become the *Target* profile. *Target* profile information can be viewed in the *Profile Graph Overlay Graph Controller* as see in Figure 89.
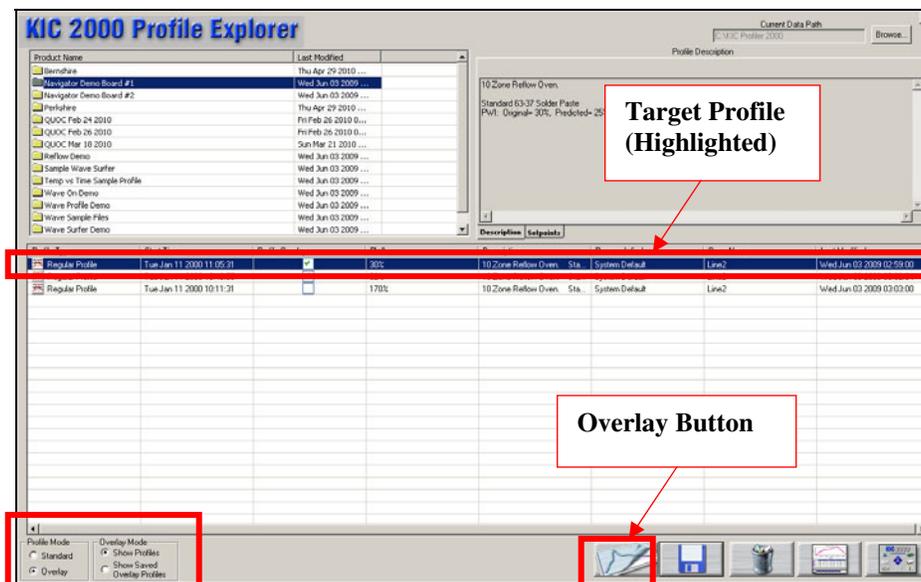
Figure 87: KIC 2000 Profiler Explorer – Overlay Option
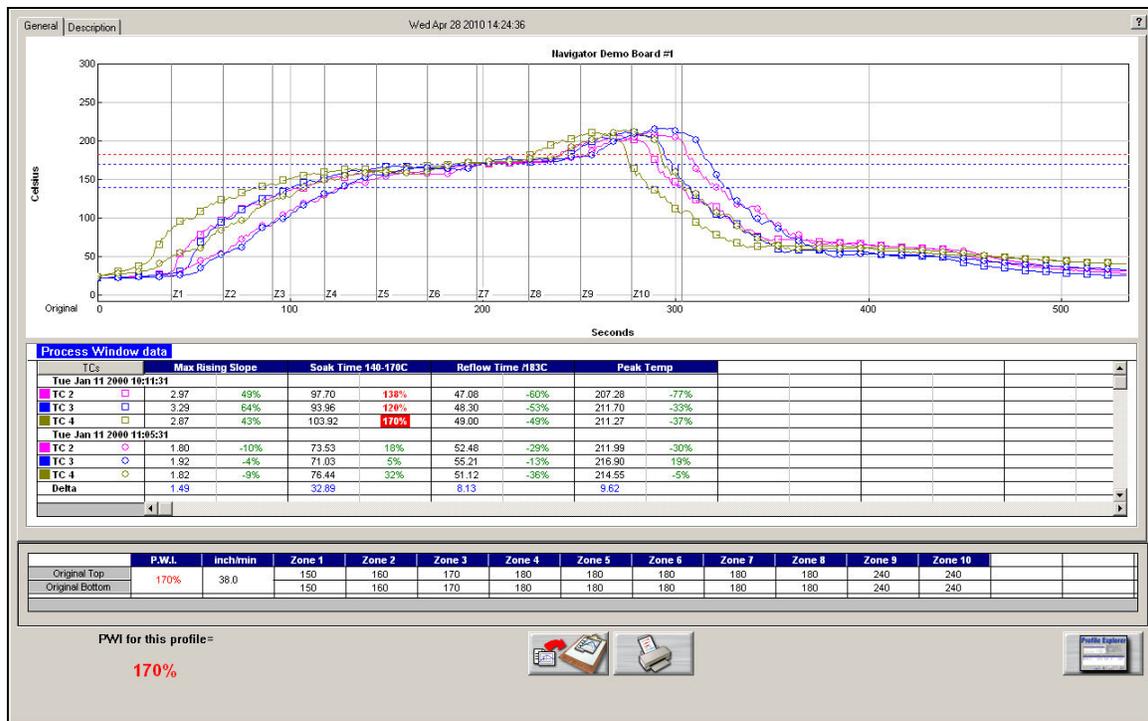
Figure 88: Overlay Option – Graph display

The profiles that have been selected are displayed on the graph. The profile statistics and Oven settings is displayed beneath the graph. Scroll down to view the data for each profile.

Note: While viewing multiple profiles, the prediction capabilities are disabled.

Profile Overlay Graph Controller
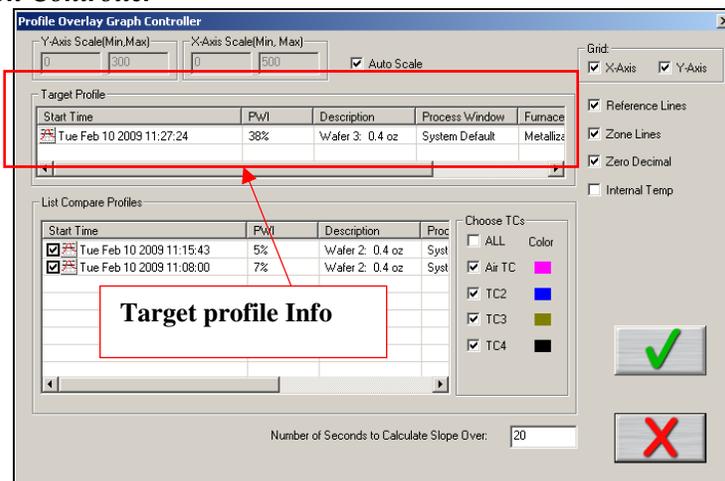
Figure 89: Overlay Option – Graph Controller

The *Overlay Graph Controller* allows the user to modify the view of the *KIC 2000 software*-multiple profile graph display. To open the *Profile Overlay Graph Controller*, Left-click on the *TC* column header in the *Statistics* table or Left –click, anywhere just outside the profile graph.

Auto Scale – The *Auto Scale* feature will automatically adjust the X, and Y axis scales to fit all of the data in the profile graph. When the *Auto Scale* feature is disabled, the user must manually input the minimum and maximum scale settings for the X, and Y axis scale of the profile graph.

Target Profile – Displays the profile information for the profile selected as the *Target Profile*. The *Target Profile* is the highlighted profile when selecting multiple profiles from the *Profile Explorer* Main Screen.

List Compare Profiles – Displays the profile information for the profiles that have been selected. Scroll to view the information. Deselect the check box to remove the profile from the graph.

Selecting Thermocouples to View
The TC's section is a list of the thermocouples used for the profile. By selecting *All* you are selecting that all the thermocouples used for the original profile will be displayed on the profile graph. In the event that you wish to view the profile without a particular or multiple thermocouples, you can deselect individual thermocouples, or deselect the *All* check box, and choose only the thermocouples you wish to view.

Deselecting Thermocouples
You can deselect thermocouple(s). The *KIC 2000* software will recalculate the PWI, and update the profile statistics based on the remaining thermocouples selected. You must select at least one product thermocouple.

Grid – Enables/disables the view of the X, and Y-Axis scales.

Reference Lines – Enables the view of *Reference Lines* displayed on the profile graph. These lines represent any temperatures referenced in the selected *Process Window*.

Zone Lines – Enables the view for the furnace zone lines on the profile graph.

Zero Decimal – When viewing the Pointer tool, this setting enables or disables the decimal display. When unchecked, the software will display one decimal point.

Internal Temp – Enables the view of the *KIC* profilers' internal temperature profile plot on the graph.

Number of Seconds to Calculate Slope Over- User defined field for entering the time in seconds to calculate the *Slope* values for the *Pointer/Slopes* feature.

Saving Overlay Profiles
Overlay profiles can be saved separately without affecting the original profile data. Each time the user exits an *Overlay* profile the *KIC 2000* software will prompt the user to save the profile *Overlay*.
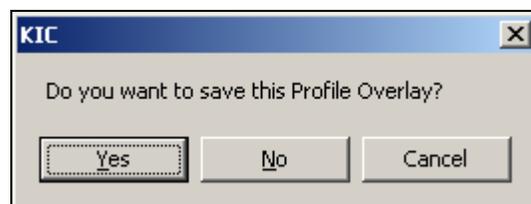
Figure 90: Overlay Save Message

Saved *Overlay* profiles can be viewed by selecting the "*Show saved Overlay Profiles*" check box in the *Profile Explorer* screen.

SPC Option

Activated by a software key, the *SPC* software option will display SPC (Statistical Process Control) data, specifically Cpk values for selected profiles. When the *SPC* software key is detected the *SPC* column in the *Profile Explorer* is displayed.
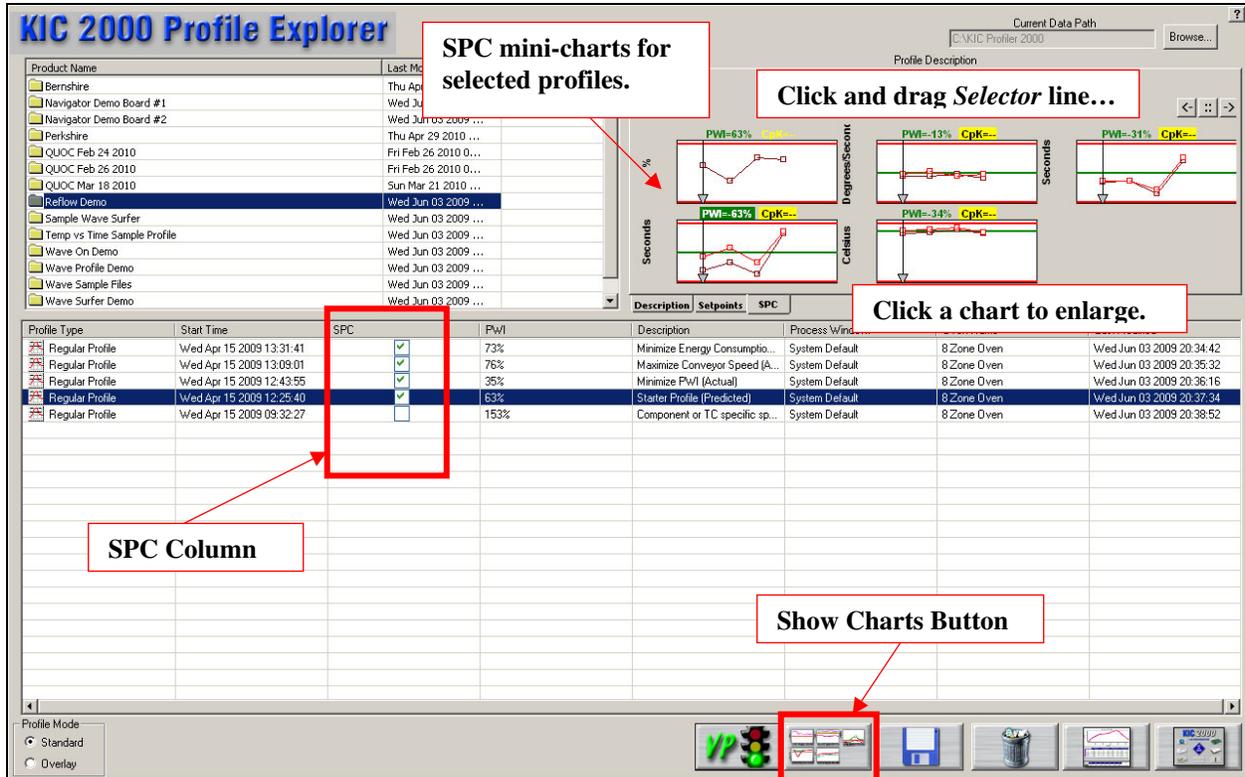
Figure 91: KIC 2000 Profiler Explorer – SPC Option

To view a product's chart(s) and/or SPC data follow these steps:

1.   Select a product folder.

2.   In the *SPC* column select the profiles to be charted by clicking the check box for each profile.

Note: *MVP Users - Select* either *Baseline* profiles or *Virtual Profiles* since the software can only chart one type of profile at any given time.

3.   Next, select the "Show Charts" button.

4.   The charts for the selected profiles will be displayed in a full screen format.

SPC Chart Display

Figure 92: SPC Option – Chart Display

The *Chart* tab will display a control chart for the overall profile *PWI* and for each individual process specification with upper and lower alarm limits as defined in the *Process Window* setup. The chart data will coincide with the stored profile data for the selected board, date and time.

The control charts hold all of the historical profile data for your product as selected in the *Profile Explorer-SPC column*. Each chart contains data for every product thermocouple used during the profile.
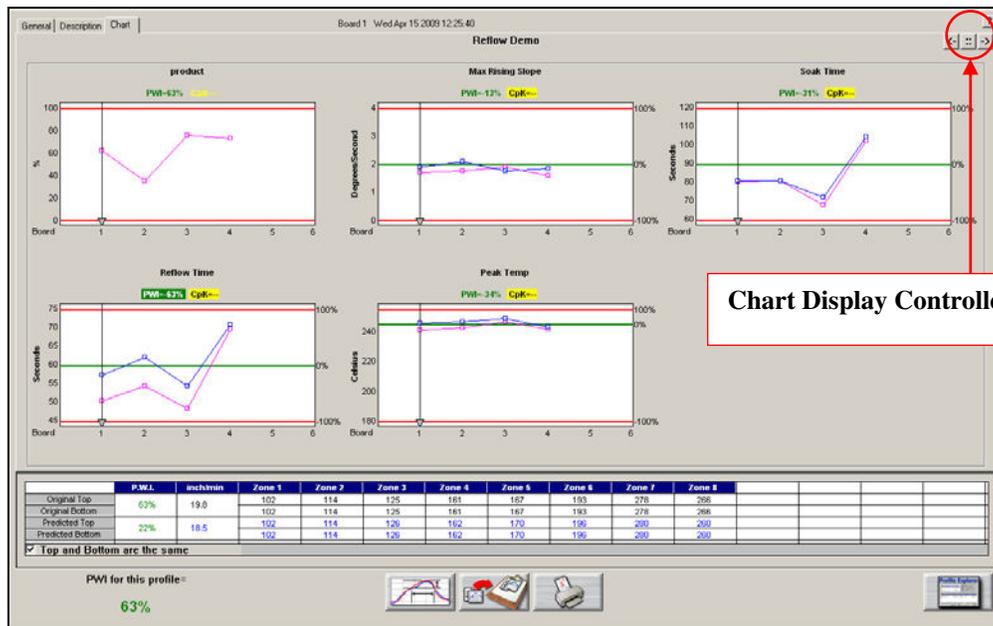
Selector Line - Each chart has a *Selector Line*. The *Board* or Profile # will be displayed at the top of the screen; along with the date and time that profile was run. You can move the *Selector line* position by clicking and dragging the small triangle at the bottom of the *Selector line* in any chart window.

The Maximum *PWI* and Cpk for the selected board, date and time will be highlighted above the corresponding chart(s). In the bottom-left corner of the screen, the *PWI* for the selected profile is displayed.

Chart Display Controller
Select the *Chart Display Controller* button (*Upper-Right Corner*) to:
1. Select the number of control charts to display
2. Enable/Disable *Cpk*.
3. Edit the minimum and maximum number of data points to calculate *SPC (Cpk)* data for the selected product.
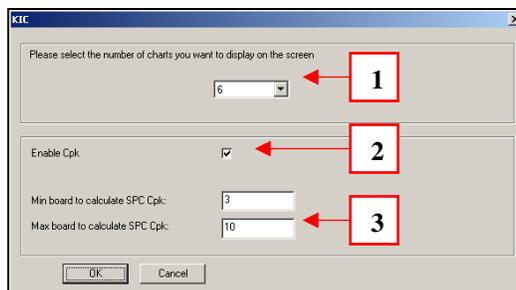
Viewing Chart Data

To view individual chart data, select a chart and then click inside the chart area. This will display that particular chart in a full screen format.

Figure 93: SPC Option - Chart Display, Full Screen

Move the mouse pointer over the chart data, and a *Display Info* box will appear. This *Display Info* box data includes *PWI*, Cpk, date, and time for each board.

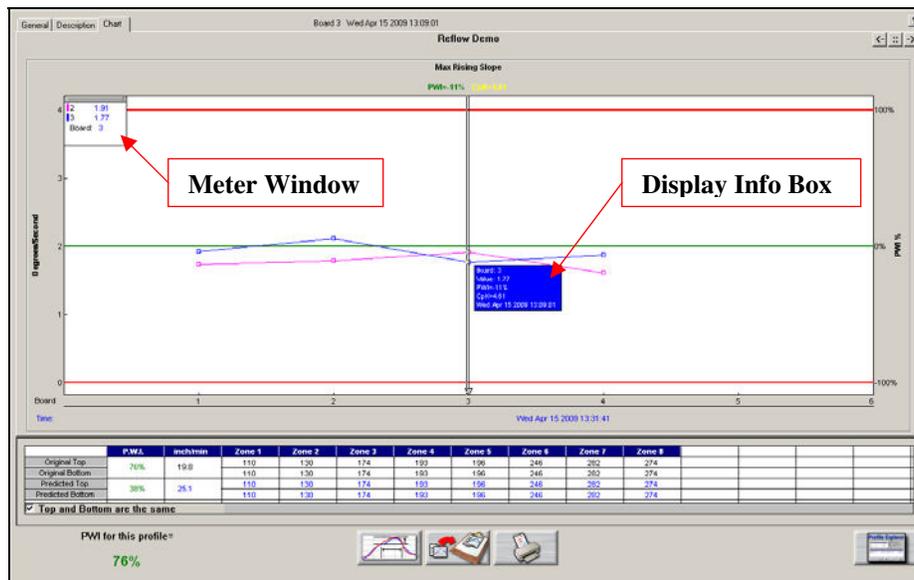- **Meter Window –** Right click anywhere in the full screen chart area. A menu will appear, select *Meter Window*. This will display a small data box in the upper-left corner of the profile graph. This data box will display the historical – statistic data for any selected board. To select a board move your mouse pointer along the chart data, at each data point the historical – statistic data for that board will be displayed. Right-click in the chart area again and de-select *Meter Window* to disable this feature.

- **Point Protector –** When this feature is enabled, the charts will display individual data points for each board. To activate this feature right click anywhere in the full-screen chart area. A menu will appear, select *Point Protector*. This will display the individual data points on each control chart. De-selecting this feature will remove the data points from the control chart, showing only a plot of the same data. By default, the *Point Protector* will be enabled for charts containing 20 boards or less. Click in the full screen chart area again to return to the regular Chart tab view.

Virtual Profiling

The optional *Virtual Profile* feature is automatically enabled when the *KIC 2000* software detects that the *MVP* software key is connected to the computer. The *Virtual Profiling* feature requires the *MVP (Manual Virtual Profile)* hardware in order to collect *Baseline* and/or *Virtual Profile* data.

The combination of *MVP* hardware and *Virtual Profile* software gives the user the advantage of not having to run an actual instrumented profile board through the oven in order to check the ovens current thermal profile. Instead the user simply runs the *MVP* through the oven and a *Virtual Profile* is calculated based on the *MVP's* temperature readings.

Required Hardware:
- *MVP* hardware kit, including *MVP* software key
- *KIC* Profiler
- Profile board (instrumented with type K thermocouples.

Required Software:
- KIC 2000 software v3.0.0.0 or later

Standard profiles, or profiles run without the *MVP* profiling fixture can not be used with the *Virtual Profiling* feature. In order to utilize the *Virtual Profiling* feature you must run the profiles for your product(s) using the *MVP* profiling fixture. These profiles are called *MVP* profiles.

There are 3 types of MVP profiles:

Baseline Profile – The *Baseline* profile is used by the *KIC 2000* software as a set of data to which it will compare or measure a *Virtual Profile* against. Using the thermal profile data from the users profile board as well as the *MVP* profiling fixture as a model the *KIC 2000* software can calculate the current *Virtual Profile* each time the *MVP* is run through the oven.

Note: The default criterion for a *Baseline* profile is that the *PWI* is less than 90%. This maximum *PWI* value can be changed in the *Global Preferences* screen.

Virtual Profile – A *Baseline* profile must be established for any given product before a *Virtual Profile* can be run. Once a B*aseline* profile has been established the user can then run a *Virtual Profile* using only the *MVP* profiling fixture eliminating the need to run the actual profile board. The *MVP* is run through the oven and the *Virtual Profile* is calculated based on the temperature readings of the *MVP*.

Verification Profile – A *Verification profile* is run whenever the user wishes to verify the actual thermal profile of the oven. A *Verificatio*n profile requires the user to run a profile using their instrumented profile board along with the *MVP,* similar to a *Baseline* profile. If the *PWI* of the *Verification* profile meets the *Baseline* profile criteria then it becomes the new *Baseline* profile for that product.

Baseline Profile

In order to obtain *Virtual Profile* data for a product a *Baseline* profile must first be established.

Follow these steps to run a *Baseline* profile:

1. Install *KIC 2000* software v3.0.0.0 or later

2. Connect the *MVP* software key to the computer

3. Start the *KIC 2000* software

4. In the *Global Preferences* screen select the *MVP* check box and then enter the maximum *PWI* value to allow *Virtual Profiling*.
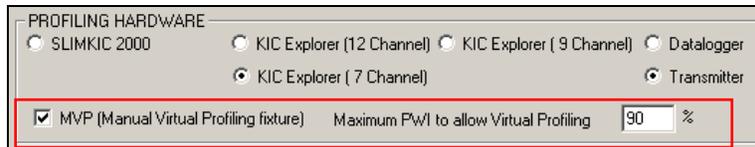
Figure 94: Global Preferences – MVP option

5. Next run a profile by selecting the "*Run a Profile*" button from the *KIC 2000* main menu.

6. In the *Select* screen, select your *Product, Process Window*, *Application* type, *Sample Rate*, *Oven*, and then select the *MVP* profile check box. Notice the "*Run a Baseline Profile*" is grayed out and automatically selected for you. Select the forward arrow button to proceed.
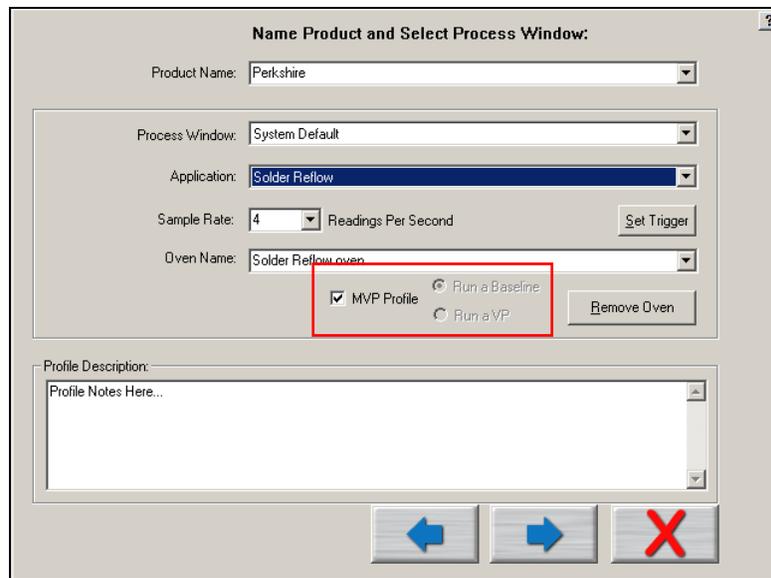
Figure 95: Run a Profile – Select Screen

7. The next screen will have you enter the oven set points and conveyor speed. Then select the forward arrow button to proceed.

8. The next screen will graphically depict the connection of the *MVP* thermocouples to the *KIC* profiler. Follow the on screen directions and then select the forward arrow button to proceed.

Figure 96: Run a Profile - Attach MVP Thermocouples

9. The next screen instructs the user to insert the (instrumented) profile board into the *MVP* board clamps and then attach the thermocouples to the *KIC* Profiler. Follow the on screen directions and then select the forward arrow button to proceed.

Figure 97: Run a profile – Insert Profile Board and Attach Thermocouples

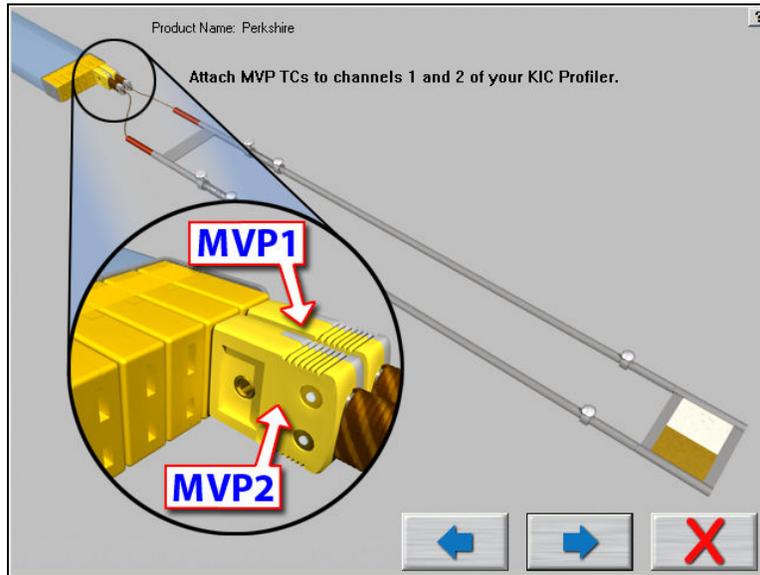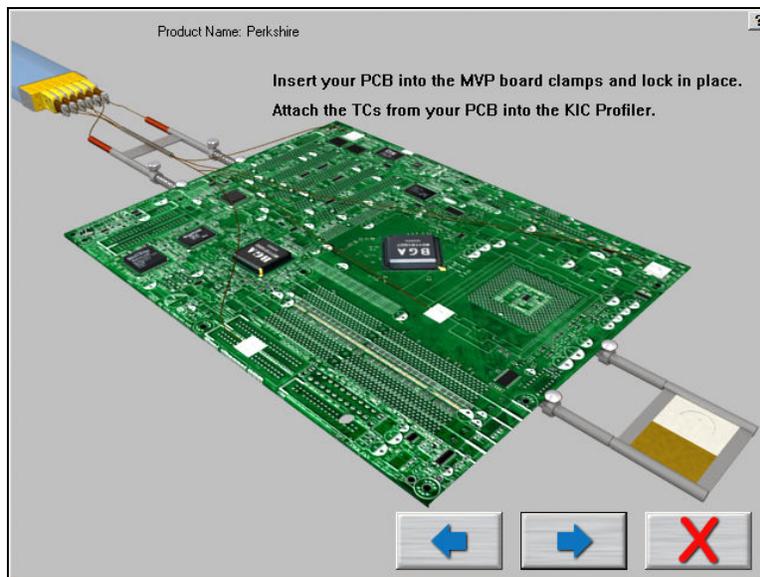10. In the next screen the user selects the thermocouples to be used. Select the check box for each thermocouple and then select the *Start Profile* button when ready. As long as the *KIC* profiler is on and connected, the temperatures for all connected thermocouples are below 31C, and the oven is within 2 degrees of the set point temperatures the profile can begin.
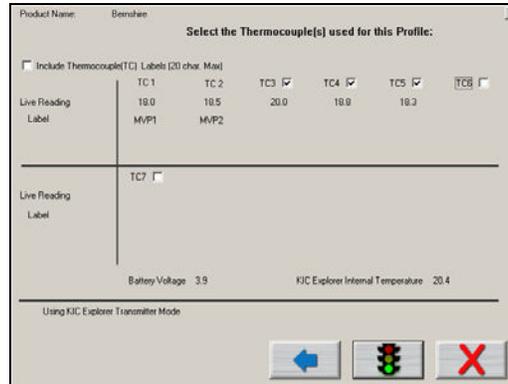
Figure 98: Run a Profile - Select Thermocouples

11. The next screen will depict the *MVP*, profile board, and *KIC* profiler being loading onto the conveyor and entering into the oven. Select the forward arrow button to proceed to the profile graph where the profile will be displayed.
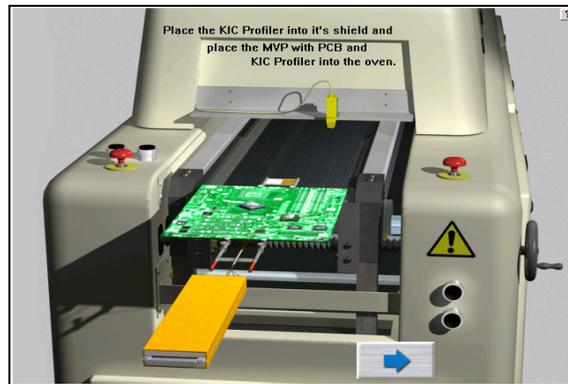
Figure 99: Run a Profile – Baseline Profile – Profiler Entering Oven

12. When the profile run has finished the *KIC 2000* software will calculate the profile's *PWI* value. If the *PWI* value is less than 90% (default max *PWI* value for *Virtual Profiling*)) then the profile qualifies as a *Baseline* profile. A *Virtual Profile* can not be run until a *Baseline* profile for the product has been established.

