

Vitronics Soltec



Reflow Soldering / Curing Systems
Process Optimization Software
User Manual

Purpose

Autoset is a feature within recipe manager and is part of the recipe creation process. Autoset is intended to minimize the time required to develop a profile by removing the initial starting point guesswork for heater setpoints and conveyor speed.

Definitions

Setpoint

Setpoint is a target value defined by the user. The setpoint is the value the automatic control system tries to attain and maintain.

Recipe

A recipe is a file within the recipe manager where the user enters/defines setpoints. Examples of recipe setpoints are heater setpoints, conveyor speed or board width. The setpoints are targets the oven control will maintain and monitor. Recipe setpoints are configuration dependant.

Profile

A profile is the measurement of board temperatures as a function of time while the board passes through the oven. A profile characterizes how effectively the reflow oven heats and cools the board as it travels through the oven. The results are often displayed graphically. The profile information is evaluated relative to a process window.

Straight ramp

A method of applying heat to a circuit board characterized by a steady increase in board temperatures as the board passes through the oven.

Ramp soak spike

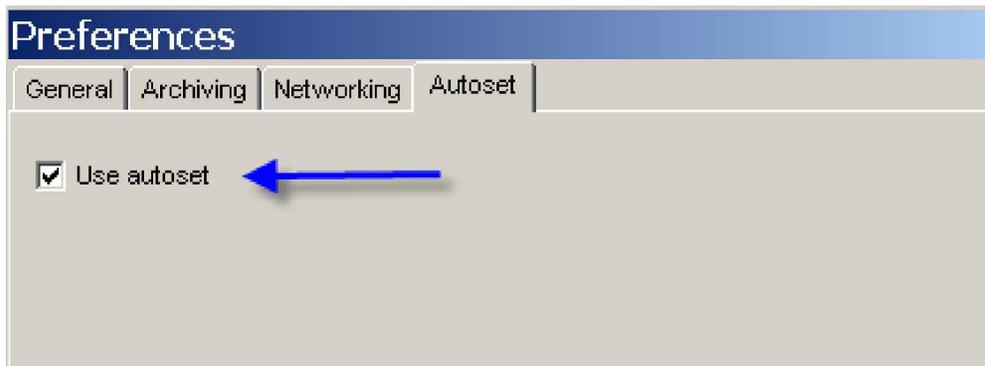
A method of applying heat to a circuit board, characterized by an increase in board temperature (ramp) at which point the board temperatures level off (soak) before again increasing (spike). The intent of this profile shape is to give heavier more complex assemblies time to reach thermal equilibrium before the thermal spike into the reflow.

Process Window

Process window is the complete description of thermal requirements for a profile. Within a process window there can be many process criteria such as peak temp or ramp rate. The process requirements are usually defined by the paste but can include limitations of components. The process window is the thermal target for the board profile. A board is said to be "in spec" if all the process window requirements are met. One process window can be used for many boards.

Enabling - Disabling Autoset Wizard:

