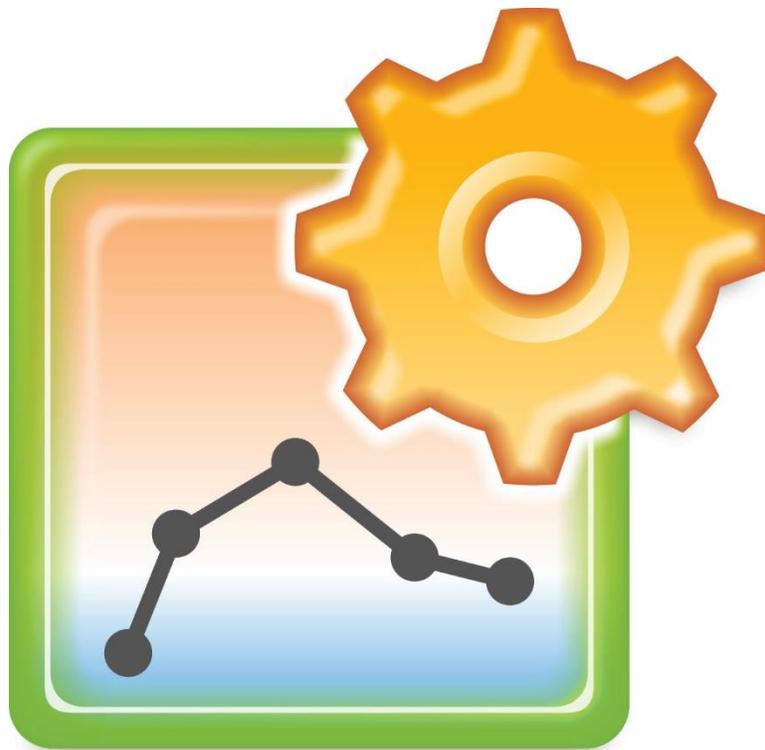




## **PROFILE GENERATOR**



## **USER MANUAL**

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# 1 Introduction

## 1.1 Overview

As part of the Akrometrix Studio software platform, **Profile Generator** is a graphical layout tool designed to assist in the creation of temperature profiles for use with the Akrometrix **Thermal Profiler** application. It creates files with the extension \*.akx\_profile, which can be easily modified using a simple text editor as they are standard XML files. This manual is intended for use with Akrometrix Studio 8.3.

This manual describes the interface and functions of the Profile Generator software. Profile Generator may reside on the measurement equipment computer and/or on a remote computer, provided the user has the requisite USB software key.

**Section 2** describes the Profile Generator application and its operation. **Appendix A** describes software file formats and keyboard shortcuts.

## 1.1 Warnings and Precautions

### 1.1.1 Warnings and Notes in this Manual

Warnings and Notes are marked throughout the manual with these icons:



Figure 1.1 Warning Icon



Figure 1.2 Note Icon

Warnings are specific health hazards for the operator or potential sources of system damage. Notes highlight system limitations or automatic responses that may require corrective action by the operator for successful operation.

## 1.2 Technical Support

For technical support, contact Akrometrix:

Akrometrix	404-486-0880	<a href="mailto:support@akrometrix.com">support@akrometrix.com</a>
2700 NE Expressway	404-486-0890 (fax)	<a href="http://www.akrometrix.com">http://www.akrometrix.com</a>
Building B, Suite 500		
Atlanta, GA 30345		

When contacting Akrometrix, please provide the system serial number, the version numbers of the Akrometrix software being used, a description of the problem or question, and contact information for reply. If the question concerns a particular measurement or analysis, please provide electronic copies of the phase images, reference images, and final results and a description of data acquisition and/or analysis conditions. If the problem concerns changes or failure in general system operation, please describe any events or system modifications that occurred immediately before the problem arose.

## 2 Overview

**Profile Generator** is an application designed to easily and rapidly create input temperature profiles compatible with the **Thermal Profiler** data acquisition software.

The profile space is defined as Temperature (°C) vs. Step. As of Studio 8.3, each Step represents one second of time.

### 2.1 Creating Profiles

Profiles are created from a series of connecting line segments. Segments may be added logically, where the user specifies a criterion which best describes the segment endpoints, or by hand, where the user simply clicks to extend a segment to its desired end point.