    Baseline profiles are listed n the *Profile Explorer-Profile Type* column. They also have a "*BL*" designation as the icon.

Figure 100: Profile Explorer – Profile Types - Baseline

Virtual Profile

Unlike *Standard* profiles which are initiated by selecting the "*Run a Profile*" button on the *KIC 2000* software main menu, *Virtual Profiles* can only be run from the *Profile Explorer* screen and only if a *Baseline* profile exists for the selected product.

Follow these steps to run a *Virtual Profile* for a product:

1. Connect the *MVP* software key to the computer

2. Start the *KIC 2000* software

3. Select the *Profiler Explorer* button from the *KIC 2000* software main menu.

4. Select a *Product* folder.

5. Select the "*Create VP*" button.
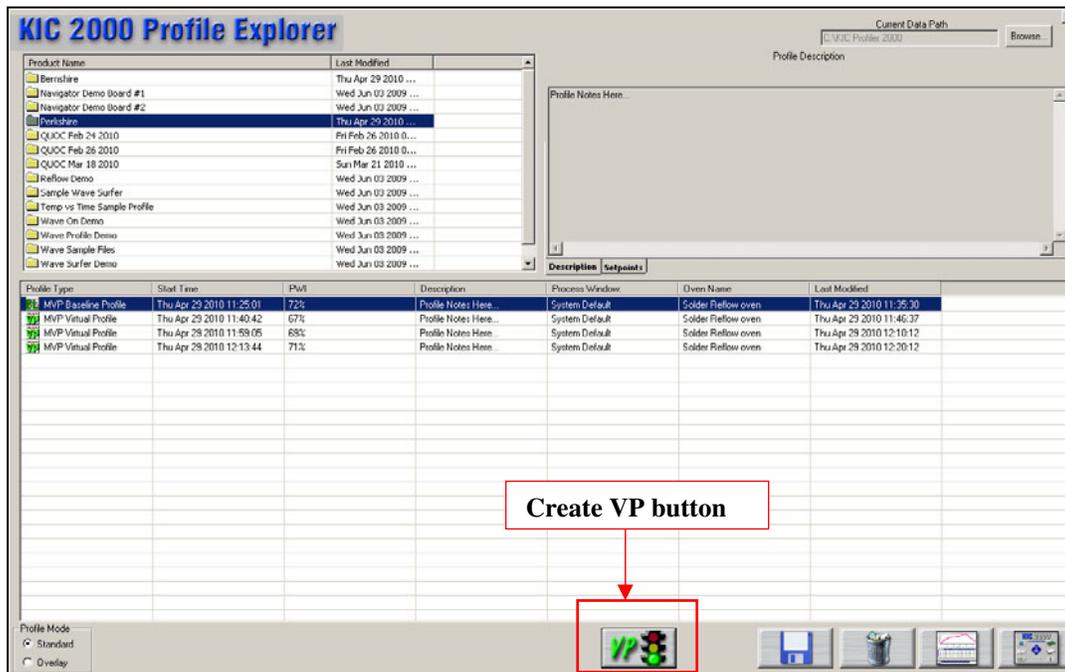
Figure 101: KIC 2000 Profile Explorer – Virtual Profiling Option

Next a message will appear asking "*Do you want to start Virtual Profiling this product*?" Select *OK* to continue; *Cancel* to cancel the *Virtual Profile*. If you choose *OK* then you will be guided through the subsequent *Virtual Profiling* screens.
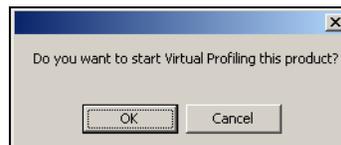
Figure 102: Start Virtual Profiling Message

Since the software already knows the *Product name*, *Process Window*, and *Sample Rate* for the product, the only available actions are to select the *Oven Name* and/or type a profile description in the text field and then select the forward arrow to proceed. Select the *red X* button to cancel the *Virtual Profile*.

Figure 103: Run a Virtual Profile – Select Screen

The next screen will graphically depict the connection of the *MVP* thermocouples to the *KIC* profiler and inserting /attaching the *MVP Carrier*. Follow the on screen directions and then select the forward arrow button to proceed.
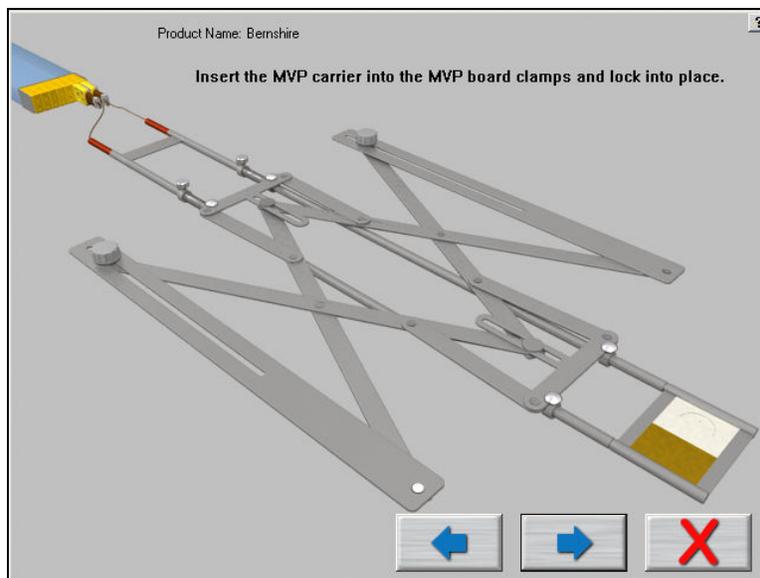
Figure 104: Run a Virtual Profile – Attach MVP, Insert Carrier

In the next screen the current temperatures for the *MVP* thermocouples are displayed. Select the *Start Profile* button. As long as the *KIC* profiler is on and connected, the temperatures for both of the *MVP* thermocouples are below 31C, and the oven is within 2 degrees of the set point temperatures the *Virtual Profile* can begin.
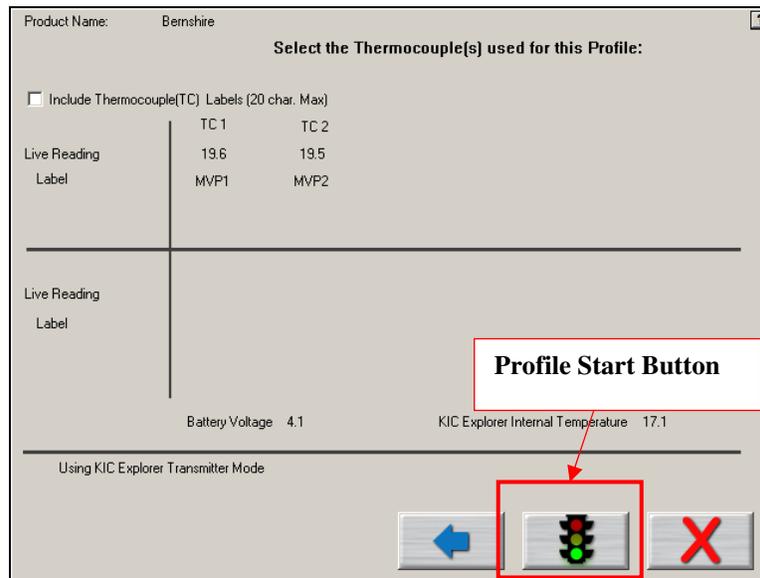
Figure 105: Run a Virtual Profile – Select Thermocouples screen

The next screen will depict the *MVP*, *MVP Carrier*, and *KIC* profiler being loading onto the conveyor and entering into the oven. Select the forward arrow button to proceed to the profile graph.
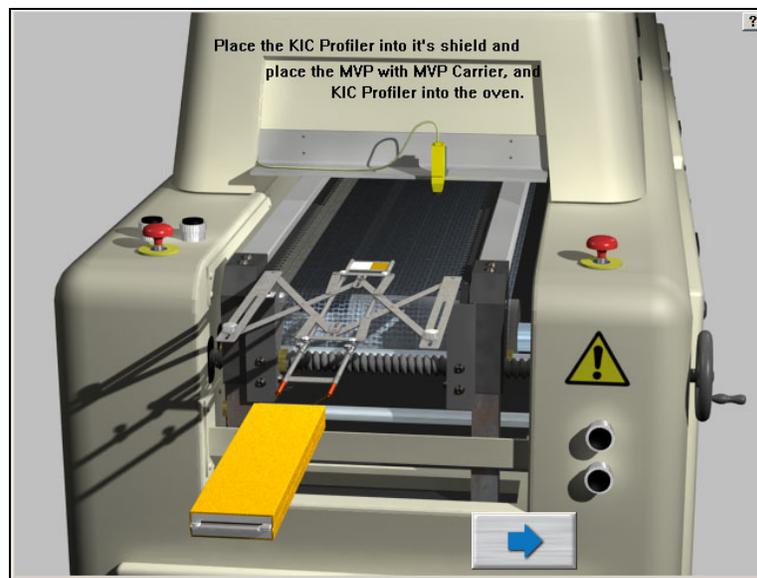
Figure 106: Run a Virtual Profile – MVP, Carrier, and KIC Profiler Entering Oven

During the live profile there will no profile data displayed on the profile graph. When the profile has finished the profile results including *PWI*, and the profile *Statistics* will be displayed on the profile graph.

The *Virtual Profiles* for each product are listed in the *Profile Explorer-Profile Type* column. *Virtual Profiles* also have a "*VP*" designation as the icon.
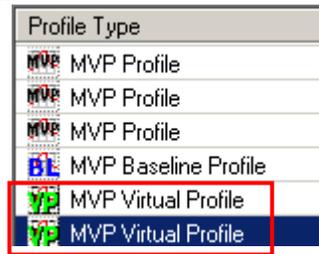
Figure 107: Profiler Explorer – Profile Types
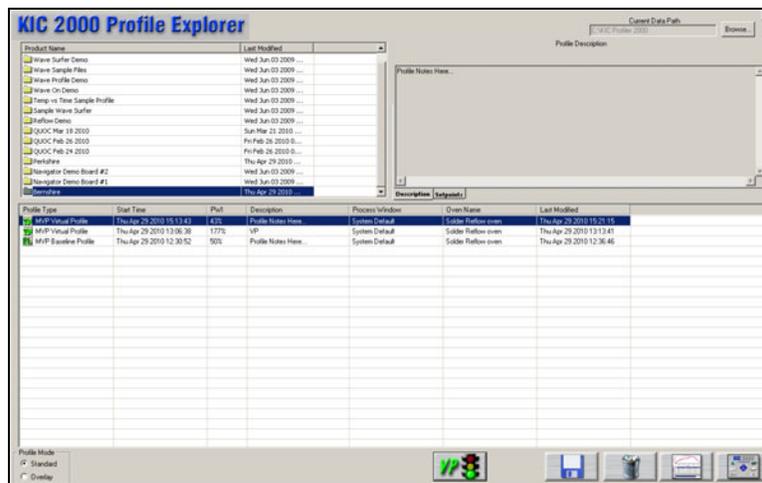
Figure 108: KIC 2000 Profiler Explorer – Virtual Profile Option

Verification Profiles

A *Verification profile* is run whenever the user wishes to verify the actual thermal profile of the oven. A *Verificatio*n profile requires the user to run a profile using their instrumented profile board along with the *MVP,* similar to a *Baseline* profile. If the *PWI* of the *Verification* profile meets the *Baseline* profile criteria then it becomes the new *Baseline* profile for that product.

Follow these steps to run a *Verification Profile*:

1. Connect the *MVP* software key to the computer

2. Start the *KIC 2000* software

3. Select the *Profiler Explorer* button from the *KIC 2000* software main menu.

4. Select a *Product* folder.

5. In the *Profile Type* column select a *Virtual Profile* and then select the *Display Graph* button. The selected *Virtual Profile* graph will be displayed.

6. From the profile graph screen select the *Profiler Explorer* button. A message will appear asking the user "Do you want to run a MVP Verification profile with this product?" Select Yes.
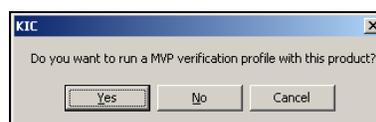
Figure 109: Verification Profiler Message

7. In the *Select* screen, select your *Product, Process Window*, *Application* type, *Sample rate*, *Oven*. In the *MVP* profile area, notice the "*Run a Baseline Profile*" is grayed out and automatically selected for you. Select the forward arrow button to proceed.
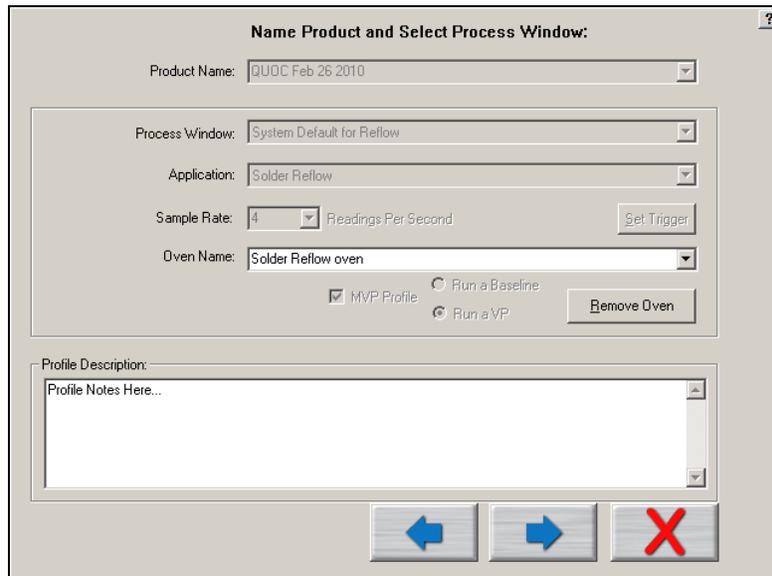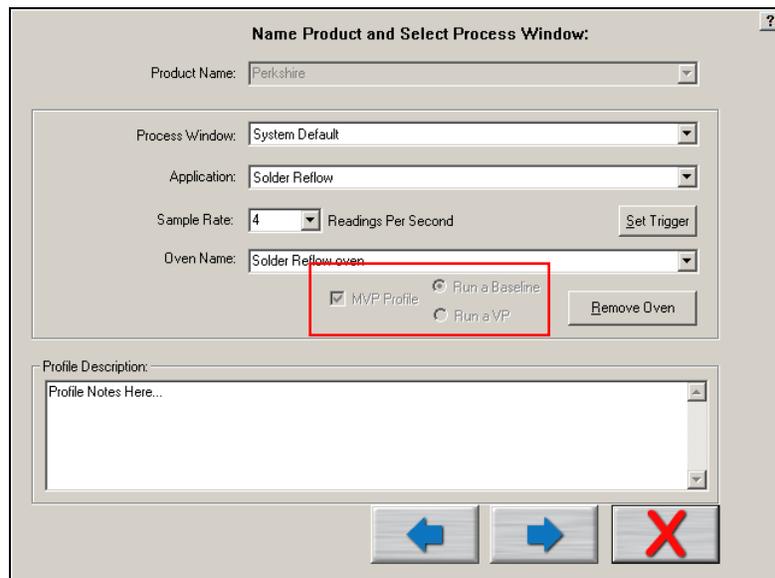

Figure 110: Verification Profile – Select screen

8. The next screen will graphically depict the connection of the *MVP* thermocouples to the *KIC* profiler. Follow the on screen directions and then select the forward arrow button to proceed.
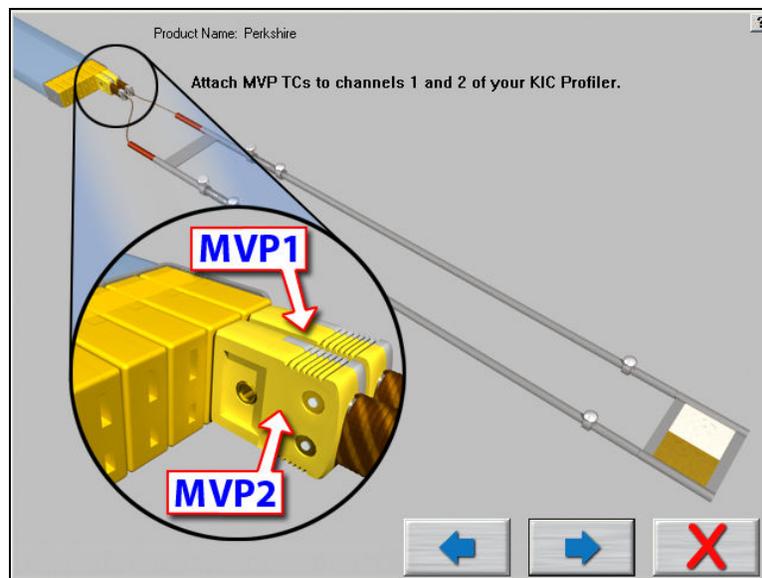
Figure 111: Verification Profile – Attach MVP Thermocouples

9. The next screen instructs the user to insert the (instrumented) profile board into the *MVP* board clamps and then attach the thermocouples to the *KIC* Profiler. Follow the on screen directions and then select the forward arrow button to proceed.
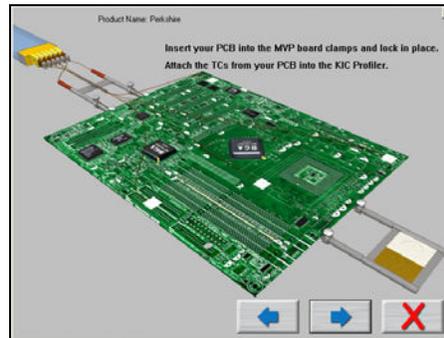
Figure 112: Verification Profile – Insert Profile Board and Attach Thermocouples

10. In the next screen the user selects the thermocouples to be used. Click the check box for each thermocouple and then select the *Start Profile* button when ready. As long as the *KIC* profiler is on and connected, the temperatures for all connected thermocouples are below 31C, and the oven is within 2 degrees of the set point temperatures the profile can begin.
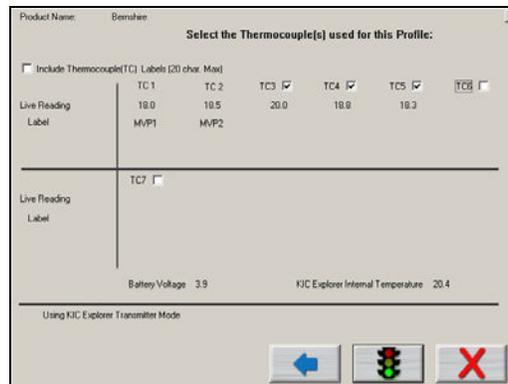
Figure 113: Verification Profile – Select Thermocouples

11. The next screen will depict the *MVP*, profile board, and *KIC* profiler being loading onto the conveyor and entering into the oven. Select the forward arrow button to proceed to the profile graph where the profile data will be displayed.
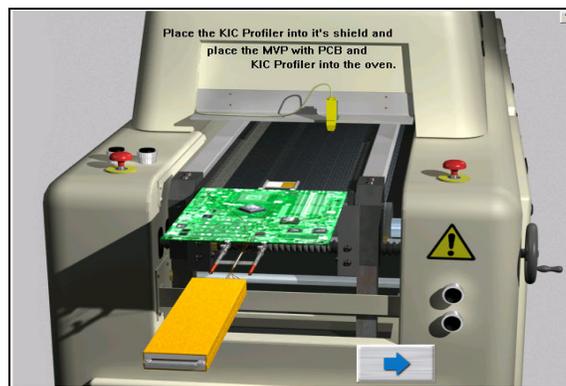
Figure 114: Verification Profile – MVP, Profile Board, and KIC Profiler Entering Oven

12. When the *Verificatio*n profile is finished the *KIC 2000* software will calculate the ovens thermal profile and resulting *PWI* value. If the *PWI* value is less than 90% (default max *PWI* value) then the profile becomes the new *Baseline* profile. Select the *Profile Explorer* button to return to the *Profile Explorer*.

All *Verification* profiles are listed n the *Profile Explorer-Profile Type* column. They will have a "*MVP*" designation as the icon. See Figure 107.

Inserting KIC 2000 data files from an outside source

KIC 2000 data files can be sent or received via floppy disk or email. In order to view them using the *KIC 2000* software, copy them to the **KIC Profiler 2000\Profiles** folder using Windows Explorer.

The next time you enter the *KIC 2000-Profile Explorer* screen the software will automatically create folders for those profiles based on the profile name and move the profiles to the correct folders.

KIC 2000 File Types

The *KIC 2000* software utilizes different file types. See the table below for file type's information.

File Extension	File Type (Description)	File Location
.KIC2000Profile	Data File	C:\KIC Profiler 2000\Profiles\Product Name
.KIC2000MVPprofile	MVP Data File	C:\KIC Profiler 2000\Profiles\Product Name
.KIC2000ProcessSpec	Process Specifications	C:\KIC Profiler 2000\ProcessSpecs
.Kiccfg	Oven File	C:\KIC Profiler 2000\Ovens
.Kiccfg	Log Files	C:\KIC Profiler 2000\Log

Table 3: KIC 2000 File Types

Printing

The *KIC 2000* software will print profiles only from within the profile display screens. There are two print formats available. Print Format #1 is the default format used.

Select the print button at the bottom of the screen to print a profile. A print dialog box will appear.
See Figure 115.

Print Format #1
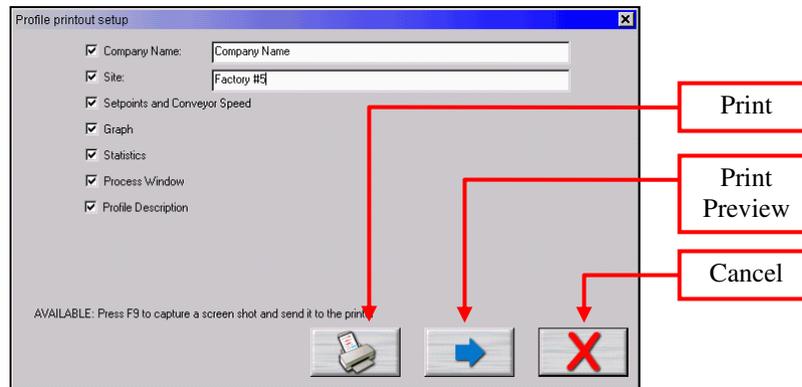
Figure 115: Print Options Screen – Print Format #1

Enter the "Company Name" and "Site ID." Check the items you wish to include on your profile printout.
Press the **Print** button to print the report.
Press the **Print Preview Button** to display a preview of the report. See Figure 116.

Print Format # 1 Print Preview
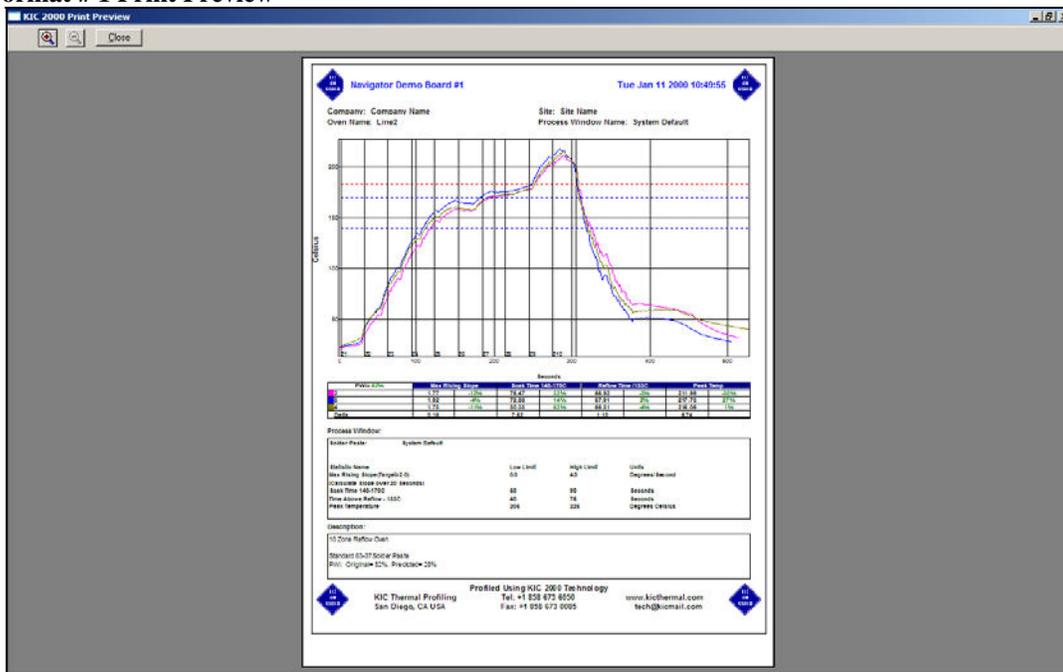
Figure 116: Sample Print Preview for Report Format #1. Report is printed in Portrait layout.
Includes the Company Name, Site ID, Date, Statistics, Profile Information, Set Points,
Profile Graph, Statistic Limits and Profile Description.

Print Format #2
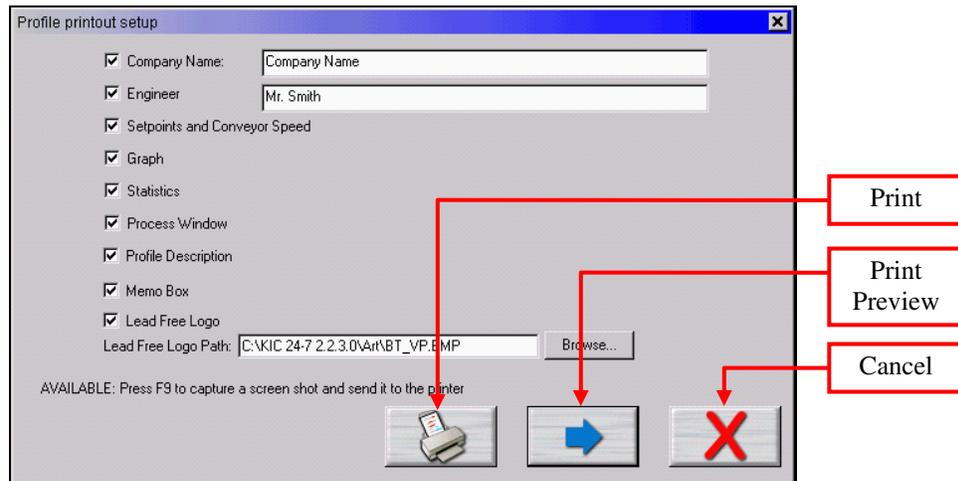
Figure 117: Print Options Screen – Print Format #2

Enter the "Company Name" and "Engineer's name". Check the items you wish to include on your profile printout. See Figure 117.

Press the **Print** button to print the report.
Press the **Print Preview Button** to display a preview of the report. See Figure 118.

Below are the additional options available with Print Format #2:

Memo Box –Enables/Disables a Memo Box area for Draft, Review and Approval Signatures and Dates.

Lead Free Logo – Enables/Disables the Lead-Free Logo display area.

Lead Free Logo Path – When "Lead Free Logo" is enabled, specify the path to any BMP image file that you want to appear in the Lead Free Logo display area on the report. The default image is the KIC Lead-Free logo image

Print For mat # 2 Print Preview
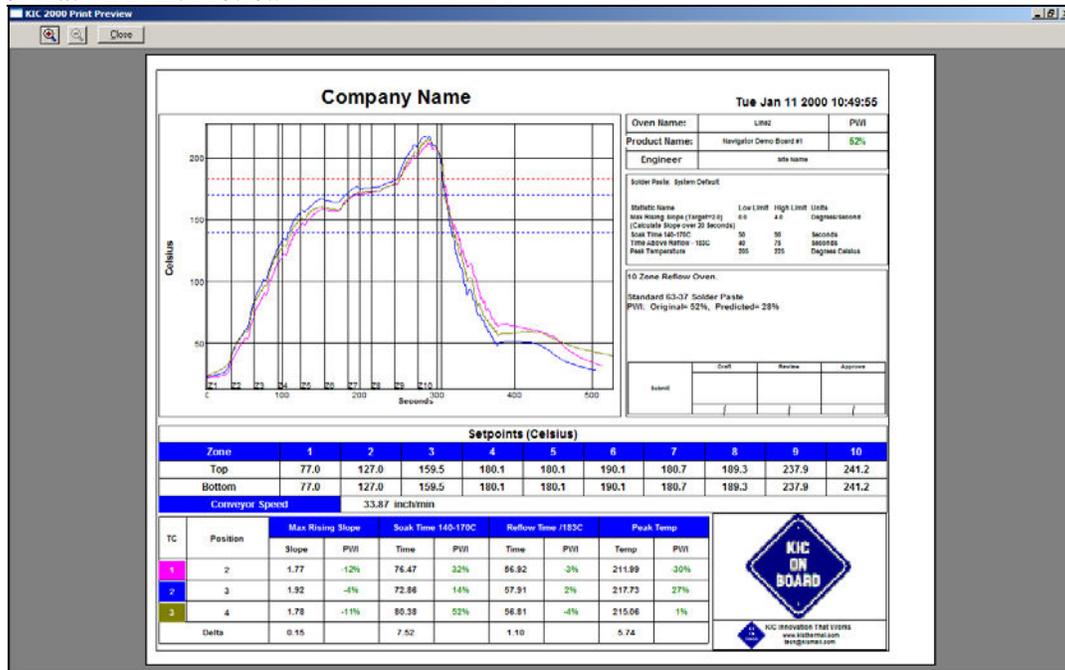
Figure 118: Sample Print Preview for Report Format #2. Report is printed in Landscape layout.
Includes the Company Name, Engineer, Date, Statistics, Process Window, Set Points,
Profile Graph, Profile Description, Lead-Free Logo Area and Memo Box Area

Optionally, you can print the contents of any screen in the *KIC 2000* software by pressing **F9** on your keyboard.
The **F9** function will not work while viewing the *Profile Printout Setup* dialog box.

