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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 your 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 Profiler* 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:

<table>
<thead>
<tr>
<th>English</th>
<th>Japanese</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>Korean</td>
</tr>
<tr>
<td>Spanish</td>
<td>Simplified Chinese</td>
</tr>
<tr>
<td></td>
<td>Traditional Chinese</td>
</tr>
</tbody>
</table>

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 computer's 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 computer's USB port.

To install the software key:
• Connect the USB software key 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](image1.jpg)

![Figure 2: SlimKIC 2000 9-Channel product kit](image2.jpg)

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:

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.

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

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 2000* 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.

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.

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

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

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.
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.

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.

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 *Mini-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](image-url)
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.

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)

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

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 Power 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

- **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 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 Explorer*.

- **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

- **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

![Global Preferences – Auto Focus Tab](image)

**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 Setpoints 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 consumption of the oven by finding set point solutions 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

**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 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.
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
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

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

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

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**

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.

Name Product and Select Process Window

- **Product Name** – Enter in a unique product name (long file names are acceptable) or choose an existing product name from the drop down list.
- **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.
- **Application** – Select your Application type/profiling fixture from the drop down list.
- **Sample Rate** - Select the number of samples per second from the drop down list for each product.
- **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 2°C 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.
- **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.
- **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.
- **Enable Auto-Focus** – Enables or disables the Auto Focus tool for the current profile (requires software key).
- **Profile Description** – Allows for freehand typing of any notes you may want to include with this profile.
Auto-Focus, Product Dimensions

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.
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.

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.

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 database, the following dialog box will appear: See 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.
If you select **YES**, you will be prompted to *Confirm the First Guess Recipe*. See Figure 38.

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.

If there is communication with the oven, then the recipe is copied directly to the oven.
Zone Length and Minimum/Maximum Temperature Settings

By default 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 Setpoint Temperatures

This setting is used by the Navigator option as limits for its prediction results. The KIC 2000 software 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 its prediction results.

Zone lengths – Deselect the check box if your zone lengths are not the same. Enter the actual 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

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 currently 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 thermocouples 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](image)

![Figure 43: Run a Profile screen #5](image)

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

![Figure 44: Run a Profile screen #4](image)

![Figure 45: Run a Profile screen #5](image)
Example of SlimKIC 2000 - Solder Reflow, Cure, and Wave Off - Application type specific graphics:

![Figure 46: Run a Profile screen #4](image1.png) ![Figure 47: Run a Profile screen #5](image2.png)

Example of SlimKIC 2000 Semiconductor - Application type specific graphics:

![Figure 48: Run a Profile screen #4](image3.png) ![Figure 49: Run a Profile screen #5](image4.png)
Example of Wave Solder-Wave On – Application type specific graphics

Please see the Appendix for using the Aluminum tape to attach your thermocouples.
Select Thermocouples and Start Profile

**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 directly 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.

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 2000 asks you to turn off the KIC profiler.
Live Profile Graph

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 Profilers* 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.

![Figure 58: Retransmission of Profile Data, RF Profilers only](image)

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

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 *Navigator* 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 *Navigator* to recommend for new products.

- **High** - Select the maximum conveyor speed you would like *Navigator* to recommend for new products.
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 in minimizing the time spent fine tuning or developing a thermal profile.

<table>
<thead>
<tr>
<th>P.W.I.</th>
<th>inch/min</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Top</td>
<td>47%</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Original Bottom</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Top</td>
<td>47%</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Bottom</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
</tbody>
</table>

Figure 64: Original/Predicted set points – Manual Prediction

<table>
<thead>
<tr>
<th>P.W.I.</th>
<th>inch/min</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Top</td>
<td>47%</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Original Bottom</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Top</td>
<td>26%</td>
<td>220.7</td>
<td>256.1</td>
<td>284.5</td>
</tr>
<tr>
<td>Predicted Bottom</td>
<td>49.2</td>
<td>220.7</td>
<td>256.1</td>
<td>284.5</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>P.W.I.</th>
<th>inch/min</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Top</td>
<td>47%</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Original Bottom</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Top</td>
<td>47%</td>
<td>220.7</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Bottom</td>
<td>49.2</td>
<td>220.7</td>
<td>260.0</td>
<td>290.0</td>
</tr>
</tbody>
</table>

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

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.