#### 2.1.1 Adding Segments Descriptively

1. If the default value of 25°C is not desirable, set the Initial Temperature.
2. Choose the appropriate criteria (Ramp, Soak, or End-At) and fill in the corresponding values.
3. Press **Add Segment**.
4. Repeat steps 2 and 3 to keep adding segments.

#### 2.1.2 Adding Segments with the Mouse

1. If the default value of 25°C is not desirable, set the Initial Temperature.
2. Click anywhere on the profile space to draw the first segment.
3. Move the mouse cursor to the next desired segment endpoint and click.
4. Repeat step 3 to keep adding segments.



**Note:** Temperature addition is modal. To add temperature points with the mouse, the small button with an image of line segments underneath the “Segment Points” heading must be toggled blue. This is the default on entering the program, but if actions have been added it is necessary to click this button before adding more temperature points with the mouse.

#### 2.1.3 Adding Actions Descriptively

1. Select the action type(s) from the Actions box located below the design space. All selected actions (highlighted in blue) will be added to the profile.
2. Specify the criteria at which to add the action group (At-Step, At-Temperature, Every X steps, Every X C, or At Each Existing).

3. Fill in the corresponding values for the selected option to determine which step or range the action(s) are added to.
4. Press **Add Action**



**Note:** These commands can also be used to add additional actions to existing groups.



**Note:** Whenever the 'at Step' value is changed, the corresponding profile temperature is supplied.



**Note:** If a soak occurs at the selected temperature, an instruction is added to only the segment starting and ending points.



**Note:** When an action with parameters that affect the profile – Controller Parameters, Wait for Temperature, or Lower/Raise – is selected, its current parameters are displayed above and below it. These can be changed by right-clicking on the selected action and selecting Configure. Configuring action parameters will apply those parameters to subsequently added actions.

#### 2.1.4 Adding Actions with the Mouse

1. Select the appropriate action(s) from the Actions box.
2. Position the mouse pointer along the desired profile position.
3. Primary-mouse click to add the action(s).



**Note:** The action group's position is dictated by the mouse pointer step (x) coordinate. The instruction is always set at the corresponding profile temperature coordinate, regardless of the y-location of the mouse.

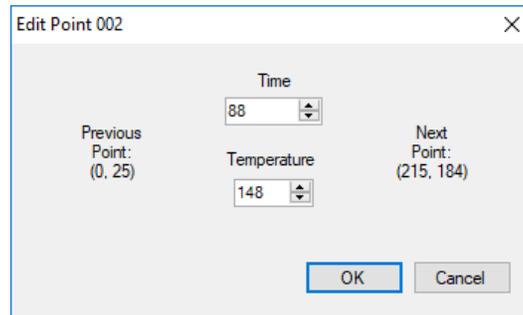
## 2.2 Editing Profiles

The temperature points and actions of an existing profile can be edited. This can be done in two main ways: by altering the individual points from the main interface, and by editing steps in Table View.

### 2.2.1 Editing Temperature Points

1. Click on the gray button underneath "Segment Points." It will light up in blue, indicating that the correct modal state is active to edit temperature points.
2. Right click on any temperature point in the profile. A menu will appear.

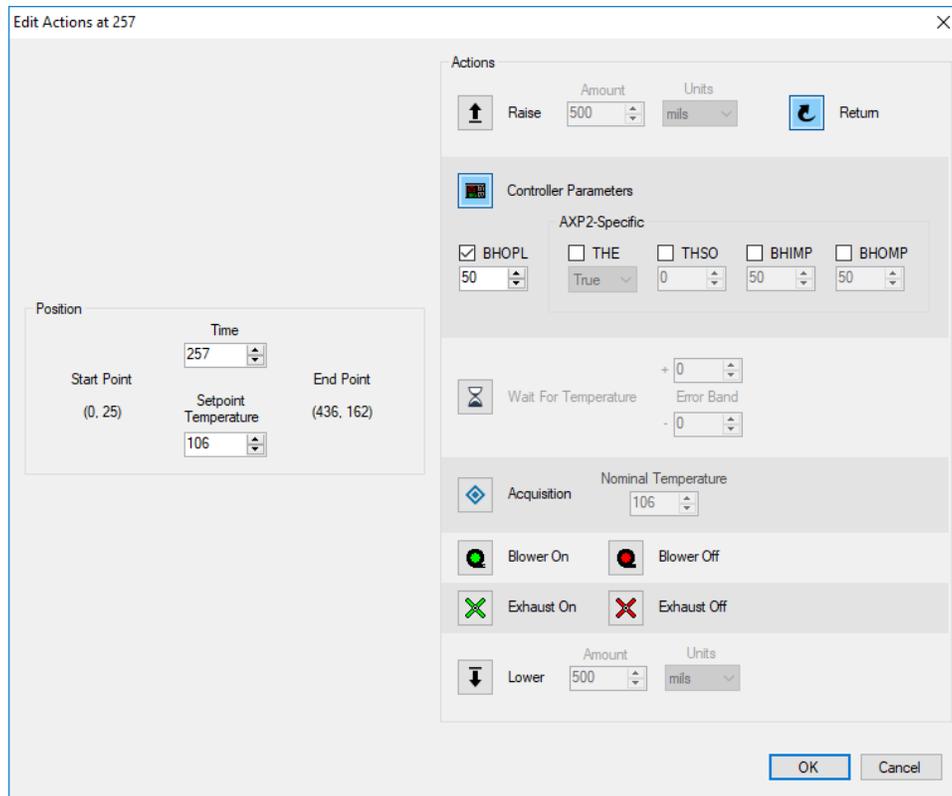
3. From this menu there are two options.
  - a. Select “Delete point X”, where X is the point number. This will remove the point.
  - b. Select “Edit Point “X”. This will bring up another menu, as shown in **Figure 2.1**. From this menu the exact step and temperature value of the point can be altered. Connected line segments will change to match the new point.