Before printing a profile make sure you have installed a printer on the computer.

Changing Print Formats

The default Print Format is #1 (Portrait). Includes the Company Name, Site ID, Date, Statistics, Profile Information,
Set Points, Profile Graph, Statistic Limits and Profile Description.

You can change the default format by editing a KIC 2000 configuration file.

To change Print formats follow these steps:

1. Close the KIC 2000 software if open.

2. Using Windows Explorer, find and open the file:
   `C:\KIC Profiler 2000\Log\GControl.kiccfg`

3. Find the command line that reads:
   ```
   [PRINT_FORMAT]
   AlternativePrintFormat=0
   ```

4. Change the command line to read:
   ```
   [PRINT_FORMAT]
   AlternativePrintFormat=1
   ```

5. Save and exit the file: `C:\KIC Profiler 2000\Log\GControl.kiccfg`

6. Restart the KIC 2000 software, the new print format will be active. Confirm by printing a profile.

Wave Solder Profiling

The *SlimKIC 2000 and KIC Explorer* profiles can be used to measure wave solder profiles. Profiling wave solder machines using a *KIC profiler is* very similar to profiling a solder reflow oven. The *KIC 2000* software will guide you through the profiling process.

KIC does not recommend installing this software on an oven controller PC if you plan to run wave solder profiles. Contact *KIC* for instructions should the need arise. tech@kicmail.com.

Wave Surfer Profiling Fixture

KIC offers a wave solder accessory for the *SlimKIC 2000* called the *Wave Surfer*. See Figure 119.

The *Wave Surfer* has embedded thermocouples that give wave specific data including conveyor speed each time you run it through your wave solder machine.

Using the *KIC 2000* software *Wave Surfer* users can collect profile and wave data and using the *Navigator* and *SPC* option(s) optimize their process.

Figure 119: Wave Surfer Fixture

The *Wave Surfer* simplifies wave soldering profiling. The device is used to routinely check the wave machine. Using the *Process Window Index*, the machines performance is measured each time a pass is made based on your selected *Process Window*.

KIC 2000 software Wave Solder Profiling

This section will outline the steps necessary to setup and run a wave solder profile using your *KIC Profiler* and *KIC 2000* software. This section is written assuming you have a basic understanding of the *KIC 2000* software and its functions before attempting to profile a wave solder machine.

Global Preferences

Unit of Measure – Wave solder machines generally use the Fahrenheit scale for preheat and solder pot temperature measurements. If necessary change the temperature units to Fahrenheit.

Product Start Temperature – This temperature setting can be changed. It is up to you to determine what temperature setting will work best for their process.

Maximum Product Temperature at Start of Profile – This setting will determine the maximum product temperature before the software will allow you to start a profile. If any of the thermocouples connected to the *KIC Profiler* or your product measure above this setting, the software will not allow you to proceed. You will be prompted with a message stating that *one of the selected TC's is not reading valid temperatures*. You will have to wait until the thermocouple or the object your thermocouples are connected to cools below this temperature setting before the *KIC 2000* will allow you to proceed. This software feature helps you to collect consistent profile data by always beginning the profile with the same or nearly the same product temperatures.

The *KIC 2000* software also uses this setting to determine the profile start - temperature trigger value. The profile start–temperature trigger is always set 2ºC above the "Maximum product temperature at start of profile". If the *Maximum product temperature at start of profile* is set to 31ºC, the profile start–temperature trigger is automatically set to 33ºC, which is the default setting. When the *Air TC* reads above 33ºC, the profile will begin.

Process Window

The *KIC 2000* software does not contain a list of fluxes or materials used specifically for wave soldering; only a list of solder pastes generally associated with solder reflow. In most situations, users defining a *Process Window* for a wave solder process will have to define their own specifications.

Select the line item at the top of the list- *Define your own spec* from the *Solder paste Menu*. You will be automatically directed to the *Edit Specs* window where you can enter your unique process specifications. Enter your process specifications, when finished; select the *Green check* button.

Including the Wave Portion of the Profile

Select the *Wave* checkbox to activate the wave specific process specs. When the *Wave* checkbox is checked the *KIC 2000* software will display profile statistics for the wave portion of the profile when viewing the completed or saved profile. See Figure 120.

Figure 120

If you have followed the above directions, you should be looking at the *Process Window* screen. If you are satisfied with the settings and wish to apply these specifications to all the thermocouples used, type a descriptive name in the top field and select the *Green check* button. Select *Yes* when prompted to save the *Process Window* file.

If you want to use different specifications for one or more thermocouples, you can do so.

Note: When running wave solder profiles with the" wave on", KIC Profilers utilize two Wave TC's in addition to the Air TC to collect wave specific data. The Wave TC's will connect to channels #2, 3 on the KIC profiler. See the "Connecting Wave TC's" section of this manual for details, page 77.
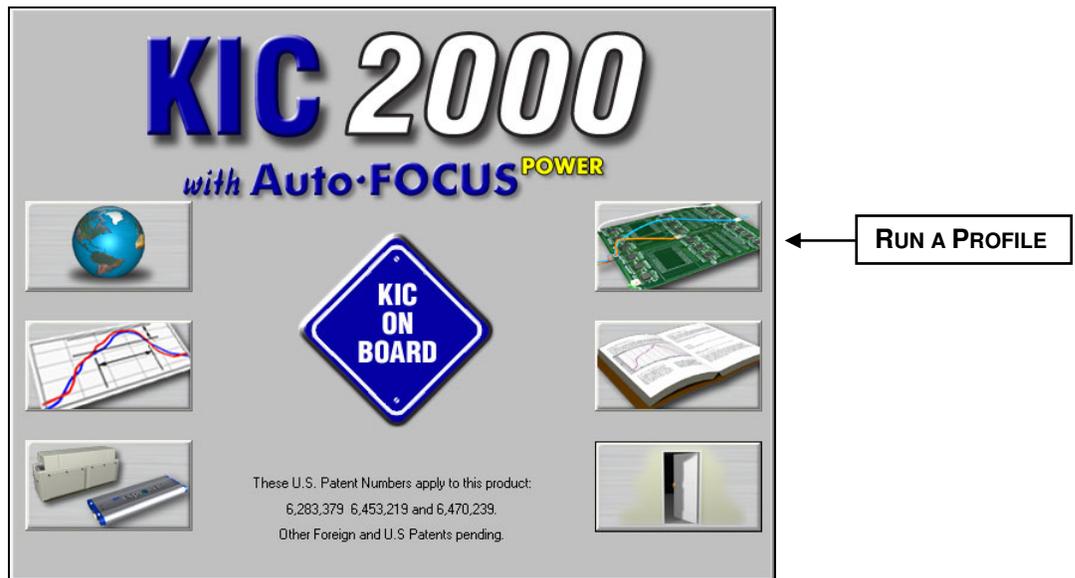
Running a Wave Solder Profile

Figure 121: KIC 2000 Main Screen

From the *KIC 2000* main screen select the *Run a Profile* button. See Figure 121.

Name Product and Select Process Window/Application Type

Figure 122: Run a Profile Screen #1

- Select your *Product Name* from the list. If you are profiling a new product type the name.

- Select your *Process Window* from the list.

- Select your process type from the *Applications* list. The *KIC 2000* software profile and prediction results are based on this setting, it is imperative that your select the correct *Application* type. Failing to do so can affect the profile results. For wave solder select to run the profile with the wave On or Off using extra thermocouples to measure wave characteristics such as dwell time, Parallelism, and Solder temperature. Select the *Wave Profile* option to run a profile without the wave characteristics data .
  - If you select *Wave on*, the *KIC 2000* software will utilize two wave TC's in addition to the *Air TC*. The *Wave TC's* will measure: wave dwell time and Parallelism when profiling with the wave on. The *Air TC* must be positioned to run through the wave(s).

  - If you select *Wave on*, the *KIC 2000* software will display preheat and wave profile data, but offer prediction results only for the pre-heat section of the profile. . The *Air TC* must be positioned to run through the wave(s).

  - If you select *Wave Off*, the software will not display wave charachteristics data

  - If you select *Wave Profile*, you can run with or without the wave on. If you choose to run the profile with the wave on, the only wave data that will provided is the solder temperature. . The *Air TC* must be positioned to run through the wave(s).

  - If you purchased the *Wave Surfer* select *Wave Surfer* from the *Application*s list.
- Select the *Sample Rate* from the drop-down list.

- Select your oven name from the list. If you're profiling on a new oven or machine, type the name in the "Oven Name" field.

- Optionally you can type notes or descriptions for this profile in the "Profile Description" field. These notes will be stored with the profile and can be edited later if necessary.

When you are finished with your selection, choose the *Forward Arrow* button to proceed. See Figure 122.

Zone length, Minimum and Maximum Temperature settings

If you typed a new oven name, the *KIC 2000* software also requires you to enter the length of each zone as well as the minimum and maximum zone temperature settings. This information will help the *KIC 2000* software narrow the possibilities of prediction results that your oven can actually achieve. See Figure 123.

For wave solder processes you are required to enter the distance from the end of the last preheat zone to the beginning of the main wave. Enter this value in the field labeled *Distance from end of last preheat zone to the main wave*.

Once you have finished entering this information select the *Forward Arrow* button to continue.

Figure 123: Run a Profile Screen #3

Entering Temperature Set Points and Conveyor Speed

If you typed a new oven name, the *KIC 2000* software requires you to enter the number of heated zones or pre-heat zones in your wave solder machine. See Figure 124.

If your process requires different top and bottom set points, deselect the check box labeled *Top and Bottom set points are the same* This will allow you to enter different values for top and bottom heaters in each zone. If your oven has top and bottom heaters, but not in all of the heated zones, just enter the same value as the actual set point in that zone for both the top and bottom setting.

This is also were you will enter the temperature settings for each zone or pre-heater in your wave solder machine and the conveyor speed setting. In the field marked *Solder temperature* enter the setting for the solder pot temperature from your wave solder machine.

When you have finished entering this information select the *Forward Arrow* button to continue.

Figure 124: Run a Profile Screen #2

Connecting the Air TC

The next screen shows directions for attaching the *Air TC* to your product. It is important to follow these instructions. See Figure 125.
The *Air TC* starts and stops the profile automatically, measures the oven, and provides useful profile information.

In certain processes it may be beneficial to wrap the end of the *Air TC* with tape to give it more surface area. KIC recommends wrapping the *Air TC* when profiling:

- Wave Solder.
- Anytime IR heat is present.

Wave Surfer

Wave Surfer users connect the designated thermocouples to the corresponding channels on the *SlimKIC 2000*.

Make sure the retainers holding the *SlimKIC 200*0 are in place and secure. See Figure 126.
If any of the embedded thermocouples are damaged or show signs of wear replace them.

In addition to the instructions given, it is very important that you position the "Air TC" so that it touches the wave(s). The "Air TC must pass through the wave in order to provide accurate profile results. Of course it you are profiling a Wave Solder machine with the wave off, the Air TC position is not critical to the profile results.

Select the *Forward Arrow* button to continue.

Figure 125: Run a Profile Screen #4 – No Wave Surfer
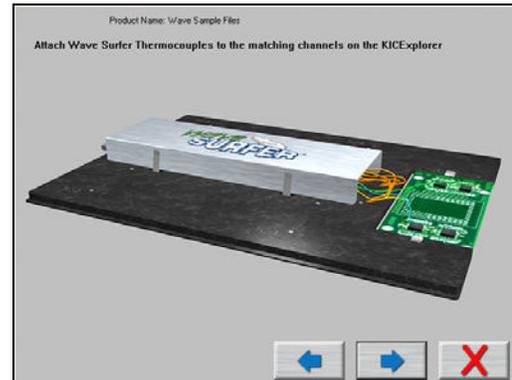
Figure 126: Run a Profile Screen #4 – Wave Surfer

Connecting Wave TC's

The next screen will depict thermocouple attachment for wave solder profiling with the wave on. The *KIC 2000* software utilizes two *Wave TC's* in addition to the *Air TC* to collect wave specific data. See Figure 127.

One *Wave TC* is placed on the Right side of the board and one on the Left side near the leading edge of the profile board.

KIC recommend using high temperature solder to connect both Wave TC's.

The wave TC's will measure -Wave Dwell time and Parallelism when profiling a wave solder machine with the wave on.

Select the Forward *Arrow button* to continue.

Figure 127: Run a Profile Screen #5

The next screen will depict the placement of the *Wave TC's* and instructs what slot/channel of the *KIC Profiler* to connect each *Wave TC* to. See Figure 128.

It is very important to follow these directions.

- Plug the Left-*Wave TC* into the #2 slot of the *KIC Profiler*.

- Plug the Right-*Wave TC* into the #3 slot of the *KIC Profiler*.

When you have properly connected your *Wave TC's*, select the *Forward Arrow* button to proceed.
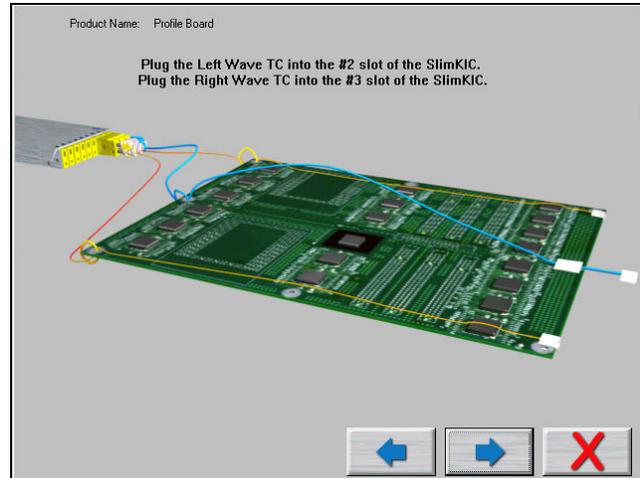
Figure 128: Run a Profile Screen #6 – Wave-On

Connecting Product TC's

The next screen will depict placement of the thermocouples used for profiling the product (*Product TC's*). See Figure 129.

Product TC's are connected to the product in key locations across the product. The selected locations need represent the highest and lowest- mass areas of the product or even specific temperature sensitive components.

Once you have connected your *Product TC's* to your product, connect them to the *KIC* profiler stating with slot or TC #4.

Select the *Forward Arrow* button to continue.
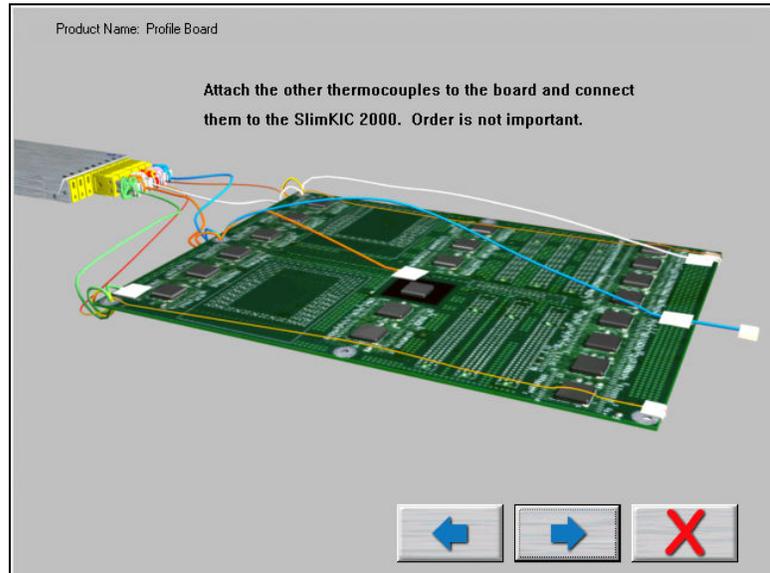
Figure 129: Run a Profile Screen #6

Selecting the thermocouples and starting a profile

This screen displays the live readings from the *KIC* profiler for all thermocouples selected, as long as the hardware is properly connected. See Figure 130. Make sure your *KIC* Profiler has a fresh battery and is powered on.

Selecting Thermocouples - To select a thermocouple, check the box next to the thermocouple number. The live temperature is displayed beneath each thermocouple label.

Thermocouple Labels - Optionally you can check the box to *include thermocouple labels*. When this box is checked you can type a text label for each selected thermocouple. 20 character maximum.
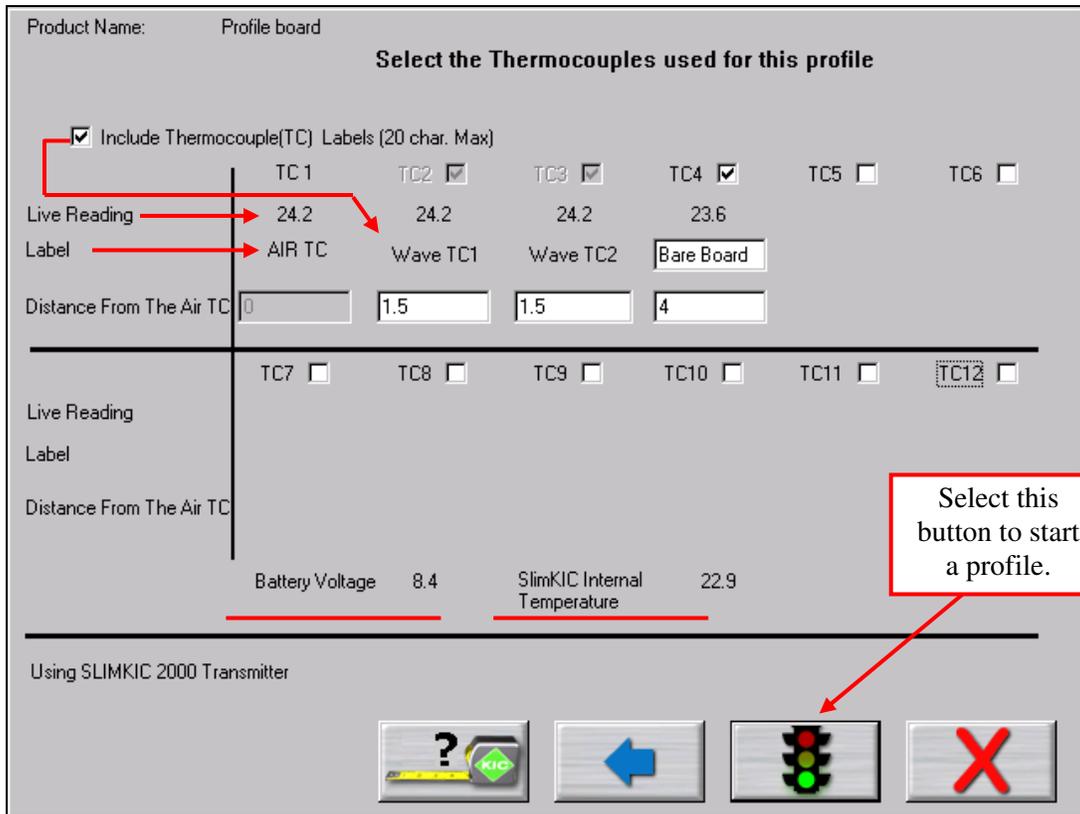
Figure 130: Run a Profile Screen #7

Distance from the Air TC – Measure and enter the distance from the *Air TC* to each thermocouple used, including the *Wave TC's*.

Select the *Help Measurement* (Tape Measure Help) button for an example of how to correctly measure the distance from the *Air TC*. See Figure 131.
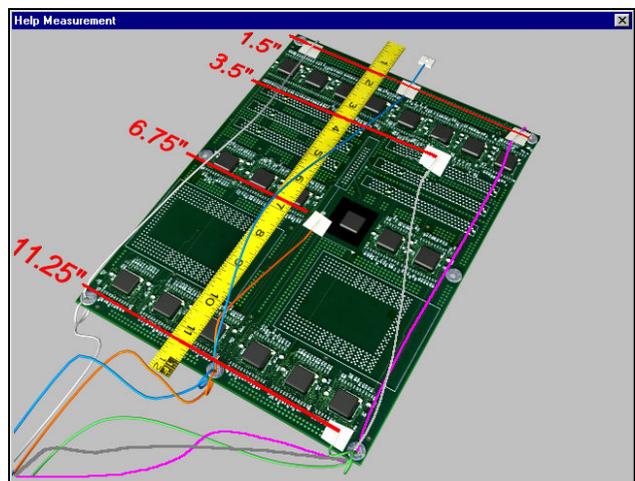
Figure 131: Wave-On TC measurements

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Once you have selected your thermocouples, you are ready to profile.

Make sure your *KIC profiler* hardware is properly connected to the computer. You will be able to view the live readings for each selected thermocouple. If you do not see the live readings, the *KIC Profiler* hardware is not connected properly. Recheck the cable connections.

Select the *Start Profile* (Green traffic light) button to begin profiling.

The *KIC 2000* software requires that the selected thermocouples read valid temperatures below the *Maximum product temperature at start of profile* as set in the *Global Preferences* screen. The default setting is 31ºC/88ºF.

If any of the selected thermocouples read too high, the following message will appear:
See Figure 132.
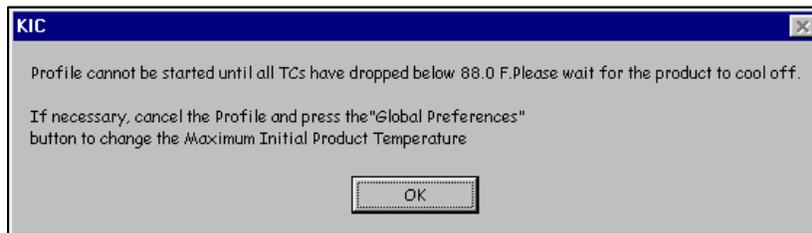
Figure 132

When the *KIC 2000* software detects valid temperatures for all of the selected thermocouples, it will allow you to start the profile.

In certain situations the KIC 2000 software may display other messages with directions in addition to what is outlined below. Read these messages and follow these directions carefully.

Next, the *KIC 2000* software will ask you to verify the oven is stable. See Figure 133.

- **Yes –** The software will prompt you to put the *KIC Profiler* and the board in to the oven.
- **No –** The software will ask if the oven is getting closer to the set points.
  See Figure 134.

Figure 133

- **Yes –** The software will return to previous screen to wait till oven is ready, oven set points within 2.0ºC/3.6ºF.
- **No –** The software will ask you to change the oven set point temperatures to the temperatures that the control thermocouples are currently reading, and then press OK.
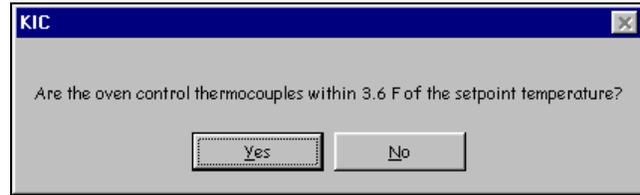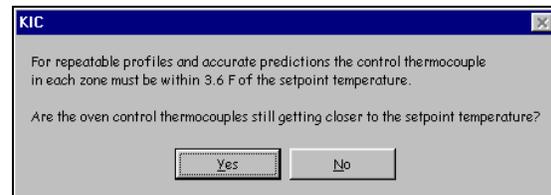
Figure 134

- The *KIC 2000* software will have you enter the new set points and then recalculate the capability of your oven. Then continue forward through the *Thermocouple Attachment* screens until you get to the *Select thermocouples* screen. Then select the *Start Profile* button (Green traffic light) to start the profile, once the oven has stabilized.

If you selected **yes**, the software shows a picture of and instructs you to put the *SlimKIC 2000* and the board into the wave machine, and then select the *Arrow Forward* button. See Figure 135.
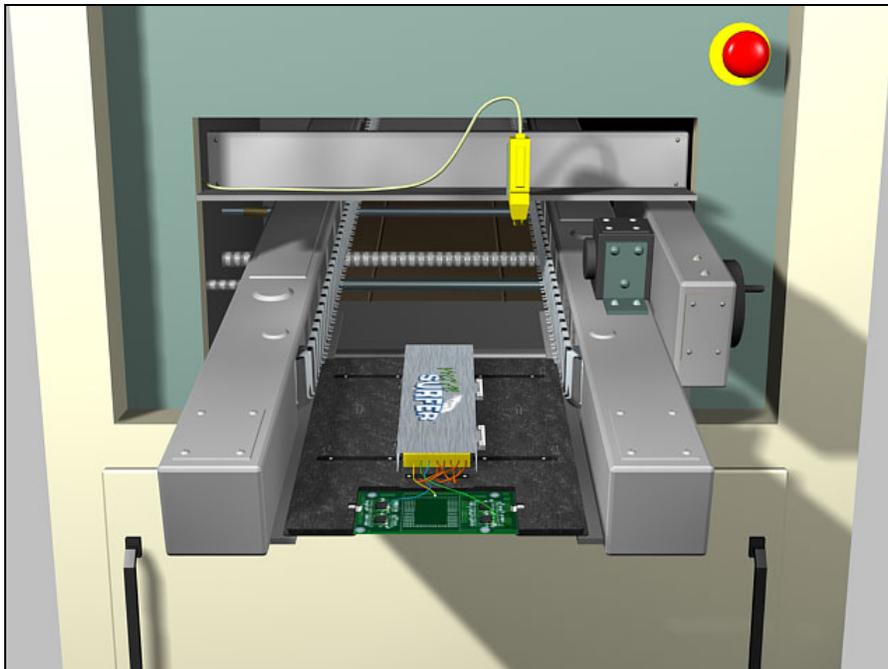
Figure 135: Wave Surfer Device loading into Wave machine

Next, the software will display the *Live Profile* graph.

Live Profile Graph Display

The live profile graph display is displayed only when using the *SlimKIC 2000* or *KIC Explorer RF* models. The live profile graph display will show the profile plot on the graph for the current profile that is running. See Figure 136.

If you have a SlimKIC 2000 or KIC Explorer-Data log model, you will not see a live profile display.
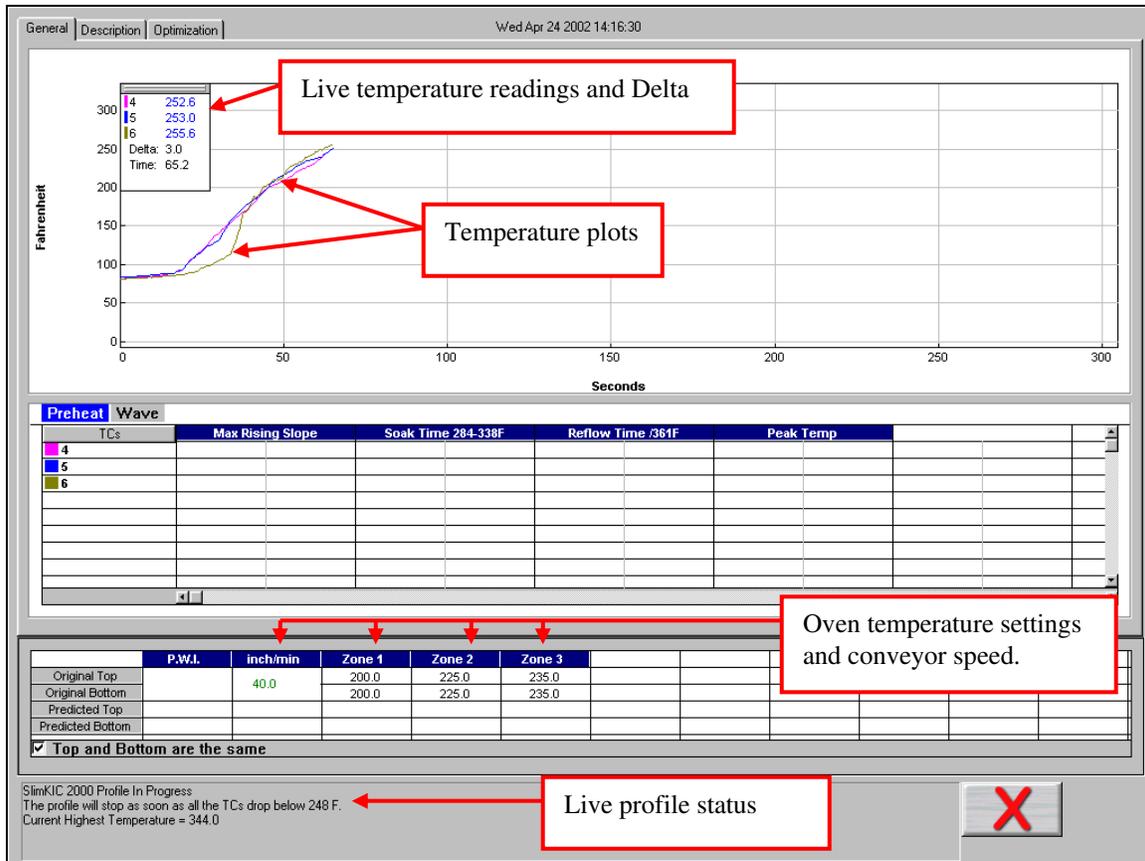
Figure 136: Live Profile Graph Display

While the *KIC Profiler* is in the oven, and until the profile has ended, the software will continue to display the live profile graph. The other tabs at the top of the screen; *Description*, and *Optimization* are inaccessible. See Figure 136.