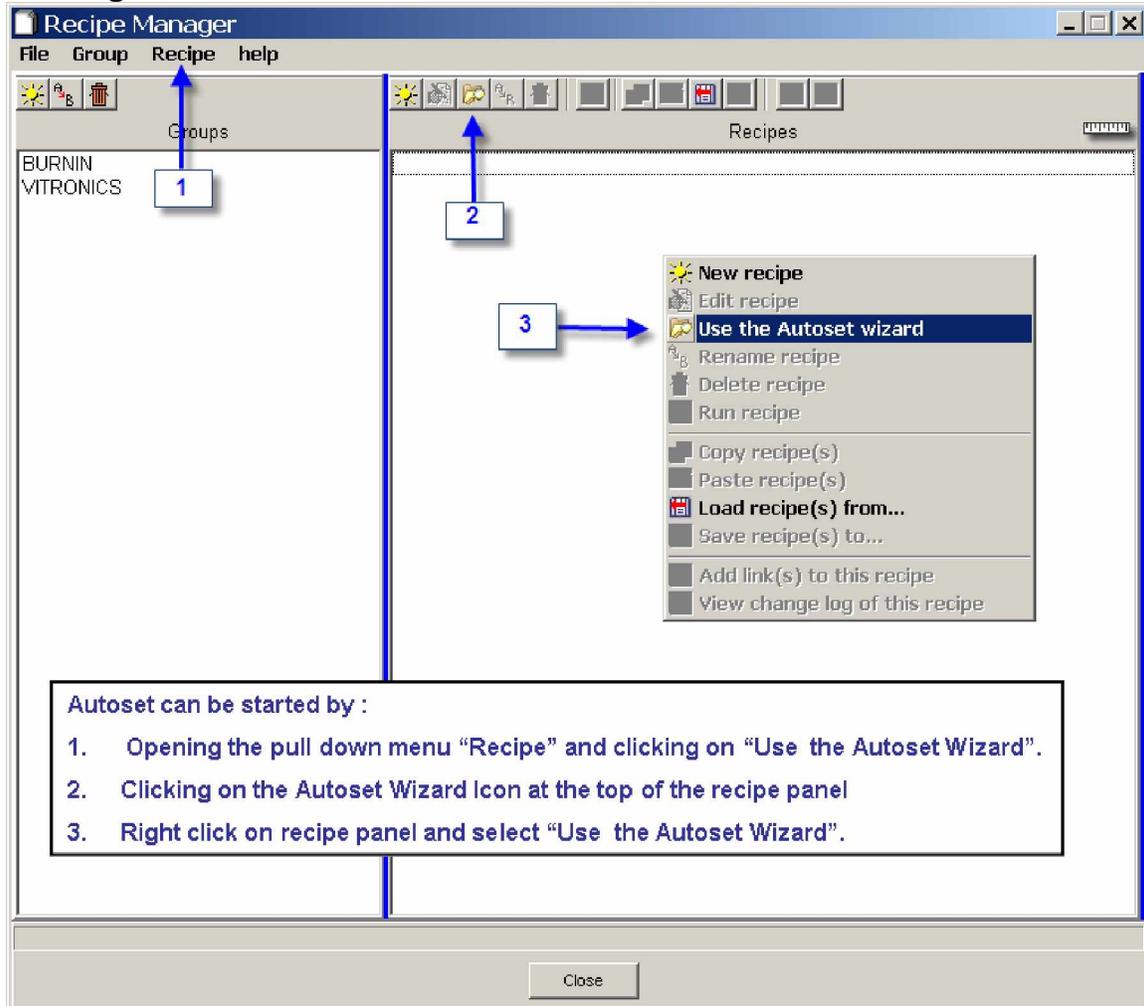
Autoset wizard can be enabled or disabled in the recipe manager. To enable - disable the wizard go to recipe manager, left click on the pull down menu "file", and then left click on "preferences". Highlight the tab "Autoset". To enable Autoset check the box to the left of "use Autoset". Enabling Autoset does not mean Autoset is required to create recipes. Disabling Autoset, by unchecking the "use Autoset" box will remove the Autoset functionality from the recipe manager.



Default recipe:

In the Group "Vitronics" there is or should be created a recipe "Default". The "default" recipe serves as a template whenever a new recipe is created. The importance of this template for Autoset is it contains presets for recipe setpoints not created by Autoset wizard. (Autoset only suggests heater setpoints and conveyor speed.) Non-Autoset recipe setpoints, are machine configuration dependant. Examples of non-autoset recipe setpoints might include cell fan speed, coolant temperature, and the type of atmosphere, air or nitrogen. The Autoset generated setpoints are combined with the default recipe setpoint to form a "complete" recipe which will contain all of the recipe setpoints

Starting Autoset:



Using the Autoset Wizard to create a recipe:

The Autoset Wizard consists of three steps. Each of the steps has an associated icon.