**Figure 2.1** Temperature Point Edit Menu

### 2.2.2 Editing Actions

1. To edit actions, first either click on the blue image of a line segment or click on any action button. The line segment button will turn grey, indicating that the program is in the correct modal state to edit actions.
2. Right click on any action in the action group in question. A menu will appear with options to delete or edit the actions.
3. If edit is chosen, a menu like that in **Figure 2.2** will appear, allowing the position, action types, and/or parameters (see **Section 2.4**) of the action group to be changed.



**Figure 2.2** Action Edit Menu



**Note:** Actions occur along the temperature profile and do not alter it. Changing an action group's Step value alters the temperature to correspond to that of the profile at that step, and vice versa.



**Note:** If the user right-clicks on an action group containing a Lower, Raise, or Return action, a third option – “Net Height Change...” will be available in the context menu. Selecting this displays a popup which tells the user the net change in stage height between the start of the profile and the selected action group.

### 2.2.3 Editing from the Table View

Actions and temperature points can be edited from the Table View.

1. To edit an action group, either right click on that row and select Edit Actions from the context menu or double click on the Actions cell of that row. The action types and parameters can then be edited.
2. To edit a temperature setpoint, click on the setpoint temperature in question and type in a new number when the cell turns yellow.

### 2.2.4 Shortcuts in the Table View

Table View allows the use of several common shortcuts to edit the list of steps.

<b>Select</b>	<b>Ctrl+Click:</b> Add or remove individual steps from the selection <b>Shift+Click:</b> Selects a range of steps between the initial and new selection
<b>Add Row</b>	<b>Ctrl+D:</b> Adds a single step at the end of the file.
<b>Insert Row</b>	<b>Ins:</b> Adds another step with the same temperature set point as the step just before the selected step.
<b>Delete Row</b>	<b>Del:</b> Deletes all selected steps.
<b>Select All</b>	<b>Ctrl+A:</b> Selects all steps.
<b>Cut</b>	<b>Ctrl+X:</b> Cuts selected steps.
<b>Copy</b>	<b>Ctrl+C:</b> Copies selected steps.
<b>Paste</b>	<b>Ctrl+V:</b> Pastes steps from most recent copy.

## 2.3 Menu Options

### 2.3.1 File Menu

**New** **Ctrl+N:** Clears any profile information in memory.

**Load...** **Ctrl+O:** Opens previously saved XML profile templates.

**Save...** **Ctrl+S:** Saves segment-based profiles in an application-specific XML file format.

**Import...:** Imports profiles based on the legacy \*\_in.txt format. The resulting profiles will have every row from the \*\_in.txt profile as a step in the **Profile Generator** application. Measurement and blower/exhaust instructions will also be imported and placed in their appropriate locations on the profile.

**Exit:** Closes the program.

### 2.3.2 Edit Menu

**Undo:** A queue of the last 8 actions performed.

**Hot Tracking:** Toggles whether or not the design space coordinates are displayed alongside the mouse cursor.

**Reset Acq Nominal Temperatures:** Resets the nominal temperatures of all acquisitions to their setpoint temperatures.

**Initial Sample Height:** Sets an initial sample height in the profile. The user will be warned if they attempt to start a profile that has this enabled and the stage is more than 5 mils from the set height.