- The live profile is plotted on the graph.

- The current temperatures for each thermocouple and the Delta between them are displayed in a small window in the upper-Left hand corner of the profile graph. The elapsed time is also displayed.

- The current oven temperature set points and conveyor speed for this profile is displayed beneath the *Statistics table*.

- The profile status is continually updated throughout the profile. *SlimKIC 2000* and *KIC Explorer RF* models only.

The Live profile graph display will remain on your screen until the *KIC Profiler* has achieved the trigger temperature that determines the profile end.

Profile Retransmission

For users of the *SlimKIC 2000 or KIC Explorer* profilers with *RF* transmit capability.

While the *KIC Profiler* transmits the live profile data to the *SlimKIC Receiver* or *KIC Explorer Base Station;* it simultaneously stores the profile data in its memory.

Once the *KIC Profiler* detects that all of the thermocouples have cooled below the profile-end trigger temperature, it will begin retransmitting the profile data to the *KIC 2000 software via RF*. The *KIC Profiler* will send the profile in *data packets*. The retransmission status is displayed at the bottom of the screen. See Figure 137.


```
SlimKIC 2000 Profile In Progress
SlimKIC currently retransmitting 28 packets of profile data.
Packets Received= 1 2 3 4 5 6 7 8 9 10 X X X X X X X X X X X X X X X X X X (10)
```

Figure 137: KIC Profiler RF model only

When all of the *data packets* have been received, the software will display a message asking you to turn the *KIC Profiler* off, choose OK. <u>Failing to turn your *KIC Profiler* off will drain the battery</u>.

Next, the *KIC 2000* software will automatically analyze the profile data and presents the profile and profile statistics. If you purchased the *Navigator* option, the predicted oven settings will be displayed as well.

If the *Air TC* or either *Wave TC* does not touch the wave(s), the *KIC 2000* software will display an error message: See Figure 138.


```
KIC                                                                      [X]

ERROR: The Air TC, Wave1 and Wave2 did not go through wave.

If the wave is off, run another profile and select "Wave Solder - Wave Off".
If the wave is on, then run another profile making sure that the Air TC is making solid thermal contact with the wave.

(Profile was automatically copied to the clipboard for viewing in EXCEL or other similar program.)

For help send e-mail to tech@KICmail.com or call KIC 24 hour tech support at 858-673-6050.

                              [    OK    ]
```

Figure 138

Profile Graph Display

Once the *KIC 2000* software opens the *Profile Graph Display*, all the tabs at the top will be accessible. The *General* Tab will show the profile results for both the *Preheat* and *Wave* sections of the profile. You can select either the *Preheat* tab or the *Wave* tab above the S*tatistic* table. See Figure 139.

Preheat Tab

The *Preheat* tab represents only the section of the profile before the wave. The *KIC 2000* software draws a Blue rectangle around the area that is considered *preheat*. The profile statistics and set points which are shown below the profile graph depict only the *preheat* section of the profile, the profile data inside the Blue rectangle. See Figure 139.

Information regarding the *Wave TC's* is displayed in a window at the upper-Right hand corner of the profile graph. This information includes; Dwell time, parallelism, and the solder temperatures for the wave(s).
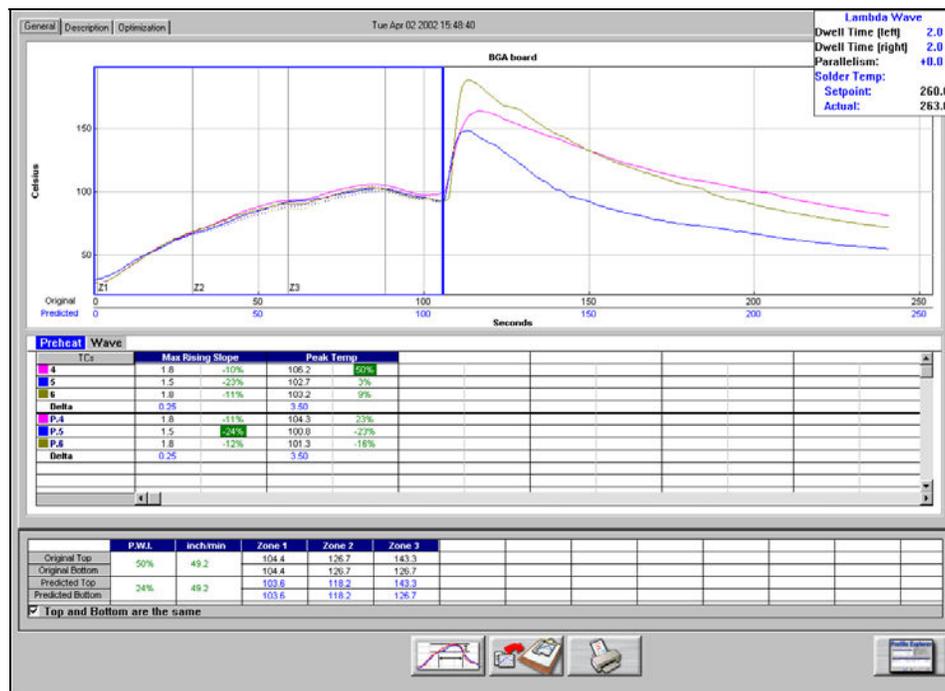
Figure 139: Profile Graph Display

Profile Information from the *Wave TC's* is displayed in a window at the upper-Right hand corner of the profile graph. See Figure 139 and Figure 140. This information includes; Dwell time and Parallelism in seconds, and the Solder temperature set point and actual for the *wave(s)* portion of the profile.

The Dwell time is measured by the *Wave TC's.* The Parallelism is the measured time difference between when the *Wave TC*-Left, and *Wave TC*-Right hit the wave.

The Solder Temperature set point is input by you before the profile when entering oven set point information. The solder temperature value is measured by the *Air TC* during the profile.

Figure 140: Wave Information

Navigator – The Navigator software option will optimize only for the *preheat* section of the profile. The *Navigator* will not predict changes to the *wave* section of the profile.

Statistics - Below the profile graph is the *Profile Statistics*. The *Statistics* are a numeric representation of the profile and how well the profile fits the selected *Process Window*. The *Statistics* for this profile and the predicted profile are shown. A percentage value is displayed in each cell beside the *Statistic* value. This percentage represents the amount of *Process Window* being used. A PWI under 100% indicate the profile fits within the selected *Process Window*, a PWI 100% or higher indicates the profile has exceeded the selected *Process Window*. The *KIC 2000* software will only display PWI values for the *Preheat Statistics*.

Original/Predicted Set points - Below the profile *Statistics* is the oven temperature and conveyor settings. The *original* set points represent the oven settings when this profile was run; the *predicted* settings represent the recommendation of the *Navigator* prediction software. If you did not purchase the *Navigator* option, the software will display the same oven settings for the *original* and *predicted* statistics. *Navigator* is an optional *KIC 2000* software feature that automatically finds the best profile for your product based on your solder paste specifications.

The KIC 2000 software will not show the predicted set points should you want to print the profile. If you wish to print the predicted set points, you can do so by pressing the F9 key. The F9 function key will print any active profile screen of the KIC 2000 software.

Wave Tab

The *Wave* Tab will show profile information specific to the wave portion of the profile. The *KIC 2000* software draws a Blue rectangle around the area that is considered *Wave*. The profile statistics and set points which are shown below the profile graph depict only the *Wave* section of the profile. See Figure 141.

Wave PWI – If you entered Wave specific *Process Window* specs when setting up your *Process Window* then the Wave *PWI* will also be displayed when viewing the *Wave* tab. See Figure 141.

Figure 141: Profile Graph Display – Wave Tab

Manual Profile Prediction

The *KIC 2000* software has automatic (*Navigator*), and manual prediction capabilities. The standard *KIC 2000* software installation includes manual prediction capabilities.

Manual prediction gives you the flexibility to easily predict changes to the oven settings (temperature settings, conveyor speed), and view the results without having to spend the time actually running the profile. This feature is very helpful to minimizing the time spent fine tuning or developing a thermal profile. See Figure 142.

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	47%	49.2	220.0	260.0	290.0
Predicted Bottom			220.0	260.0	260.0

Figure 142: Original/Predicted set points – Manual Prediction

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	28%	49.2	220.7	256.1	284.5
Predicted Bottom			220.7	256.1	254.5

Figure 143: Original/Predicted set points – Navigator (Optional)

This is an example of how the *KIC 2000* software (*standard* and with *Navigator*) lists the PWI, and oven settings for the profile. This table is divided into the *original* section (top), and the *Predicted* section (bottom). The *original* values represent the oven settings at the time the profile was run. The *predicted* values represent the prediction results as determined by the *Navigator* software. See Figure 143.

If you purchased the *Navigator* software option, the *KIC 2000* software will automatically generate results that are best suited for the selected *Process Window*. In the event you wish to modify the prediction results of the *Navigator*, you can do so.

To predict changes to the oven settings, or modify the *Navigator* prediction results, click on the zone you wish to change. In the example below, zone 1 has been selected. See Figure 144.

	P.W.I.	inch/min	Zone 1	Zone 2	Zone 3
Original Top	47%	49.2	220.0	260.0	290.0
Original Bottom			220.0	260.0	260.0
Predicted Top	47%	49.2	230	260.0	290.0
Predicted Bottom			220.0	260.0	260.0

Figure 144

Type the new temperature setting, and then press *Enter*. The *Navigator* will predict the results of that change, and then automatically update the PWI, *predicted Statistics*, and the profile graph. The new predicted results will be displayed on the graph in a dotted-line format. This format enables you to easily determine the difference between the *original* and *predicted* profiles. See Figure 145.
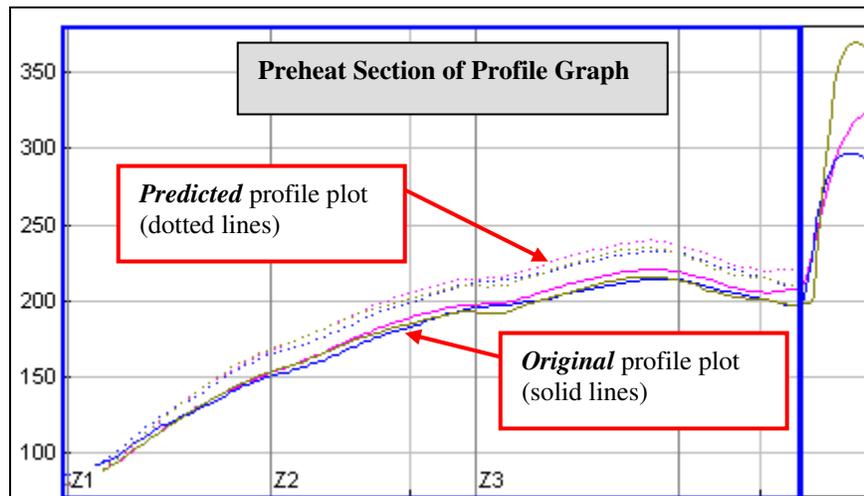
Profile Graph Display

Figure 145

The PWI for the profile is displayed in the bottom-Left corner of this screen. If the measured PWI is below 100%, the value will be displayed in a Green font. If the measured PWI is 100% or higher, the value will be displayed in a Red font. See Figure 146.
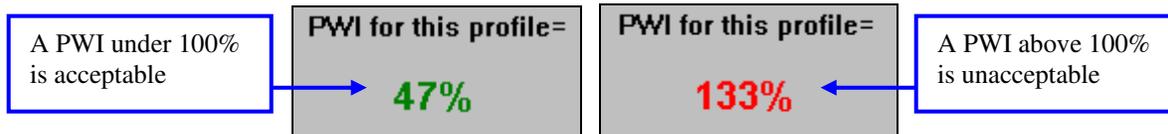

Figure 146: Profile PWI

This display method enables you to easily identify whether the profile is in- or out-of-spec.

Graph Controller

The *Graph Controller* allows you to modify the view of the *KIC 2000*-profile graph. To open the *Graph Controller*, Left-click on the *TC* column header in the *Statistics* table or Double-Left –click, anywhere just outside the profile graph.

Auto Scale – The *Auto Scale* feature will automatically adjust the X, and Y axis scales to fit all of the data in the profile graph. When the *Auto Scale* feature is disabled, you must manually input the minimum and maximum scale settings for the X, and Y axis scale of the profile graph.

Selecting Thermocouples to View
The TC's section is a list of the thermocouples used for the profile. By selecting *All* you are selecting that all the thermocouples used for the original profile will be displayed on the profile graph. In the event that you wish to view the profile without a particular or multiple thermocouples, you can deselect individual thermocouples, or deselect the *All* check box, and choose only the thermocouples you wish to view.
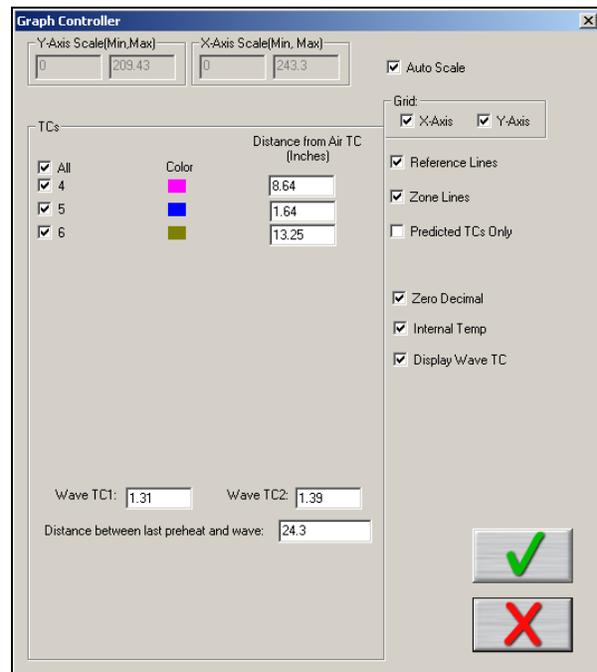
Figure 147: Graph Controller – Wave-On

Deselecting Thermocouples
If a thermocouple has become disconnected during the profile, the profile results may be affected to due above normal peak temperatures and such. This situation may cause the profile PWI value to be artificially inflated due to bad data. In the event a single or multiple thermocouples become disconnected from the product during the profile, you can deselect the affected thermocouple(s). The *KIC 2000* software will recalculate the PWI, and update the profile statistics based on the remaining thermocouples selected. You must select at least one product thermocouple.

Grid – Enables/disables the view of the X, and Y-Axis scales.

Reference Lines – Enables the view of *Reference Lines* displayed on the profile graph. These lines represent any temperatures referenced in the selected *Process Window*.

Zone Lines – Enables the view for the oven zone lines on the profile graph.

Predicted TCs Only - Removes the Original profile plot form view, displaying only the prediction profile plot on the graph.

Zero Decimal – When viewing the Pointer tool, this setting enables or disables the decimal display. When unchecked, the software will display one decimal point.

Internal Temp – Enables the view of the *KIC profiler's* internal temperature profile plot on the graph.

Display Wave TC's – Enables the display of the Wave TC's and the Divider Timestamp Line on the profile graph

Distance From Air TC – Displays the *Distance From the Air TC* for each thermocouple. You can edit these values. These values were originally entered before the Profile start.

Wave TC 1/TC 2 – Distance from *Air TC* to each *Wave TC*.
Distance Between Last Preheat and Wave – This is the distance form the main wave to the last preheat zone. You can edit this if necessary. This value was originally entered by you in the *Entering Oven Recipe* screen.

Graph Option Menu

To view the Graph Option Menu, right-click anywhere within the profile graph area. See Figure 148.

Examine Line

The Examine Line feature displays the temperature for the location of the pointer on the profile graph. See Figure 149.

Figure 148: Graph Option Menu

Wherever the pointer is moved across the profile, the following data will be displayed:

- The first column is the actual temperature for each TC.

- The second column is the temperature of the predicted profile data – based on set point or belt speed changes.

- The Delta T for both actual and predicted TC data.

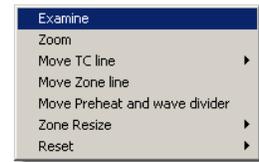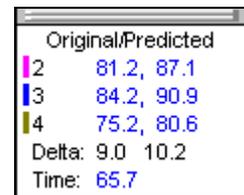- The time during the profile at which the pointer is placed

Figure 149: Graph Pointer

Automatic Calculation of Delta T + Delta (or range) for all Stats

The software will automatically calculate, and display in the statistical chart, the Delta for both the original and predicted profile data for all *TC's* for all *Statistics*. This is the range of the highest to the lowest value for any given specification. This information is strictly being displayed and is not factored in to the *PW*I value and is not used in *the Navigator or Auto-focus* calculations.

Zoom

You can also view the profile by zooming in to get a better view of a particular area of the profile display. Right-click on the graph, this will bring up a menu. See Figure 150. Select the *Zoom In* and a chart will appear on the left side of the graph.
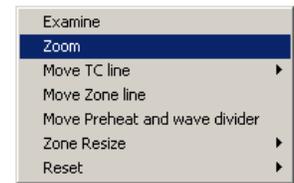

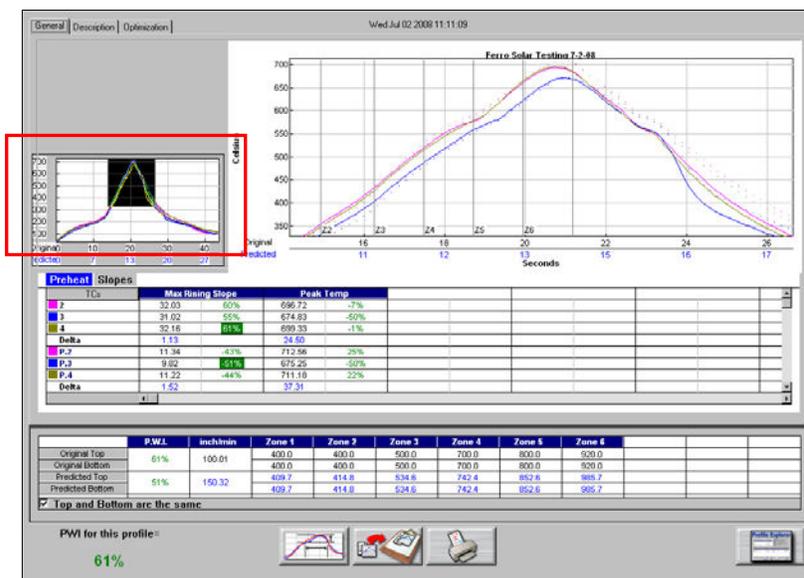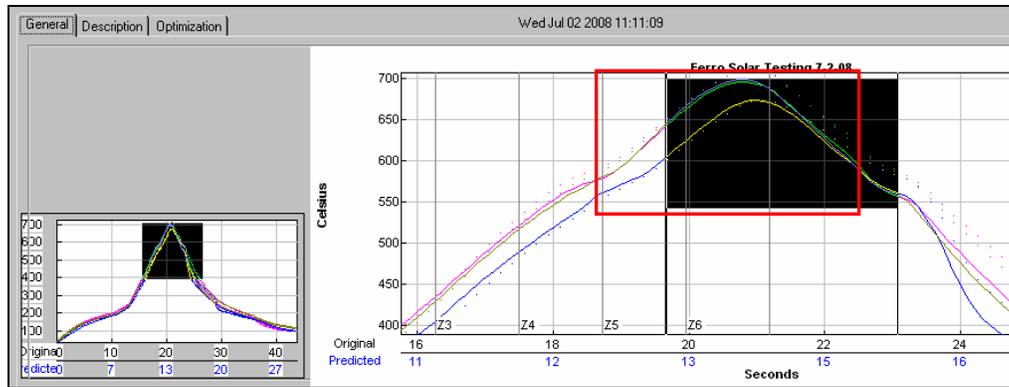Figure 150: Graph Option Menu - Wave

Figure 151: Graph Option Menu – Zoom

Using your mouse pointer, click and drag the view window in the graph over the area you wish to *Zoom* in to.

To disable the *Zoom In view*, Right-click on the graph and deselect *Zoom In*.

Move TC Line

The *Move TC Line* feature allows the user to manually move the thermocouple plot on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display the plot. See Figure 152.

Select the thermocouple you wish to move and then click and drag the highlighted plot and move it to the desired location on the profile graph.   See Figure 153.
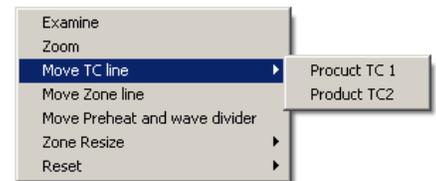
Figure 152: Graph Option Menu – Move TC Line
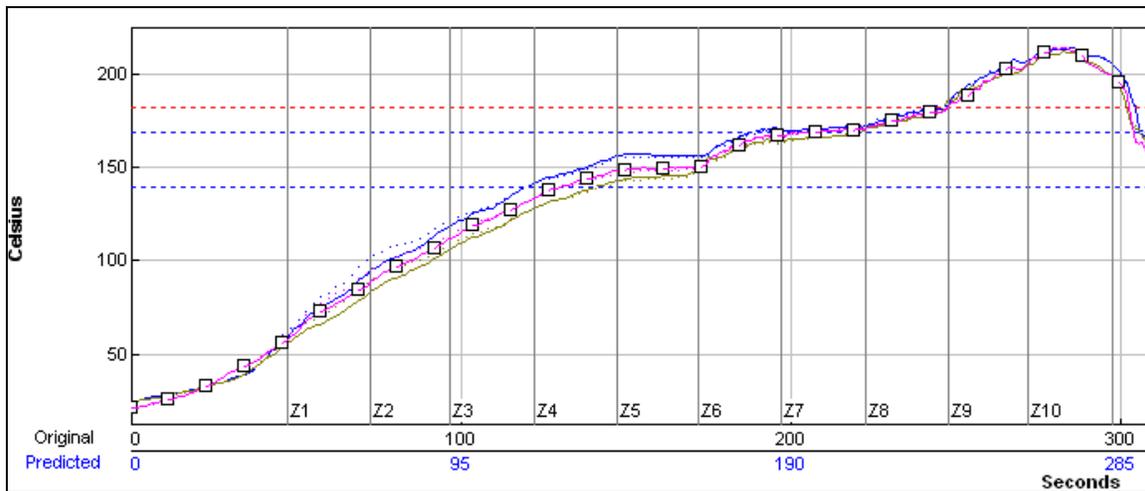
Figure 153: Move TC Line

Move Zone Line

The *Move Zone Line* feature allows the user to manually move the zone separation lines on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display the zones.

Select to move the first line (Zone beginning) or the Last line (Zone ending) (See Figure 154) and then click and drag it to the desired location on the profile graph. See Figure 155.
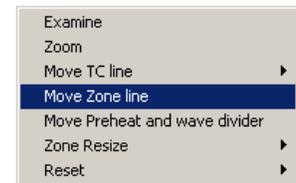
Figure 154: Zone Resize
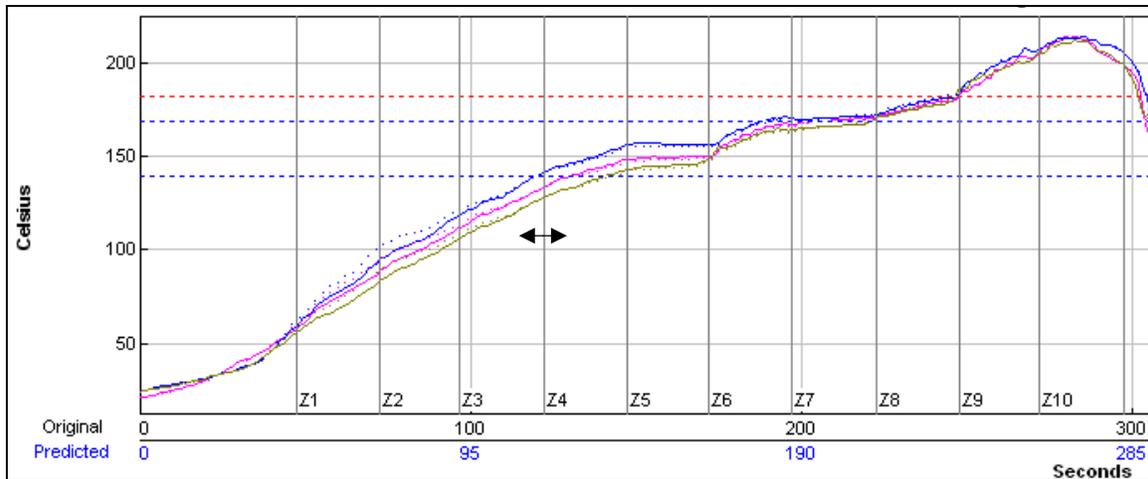
Figure 155: Move Zone Line

Move Preheat and Wave Dividers

The *Move Preheat and Wave Divider* feature allows the user to manually move the Preheat and Wave locations on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display these points.
.
Place the cursor over the Blue wave divider line and then click and drag it to the desired location on the profile graph.   See Figure 157.
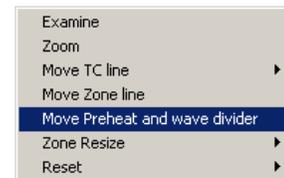
Figure 156: Move Preheat and Wave Divider
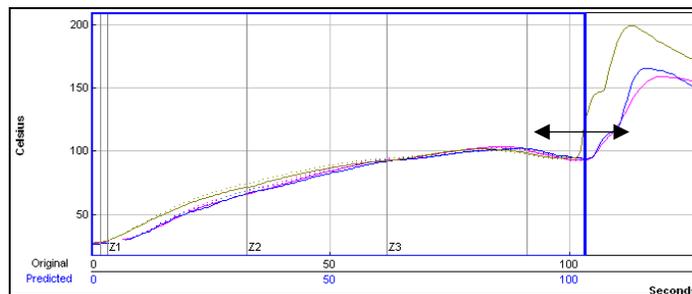
Figure 157

Zone Resize

Select to move the *First line* (Zone beginning) or the *Last line* (Zone ending and then click and drag it to the desired location on the profile graph.   See Figure 158.
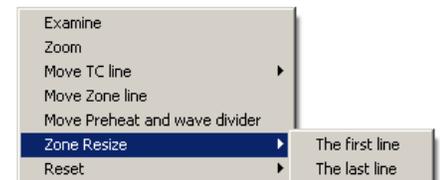

Figure 158: Graph Option Menu – Zone Resize

Reset

The *Reset* feature will reset the profile and undo any changes you have made to the graph using the *Graph Option Menu*. Select the *TC Line,* or *Zone Line* option. See Figure 159.

Figure 159: Graph Option Menu -Reset

Tips for Profiling Wave Solder

Listed below are tips for profiling wave solder machines using your *KIC Profiler*. These tips are intended to help you in profiling your wave solder machine.

Your process may not match the pictures below.

Contact *KIC* Technical support if you have any questions regarding wave solder profiling using your SlimKIC *2000 or KIC Explorer* profiler. tech@kicmail.com.

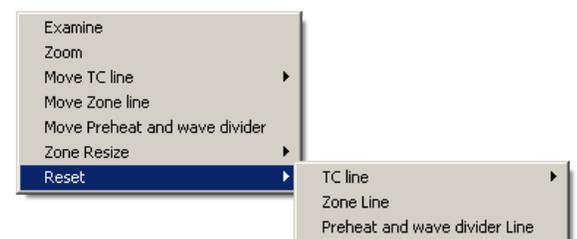- Wave solder profiling is simplified with the *Wave Surfer* device. If you are not using a *Wave Surfer* device, use a blank, spare board, or palette to carry the *KIC Profiler* on. It may be helpful to secure the *KIC profiler* and *Thermal Shield* to the board/palette.

- During the profile, you can run the *KIC Profiler* in front or behind the profile board. See Figure 160.

- Run the thermal shield upside-down to prevent any solder from contacting the *SlimKIC 2000*. See Figure 160.

- Use a board stiffener when available. This will help prevent the board from sagging due to the weight of the *KIC Profiler*.

  - This will also help prevent liquid solder from flowing onto the board, possibly contacting the *Thermal Shield* or *KIC Profiler*.
  - It is helpful to raise the *SlimKIC 2000* thermal shield at least 1/8" to 1/4" off the carrier board/palette in order to prevent any liquid solder from entering the *Thermal Shield.* See Figure 160.