Step 1 : name the recipe, choose the paste profile



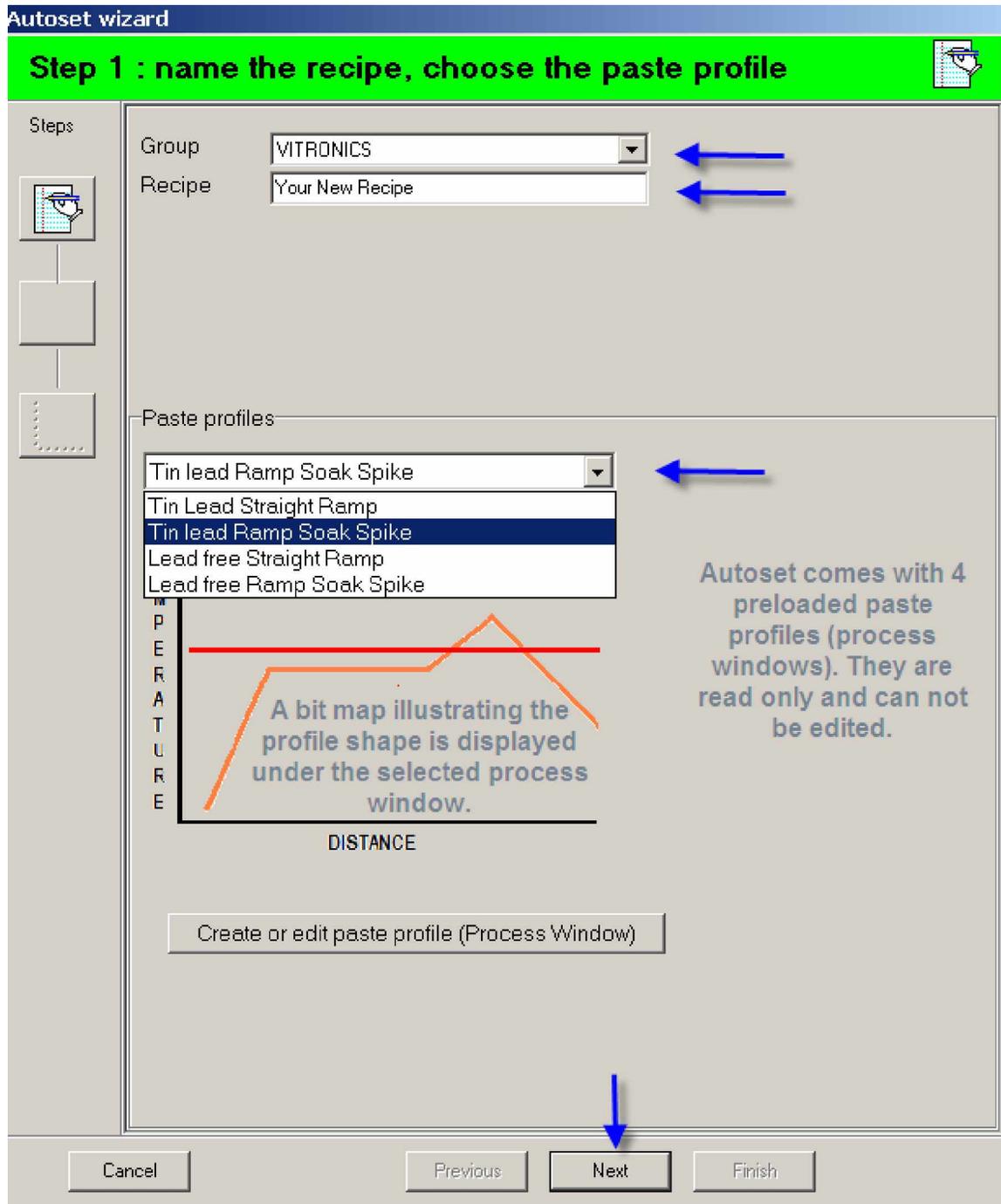
Step 2 : measure the board, set the speed range



Step 3 : Create a recipe, using the Autoset search engine



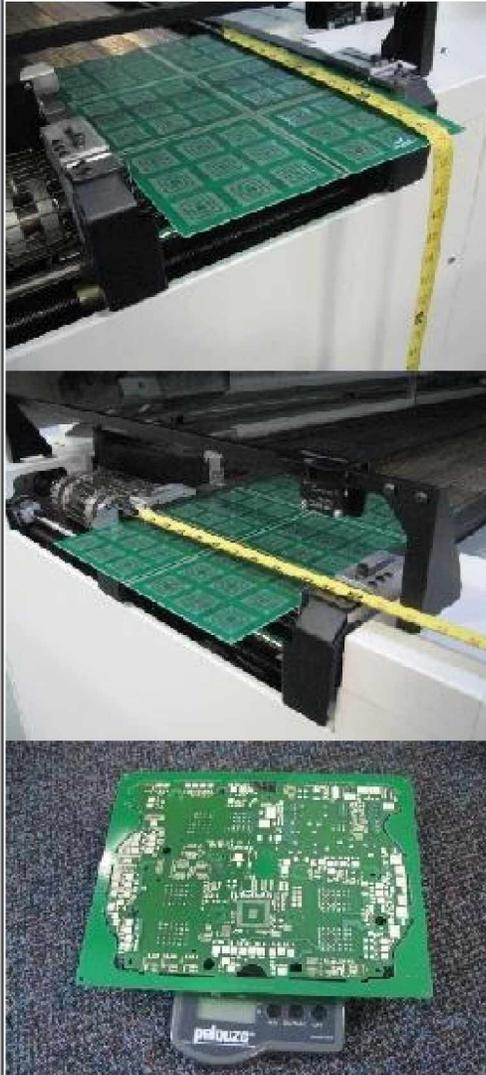
The following 4 screen shots walk you through the wizard. Step three is show before and after the search engine creates the recipe.