**AXP 2 Top Heater TC:** Sets the default thermocouple used to give top heater feedback on the AXP 2.0.

### 2.3.3 View Menu

**Table Ctrl+T:** Clicking on the Table view will open a separate window showing the current profile in a table view. If the profile was created using ramps and soaks, viewing it in this manner will convert the file into discretized Temperature-Action pairs. Once this window is closed, the Segment Endpoints will be turned off since the profile will now consist of many more endpoints than before.

**Segment Endpoints F3:** Toggles the display of segment endpoints on the graph. This is useful for when endpoints are tightly spaced, such as after importing a legacy \*\_in.txt profile.

**Action Filter** Allows the user to filter out specific action types. When this is activated for an action type, existing actions of the type in question disappear, and the user cannot add more actions of that type. The existing actions are still present, but are hidden for ease of interaction with other actions in close proximity.

### 2.3.4 Help Menu

In the help menu the user can access a .pdf of the User Manual as well as find version information for the current software.

## 2.4 Action Groups

As of Studio Version 8.3, Profile Generator supports multi-action groups at each individual profile step, as well as a number of actions that increase profile automation. All available actions are listed and explained below.

### 2.4.1 Raise

This action raises the stage by a user-selectable amount. It cannot be paired with a Return action in a given step.



**Note:** Attempts to add conflicting actions to a step are ignored by the program.



**Note:** Profiles in which the stage height rises higher than the initial value are not permitted to avoid damage to the motors or grating.

### 2.4.2 Return

This action returns the stage to its original position at the start of the profile. It cannot be paired with a Raise action in a given step.

### 2.4.3 Controller Parameters

This action allows the user to automatically change oven settings during the profile. It has five possible parameters, any or all of which can be active at one time. The latter four parameters are specific to the AXP 2.0, and are ignored on other systems.

1. BHOPL: Bottom Heater Output Power Limit. Sets the overall power of the oven's primary or bottom heater.
2. THE: Top Heater Enabled. Sets whether the AXP 2.0 top heater is active.
3. THSO: Top Heater Setpoint Offset. Sets the amount by which the top heater setpoint differs from the profile setpoint.
4. BHIMP: Bottom Heater Inner Max Power. Output power percentage of the inner bottom heaters on the AXP 2.0.
5. BHOMP: Bottom Heater Outer Max Power. Output power percentage of the outer bottom heaters on the AXP 2.0.

#### **2.4.4 Wait for Temperature**

This action lets the user pause the profile at a specific temperature. After that temperature has been reached (or within the specified error band) any other actions present at that step will be executed.



**Note:** When both Acquisition and Wait for temperature are present at a step, they combine on the profile into an acquisition symbol with a box around it.



**Note:** Prior to Studio 8.3, Wait for Temperature was only available (as a concept, not specifically named) for Acquisition actions when running a profile in Temperature mode.

#### **2.4.5 Acquisition**

This is the basic action of a profile. It commands the measurement software to take an image at the setpoint temperature.

The acquisition action has an optional parameter called Nominal Temperature. This is a metadata value that indicates the desired temperature for reporting purposes but does not affect the profile. This does not need to be the same as Setpoint, although that is the default value.

#### **2.4.6 Blower On**

This action turns on the blower.

#### **2.4.7 Blower Off**

This action turns off the blower.

#### **2.4.8 Exhaust On**

This action turns on the exhaust.

#### **2.4.9 Exhaust Off**

This action turns off the exhaust.

#### **2.4.10 Lower**

This action lowers the stage by a user-selectable amount. The lower action does not conflict with Raise and Return. When a group contains both Raise (or Return) and Lower, Raise happens first, then other actions in the group, and then Lower. This makes it simple to set up automated lowering at acquisitions.

## Appendix A- Miscellaneous Information

### A.1 File Formats

Akrometrix **Profile Generator** imports legacy \*\_in.txt profiles and saves profiles as \*.akx\_profile documents. These documents are standard XML documents which can still be read and edited manually should the need arise. A description of the file format and its construction follows.