- You can run the profile with or without the spray fluxer active. If you choose to run wave solder profiles with the spray fluxer on, you run the risk of contaminating the *Wave Surfer* or Thermal shield. If operating properly all the spray flux should be removed by the process.
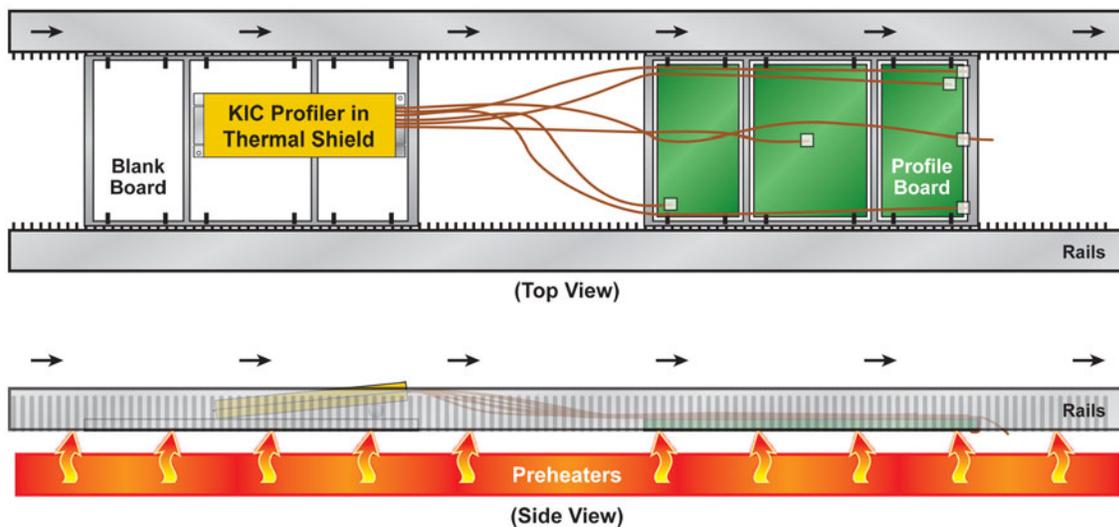

Figure 160: Profiling Wave Solder Using a KIC Profiler

Cure Profiling

The process for running a Cure profile is very similar to the *KIC 2000* software *Reflow* application. You may have to define your own spec, as the *KIC 2000* software does not contain process windows specifications designed for cure applications.

From the *KIC 2000 Main Menu* select the *Run Profile* button. See Figure 161.

This is the button that has a picture of a PCB. A text label will be displayed as you place the mouse pointer over each button.
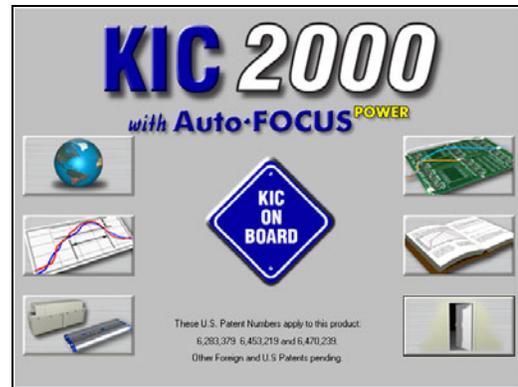
Figure 161: KIC 2000 Main Screen

Name Product and Select Process Window/Application type

Figure 162: Run a Profile – Select Screen

- Select your product name from the list. If you're profiling a new product type the name.
- Select your *Process Window* from the list.
- Select your process type from the application list. The *KIC 2000* software profile and prediction results are based on this setting, it is imperative that your select the correct application type. Failing to do so can affect the profile results. Choose Cure.
- Select your *oven name* from the list. If you're profiling on a new oven or machine, type the name in the *Oven Name* field.
- Optionally you can type notes or descriptions for this profile in the "Profile Description" field. These notes will be stored with the profile and can be edited later if necessary.

When you are satisfied with your selection, choose the "Next" arrow to proceed. The software will step you through the screens in order to run a profile. See Figure 162.

If you have any questions, contact KIC Technical Support. tech@kicmail.com, (858)-673-6050.

Temperature vs. Time profiling

The *Temperature vs. Time* feature allows you to profile a large variety of processes. By allowing you to make a simple temperature/time profile they will have the ability to run profiles and set up experiments for practically any thermal process. This would include, batch processes for cure, environmental temperature cycling, rework, hi-temp process, etc. Additional capabilities include being able to measure temperatures from -150 to 1050C. *Temperature vs. Time* profiling is different than the other application types.

Differences include:

- The *KIC Profiler* will not utilize temperature triggers for starting/stopping the profile. These actions are performed manually.

- *TC* #1 is not used as an *Air-TC*; it behaves as a normal *TC*. *TC* #1 can be included in *Process Window* calculations. Data for TC #1 is displayed on the profile graph. Using any other application type, it is not.

- *KIC 2000* prediction capabilities by design are not compatible with *Temperature vs. Time* profiles. The *Navigator* prediction tool as well as *Auto-Focus* will not work on *Temperature vs. Time* profiles. *PWI* is calculated for each profile.

- The *KIC Profiler* must remain connected to the communication cable throughout the *Temperature vs. Time* profile. This includes *SlimKIC 2000* Profilers with RF capability.

- KIC Explorer Profilers can utilize the RF option for wireless *Temperature vs. Time* profiles.

- Using *Temperature vs. Time*, users can measure negative temperatures. Because temperature triggers are not used, the *KIC 2000* software can display data as low as -150C.

KIC 2000 software

This section will outline the information necessary to set up and run a *Temperature vs. Time* profile using your *KIC Profiler* and *KIC 2000 software*. This section is written assuming you have a basic understanding of the *KIC 2000* software before attempting to run a *Temperature vs. Time* profile.

Global Preferences

Units of Measure – Set the unit of measure for each item. These settings will determine the units used to display the profile graph.

Product Start Temperature - The default setting is 31C. This setting is used for *Temperature vs. Time* profiling even though temperature triggers are not used. Instead the profile can start as soon as the *Start Profile* button is selected and as long as the product TC's are below this temperature setting.

Profiling Hardware –Even if you have a *SlimKIC 2000 or KIC Explorer* profiler that has RF capability, the *KIC Profiler* must remain connected to the communication cable throughout the duration of the *Temperature vs. time* profile.

Auto Focus Tab – The *Auto Focus* feature by design is not compatible with *Temperature vs. Time* profiles.

If you have made any changes, be sure and select the Green check mark button to save those changes when exiting the *Global Preferences* screen.

Process Window Setup

The *Process Window* is a set of limits applied to the profile data. You have the option of either not using a defined *Process Window* in which case no *PWI* will be calculated, or define a *Process Window* and have the *KIC 2000* software calculate and display a *PWI* for that profile.
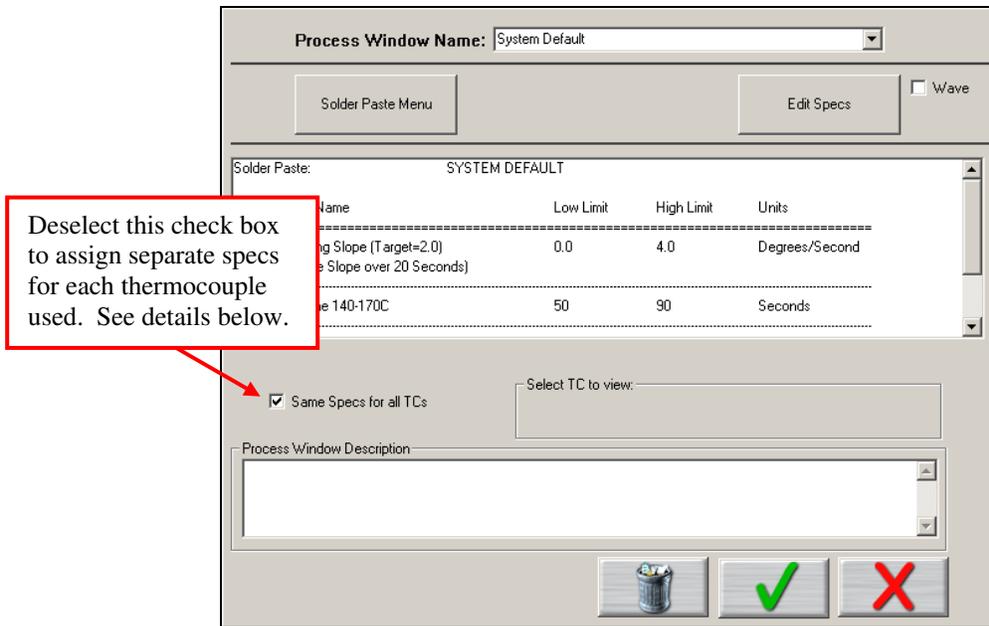

Figure 163: Process Window

Process Window Name – Name of the KIC Process Window file that includes the statistics chosen and limits for those statistics, along with whatever text is typed in the *Description* field.

- **Solder Paste Menu** - A read only library list of numerous solder pastes along with the statistics and limits suggested by the paste mfg., also included is a *User-Defined* option in the list which allows you to create a spec. of your own. See below for additional details.

- **Edit Specs** – Screen allowing you to edit or choose statistics and limits for a chosen solder paste or define your own specs

- **Wave** – This radio button switches between the process specs and the *Wave* process specs for the selected *Process Window*. Set up a Process Window specific to *Wave* TCs for Wave Solder profiling.

- **Read only text box** – Shows the paste name, statistics name, and limits for a Process Window chosen, edited, or saved by you. To edit select the *Edit Specs* button.

- **Same Specs for all TC's –** By deselecting this checkbox, you can assign separate specifications for each individual thermocouple you are using. After deselecting the checkbox, you'll need to click on the *Edit Specs* button to choose which statistics will be used and what spec limits will be set for each thermocouple used. This option would be used if you had component specific specifications that differ from the general solder paste specs. Another use for this would be if you wanted to monitor the actual board temperature as well as component temps. You would then only select the statistics for that TC that are relevant. If you wish to use the same specifications for all thermocouples, put a check mark in the box.

- **Select TC to View –** This dialog box will appear only if the *Same Specs for all TC's* checkbox is deselected. By clicking on the dropdown menu, you can view the specifications that have been defined for that number thermocouple. If a description was included, it will be displayed next to *Label*.

- **Process Window Description** – Field allowing for freehand notes for a particular *Process Window*

Running a Temperature vs. Time profile

From the *KIC 2000 Main Menu* select the *Run Profile* button.

This is the button that has a picture of a PCB. A text label will be displayed as you place the mouse pointer over each button.

Name Product and Select Process Window/Application Type
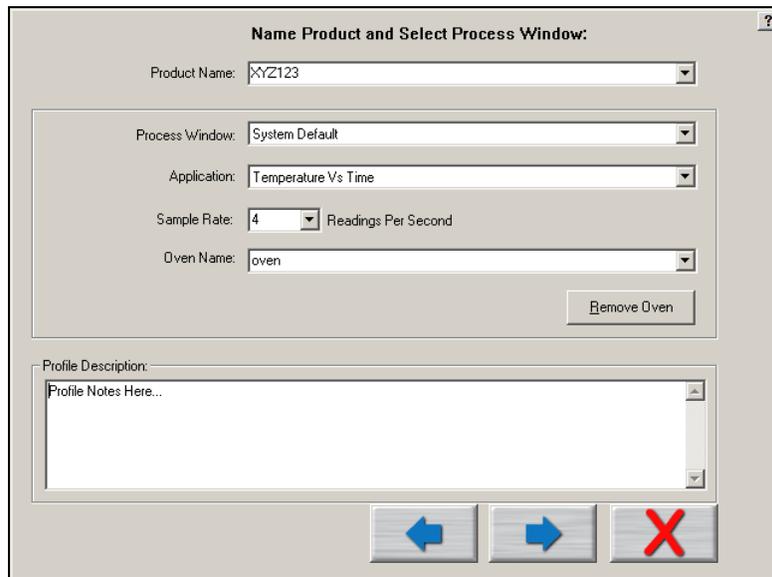
Figure 164: Run a Profile Screen #1 – Time vs. Temperature

- Select your *Product Name* from the list. If you are profiling a new product type the name.

- Select your *Process Window* from the list.

- Select Temperature vs. Time from the *Application* list. The *KIC 2000* software profile display and calculations are based on this setting

- Select your oven name from the list. If you're profiling on a new oven or machine, type the name in the *Oven Name* field.

- Optionally you can type notes or descriptions for this profile in the *Profile Description* field. These notes will be stored with the profile and can be edited later if necessary.

When you are finished with your selection, choose the *Forward Arrow* button to proceed. See Figure 164.

Selecting the thermocouples and starting a profile

This screen displays the live readings for all thermocouples connected to your *KIC profiler*. Select the thermocouples by clicking the check box next to each *TC* number. Make sure the *SlimKIC 2000* has a fresh battery and is powered on. See Figure 165.

Selecting Thermocouples - To select a thermocouple, check the box next to the thermocouple number. The live temperatures are displayed beneath each thermocouple label.

Thermocouple Labels - Optionally you can check the box to *Include Thermocouple Labels*. When this box is checked you can type a text label for each selected thermocouple. 20 character maximum.

If the selected Process Window has Separate Specs for TC's, then you must return to the Process Window-Edit Specs screen in order select/deselect TC's or change their labels.

Figure 165: Run a Profile Screen #2 – Time vs. Temperature

Expected Profile Length – This value controls the X-Axis on the profile graph. Make sure to enter enough time to complete your profile. Otherwise the profile plot will stop as soon as the *Expected profile Length* is achieved. Data outside this time limit will not be displayed.

Note: to decrease the number of samples, enter a longer Expected Profile Length

Once you have selected your thermocouples, you are ready to profile.

Make sure your *KIC profiler* hardware is properly connected to the computer. You will be able to view the live readings for each selected thermocouple. If you do not see the live readings, then your *KIC profiler* hardware is not connected properly.

Recheck the connections. *Temperature vs. Time* profiles cannot begin until your *KIC Profiler* is connected via the cable, and communication established.

Select the *Start Profile* (Green traffic light) button to begin profiling. The profile will begin at this point.

The *KIC 2000* software requires that the selected thermocouples read valid temperatures below the *Maximum product temperature at start of profile* as set in the *Global Preferences* screen. The default setting is 31ºC/88ºF.

If any of the selected thermocouples read too high, this message will appear. See Figure 166.

Figure 166

When the *KIC 2000* software detects valid temperatures for all of the selected thermocouples, it will allow you to start the profile.

The maximum operating temperature for the *SlimKIC 2000* profiler is 105°C/220°F. If your process temperatures will cause the *SlimKIC* to exceed this limit then **DO NOT** place the profiler into the oven.	**The maximum operating temperature for the *KIC Explorer* profiler is 85°C/185°F**. If your process temperatures will cause the *KIC Explorer* to exceed this limit then **DO NOT** place the profiler into the oven.

Trailing Wire Profiling

The *SlimKIC 2000 and KIC Explorer* profilers can be used with elongated thermocouples or a thermocouple extension long enough to pass through the process. This is especially useful for low clearance processes or higher temperature processes that would normally cause the *SlimKIC 2000 or KIC Explorer* profiler to overheat during use.

Select the *Stop Profile* button when the profile is complete. Leave the product *TC's* connected until the software displays a message instructing you to turn off your *KIC* profiler.

Live Profile Graph Display

The *Live Profile Graph* display will show the profile plot on the graph for the current profile that is running. See Figure 167.
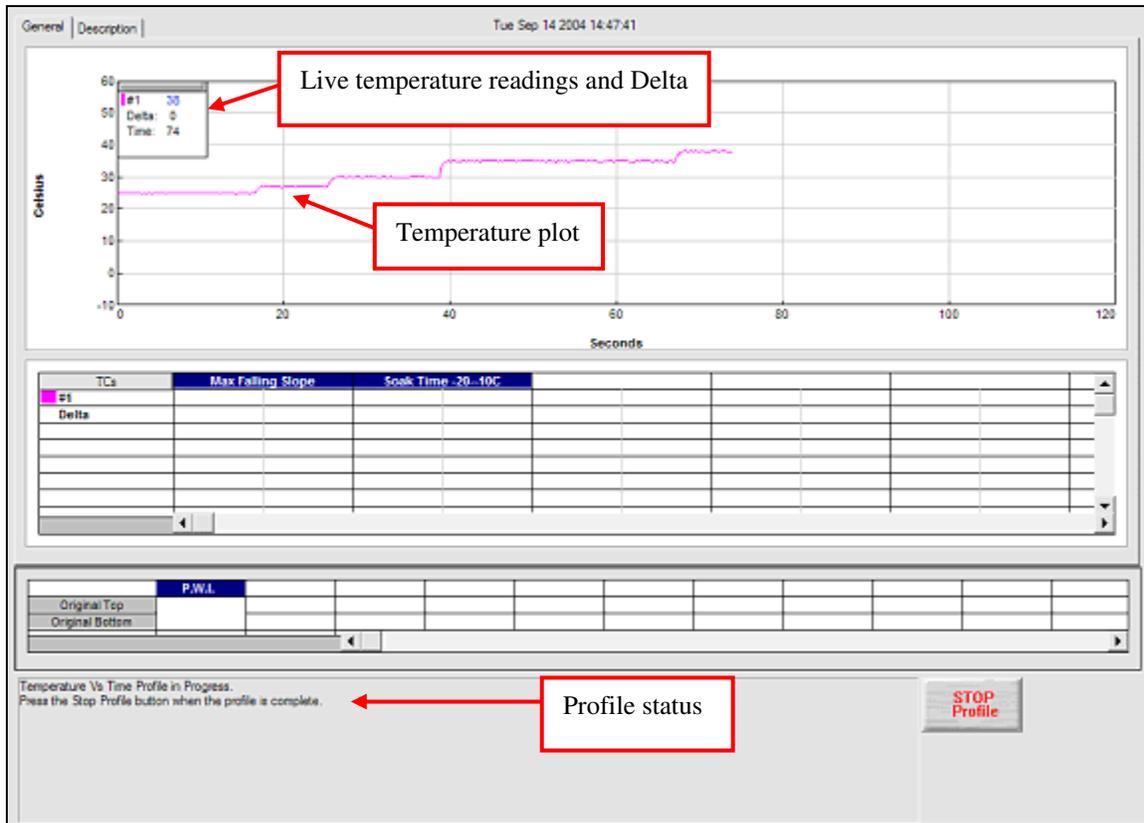
Figure 167: Live Profile Graph Display

While the *KIC Profiler* is in the oven, and until the profile has ended, the software will continue to display the Live Profile Graph. The Description tab at the top of the screen is inaccessible.

- The live profile is plotted on the graph

- The current temperatures for each thermocouple and the Delta between them are displayed in a small window in the upper-Left hand corner of the profile graph. The elapsed time is also displayed.

The *Live Profile Graph* display will remain on your screen until the *Stop Profile* button is selected even if the profile time has completed and the profile plot has ended. See Figure 167.

The software will display 2 messages when the *Stop Profile* button is pressed:

The first will ask you to confirm the Profile Stop. See Figure 168.

If you select *No*, then the profile continues.

If you select *Yes,* then the second message instructs you to turn your *KIC Profiler* off. See Figure 169.

Figure 168

Figure 169

Viewing the Profile and Statistics
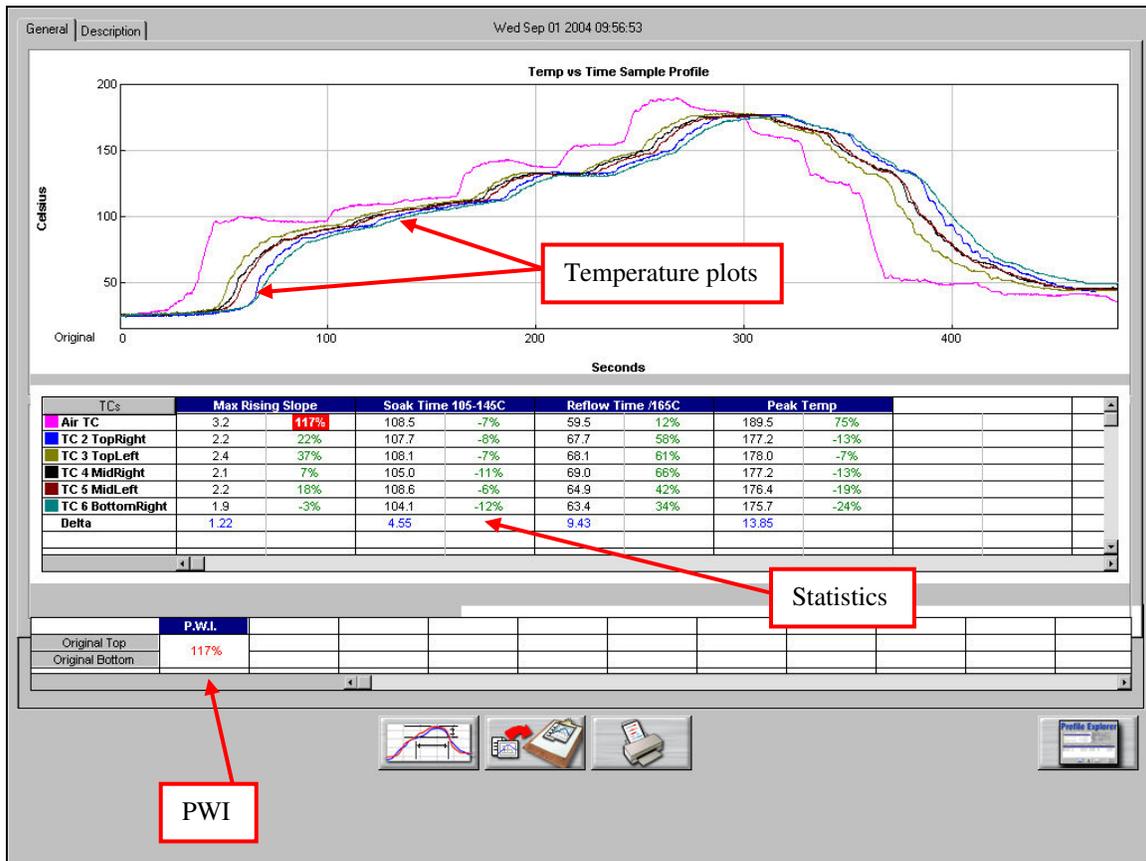
Figure 170: Profile Graph Display – Time vs. Temperature

The *Profile* screen-*General* Tab displays the product name, and profile start time at the top of the screen. The profile, profile statistics and PWI are also displayed. See Figure 170.

Profile View – To maximize the profile display, double click inside the profile graph area. The profile graph will change and be displayed in a full screen format. Double click again to return to normal view.

Statistics View – To maximize the *Statistics* view, double click inside the *Statistics* table area. The *Statistics* will change and be displayed in a full screen format. Double click again to return to normal view.

Description tab

The *Description* tab contains a text area that displays a description of the profile should you wish to enter any. See Figure 171.

This text is the same text that you can enter in the *Select Product* screen at the beginning of the *Run Profile Routine*.

This text is also displayed in the *Profile Explorer* view for each profile.
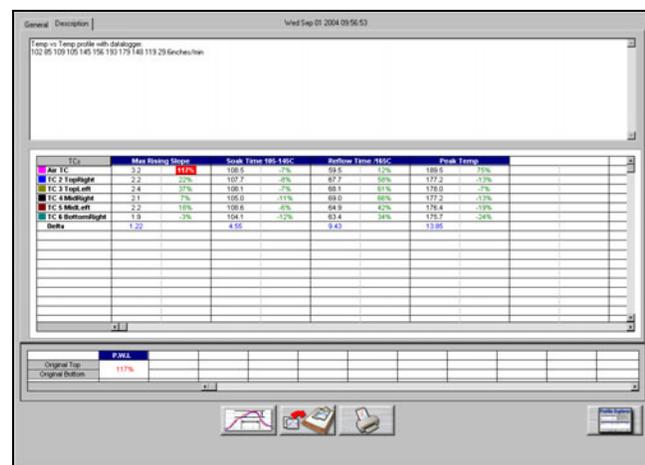
Figure 171: Description Tab – Time vs. Temperature

Graph Controller

The *Graph Controller* allows you to modify the view of the *KIC 2000*-profile graph. To open the *Graph Controller*, Left-click on the *TC* column header in the *Statistics* table or Double-Left-click, anywhere just outside the profile graph. See Figure 172.

Auto Scale

The *Auto Scale* feature will automatically adjust the X, and Y axis scales to fit all of the data in the profile graph. When the *Auto Scale* feature is disabled, you must manually input the minimum and maximum scale settings for the X, and Y axis scale of the profile graph.

Selecting Thermocouples to View

The *TC's* section is a list of the thermocouples used for the profile. By selecting *All* you are selecting that all the thermocouples used for the original profile will be displayed on the profile graph. In the event that you wish to view the profile without a particular or multiple thermocouples, you can deselect individual thermocouples, or deselect the *All* check box, and choose only the thermocouples you wish to view.

Deselecting Thermocouples

If a thermocouple has become disconnected during the profile, the profile results (*PWI*) may be affected to due

Figure 172: Graph Controller – Time vs. Temperature

above normal peak temperatures and such. This situation may cause the profile *PWI* value to be artificially inflated due to bad data. In the event a single or multiple thermocouples become disconnected from the product during the profile, you can deselect the affected thermocouple(s). The *KIC 2000* software will recalculate the *PWI*, and update the profile *Statistics* based on the remaining thermocouples selected. You must select at least one product thermocouple.

Grid – Enables/disables the view of the X, and Y-Axis scales.

Reference Lines – Enables the view of *Reference Lines* displayed on the profile graph. These lines represent any temperatures referenced in the selected *Process Window*.

Zone Lines – Enables the view for the oven zone lines on the profile graph.

Zero Decimal – When viewing the *Pointer* tool, this setting enables or disables the decimal display. When unchecked, the software will display one decimal point.

Internal Temp – Enables the view of the *KIC profiler's* internal temperature profile plot on the graph.
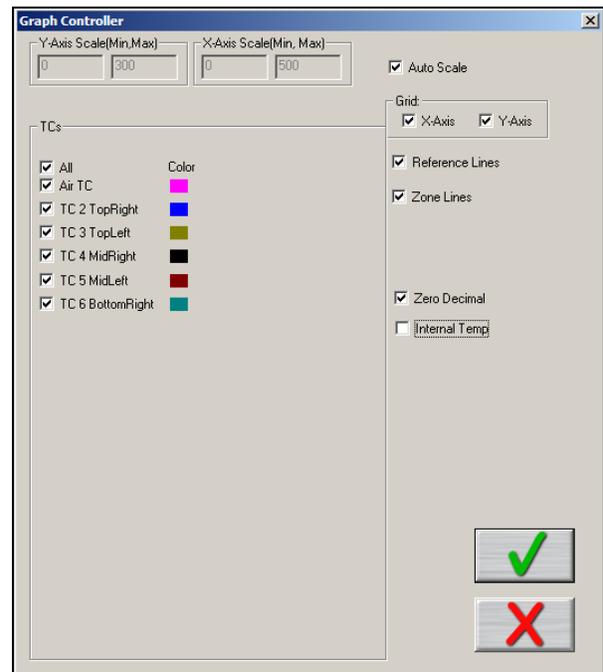
Graph Option Menu

To view the Graph Option Menu, right-click anywhere within the profile graph area. See Figure 173.

Figure 173: Graph Option Menu

Examine Line

The Examine Line feature displays the temperature for the location of the pointer on the profile graph. See Figure 174.

Wherever the pointer is moved across the profile, the following data will be displayed:

- The first column is the actual temperature for each TC.

- The second column is the temperature of the predicted profile data – based on set point or belt speed changes.

- The Delta T for both actual and predicted TC data.

- The time during the profile at which the pointer is placed

Figure 174: Examine Line

Automatic Calculation of Delta T + Delta (or range) for all Stats

The software will automatically calculate, and display in the statistical chart, the Delta for both the original and predicted profile data for all *TC's* for all *Statistics*. See Figure 174. This is the range of the highest to the lowest value for any given specification. This information is strictly being displayed and is not factored in to the *PWI* value and is not used in *the Navigator or Auto-focus* calculations.

Move TC Line

The *Move TC Line* feature allows the user to manually move the thermocouple plot on the profile graph. This is used to fine tune the profile or make corrections in the event the *KIC 2000* software did not properly display the plot. See Figure 175. .