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.

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.

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.

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.

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 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.
**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.

**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.

**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.
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 want 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.

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.

**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.

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.

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.
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.
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**

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*.

![KIC Overlay Save Message](image)

**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.

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

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.

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 oven's 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 Baseline 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 Verification 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.

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.

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 \textit{MVP} thermocouples to the \textit{KIC} profiler. Follow the on screen directions and then select the forward arrow button to proceed.

9. The next screen instructs the user to insert the (instrumented) profile board into the \textit{MVP} board clamps and then attach the thermocouples to the \textit{KIC} Profiler. Follow the on screen directions and then select the forward arrow button to proceed.
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 31°C, and the oven is within 2 degrees of the set point temperatures the profile can begin.

![Figure 98: Run a Profile - Select Thermocouples](image)

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](image)

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 in the Profile Explorer-Profile Type column. They also have a “BL” designation as the icon.

![Figure 100: Profile Explorer – Profile Types - Baseline](image)
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.

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.
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](image)

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](image)
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.

![Select Thermocouples Screen](image)

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.

![Run a Virtual Profile – MVP, Carrier, and KIC Profiler Entering Oven](image)

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.

![Profile Type Table]

Figure 107: Profiler Explorer – Profile Types

Verification Profiles

A Verification profile is run whenever the user wishes to verify the actual thermal profile of the oven. A Verification 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.

![Verification Profiler Message]

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](image)

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](image)
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](image)

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](image)

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](image)
12. When the Verification 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 in 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.

<table>
<thead>
<tr>
<th>File Extension</th>
<th>File Type (Description)</th>
<th>File Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>.KIC2000Profile</td>
<td>Data File</td>
<td>C:\KIC Profiler 2000\Profiles\Product Name</td>
</tr>
<tr>
<td>.KIC2000MVPprofile</td>
<td>MVP Data File</td>
<td>C:\KIC Profiler 2000\Profiles\Product Name</td>
</tr>
<tr>
<td>.Kiccfg</td>
<td>Oven File</td>
<td>C:\KIC Profiler 2000\Ovens</td>
</tr>
<tr>
<td>.Kiccfg</td>
<td>Log Files</td>
<td>C:\KIC Profiler 2000\Log</td>
</tr>
</tbody>
</table>

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**

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**

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

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**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

![Print Options Screen – Print Format #2](image)

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 Format #2 Print Preview

![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](image)

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:

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](code)
   AlternativePrintFormat=0
4. Change the command line to read:
   ![PRINT_FORMAT](code)
   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.

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 2°C above the “Maximum product temperature at start of profile”. If the Maximum product temperature at start of profile is set to 31°C, the profile start–temperature trigger is automatically set to 33°C, which is the default setting. When the Air TC reads above 33°C, 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.

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

From the KIC 2000 main screen select the Run a Profile button. See Figure 121.
Name Product and Select Process Window/Application Type

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

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 where 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.
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 2000 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 if 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.

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.
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.

### 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.
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.

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.
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](image)

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.

- **Yes** – The software will return to previous screen to wait till oven is ready, oven set points within 2.0°C/3.6°F.
- **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.

- 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.

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](image)

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.

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. Failing to turn your KIC Profiler off will drain the battery.

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.
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 Statistic 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).

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.

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.

Figure 139: Profile Graph Display

Figure 140: Wave Information
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.