#### Concepts

The \*.akx\_profile format is an XML document containing the following concepts:

Step	A non-negative integer
Temperature	A thermal condition described in °C
Point	A Step-Temperature pair
Type (i.e. Supported Action)	<ul style="list-style-type: none"> <li>• Acquisition</li> <li>• ControllerParameters</li> <li>• WaitForTemperature</li> <li>• BlowerOn</li> <li>• BlowerOff</li> <li>• ExhaustOn</li> <li>• ExhaustOff</li> <li>• Lower</li> <li>• Raise</li> <li>• Return</li> </ul>
Action	A Step-Action Type pair
Parameter	An action-specific element

#### Construction

The XML content is constructed as follows:

1. The first line must read:

```
<?xml version="1.0"?>
```

2. The second line must read:

```
<AkrometrixProfile Version="6" SourceFilename="C:\1.akx_profile">
```

The SourceFilename attribute is not required, but will be referenced when the profile is loaded in the new \*.akx\_recipe file format for showing the input profile name.

3. Point and Action Steps

Inside the <AkrometrixProfile> node, a collection of Point and Action nodes exist:

- c. A point node describes its Step and Temperature as XML attributes:

```
<Point Step="100" Temperature="125" />
```

- d. An action node describes its Step and Type as XML attributes and Parameters as XML elements:

```
<Action Step="105" Type="ControllerParameters">
  <Parameters> <Inner>50</Inner> <Outer>50</Outer> </Parameters>
</Action>
```

## **Rules**

- Neither Point nor Action nodes need to be listed in numeric step order.
- At minimum two valid Points must be defined.
- One Point must be defined with Step=0.
- Each Point must have a unique Step value.
- Action nodes are optional.
- Multiple Actions can be assigned with the same Step value provided the Actions are not conflicting (i.e. BlowerOn / BlowerOff)
- Points or Actions with negative or fractional Step values are ignored.
- Duplicate Actions are ignored.
- Actions described outside the overall range of valid Point Step values are ignored.
- Actions without a "Parameters" element are ignored.

## **Good Examples**

### **Example 1**

```
<?xml version="1.0"?>
<AkrometrixProfile Version="6">
  <Point Step="0" Temperature="25" />
  <Point Step="50" Temperature="50" />
</AkrometrixProfile>
```

### **Example 2**

```
<?xml version="1.0"?>
<AkrometrixProfile Version="6">
  <Point Step="0" Temperature="25" />
  <Point Step="100" Temperature="125" />
  <Point Step="200" Temperature="225" />
  <Action Step="12" Type="Acquisition">
    <Parameters> <Value>0 none</Value>
  </Parameters>
</Action>
  <Action Step="78" Type="Lower">
    <Parameters><Value>5000 microns</Value>
  </Parameters>
</Action>
</AkrometrixProfile>
```

## **Bad Examples**

### **Example 1 (missing XML declaration)**

```
<AkrometrixProfile Version="6">
  <Point Step="0" Temperature="25" />
  <Point Step="50" Temperature="50" />
  <Action Step="12" Type="Acquisition">
    <Parameters> <Value>0 none</Value>
  </Parameters>
</Action>
</AkrometrixProfile>
```

### **Example 2 (no zero Step Point defined)**

```
<?xml version="1.0"?>
<AkrometrixProfile Version="6">
  <Point Step="100" Temperature="125" />
  <Point Step="200" Temperature="225" />
</AkrometrixProfile>
```

**Example 3 (only one point defined)**

```
<?xml version="1.0"?>
<AkrometrixProfile Version="6">
  <Point Step="0" Temperature="25" />
  <Action Step="12" Type="Acquisition">
    <Parameters> <Value>0 none</Value>
  </Parameters>
</Action>
<Action Step="90" Type="Acquisition">
  <Parameters> <Value>0 none</Value>
</Parameters>
</Action>
</AkrometrixProfile>
```

**Example 4 (no parameters)**

```
<?xml version="1.0"?>
<AkrometrixProfile Version="6">
  <Point Step="0" Temperature="25" />
  <Point Step="50" Temperature="50" />
  <Action Step="45" Type="Acquisition">
  </Action>
</AkrometrixProfile>
```

## A.2 Keyboard Shortcuts

As of Studio 8.2, in addition to the keyboard shortcuts below, Profile Generator supports drag and drop opening of \*.akx\_profile files.

<b>Ctrl+N</b>	Begin a new profile
<b>Ctrl+O</b>	Open an existing profile
<b>Ctrl+S</b>	Save the current profile
<b>Ctrl+T</b>	View profile in a table format
<b>F3</b>	Show/Hide Segment Endpoints