Select the thermocouple you wish to move and then click and drag the highlighted plot and move it to the desired location on the profile graph.   See Figure 176.
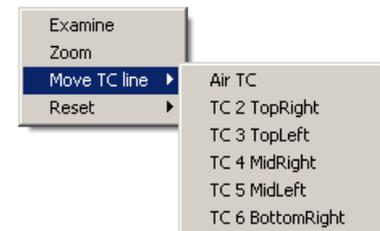
Figure 175: Move TC Line
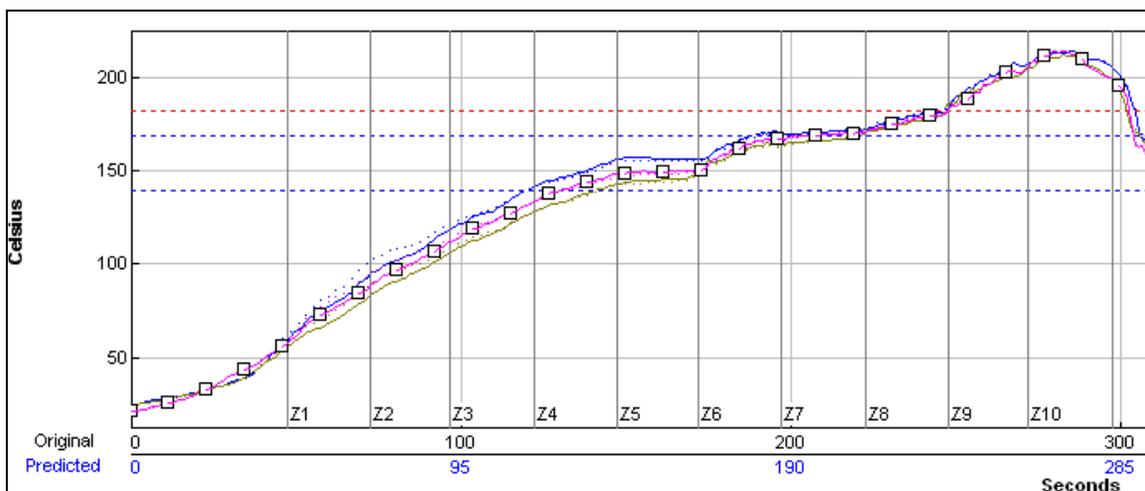
Figure 176: Move TC Line

Reset

The *Reset* feature will reset the profile and undo any changes you have made to the graph using the *Graph Option Menu*. Select the *TC Line,* or *Zone Line* option. See Figure 177.

Figure 177: Reset

Profile Screen Buttons
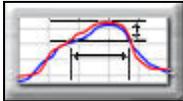
There are four buttons at the bottom of the profile screen.

 Edit/Define Process Window – Choose this button to either view or edit the process specification(s) for the product used in this profile.

 Copy to clipboard – Choose this button to copy the profile data to the windows clipboard. You can then paste the data to a different application.

 Print – Choose this button to print a copy of the profile that is currently on your screen.

 Main Menu– When finished viewing or analyzing the profile select this button to either run another profile with this product or return to the *KIC 2000* main menu. You will be returned to the *Profile Explorer* if the profile was opened from there.

Exiting the profile screen

Saving changes to the profile

Any changes to the *Description Notes* or the *Process Window* can be saved with the profile. This will permanently update this profile with the changes. Changes to the *Process Window* saved here only, save the changes with the profile. To save the changes to *Process Window* file see next dialog box. See Figure 178.

Figure 178

Saving changes to the *Process Window*

If you have made changes to the *Process Window* while viewing a profile you can save these changes when you exit the *Profile* screen. The *Process Window* will permanently have these changes whenever it is used to profile from this point forward. See Figure 179.

The *KIC 2000* software will take you to the *Edit Process Window* screen in order to save the changes that you have made.

Figure 179

These 2 messages will only appear if changes have been made while viewing the profile.

KIC Profilers

SlimKIC 2000

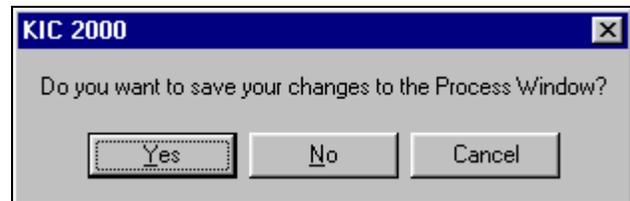The **SlimKIC 2000** is a real-time solder reflow process setup and optimization tool. The *SlimKIC 2000's* configuration guarantees a perfect profile every time by both transmitting data in real-time as it passes through the process and simultaneously recording the data internally. When the *SlimKIC 2000* profiler has completed its run through the process, the internally logged profile is automatically wirelessly downloaded, filling in any gaps that may have occurred due to broken transmission of the real-time profile. The wireless download feature ensures that every profile run is a good one, and that it will never be necessary to hold up production to run a second profile.

SlimKIC 2000 Specifications

System Accuracy:	±1.2°C (±2°F)
Resolution:	Variable 0.3°C to 0.1°C
Internal Operating Temp:	0°C to 105°C
Thermocouple Compatibility:	Type K, 9 or 12 TCs
Temperature Range:	-150°C to 1050°C
Computer Compatibility:	PC
Power Requirements:	9V Alkaline battery
Operating Frequency:	433.92 MHz
Dimensions (L x W x H mm):	Varies depending upon model and shield

Table 4

SlimKIC 2000 Maximum Internal Temperature is 105°C

Removing the SlimKIC 2000 cover
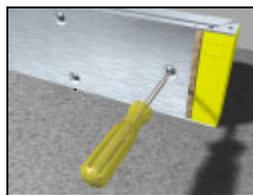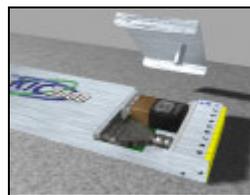
Figure 180   Figure 181

To remove the *SlimKIC 2000* cover or change the battery you will have to first unscrew the battery cover from the bottom side of the *SlimKIC 2000*. This will require a small Flathead screwdriver. The screw has a retaining clip to keep it in place so it will not come all the way out. Just loosen it enough so the cover comes free. Remove the battery cover. See Figure 180 and Figure 181.

Locate the retention slots on the side of the *SlimKIC 2000* cover. To remove the *SlimKIC 2000* cover you will need to apply equal pressure to 2 of the retention springs on the same side, and then pull up on the cover slightly. Do the same for the other side retention springs. Once both sides have been lifted slightly, you should be able to remove the cover easily.

You can use a small Flathead screwdriver to assist this procedure.

Inside the SlimKIC 2000
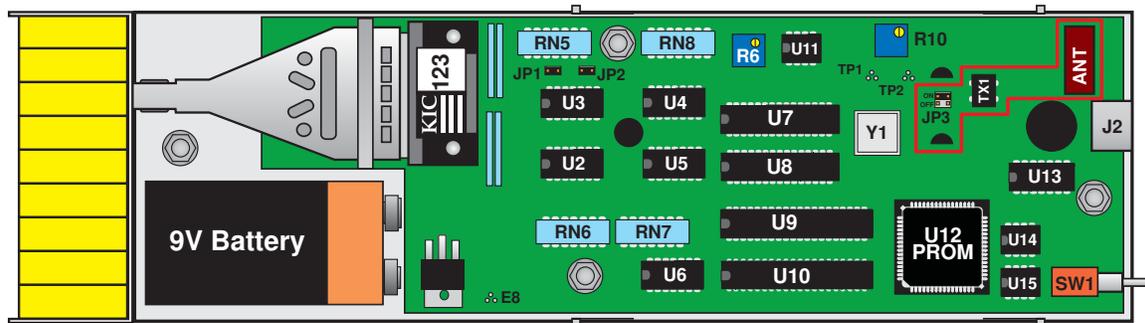
Figure 182: SlimKIC 2000 Internal view

Serial Number Location

The *SlimKIC 2000* serial number label is located on the main connector block (J1). The *SlimKIC 2000* shield must be removed I order to view the serial number. See Figure 182.

Internal Components

J2   This is the 8 pin download/communication port located at the rear of the *SlimKIC 2000*.

P1   This is the main power connector. This connector fits a 9-Volt battery.

R10   This is the CALIBRATE potentiometer, and is the only adjustment on the *SlimKIC 2000* used for calibrating the unit.

R6   This is the MAX TEMP Potentiometer. This is used to increase or decrease the upper range of temperatures that the *SlimKIC 2000* can read.

SW1   This is the On/Off toggle switch.

U12   This is the socket that holds the *SlimKIC 2000* - EPROM. The EPROM version can change, check with KIC regularly to ensure you have the latest version firmware in your *SlimKIC 2000*.

Transmitter models include

JP3   This 2 position jumper enables or disables the RF transmission capability.

TX1   This is the transmitter and facilitates the RF transmission capability.

ANT   This is the antenna connector. Normally the *KIC 2000* does not use an antenna. In some cases an antenna can be added to improve the transmission strength.

SlimKIC 2000 calibration

Before calibration, connect the *SlimKIC 2000* Profiler directly to the PC using the *SlimKIC 2000* Direct Connect cable.

The *SlimKIC 2000 Thermal Profiler* is connected to a computer COM port using the direct connect cable for the purpose of setting up the *SlimKIC 2000*, downloading logged data, collecting data in real-time, or calibration. See Figure 183.

Figure 183: *SlimKIC 2000* direct connect to PC

SlimKIC 2000 Calibration Procedure

The suggested calibration frequency cycle for the *SlimKIC 2000* is 12 months. To calibrate the *SlimKIC 2000* you will need a thermocouple simulator.

Perform the following steps to properly calibrate the SlimKIC 2000 within ±1.2°C (±2.0°F):
* Let the *SlimKIC 2000* stand for at least 30 minutes, with its power on, in a constant ambient environment free of drafts.
* Turn on the computer and start the *KIC 2000* or *KIC 24/7* software.
* Connect the *SlimKIC 2000* to the computer with the direct connect cable.
* On the *KIC 2000* or *KIC 24/7* software's main screen, choose the *Hardware status* button. The *KIC 2000* or *KIC 24/7* software will display the temperatures for each thermocouple connected.
* Connect the thermocouple simulator to the TC1 (Air TC) position on the *SlimKIC 2000*.
* Set the thermocouple simulator to the maximum temperature you expect to read in your oven. Observe the display of Product TC #1's (Air TC) temperature on the screen. This display should update rapidly.
* Adjust the Calibrate potentiometer very slowly until this *Maximum Temperature* is correct.
* Set the thermocouple simulator to below room temperature (40°F ~ 65°F).
* Adjust the Calibration potentiometer very slowly until this low temperature is correct.
* Repeat these steps until both temperatures are reading correctly.
  When both temperatures are reading correctly, the SlimKIC 2000 is calibrated.

KIC offers calibration services for all KIC hardware. Contact Technical Support for details. tech@kicmail.com.

Setting the SlimKIC 2000 Maximum Temperature

The *Maximum Temperature* setting for the *SlimKIC 2000* refers to the highest temperature that the *SlimKIC 2000* is set to read. When you received your *SlimKIC 2000*, it was preset for 932°F (500°C) as the M*aximum Temperature*. It can be changed. The highest temperature that the *SlimKIC 2000* is capable of reading is 1050°C.

TIP: If you exceed this temperature while running a profile, your TC inputs will read OVR (over-range). If this happens to you, the first thing to suspect is that the Maximum Temperature setting for your SlimKIC 2000 is not set high enough for the temperature application you're attempting to measure.

Follow these steps to change the *SlimKIC 2000 Maximum Temperature*.

* Turn on the computer and start the *KIC 2000* or *KIC 24/7* software.
* Connect your *SlimKIC 2000* to the computer via the direct connect communication cable.
* Turn on your *SlimKIC 2000*.
* Observe the *Hardware Status* screen. The number that you'll be calibrating is the *Max Temp Capability* in the *SlimKIC 2000* section.
* Remove the cover of the *SlimKIC 2000*, using a small screwdriver adjust the *Max Temp* potentiometer very slowly until the desired maximum temperature is achieved.
  * Turn Clockwise to decrease the *Maximum Temperature*.
  * Turn Counterclockwise to increase the *Maximum Temperature.*

KIC Explorer

The *KIC Explorer* is a new generation of thermal profilers featuring an impressively compact design. It will easily move through restrictive process dimensions you encounter in today's thermal applications. The *KIC Explorer* incorporates state-of-the-art SMT technology and high-temperature rated components, backed by our distinguished reputation for reliability. You can depend on this rugged, innovative hardware to endure the harsh conditions of real-world factory use

Models

12 Channel Model- As a standard feature, the *KIC Explorer* has 12 thermocouples to meet the most demanding data requirements. The 12 channel *KIC Explorer* model has the smallest form factor of the *KIC Explorer* product line.

7 and 9 Channel Models - If you prefer to use standard Type-K thermocouples, the *KIC Explorer* is available with standard Type-K thermocouple connectors with either 7 or 9 thermocouple models.

Kit Contents

Part Description	KIC Part Number
KIC Explorer Transmitter or Data logger (7, 9 or 12 channel)	KE-4- 07 (09) (12)
KIC Explorer Base Station RF Transceiver and antenna (RF models only)	REKE-9 (4)
KIC Explorer Antenna (RF Models only)	KE-MISC-4-ANT
USB Communication Cable	CB-KE-DWNLD-06
USB Extension cable 6ft (RF models Only) (RF models only)	CBKE-06EXT
Thermal Shield, Stainless Steel, Cool Touch	TS-KE-SS-PYR-07 (09) (12)
Thermocouples, set of 7, 9 or 12	TC-TKM-07 (09) (12)
Aluminum Tape and Hi-temp Solder for attaching Thermocouples	TAPE
KIC 2000 software with KIC 2000 User Manual	SW-KIC 2000
Optional Software key (Example: Navigator , Auto-Focus, or Power)	

Table 5

Specifications

System Accuracy:	±1.2°C
Internal Resolution:	±0.04°C
Internal Operating Temp:	0°C to 85°C
Measurement Range:	-150°C to 1050°C
Sample Rate:	0.1 to 10 per second
Storage Capacity:	
7-Channel Model:	131,040 samples
9-Channel Model:	168,480 samples
12-Channel Model:	224,640 samples
PC Connection:	USB 2.0 (Std-A/Mini-B)
Power Requirements:	(3) AAA batteries, 5.0 – 3.4V
Radio Frequency (RF):	433.92 MHz
Thermocouple Compatibility:	
7-Channel Model:	Type K, Standard
9-Channel Model:	Type K, Standard
12-Channel Model:	Type K, Mini-TC
Dimensions (L x W x H mm):	
7-Channel Model:	200.0 x 60.0 x 17.0
9-Channel Model:	196.0 x 75.0 x 17.0
12-Channel Model:	178.0 x 60.0 x 14.0

Table 6

KIC Explorer Maximum Internal Temperature is 85°C. Always use the provided thermal shield to protect the KIC Explorer from heat damage.
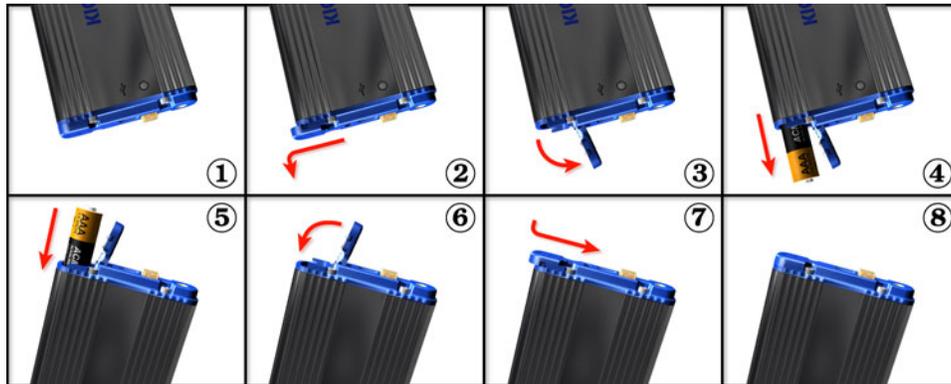
Installing/changing Batteries

Figure 184: KIC Explorer Battery install/replacement

The *KIC Explorer* uses 3 AAA sized batteries that can be easily changed by the user. *KIC* recommends the use of standard alkaline batteries; however you can use other types including rechargeable batteries.

If you experience negative effects using other types of batteries or discover your *KIC Explorer* is not operating properly then switch back to standard alkaline batteries. If problems persist, contact *KIC* Technical Support: tech@kicmail.com.

Battery Voltages

The *KIC 2000* software has a built-in battery monitor. The software will automatically recognize if your battery voltage is too low to complete at profile. When the battery voltages drop below 3.5V, the *KIC 2000* software will not allow you to start a profile until you have replaced the batteries in the *KIC Explorer*

Battery Life

The *KIC Explorer* is very efficient on battery usage. Independent tests show that a standard set of alkaline batteries will last more than 20 hours while operating at room temperature. Operating temperatures can affect battery performance.

Batteries and Temperature

The *KIC Explorer* is designed to pass through ovens that will cause the batteries inside the *KIC Explorer* to heat up. Since the batteries have a high heat capacity they will tend to continue to heat even after the *KIC Explorer* has exited the oven.

Even if the *KIC Explorer* has cooled sufficiently to allow you to run another profile, the battery may not have cooled down as low as the *KIC Explorer*.

In the event the *KIC Explorer* batteries become heated during use and you wish to run another profile, *KIC* suggests substituting a different (room temperature) cooler set of batteries before the next profile is run. This will allow you to run more frequent profiles without the chance of overheating the batteries or the *KIC Explorer*.

Note:
- High temperature thermal profiles can cause the battery packaging to un-wrap. This is normal and should be monitored to ensure the batteries condition is intact and operational before each use.

- In the event the batteries become heat damaged or corrosive, replace them immediately. Failing to do so can lead to *KIC Explorer* damage and or personal injury.

Power On/Off

Power On – Press/hold the Amber colored On/Off button for 1 second (located at the back of the *KIC Explorer*). When power in on, the LED indicators will power on. The LED color/pattern will represent the current *KIC Explorer* hardware state/status. See Figure 185.

Power Off – Press/hold the Amber colored On/Off button for 1 second (located at the back of the *KIC Explorer*). See Figure 185. When the power is turned off, the LED indicators will be off.
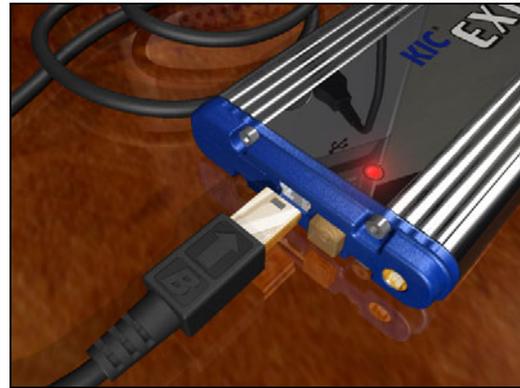

Figure 185

LED Indicators

The *KIC Explorer* has 2 LED indicators, 1-Red and 1-Green, and can be viewed by looking at the top of the *KIC Explorer* near the On/Off button. See Figure 185. The *KIC Explorer* LED indicators will indicate the current state/status of the *KIC Explorer*. See Table 7.

KIC Explorer State/Status	LED Indicators
Initialization (Power up)	**Red and Green On** (On for 2 seconds)
State 1 - Resetting or TC(s) above profile start temp.	**Red ON**
State 2 - Ready to profile (Start Trigger)	**Red Flashing**
State 3 - (Mid Trigger) , **4** - (Stop Trigger), **6** - (manual mode)	**Green Flashing** (profile in progress)
State 8 - (End of Profile)	**Green and Red Flash**
State 5 - (Idle)	**Green On**
Flashing Firmware	**Green and Red On**

Table 7: KIC Explorer LED Indicator Reference Table

12 Channel Model- Mini-TC Harness

The 12 channel *KIC Explorer* uses a thermocouple connector design called the *Mini-TC Harness*. The *Mini-TC Harness* is a 3-thermocouple harness in a very small connector. The size of these *Mini-TC* connectors allows the *KIC Explorer* to utilize 12 thermocouple inputs and keep the smallest product dimensions of the entire *KIC Explorer* product line.

The 12-channel *KIC Explorer model has Mini-TC Harness* ports. Each port facilitates three separate thermocouples.

Connecting the Mini-TC's
3. Align the *Mini-TC Harness* with the *Mini-TC* port. See Figure 186.
4. Slide the *Mini-TC Harness* into the *Mini-TC* port. See Figure 187.
5. When fully seated, the *Mini-TC Harness* will lightly click into position. See Figure 188.

Figure 186 Connect Mini-TC Step #1	Figure 187 Connect Mini-TC Step #2	Figure 188 Connect Mini-TC Step #3

Note: During use and during the calibration procedure, the 12 channel *KIC Explorer* models must remain inside their thermal shield in order to maintain accurate temperature readings. There are no exceptions.

Mini-TC Temperature ratings
Mini-TC harness assemblies are available in two different temperature ratings, *Low-Temperature*, and *Medium-Temperature*.

- *Low-Temperature* Mini-TC's – Teflon, double insulation, 30-gauge wire, for use up to 300ºC. (*Low temperature* Mini-TC's are not standard and are not included with the standard *KIC Explorer* kit.)

- *Medium-Temperature* Mini-TC's – Glass, double insulation, 30-gauge wire, for use up to 400ºC.

If you have any questions about Mini-TC temperature ratings contact KIC Technical Support; tech@kicmail.com.

Mini-TC Lengths

Due to the color of the wire used to manufacture the medium temperature *Mini-TC* Harness it can be difficult to identify the individual thermocouple wires. For ease of use each *KIC Explorer Mini-TC* Harness will have 3 different lengths of wire. The longest wire is always the first thermocouple in the group. The second longest is the 2nd thermocouple in the group. The shortest wire is always the 3rd thermocouple in the group. See Table 8 and Table 9.

Mini-TC harnesses are available in different lengths ranging from 18" to 36" in 6" increments. Standard *KIC Explorer* units' ship with the Mini-TC "Sample" set that includes multiple length thermocouples, a sample of each length offered by *KIC*. See Table 8. If a specific length wire is required, they can be ordered with the *KIC Explorer* at the time of purchase or ordered separately.

Sample Set, Mini-TC (Qty 4)										
18"	TC Position		24"	TC Position		30"	TC Position		36"	TC Position
TC #1	18"		TC #1	24"		TC #1	30"		TC #1	36"
TC #2	17"		TC #2	23"		TC #2	29"		TC #2	34"
TC #3	16"		TC #3	22"		TC #3	28"		TC #3	32"

Table 8

18" Mini-TC Set (Qty 4)			24" Mini-TC Set (Qty 4)	
Part Number: TC-TKM-MINI-0418			Part Number: TC-TKM-MINI-0424	
TC #1	18"		TC #1	24"
TC #2	17"		TC #2	23"
TC #3	16"		TC #3	22"
30" Mini-TC Set (Qty 4)			36" Mini-TC Set (Qty 4)	
Part Number: TC-TKM-MINI-0430			Part Number: TC-TKM-MINI-0436	
TC #1	30"		TC #1	36"
TC #2	29"		TC #2	34"
TC #3	28"		TC #3	32"

Table 9

Which Mini-TC do I need for my application?

To determine the length of *Mini-TC*'s needed for a particular product the user will measure their products length, and then add the distance of 12" (min. distance between *KIC* profiler and product), and then add 1" for the *Air TC* position.

Example:
6" (Product Length) + 12"
= 18" + 1" (for Air TC)
= 19"

Use the table to the Right to determine the correct Mini-TC length. See Table 10.

Mini-TC Harness Matrix		
Product Length	Min Length of TC wire needed	KIC Mini-TC
4"	17"	18"
6"	19"	24"
8"	21"	24"
10"	23"	24"
12"	25"	30"
14"	27"	30"
16"	29"	30"
18"	31"	26"

Table 10

If you have any question regarding *Mini-TC* length or are unsure what length to order, contact *KIC* Technical Support, tech@kicmail.com.

Wireless Communication

Base Station

The *KIC Explorer Base Station* is part of the optional *RF* hardware. The *Base Station* facilitates the 2-way *wireless* communication between the *KIC Explorer* and the computer running the *KIC 2000* software. See Figure 189.

The *Base Station* connects to a USB port See Figure 190. The three Base Station LED's lights will only light up while the *KIC 2000* software is open, or during a profile depending on the events that are transpiring.

Figure 189: KIC Explorer Base Station

> ***Base Station LED Indicators***
> **Red = Data received from KIC Explorer**
> **Green = A wireless signal is detected**
> **Orange = Data Sent from Base Station to KIC Explorer**

Base Station Antenna

The *KIC Explorer Base Station* antenna is a screw on connector. Connect the Base Station antenna to the Base Station as seen in Figure 191. Make sure the antenna connector is fully seated, tools should not be necessary.

For convenience, a 6'-USB port extension cable is included with your *KIC Explorer* so that you can adjust the position of the *Base Station* to find a more suitable location if needed in order to view the *Base Station* LEDs during normal operation. Use the provided Velcro® to secure the *Base Station* and attach the *Base Station* antenna to the oven.

Figure 190

The orientation of the *Base Station* antenna will affect the wireless capability of the *KIC Explorer*. Since every different location has different RF levels, *KIC* cannot recommend a particular position that will yield the best wireless results. Generally, the closer you can position the *Base Station* antenna to the tunnel opening, the better the reception will be.

In most cases, you can simply connect the *Base Station* with antenna to a USB port and be ready to profile trouble free. In some situations you must adjust the *Base Station* antenna location or position for improved or for acceptable performance.

Base Station Antenna Usage Tips

Figure 191

1. The *Base Station* antenna cannot be placed directly on a metal surface. Use the provided Velcro® to attach the antenna to the oven.
2. The *Base Station* antenna should be placed at least 2.5 feet above the ground.
3. Place the *Base Station* antenna close to the tunnel opening.
4. Multiple Base Stations – When multiple *Base Stations* are used in the same vicinity make sure the *KIC 2000* software is not open/running on those computers. If the *KIC 200*0 software is open/running the *Base Station* connected to that computer will interfere with the wireless operations of nearby *KIC Explorers*.

KIC Explorer Antenna

The *KIC Explorer* antenna is required when utilizing your *KIC Explorer* in *Wireless* Mode. Without it the *KIC Explorer* can not communicate wirelessly with the *KIC 2000* software.

The *KIC Explorer* Antenna connects to the antenna port on the *KIC Explorer*. The antenna presses easily into place. See Figure 192.

Figure 192: KIC Explorer Antenna

Enabling the KIC Explorer Wireless Function

If you have purchased a *KIC Explorer Wireless Upgrade Kit*, or need to switch the *KIC Explorer* from data log to Wireless mode you must follow these steps in order to configure your *KIC Explorer*, *Base Station* and *KIC 2000 software* for wireless use.

1. Install the *KIC 2000* software version 2.4.0.5 or higher. It is recommended to install the software to the same working directory as your current *KIC 2000 software*. The *KIC 2000* software will be updated, but the existing profile data and configuration files will not.

2. Connect the *KIC Explorer* to the computer using the USB communication cable and then power on the *KIC Explorer*.

3. Open the *KIC Profiler Hardware Utility* software. The *KIC Profiler Hardware Utility*. Can be found at: C:\KIC Profiler 2000\KE Utility\KEUtily.exe.

Follow the directions below to upgrade your *KIC Explorer* firmware to version 72 or higher. If your *KIC Explorer* already has Firmware version 72 or higher you can skip step #3 and move directly to step #4.

In order to view the current firmware version of your *KIC Explorer* profiler you will need to connect your *KIC Explorer* to the computer via the USB communication cable and launch the *KIC Profiler Hardware Utility* and then select the *Firmware Upgrade* tab to view the current Firmware version. See Figure 193. Also see details below.

Note: The USB communication cable is required for
- Flash updating or "Flashing" the KIC Explorer
- Switching operating modes (Data log – Wireless, Wireless – Data log)

Flashing (Updating) the KIC Explorer Using the KIC Profiler Hardware Utility

KIC Explorer Device -If your KIC Explorer is on and connected the KIC Profiler Hardware Utility will display the KIC Explorer Device name. If the Device field is blank then no device is detected. Select the Refresh button to refresh the Device field. See Figure 193.

API Version – Displays the current API version. *KIC Explorer* background communication utility.

Current Firmware Version – Displays the current firmware version for the *KIC Explorer* that is currently connected to the computer.

KIC Explorer Firmware Image File – Displays the selected firmware flash file. Select the B*rowse* button to search for the file.

Start Firmware Upgrade – This button starts the firmware upgrade.

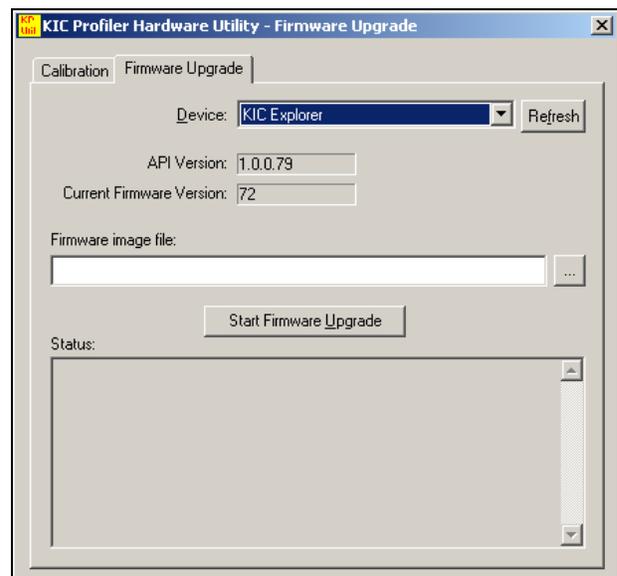**Status** – Displays the current *KIC Explorer* status once the flash process has begun.