Step 2 : measure the board, set the speed range



Steps



Board length inch

Board width inch

Board weight grams

Min Conveyor speed range Max

Cancel

Previous

Next

Finish

Autoset wizard

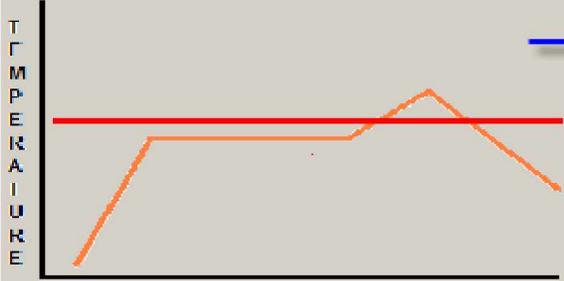
Step 3 : Create a recipe, using the Autoset search engine

Steps

Group: Board width: inch

Recipe: Board length: inch

Vitronics/default.rec will be used as template Board weight: grams



TEMPERATURE

DISTANCE

Create recipe

Calculating...

Cancel

Paste profile:

Clicking on the "Create Recipe" button will start the process of generating heater setpoints and conveyor speed.

Cancel Previous Next Finish

Step 3 : Create a recipe, using the Autoset search engine



Steps



Group

Recipe

Vitronics/default.rec will be used as template

Board width inch

Board length inch

Board weight grams



Create recipe

Paste profile

Conveyor speed ←

HEATERS

91	115	168	170	173	176	176	206	236	240	←
1	2	3	4	5	6	7	8	9	10	

91	115	168	170	173	176	176	206	236	240	←
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The results are displayed in peach boxes at the bottom of the screen.

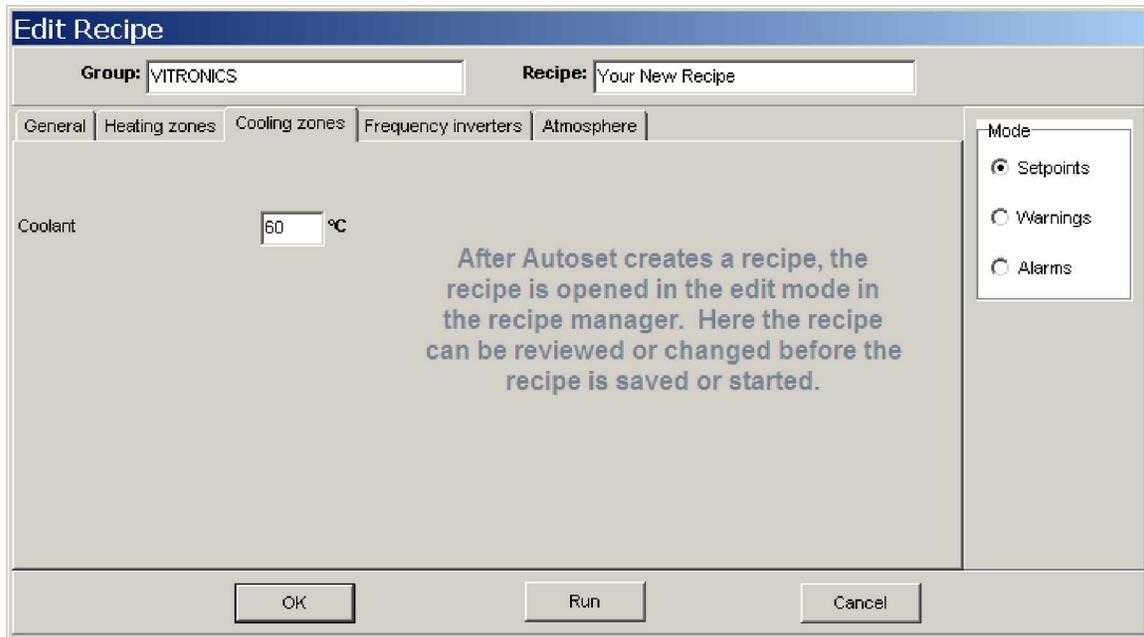


Cancel

Previous

Next

Finish



Tips for Using the Autoset Wizard:

1. Defining a conveyor speed is not required to generate a recipe within Autoset.
2. The tab key can be used to go between input boxes.
3. The “next” or “finish” button can be activated using the “enter” key to go to the next screen.
4. After each step is completed, the icon for that step becomes visible on the left side. The user can access and edit information from a previous step by clicking on the appropriate icon.
5. Occasionally a “No Match Found” dialogue box will appear. This message occurs when the search criteria (board size - board weight, or conveyor speed or process window) either singularly or collectively make finding a match within the database impossible. Check input boxes such as board size and weight for typo errors.
6. Autoset is not designed to make predictions for boards profiled on or with a pallet. However:
 - a. If a light board is profiled **on** a pallet then use the pallets size and weight to generate a prediction.
 - b. If a board is profiled **in** a pallet the use the pallets length and width and 70% of the assembly’s (pallet and board) weight to generate a prediction.

Create or editing a Process Window:

Autoset come with four preloaded process windows. They represent generic starting points but might not adequately define your specific process requirements. The four preloaded process windows are:

- Tin Lead Straight Ramp
- Tin Lead Ramp Soak Spike
- Lead free Straight Ramp
- Lead free Ramp Soak Spike

*all of the above are read only files and cannot be edited

To create and/or customize a process window click on the

Create or edit paste profile (Process Window) button which is found at the bottom of step one. This opens the process window wizard. "The process window wizard" requires the signed in user to be "System". If another user is logged in they will be prompted to log in with the user name "System".

The process window wizard will open to the screen show immediately below. From this screen the user can create a new process window by clicking on the "Solder Paste Menu" button. The solder paste menu list includes descriptions of the common pastes from the major solder paste manufactures. To edit an existing process window selected the process window to be edited from the pull down menu and click on the "Edit Specs" button.

Process Window Name: **Tin Lead Straight Ramp**

Solder Paste Menu Edit Specs

Solder Paste: SYSTEM DEFAULT

Statistic Name	Low Limit	High Limit	Units
Max Rising Slope (Target=1.5) (Calculate Slope over 20 Seconds)	0.5	2.5	Degrees/Second
Time Above Reflow - 183C	30	90	Seconds
Peak Temperature	205	225	Degrees Celsius

Same Specs for all TCs Select TC to view:

Process Window Description

To create a new process window click on the "Solder Paste menu" button and select a paste. A "default" process window can be chosen and customized. After selecting a paste click on the pull down menu and a screen similar to the illustration below will appear. In the illustration the solder paste is an "Alpha – SAC305 Sn96.5Ag3.0Cu0.5 RSS NC/LF". The check to the left of the process criteria means that process criteria is applicable to this paste. Process criteria can be added or removed by checking or unchecking the box. To edit particular process criteria, click on the description and a new window will open up. Any of the white input boxes can be edited. After reviewing and editing all the process criteria then click of the green check. This will return you to a screen similar to the one above. The new process window can be reviewed and then named. Checking the green box at the bottom of this screen will cause the program to ask "Add this process window to the list of Process Windows?" A yes answer will take you to the final screen in the process window wizard. Here the user is required to select a profile shape that matches the process window. This is done by clicking on the appropriate bitmap. After a process window is selected a blue square will frame the bit map indicating that it has been selected. If the process

window has no soak criteria or a soak criteria of less than 35 seconds then select the straight ramp profile shape. Clicking on the green check will exit the process window wizard and return you to Autoset.