<table>
<thead>
<tr>
<th>P.W.I.</th>
<th>inch/min</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Top</td>
<td>47%</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
</tr>
<tr>
<td>Original Bottom</td>
<td></td>
<td></td>
<td>220.0</td>
<td>260.0</td>
</tr>
<tr>
<td>Predicted Top</td>
<td>47%</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
</tr>
<tr>
<td>Predicted Bottom</td>
<td></td>
<td></td>
<td>220.0</td>
<td>260.0</td>
</tr>
</tbody>
</table>

Figure 142: Original/Predicted set points – Manual Prediction

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.

<table>
<thead>
<tr>
<th></th>
<th>P.W.I.</th>
<th>inch/min</th>
<th>Zone 1</th>
<th>Zone 2</th>
<th>Zone 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Original Top</td>
<td>47%</td>
<td>49.2</td>
<td>220.0</td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Original Bottom</td>
<td></td>
<td></td>
<td>220.0</td>
<td>260.0</td>
<td>260.0</td>
</tr>
<tr>
<td>Predicted Top</td>
<td>47%</td>
<td>49.2</td>
<td></td>
<td>260.0</td>
<td>290.0</td>
</tr>
<tr>
<td>Predicted Bottom</td>
<td></td>
<td></td>
<td>220.0</td>
<td>260.0</td>
<td>260.0</td>
</tr>
</tbody>
</table>

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

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.

Deselecting Thermocouples

If a thermocouple has become disconnected during the profile, the profile results may be affected due to 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.

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.

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 PWI 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.

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.

**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.
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.

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.

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.
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.

Name Product and Select Process Window/Application type

- 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 you 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.

- **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**

- 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.*

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 31°C/88°F.

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

![Figure 166](image)

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

<table>
<thead>
<tr>
<th>SlimKIC 2000 profiler is 105°C/220°F. If your process temperatures will cause the SlimKIC to exceed this limit then <strong>DO NOT</strong> place the profiler into the oven.</th>
</tr>
</thead>
<tbody>
<tr>
<td>KIC Explorer profiler is 85°C/185°F. If your process temperatures will cause the KIC Explorer to exceed this limit then <strong>DO NOT</strong> place the profiler into the oven.</td>
</tr>
</tbody>
</table>

**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.

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.
Viewing the Profile and Statistics

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.
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 due to abnormal 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.

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.

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.
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.

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.

*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

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

Table 4

SlimKIC 2000 Maximum Internal Temperature is 105°C

Removing the SlimKIC 2000 cover

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

Serial Number Location
The SlimKIC 2000 serial number label is located on the main connector block (J1). The SlimKIC 2000 shield must be removed in 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.

**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 \( \pm 1.2^\circ C \) (\( \pm 2.0^\circ F \)):**

- 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.*

**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 *Maximum 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

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

Table 5
Specifications

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

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.

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.

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

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](image1)  ![Figure 187](image2)  ![Figure 188](image3)

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 300°C. (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 400°C.

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.

<table>
<thead>
<tr>
<th>Sample Set, Mini-TC (Qty 4)</th>
<th>18&quot; TC Position</th>
<th>24&quot; TC Position</th>
<th>30&quot; TC Position</th>
<th>36&quot; TC Position</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC #1</td>
<td>18&quot;</td>
<td>TC #1</td>
<td>24&quot;</td>
<td>TC #1</td>
</tr>
<tr>
<td>TC #2</td>
<td>17&quot;</td>
<td>TC #2</td>
<td>23&quot;</td>
<td>TC #2</td>
</tr>
<tr>
<td>TC #3</td>
<td>16&quot;</td>
<td>TC #3</td>
<td>22&quot;</td>
<td>TC #3</td>
</tr>
</tbody>
</table>