Figure 193: Hardware Utility – Firmware Upgrade

Flash Update

Follow these steps to flash your KIC Explorer:

1. Make sure your *KIC Explorer* is on and connected to the computers USB port using the USB communication cable.

2. Open the *KIC Profiler Hardware Utility* software program or if already open select the Refresh button. See Figure 193.

3. Type the name of the firmware file or select the *Browse* button to locate the file. See Figure 194.

When you have selected the firmware file it will be displayed in the *KIC Explorer Firmware Image File* field. See Figure 195

4. Select the "Start Firmware Upgrade" button to begin the flash process. See Figure 195

During the flash process the *KIC Explorer* status will be displayed in the *Status* field.
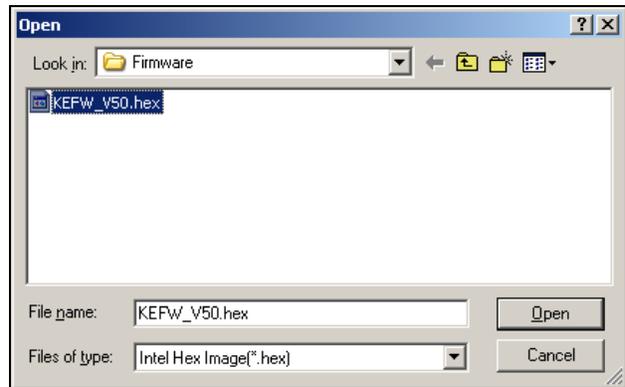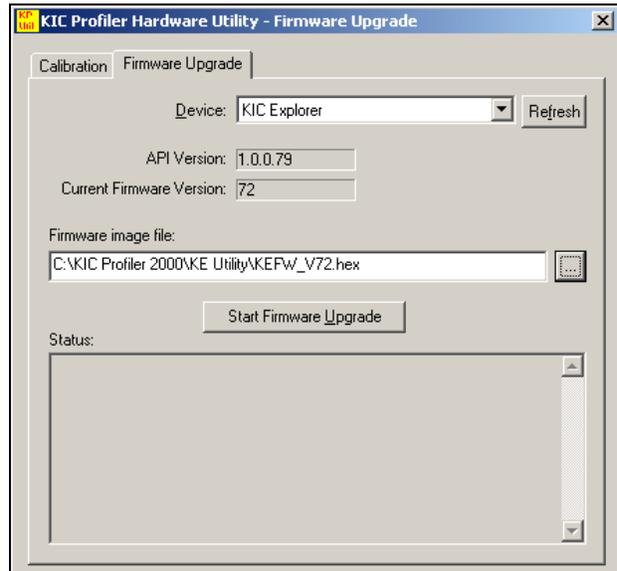
Figure 194: Select firmware file

Figure 195: Start firmware upgrade

When the flash process is finished a *KIC* message will appear letting you know the process in complete and show the previous and new-current firmware versions. Select the "OK" button. See Figure 196

Figure 196: Firmware update complete

This concludes the *KIC Explorer* flash upgrade procedure.

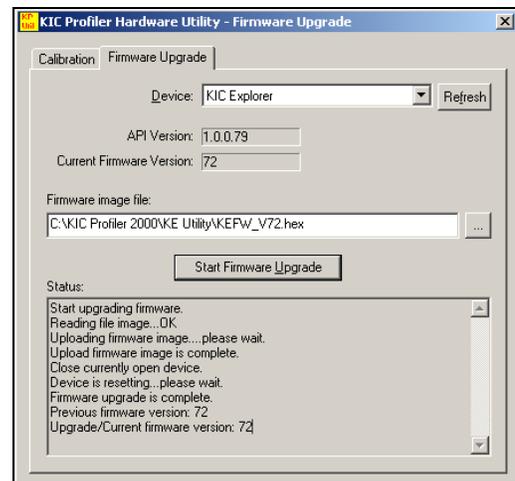

Figure 197: Firmware Update status

Note: Do not disconnect the KIC Explorer USB cable.

5. With the *KIC Explorer* connected to the USB cable and powered on, launch the *KIC 2000* software version 2.4.0.5 or higher.

6. Select the "Global Preferences" button. In the Profiling Hardware section select *KIC Explorer* 7, 9 or 12 channels depending on your model *KIC Explorer*, then select *Transmitter*. When finished select the Green check mark button. See Figure 198.
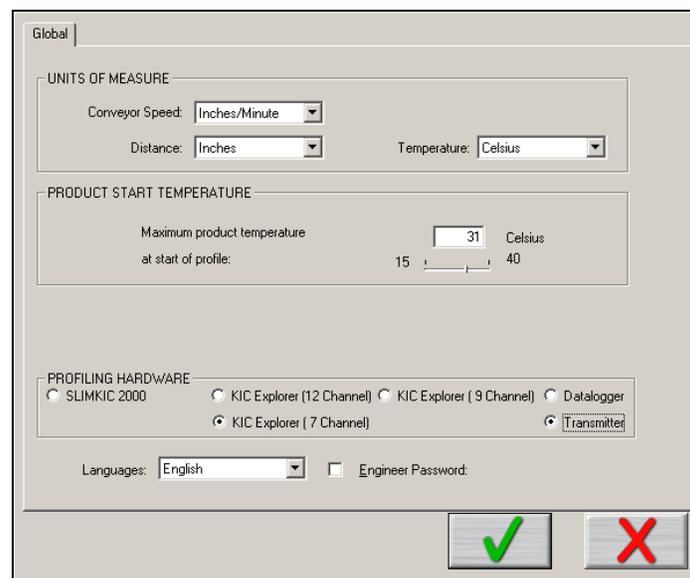

Figure 198: KIC 2000 Global Preferences

7. Close the *KIC 2000* software.
8. Disconnect the *KIC Explorer* USB cable from the computer and *KIC Explorer*.
9. Connect the USB extension cable to the computer then insert the *KIC Explorer Base Station* into the USB port on the computer. Upon connection the Windows "Found new Hardware" wizard will appear and begin stepping you through the sequence of installing the software drivers for the *KIC Explorer Base Station*.

Connecting the Base Station to the Computer

After a successful *KIC 2000* software installation you are ready to connect your *KIC Explorer Base Station* hardware to your computer.

10. Connect the *KIC Explorer Base Station* antenna to the *KIC Explorer Base Station*. See Figure 199.

11. Connect the *KIC Explorer Base Station* to your computers USB port.

The three LED's will only light up while the *KIC 2000* software is open and the *KIC Explorer* is powered on.

12. When you connect the *KIC Explorer Base Station*, Windows will recognize the USB device and the "Found New Hardware Wizard" will appear. Select the "Install the software automatically (recommended) option then select the "Next" button. See Figure 200

Note: The "Found New Hardware Wizard" USB driver installation will run each time a unique KIC Explorer or KIC Explorer Base Station is connected to your computers USB port(s).

13. Next, Windows will prompt you regarding "Windows compatibility". Select the "Continue Anyway" button. See Figure 201

14. Windows will begin installing the *KIC Explorer* USB software drivers. When completed a finished message will appear. Select the "Finish" button. See Figure 202

Figure 199: KIC Explorer Base Station

Figure 200: Windows Found New Hardware Wizard

Figure 201 Windows Hardware Installation Compatibility

Your *KIC Explorer Base Station* USB drivers are now installed and your *KIC Explorer* is ready to communicate wirelessly with the *KIC 2000* software.

Figure 202: Windows Completing Found New Hardware Wizard

15. Turn on power to the *KIC Explorer*, connect the *KIC Explorer* antenna. See Figure 203.

16. Launch the *KIC 2000* software version 2.4.0.5 or higher. The *KIC Explorer Base Station* LED's should begin blinking rapidly.

The three LED's will only light up while the *KIC 2000* software is open, or during a profile depending on the current hardware state of the *KIC Explorer* profiler.

17. Select the "Hardware Status" button to view the live temperature readings from the *KIC Explorer*.

If you followed the instruction correctly, you should see the live temperature display for any TC's connected to the *KIC Explorer* indicating that the wireless signal from the KIC Explorer is being received by the KIC 2000 software. See Figure 204.
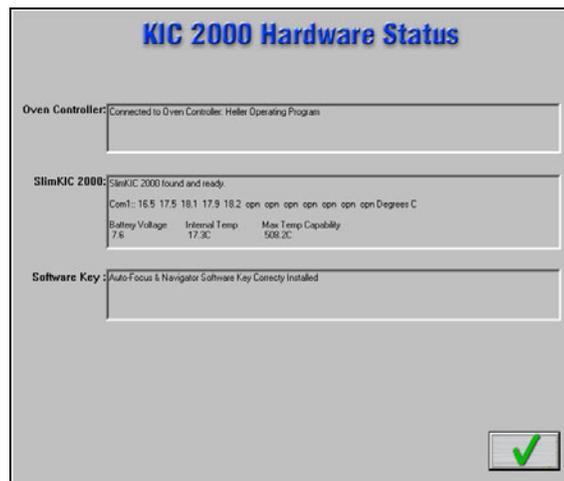

Figure 203: KIC Explorer Antenna

Figure 204: Hardware Status

You are now ready to run wireless profiles with your KIC Explorer profiler.

Trouble shooting – Wireless Communication

If your *KIC Explorer Base Station* LED's are not blinking rapidly, or your *KIC 2000* software is not displaying temperatures please check the following:

1. *KIC Explorer* has fresh batteries and is powered on. Battery level must be greater than 3.39 volts.

2. *KIC Explorer* firmware version = v72 or higher.

3. *KIC Explorer* set to "Transmitter" in "Global Preferences' screen. (Must use USB cable to set. The wireless won't function until set using the USB cable)

4. *KIC Explorer* antenna correctly installed.

5. *KIC 2000* version 2.4.0.5 or higher correctly installed on computer.

6. *KIC Explorer Base Station* antenna correctly installed.

7. USB extension cable-*KIC Explorer Base Station* connection.

8. Multiple Base Stations – When multiple *Base Stations* are used in the same vicinity make sure the *KIC 2000* software is not open/ running on those computers. If the *KIC 2000* software is open/running the *Base Station* connected to that computer will interfere with the wireless operations of nearby *KIC Explorers*.

Thermal Shields

KIC offers 2 models of *KIC Explorer* thermal shields:

- **Cool Touch** – The *Cool Touch-KIC Explorer* thermal shield is standard and is included with all standard *KIC Explorer* profiling kits. The *Cool Touch* shield can be handled without gloves, however gloves are recommended whenever heat is present. The *Cool Touch* thermal shield also allows the *KIC Explorer* longer duration at given temperatures during use.

- **Stainless Steel** – The *Stainless Steel -KIC Explorer* thermal shield is optional accessory for the *KIC Explorer*. The *Stainless Steel* thermal shield has no outer insulation and measures 1/8" lower in Height than the *Cool Touch* shield.

Loading the KIC Explorer into the Thermal Shield

12 Channel -KIC Explorer – Place the *KIC Explorer* into bottom half of the *KIC Explorer* thermal shield.
- The M*ini-TC* harnesses should rest flat on the metal block inside the shield.
- The thermocouple wires should exit from the front of the thermal shield.
- The *KIC Explorer* antenna should extend fully, and exit from the back of the thermal shield. See Figure 205.
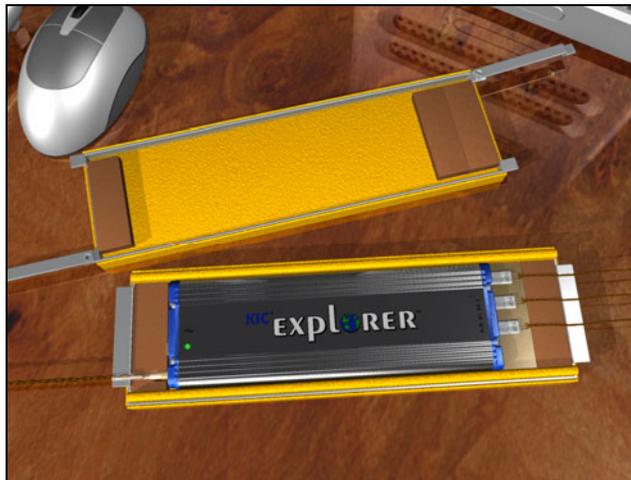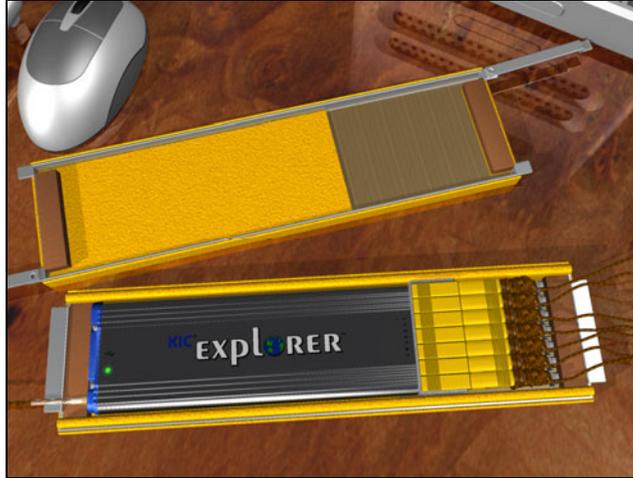

Figure 205: 12-Channel KIC Explorer with Thermal Shield

7 or 9 Channel -KIC Explorer – Place the *KIC Explorer* into bottom half of the *KIC Explorer* thermal shield.
- The thermocouples should rest flat on the bottom of the inside the shield.
- The thermocouple wires should exit from the front of the thermal shield.
- The *KIC Explorer* antenna should extend fully, and exit from the back of the thermal shield. See Figure 206.

Figure 206: 7-Channel KIC Explorer with Thermal Shield

Once the *KIC Explorer* is set inside the bottom half of the thermal shield and the thermocouple wires and antenna are properly routed to the rear of the shield, verify the *KIC Explorer* is on by viewing the LED near the *On/Off* button.

Next place the top-half of the *KIC Explorer* over the bottom half and then swing the latching mechanisms into the closed positions at each end. See Figure 207.
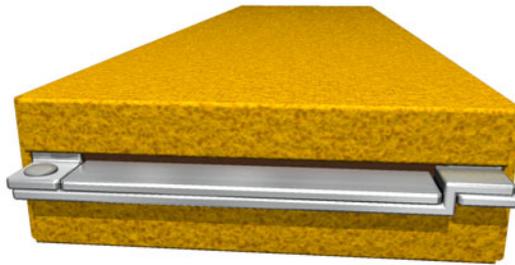

Figure 207: KIC Explorer Thermal Shield Latching Mechanism

Contact *KIC* Technical Support if you need any assistance with your *KIC Explorer*: tech@kicmail.com .

KIC Profiler Hardware Utility

The *KIC Profiler Hardware Utility* is a software program that facilitates calibration of the *KIC Explorer* as well as firmware upgrades.

The *KIC Profiler Hardware Utility* is included in the standard *KIC 2000* software installation. It is located in the folder: `C:\KIC 2000 Profiler\KE Utility`

In order to calibrate or upgrade the firmware make sure your *KIC Explorer* is on and connected to the computers USB port and then open the *KIC Profiler Hardware Utility* software program.

The KIC Utility Calibration Tab
Note: Changes made to the Gain and Offset values within the KIC Profiler Hardware Utility will have a direct affect on all thermocouple readings made by the *KIC Explorer Profiler*.

KIC Explorer Device

Whenever your *KIC Explorer* is on and connected the *KIC Explorer Utility* will display the *KIC* USB device name. If the *KIC Explorer Device* field is blank then no device is detected or the device is not displayed, in which case select the *Refresh* button. See Figure 208.

Note: If you are *KIC Explorer* is not recognized, then make sure the power is on, recheck the cable connections and or *Base Station* connection and verify your USB port is working correctly.

Figure 208: Hardware Utility – Calibration

Note: For calibration of the *KIC Explorer* you can use the USB communication cable or if your *KIC Explorer* is equipped for wireless use you can connect the *KIC Explorer Base Station* and perform the *KIC Explorer* calibration procedure wirelessly.

Select your *KIC Explorer* model – Select 12 *channels, 9 channels*, or *7 channels model*.

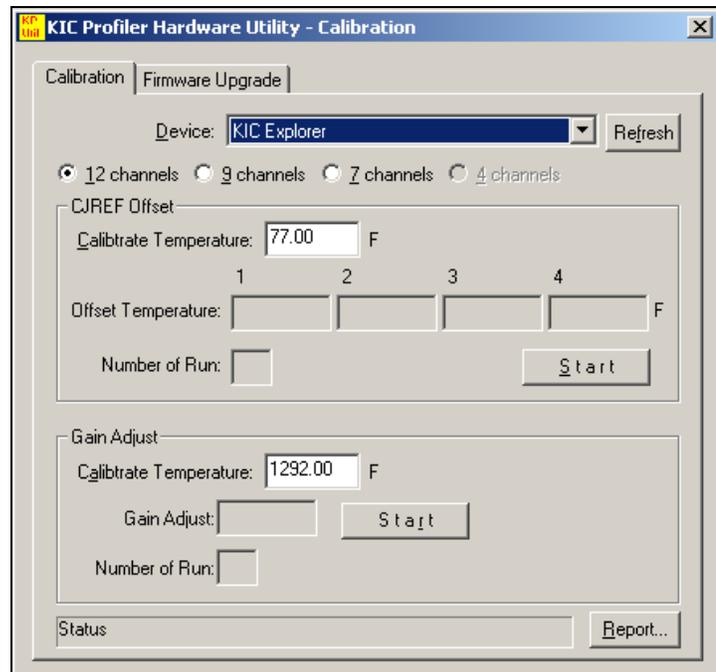*Note: Failure to select the correct model will result in a failed calibration.*

Calibration Status Window

The *Calibration Status* Window displays the log of all *KIC Explorer Utility* events and recorded temperatures during Offset and Gain calibration. See Figure 209.

Figure 209: Hardware Utility – Calibration Status Log

Calibration Status Window Functions

Get Current TC – displays the current thermocouple values for all channels of the *KIC Explorer*. See Figure 210.
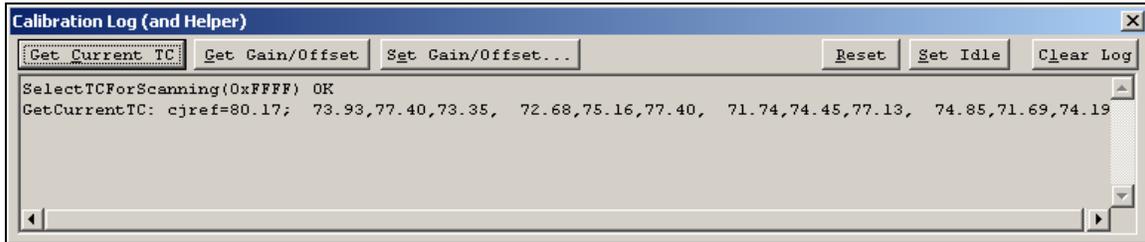

Figure 210: Hardware Utility – Calibration Status Log – Get Current TC

Get Gain/Offset – Displays the currently stored Gain and Offset values for the *KIC Explorer*. See Figure 211.

Figure 211: Hardware Utility – Calibration Status Log – Get Gain/Offset

Set Gain/Offset – Opens the "Set Gain Adjust and Offset Temperatures" Window. This window displays the currently stored Gain/Offset values for the *KIC Explorer*. See Figure 212.

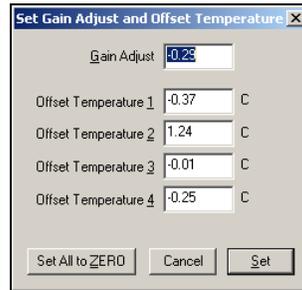

Figure 212
Calibration – Set Gain/Offset

Offset Temperatures #1-4 – Displays the current Gain and Offset values stored in the *KIC Explorer* for each of the 4 thermocouple ports. You can manually change the offset values if needed. See Figure 212.

Note: Changes made to the Gain and Offset values within this window will have a direct affect on all thermocouple readings made by the *KIC Explorer*.

Set All to Zero – Manually set the Gain and all Offset values to zero and closes the "Set Gain Adjust and Offset Temperatures" windows. See Figure 212.

Set – Hard sets the *KIC Explorer* profiler to the currently displayed Gain and Offset values.

Cancel – Cancels all actions and closes the "Set Gain Adjust and Offset Temperatures" window. See Figure 212.

Reset – Clears the *KIC Explorer* data memory and returns the *KIC Explorer* to the "ready to Profile" state.

Set Idle – Stops data collection and sets the *KIC Explorer* to "Idle" state.

KIC Explorer Calibration

KIC Explorer calibration procedure should only be performed by qualified persons. If you need assistance, training, or need to arrange for *KIC* to calibrate your *KIC Explorer* contact *KIC* Technical Support tech@kicmail.com, asia.tech@kicmail.com, europe.tech@kicmail.com.

The *KIC Explorer* has four separate calibrations, one for each of its four thermocouple connector ports. Using the *KIC Explorer Calibration Adapter* is the only way to properly calibrate the *KIC Explorer* profiler. The *KIC Explorer* is electronically calibrated using the *KIC Profiler Hardware Utility*. Do not use an ungrounded computer to calibrate the *KIC Explorer*.

The suggested calibration frequency cycle for the *KIC Explorer* is 12-months.

To calibrate the *KIC Explorer* you will need the following hardware:
- KIC Explorer
- KIC Explorer USB communication cable or Base Station
- KIC Explorer thermal shield
- Type "K" thermocouple simulator
- KIC Explorer Calibration Adapter (7, 9 or 12 channel models).

Software:
- *KIC 2000* v. 2.4.0.5 or higher

The *KIC Profiler Hardware Utility* uses the Fahrenheit temperature scale for its calibration.

Perform the following steps to properly calibrate the *KIC Explorer* within $\pm 2.0°F$ ($\pm 1.2°C$):

1. Make sure your *KIC Explorer* is on and connected to the computers USB port or connect the *KIC Explorer Base Station*.
2. Connect the *KIC Explorer calibration adapter* to the *KIC Explorer* making sure to occupy all of the thermocouple inputs as required. Connect the other end to your type "K" thermocouple simulator's output port.
3. Turn the power to your thermocouple simulator on and set the output value to 77°F.
4. Open the *KIC Profiler Hardware Utility* software program or if already open select the Refresh button. To verify communication between the *KIC Explorer* and the *KIC Profiler Hardware Utility*, select the "get Current TC" button in the *Calibration Status* window. If communicating properly you should see the current live temperatures from the *KIC Explorer*. See Figure 213.
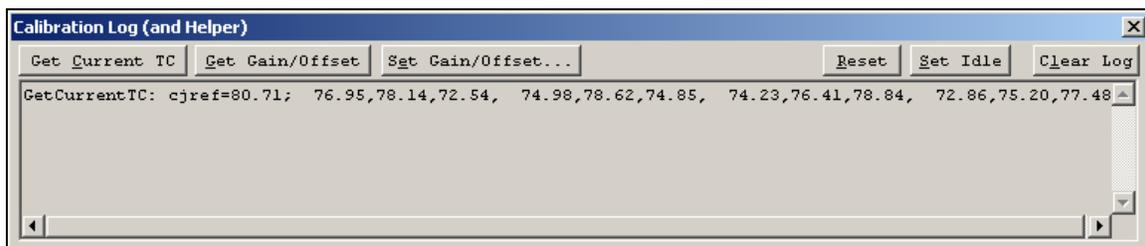

Figure 213: Hardware Utility – Calibration Status Log

CJREF (Cold Junction Reference) Offset

The CJREF Offset is the amount of temperature to add or subtract from the base *KIC Explorer* readings.

KIC recommends setting this value to the same temperature as the *cjref* (Internal) temperature. You can view the *cjref* (Internal) temperature by selecting the "Get Current TC" button.

It is recommended to use the default *Calibration Temperature* value; however you can enter the *Calibration Temperature* value between 50°F and 212°F.

Calibration Temperature – The default *Calibration Temperature* is 77°F.

Whatever the value of the *Calibration Temperature* field, the thermocouple simulator must match exactly.

1. Adjust the thermocouple simulators output to be the same value as the *Calibration Temperature* field.

2. When both the *calibration Temperature* field and the thermocouple simulator output values match, select the *CJREF Offset-Start* button to begin *the KIC Explorer* calibration. See Figure 214.
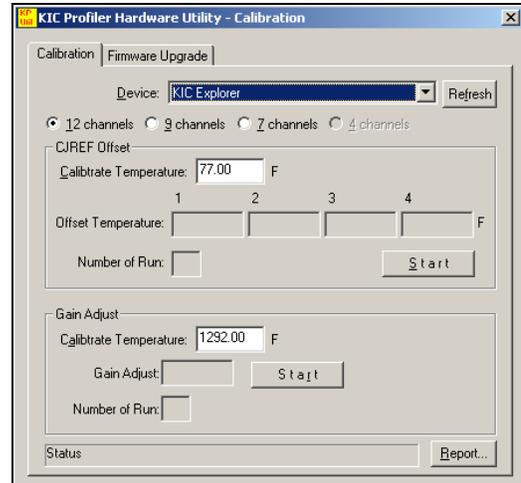

Figure 214

The *KIC Profiler Hardware Utility* will automatically adjust the 4 thermocouple port's calibrations. The calibration for each thermocouple port is separate and differences in Offset values between thermocouple ports are normal.

Note: During this process electronic adjustments are made in order to "tune" the *KIC Explorer* for maximum accuracy at the specified temperature.

When the *KIC Profiler Hardware Utility* has finished the Offset calibration a "CJREF Offset calibration is successfully completed" notice will appear in the Report area at the bottom of the *KIC Profiler Hardware Utility* screen and the *Offset calibration* Log is displayed in the *Calibration Status* window. See Figure 215.
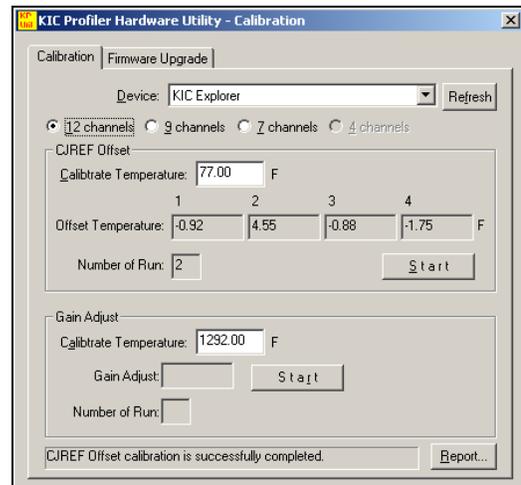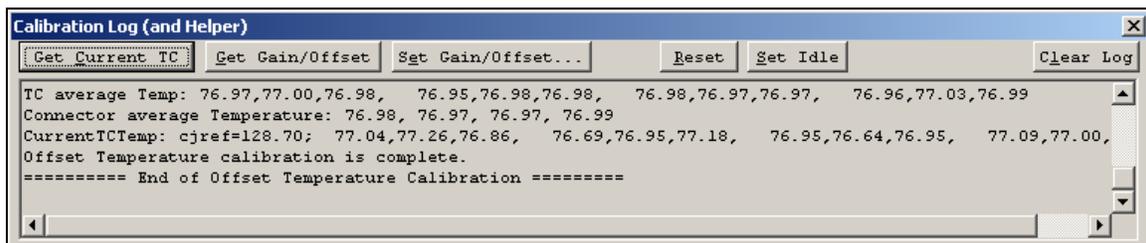

Figure 215

Figure 216

When the "End of Offset Temperature calibration" is displayed in the *Calibration Status* Log window the Offset portion of the *KIC Explorer* calibration procedure is complete. See Figure 216. Next is the Gain Adjust procedure.

Gain Adjust

The Gain Adjust portion of the *KIC Explorer* calibration procedure affects the accuracy of the *KIC Explorer* across its temperature capability range.

For maximum accuracy set the *Gain Adjust* calibration value to the highest temperature you expect to read for your process. It is recommended to use the default calibration temperature; however, you can enter calibration values between -1480°F and -58°F, or between 302°F and 1832°F.

Calibration Temperature – The default *Calibration Temperature* is 1292°F.

1. Whatever the value of the *Calibration Temperature* field, the thermocouple simulator must match exactly. Adjust the thermocouple simulators output to be the same value as the *Calibration Temperature* field.

2. When both the *Calibration Temperature* field and the thermocouple simulator output values match, select the Gain Adjust-Start button to begin the *KIC Explorer* calibration. See Figure 217.
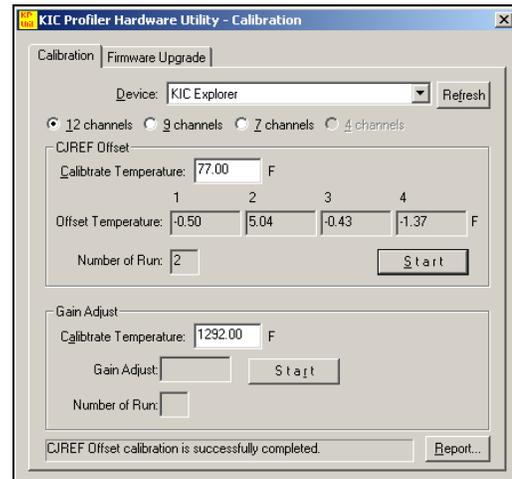

Figure 217

The *KIC Profiler Hardware Utility* will begin to automatically adjust the Gain Adjust setting.