Solder Paste: Alpha OM-325 SAC305 Sn96.5Ag3.0Cu0.5 RSS NC/LF Air or N

Specs details:

Slope Range

Celsius

- Maximum Falling Slope (Cooling Rate)
- Maximum Slope Between Temperatures (Slope 1)
- Maximum Slope Between Temperatures (Slope 2)
- Maximum Slope Between Temperatures (Slope 3)
- Maximum Rising Slope (Ramp Rate)
- Maximum Falling Slope (Cooling Rate)
- Preheat 1
- Preheat 2
- Preheat 3
- Preheat 4
- Soak 1
- Soak 2
- Soak 3
- Soak 4

TC Selection & Label

Solder Paste:Alpha OM-325 SAC305 Sn96.5Ag3.0Cu0.5 RSS NC/LF Air or N

Maximum Falling Slope (Cooling Rate) ▼

Specs details:

Slope Range

Celsius/Second(s)

-2

.....>

-1

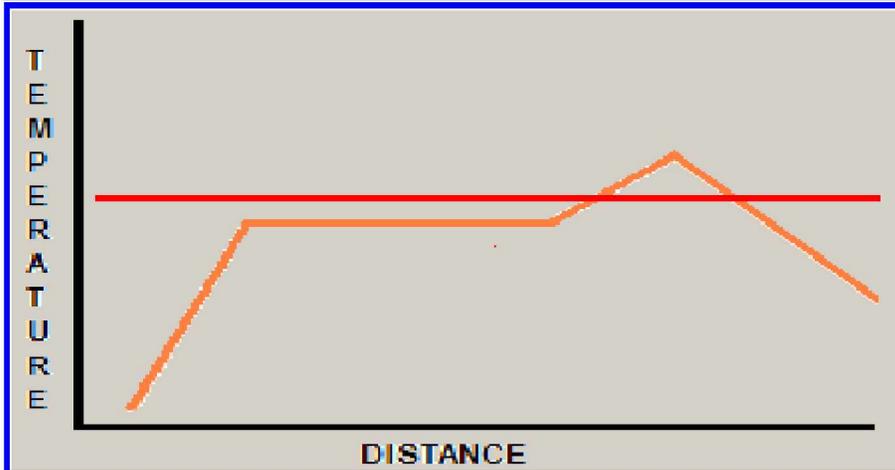
Number of Seconds to Calculate Slope Over: 20

TC Selection & Label



Process window wizard

Choose profile shape by clicking one of the shapes



Selected paste profile: **Alpha OM-325 SAC305**

Selected paste shape: **Ramp Soak Spike**

Cancel

Previous

Finish

Tips for Using the Process Window Wizard:

1. Always verify the suggested solder paste menu criteria with a paste manufactures recommended reflow profile.
2. Remove (uncheck) cooling slope criteria from the process window. Inclusion of cooling slope criteria adversely affects the prediction. If cooling slope is a critical then add it back in later to evaluate profile.

3. If you're unsure which profile shapes to choose then choose the straight ramp profile shape.

4. Frequently Asked Questions

What does Autoset do?

Autoset suggests heater and conveyor setpoints and thereby minimizing the time required to develop a thermally acceptable profile for a particular board

How does Autoset work?

Autoset takes the board dimensions (which are entered by the operator) then looks at the process window (selected by the operator) then uses an algorithm to search a library of profiles and suggests heater and conveyor setpoints. The end user can run this recipe as is or modify it as needed.

How accurate will the autoset predictions be?

The accuracy of the predictions depends primarily on board complexity, and the process window selected. The closer the board dimensions are to the board dimensions in the database the more accurate the predictions. Similarly the more the process window matches the process window that the database were developed with the more accurate the predictions. More complex boards with large BGA's will likely require multiple profile runs.

Does Autoset set all the recipe parameters?

No. Autoset suggests the recipe heater setpoints, conveyor speed and conveyor width on those ovens with computer rail adjust. Other recipe setpoints which are configuration dependant, can be preset in the default recipe in the Vitronics folder.

How will Autoset help an experienced process technician?

Generally an experienced process technician will not have trouble creating a profile for a new product if he has profiled similar boards in the past. However when faced with profiling a board which is markedly different then that which he is familiar with and/or the process window is different then Autoset will provide a good starting point. The technician can use the suggested heater and conveyor setpoints suggested as is or modify them.

Does it matter which third party profiler is being used?

Any third party thermal profiler can be used to verify the profile.

What differences will I encounter on ovens where the line voltage frequency is at 50Hz?

The autoset database was developed with the cell fans spinning at 3500rpm. Oven with the fans spinning at 2917 RPM (which is 50hz.) might require some minor adjustment of reflow heater setpoints depending on board weight and process window.

Can one Process Window with more than one recipe.

Yes. A Process Window can be used with a number of different recipes.