Table 8

<table>
<thead>
<tr>
<th>18&quot; Mini-TC Set (Qty 4)</th>
<th>Part Number: TC-TKM-MINI-0418</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC #1</td>
<td>18&quot;</td>
</tr>
<tr>
<td>TC #2</td>
<td>17&quot;</td>
</tr>
<tr>
<td>TC #3</td>
<td>16&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>24&quot; Mini-TC Set (Qty 4)</th>
<th>Part Number: TC-TKM-MINI-0424</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC #1</td>
<td>24&quot;</td>
</tr>
<tr>
<td>TC #2</td>
<td>23&quot;</td>
</tr>
<tr>
<td>TC #3</td>
<td>22&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>30&quot; Mini-TC Set (Qty 4)</th>
<th>Part Number: TC-TKM-MINI-0430</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC #1</td>
<td>30&quot;</td>
</tr>
<tr>
<td>TC #2</td>
<td>29&quot;</td>
</tr>
<tr>
<td>TC #3</td>
<td>28&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>36&quot; Mini-TC Set (Qty 4)</th>
<th>Part Number: TC-TKM-MINI-0436</th>
</tr>
</thead>
<tbody>
<tr>
<td>TC #1</td>
<td>36&quot;</td>
</tr>
<tr>
<td>TC #2</td>
<td>34&quot;</td>
</tr>
<tr>
<td>TC #3</td>
<td>32&quot;</td>
</tr>
</tbody>
</table>

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:

\[
\text{6" (Product Length) + 12" = 18" + 1" (for Air TC) = 19"}
\]

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

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.

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.

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
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 2000 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](image)
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\KEUtility.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 Browse 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 computer’s 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.

   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
This concludes the *KIC Explorer* flash upgrade procedure.

**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.

7. Disconnect the *KIC Explorer* USB cable from the computer and *KIC Explorer*.

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

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.

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 *Mini-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](image-url)
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](image)

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](image)

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.

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](image)

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](image)

**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](image)
**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.

![Set Gain Adjust and Offset Temperatures Window](image)

**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 ±2.0°F (±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](image)
**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.

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.

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 simulator 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.

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.

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 Explorers 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 Browse 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.
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.

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.

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.
This concludes the *KIC Explorer* flash upgrade procedure.
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 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.

**How Process Window Index (PWI) is Determined**

Typical Leaded Process Window

![Diagram showing process window index calculations](image)

**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); $\text{measured\_value}_{i,j}$ is the $[i,j]$th statistic’s value; $\text{average\_limits}_{i,j}$ is the average of the $[i,j]$th statistic’s high and low limits; and $\text{range}_{i,j}$ is the $[i,j]$th statistic’s high limit minus the low limit.

$$\text{PWI} = 100 \times \max_{i,j=1}^{N,M} \left\{ \frac{\text{measured\_value}_{i,j} - \text{average\_limits}_{i,j}}{\text{range}_{i,j}/2} \right\}$$

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.

<table>
<thead>
<tr>
<th>Oven</th>
<th>Board Type</th>
<th>Motherboard</th>
<th>Cell Phone</th>
<th>Display Adapter</th>
<th>Mainframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>X</td>
<td>PWI = 87%</td>
<td>PWI = 62%</td>
<td>PWI = 79%</td>
<td>PWI = 126%</td>
</tr>
<tr>
<td>B</td>
<td>Y</td>
<td>PWI = 71%</td>
<td>PWI = 58%</td>
<td>PWI = 61%</td>
<td>PWI = 93%</td>
</tr>
<tr>
<td>C</td>
<td>Z</td>
<td>PWI = 33%</td>
<td>PWI = 29%</td>
<td>PWI = 34%</td>
<td>PWI = 58%</td>
</tr>
</tbody>
</table>

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, sales@kicmail.com.
**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.

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.

3. Change the line AllowUserToManuallyChangeWorkingDataPathInTheIniFile=0 to the value =1. See Figure 232.

4. Change both the KIC2000DefaultDataPath= and ProfileExplorerDataPath= lines to the desired network location. See 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.

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.

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On the Web
You can find the latest KIC product news along with a library of useful information at our website www.kicthermal.com or www.kic.cn

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Find the KIC Representative in Your Area
Call KIC; send an email, or visit or web page Find a Local Representative.

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