Note: During this process electronic adjustments are made in order to "tune" the *KIC Explorer* for maximum accuracy at the specified temperature.

When the *KIC Profiler Hardware Utility* has finished the Gain Adjust portion, a "Gain Adjust calibration is successfully completed" notice will appear in the Report area at the bottom of the *KIC Explorer Utility* screen and the *Offset calibration* Log is displayed in *the Calibration Status* window. See Figure 218.
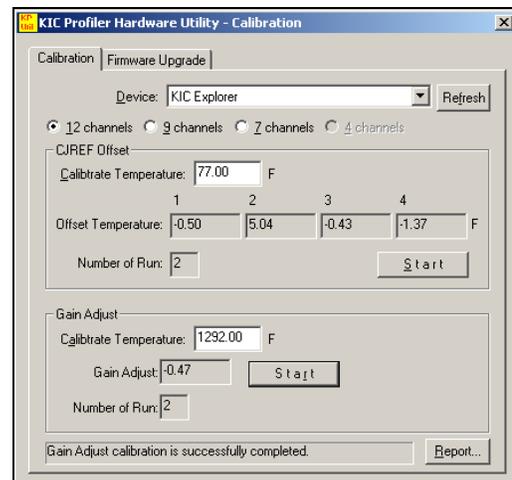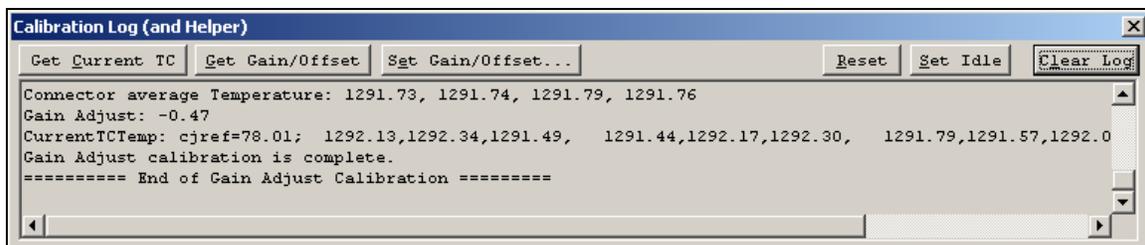

Figure 218

Figure 219

When the "End of Gain Adjust calibration" is displayed in the *Calibration Status* Log window the Gain Adjust portion of the *KIC Explorer* calibration procedure is complete. See Figure 219.

This concludes the *KIC Explorer* calibration procedure. You can close/exit the *KIC Profiler Hardware Utility.*

KIC Utility Flash Upgrade Tab

The *KIC Explorers* firmware can be upgraded using the *KIC Explorer Utility*. This gives *KIC Explorer* users the ability to upgrade their *KIC Explorer*s whenever a new firmware is available.

Periodically *KIC* will post updated firmware files on the website www.kicthermal.com . The *KIC* Firmware flash file is needed to complete this process.

Flash updating or "Flashing" the *KIC Explorer* can only be done by use of the USB communication cable.

Flashing the KIC Explorer

KIC Explorer Device

If your *KIC Explorer* is on and connected the *KIC Explorer Utility* will display the *KIC Explorer Device* name (*KIC Explorer*). If the *KIC Explorer Device* field is blank then no device is detected or the device is not displayed, in which case select the *Refresh* button. See Figure 220.

API Version – Displays the current API version; *KIC Explorer* background communication utility.

Current Firmware Version – Displays the current firmware version for the *KIC Explorer*.

KIC Explorer Firmware Image File – Displays the selected firmware flash file. Select the B*rowse* button to search for the file.

Start Firmware Upgrade – This button starts the firmware upgrade.

Figure 220

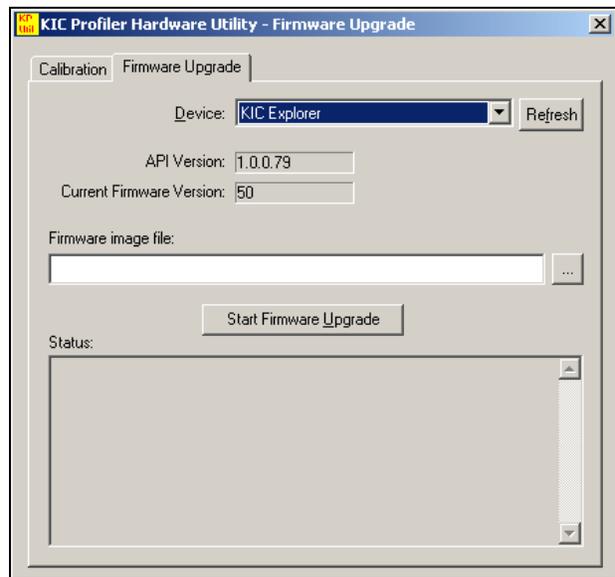**Status** – Displays the current *KIC Explorer* status once the flash process has begun.

Flash Update

Follow these steps to flash your KIC Explorer:

1. Make sure your *KIC Explorer* is on and connected to the computers USB port using the USB communication cable.

2. Open the *KIC Explorer Utility* software program or if already open select the Refresh button. . See Figure 220.

3. Type the name of the firmware file or select the Browse button to locate the file. See Figure 221.

Figure 221

4. When you have selected the firmware file it will be displayed in the *KIC Explorer Firmware Image File* field. See Figure 222.

5. Select the "Start Firmware Upgrade" button to begin the flash process. See Figure 222.

6. During the flash process the *KIC Explorer* status will be displayed in the *Status* field.

Figure 222

7. When the flash process is finished a *KIC* message will appear letting you know the process in complete and show the previous and new-current firmware versions. Select the "OK" button. See Figure 223.
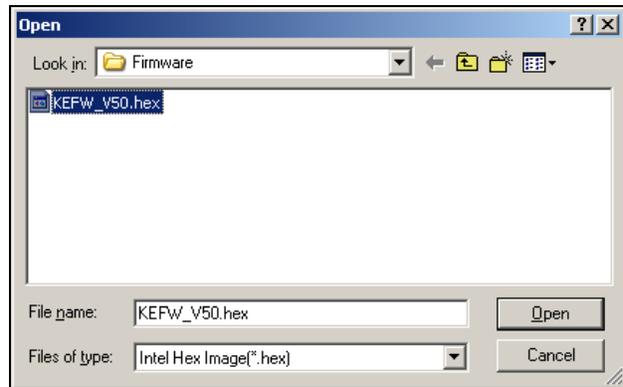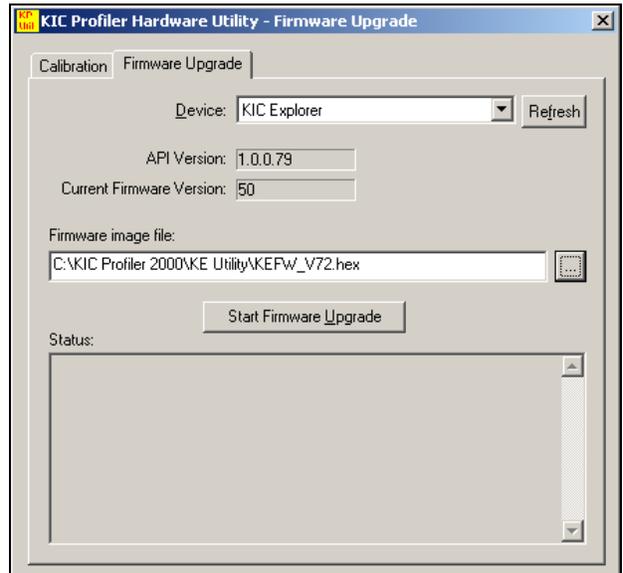

Figure 223

This concludes the *KIC Explorer* flash upgrade procedure.
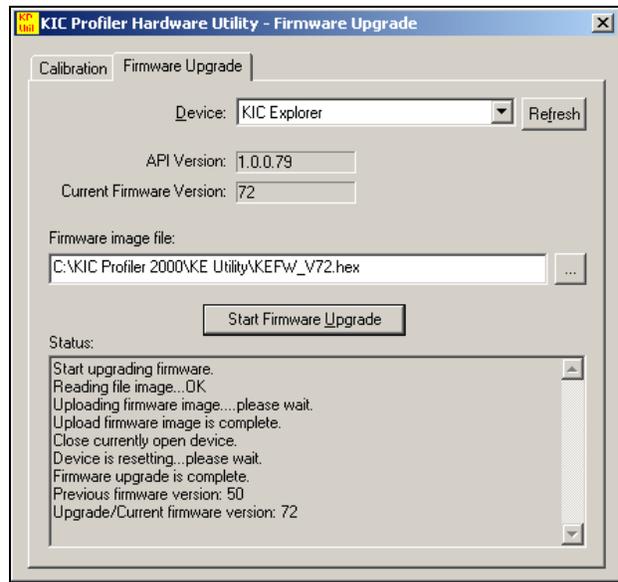

Figure 224

Appendix A:
The Process Window Index
A Method for Quantifying Thermal Profile Performance

The Problem

While there are currently statistically valid methods for quantifying pick and place and screen printer performance, there is no widely accepted method for comparing performance of thermal profiles, and thus, no quantifiable system of ranking thermal process performance. Once a thermal profile has been run, it is judged as being either in or out of spec, and perhaps subjectively judged as being OK, good, or really good. Efforts to track process performance for SPC or QC generally focus on a single, or a small group, of profile statistics; for example, peak temperature of one or two thermocouples on a golden board. The Process Window Index is a statistical method for ranking thermal profile and thermal process performance.

Defining the Process Window Index

The Process Window Index is a measure of how well a profile fits within user defined process limits. See Figure 225.

This is done by ranking process profiles on the basis of how well a given profile "fits" the critical process statistics. A profile that will process product without exceeding any of the critical process statistics is said to be inside the Process Window. The center of the Process window is defined as zero, and the extreme edge of the process window as 99%.

A "Process Window Index" of 100% or more indicates that the profile will not process product in spec. A "Process Window Index" of 99% indicates that the profile will process product within spec, but it is running at the very edge of the Process Window. A "Process Window Index" of less than 99% indicates that the profile is in spec and tells users what percentage of the process window they are using: for example, a PWI of 70% indicates a profile that is using 70 percent of the process spec.

The PWI tells users exactly how much of their process window a given profile uses, and thus how robust that profile is. The lower the PWI, the better the profile. A PWI of 99% is risky because it indicates that the process could easily drift out of control. Most users seek a PWI of below 80%, and profiles with a Process Window Index between 50% and 60% are commonly achieved (if the oven is sufficiently flexible and efficient).

Figure 225: Process Window and PWI

Figure 226: The Process Window Index (Single Statistic—Peak Temperature of one Thermocouple)

Figure 226 shows the Process Window Index for the Peak Temperature of a single thermocouple. The Process Window Index for a complete set of profile statistics is calculated as the worst case (highest number) in the set of statistics.
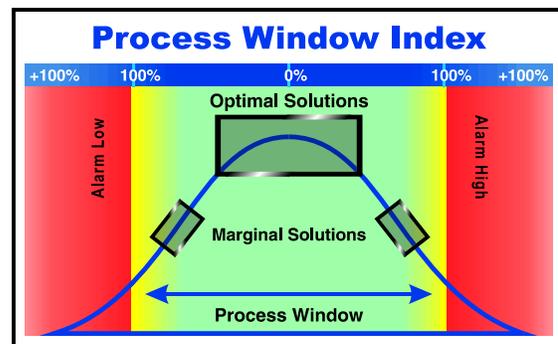
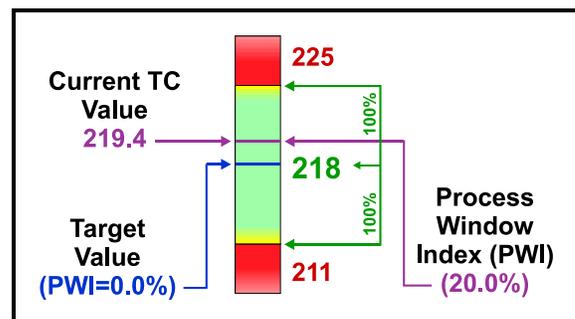For example: if a profile is run with six thermocouples, and four profile statistics are logged for each thermocouple, then there will be a set of twenty-four statistics for that profile, and the PWI will be the worst case (highest number expressed as a percentage) in that set of profile statistics. Note that Figure 227 shows your designated critical statistics for a single thermocouple.
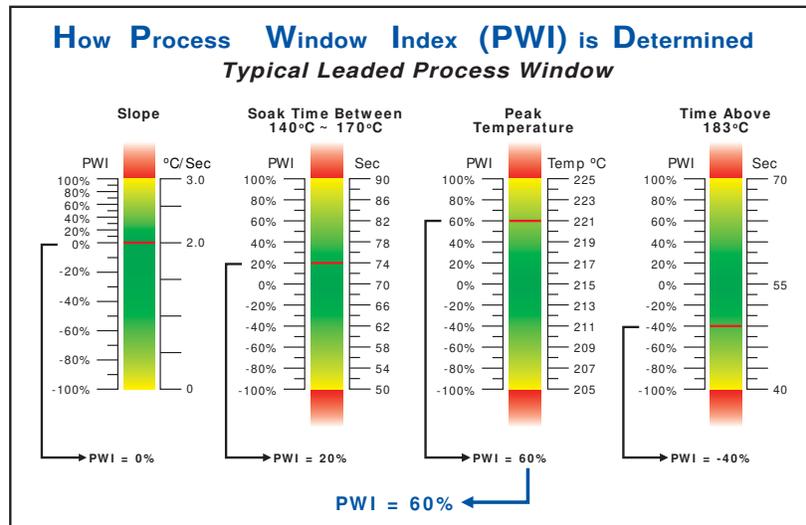

Figure 227: The Process Window Index
(Multiple Statistics for a Single Thermocouple and Final PWI Calculation)

Calculating the PWI

To calculate the Process Window Index: i=1 to N (number of thermocouples); j=1 to M (number of statistics per thermocouple); **measured_value**$_{[i,j]}$ is the $[i,j]^{th}$ statistic's value; **average_limits**$_{[i,j]}$ is the average of the $[i,j]^{th}$ statistic's high and low limits; and **range**$_{[i,j]}$ is the $[i,j]^{th}$ statistic's high limit minus the low limit.

$$\textbf{PWI} = 100 \times \underset{N,M}{\overset{i,j=1}{MAX}} \left\{ \left| \frac{(\text{ measured\_value}_{[i,j]} - \text{average\_limits}_{[i,j]})}{(\text{ range}_{[i,j]}/2)} \right| \right\}$$

Figure 228: Formula for calculating the PWI

Thus, the PWI calculation includes all thermocouple statistics for all thermocouples. The profile PWI is the worst case profile statistic (maximum, or highest percentage of the process window used), and all other values are less.

Benefits of Ranking Thermal Profile Performance

The analysis of thermal profiles with the Process Window Index offers four significant benefits. The first is that profiles can be easily compared, and users can be confident that they are using the best profile their process can achieve. Before the PWI was available for profile analysis, comparing profiles was subjective, and users could never be certain they had the best profile for their product. The PWI provides an excellent opportunity for process improvement and its use is a significant step towards Zero-defect Production.

The second benefit is that the PWI greatly simplifies the profiling process. When used in advanced profiling tools, all profile statistics are reduced to a single number (the PWI) that even the most inexperienced operator can understand. This means significant savings in terms of training costs and a reduction in defects caused by operator error. It further means that in a few minutes, an inexperienced operator can setup an oven with the optimal profile, a job that formerly could take an experienced engineer hours.

The third benefit is that because the PWI reflects the performance of the whole profile, it provides much better indicator of process capability than tracking a single statistic. The PWI thus provides excellent data for SPC and other QC monitoring programs while simplifying data gathering and reducing process monitoring costs.

Finally, the PWI gives users a simple method for comparing thermal process performance. Comparisons may be made between individual lines on the shop floor, between processes at multiple plants, and between processes using dissimilar equipment. The ability to quantify thermal process performance will give electronics assemblers a means for comparing the performance of their soldering equipment. This will be of value in selecting equipment, for buy off, and for process troubleshooting.

Table 11 is the result of a series of tests comparing oven performance using several sizes of PCBs. Each board was profiled in the given oven, and then an automated profile prediction tool was used to find the optimal profile for that board in the given oven. After the oven set points were changed and the oven stabilized, a second profile was run to confirm that the predicted PWI had been achieved. Table 11 shows that there is significant variation in oven performance between various makes and models. In this test, Oven C had more zones than Ovens A and B, and performed better, as would be expected.

Oven		Board Type			
Manufacturer	**Model**	**Motherboard**	**Cell Phone**	**Display Adapter**	**Mainframe**
A	X	PWI = 87%	PWI = 62%	PWI = 79%	PWI = 126%
B	Y	PWI = 71%	PWI = 58%	PWI = 61%	PWI = 93%
C	Z	PWI = 33%	PWI = 29%	PWI = 34%	PWI = 58%

Table 11: Comparison of Oven Performance – Best Achievable PWI

Conclusion

The simplicity of the Process Window Index makes its validity as a statistical tool readily apparent and its adoption as an industry standard clearly offers a significant opportunity for the improvement of the soldering process. The advantages detailed above point to its value in demystifying the soldering process and open the door to precision control of a process that has been ignored for too long. Issues like the coming of Lead-free electronic assembly mean that electronics assemblers can no longer be complacent about their soldering process. Sophisticated tools utilizing the PWI as a standard for accurately measuring the thermal process will mean more efficient production, improved and simplified process control, and higher quality final product.

APPENDIX B:
Attaching Thermocouples to the product

Overview

Thermocouple attachment is one of the single most important factors for attaining accurate thermal profile results. If a thermocouple is not attached properly, the profile will yield inaccurate results. The objective is to attach a thermocouple to the lead of a component in order to measure the solder joint temperature to verify the thermal profile meets the specified process parameters. We have outlined 2 methods for thermocouple attachment below.

When selecting a position for your thermocouples, you want to measure points on the product that represent the entire mass-range of the product. Select at least one position that is a high-mass area of the board (large component) and at least one position that is a low-mass area of the board (small component). If you can develop an acceptable profile for the low and high -mass areas of the board, the other areas of the board will be processed within the same process parameters.

High temperature solder is considered the industry standard for attaching thermocouples to PCBs for thermal profiling. High temperature solder provides excellent repeatability, and is a very strong attachment method. The cons to using high temperature solder are that it is not easy to work with, requires tools, and is usually destructive to the test product. For these very reasons *KIC* tested alternative means of attaching thermocouples to PCBs. Of the many different attachment methods tested by *KIC*, Aluminum tape provided profile results most similar to high temperature solder and it proved to be non-destructive as well.

Aluminum Tape

Aluminum tape provides a secure connection with excellent thermal conductivity. It offers users of pass-through profilers a simple, inexpensive, and nondestructive method of attaching thermocouples for thermal profiling. Using Aluminum tape reduces the effort required for obtaining an accurate thermal profile as opposed to high temperature solder.

The Aluminum tape is cut with scissors to a size of approximately 1/4" × 1/4" and is used to secure the thermocouple to the product. The tape can be used on the bare PCB or easily conform over the shape of components and leads. Tape can be used to hold excess wire down to the board and provide some strain relief. See Figure 229.

For Aluminum tape ordering information, contact KIC, <u>*sales@kicmail.com*</u>*.*
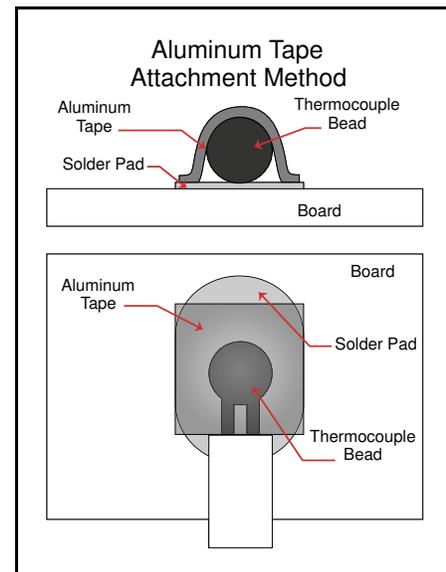

Figure 229: Aluminum Tape Attachment Method

High Temperature Solder

Do not attempt to attach the TC by melting solder into the spot and then shoving in the bead. Place the TC bead on the attachment surface and heat both evenly with the soldering iron. Make sure your iron is set to achieve temperatures over the solder melting point. For the solder that KIC provides, 300C should be sufficient. Then touch the solder to the heated TC bead and let the heat from the TC bead melt the solder. This method gives you superior wetting and a stronger solder attachment to the pad or lead. See Figure 230.

Be sure and remove any residual eutectic solder before applying the high temperature solder. If the eutectic solder is not removed, the tension of the thermocouple wire may lift the component as soon as the eutectic solder reaches its melting point, which is a lower temperature than high temperature solder.

Your temperature reading will come from the first point of contact between the two wires leading from the *TC*. To insure accurate readings, it is critical to carefully separate the two wires all the way up to the *TC* bead after soldering.

Figure 230: High-Temperature Solder Attachment Method

High temperature solder is an efficient heat conductor, so if a tiny bit gets between the *TC* bead and the lead or pad; you will still get an accurate reading. However, too much solder at the measurement point will increase the heat capacity of the *TC* and cause your peak temperature measurement to read low.
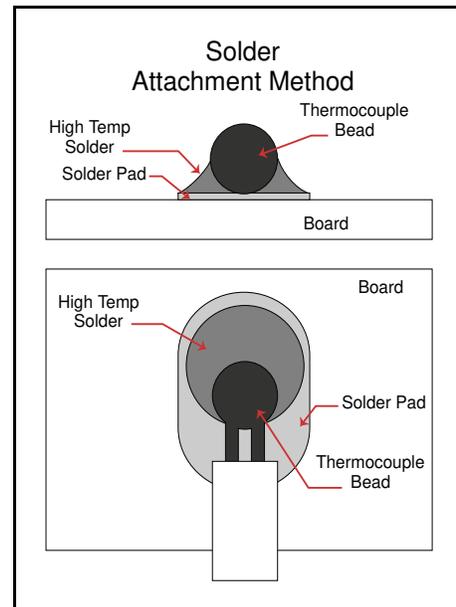
APPENDIX C:
Writing KIC 2000 Data over a Network

The *KIC* software can easily be configured to write the collected data to a network drive location. This allows data from one or even multiple systems to be stored in one centralized location (Server/Shared Hard Drive).

You must have a mapped network drive on the PC running the *KIC 2000* software to the desired network location. Due to the varieties of OS and network configurations, *KIC* cannot detail this step. We recommend you contact your IT/Network administrator if you need assistance setting up a mapped network drive.

Once you have mapped the drive, create a "KIC" folder on the network drive and copy in the following folders from the C:\KIC Profiler 2000 directory – Log, Ovens, Process Specs, and Profiles. Once completed follow the steps below on the PC where the KIC 2000 software is installed::

1. Ensure the *KIC* software is shutdown. Open Windows Explorer, and locate the file:
    `C:\KIC Profiler 2000\Log\KIC2000DataPath.kiccfg`

2. Double-click on the `KIC2000DataPath.kiccfg` to open it in Notepad. See Figure 231.
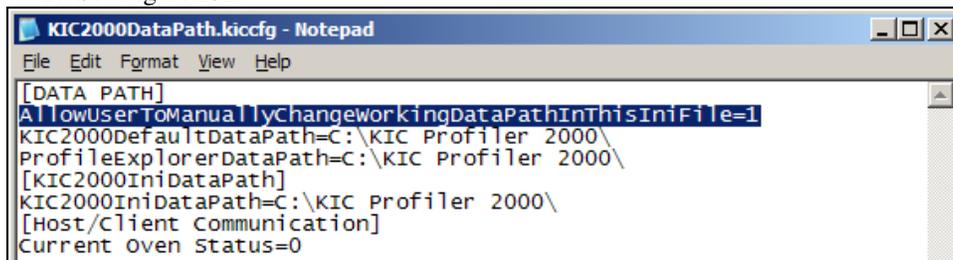

Figure 231
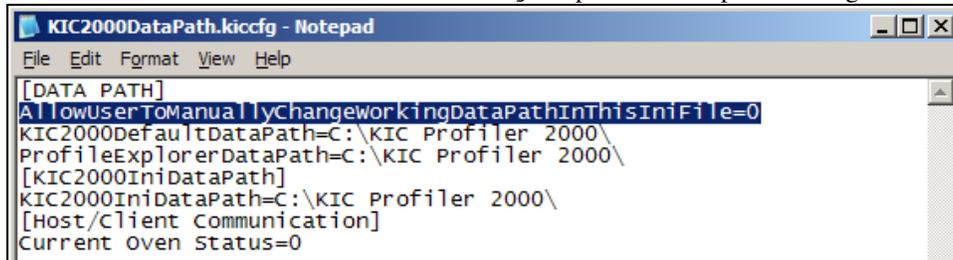
3. Change the line `AllowUserToManuallyChangeWorkingDataPathInThisIniFile=0` to the value `=1`. See Figure 232.

Figure 232
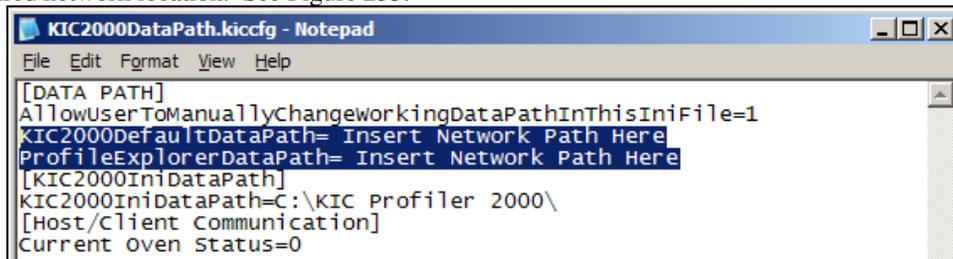
4. Change both the `KIC2000DefaultDataPath=` and `ProfileExplorerDataPath=` lines to the desired network location. See Figure 233.

Figure 233

5. Once the `KIC2000DataPath.kiccfg` file has been modified with the new locations, choose File/Save from the drop down menu to save the changes.

6.   Close Windows Explorer and start the *KIC 2000* software.

7.   With the *KIC* software open, go into *Profile Explorer*. You should now see the new data path directory displayed in the upper right hand corner of the screen. See Figure 234.
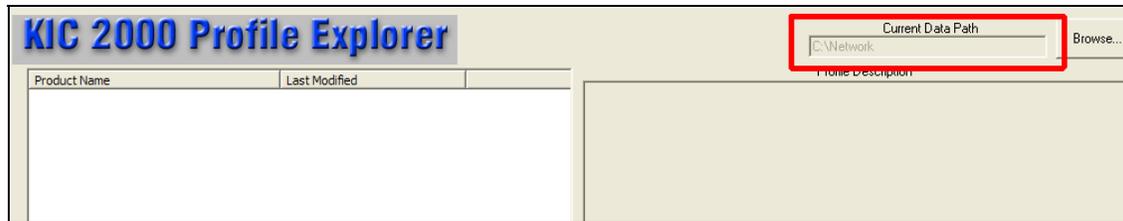

Figure 234

All data collected in this *KIC 2000* application will now be written to the network folder chosen. It will automatically create a subfolder named "Profiles" in the directory chosen. In that "Profiles" folder, it will create sub folders for each product name, just as it would in the default *KIC 2000* directory.

You can now view the collected data from any PC on the network that is running the *KIC 2000* software.

When selecting the folder, browse to the root directory of the main "Profiles" folder. For example, if the profiles are in a directory called F:\KIC Profiler 2000/Profiles/ Board A, you would browse only to the F:\KIC Profiler 2000 folder.

If there is no network connection when the KIC software is started, the software will automatically change the data path back to the default location of `C:\KIC Profiler 2000\`. *To resume writing data to a network location, you will need to repeat the steps listed above.*

Appendix D:
Acronyms and Abbreviations Used

9V.............. 9 Volt (Battery)

AAA.......... Common size of dry cell-type battery (pronounced "triple A")

CD............. Compact Disc

CD-ROM .. Compact Disc Read-Only Memory

CJREF....... Cold Junction Reference

COM port.. Communication port

GB............. Gigabyte, or 1 billion bytes

ID .... Identification

KE .... KIC Explorer

KIC........... Kazmierowicz Instrument Company (pronounced "kick")

LED........... Light-Emitting Diode

MB .... Megabyte, or 1 million bytes

MHz .... Megahertz, or 1 million hertz

MVP……... Manual Virtual Profile

PC.............. Personal Computer

PWI .... Process Window Index

RAM .... Random Access Memory

RPM .... Remote Process Monitoring

SMT .... Surface-Mount Technology

Spec........... Specification

SVGA........ Super Video Graphics Array. Also known as Super VGA.

TC .... Thermocouple

USB........... Universal Serial Bus

VAR .... Value Added Reseller

Contacting KIC

There are various means of contacting or attaining information from KIC.

KIC USA

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San Diego, CA 92127 USA
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