

ST325 / ST350 & ST350 Rework Station



Software Operation Manual

Manual Number 5050-0546 Rev 3-05-tf



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System Requirements

PACE Software Part Number	5050-0546
PC Requirements	Pentium 4, 256M Ram, Floppy, CD

Safety Guidelines

The following are safety precautions that personnel must understand and follow when using or servicing this product.

“NOTE”

Used to indicate a statement of company recommendation or policy. The message may relate directly or indirectly to the safety of personnel or protection of property. NOTE is not associated directly with a hazard or hazardous situation and is not used in place of "CAUTION", "WARNING" or "DANGER".

“CAUTION”

Used to indicate a hazardous situation, which may result in minor or moderate injury. May also be used to alert personnel to conditions, procedures and practices which, if not observed, could result in damage to or destruction of the product or other equipment.

“WARNING”

Used to define additional information that if not closely followed might result in serious damage to equipment and represent a potential for serious personnel injury.

“DANGER”

Defines additional information that if not closely followed might result in severe personnel injury or death. Danger is not used for property damage unless personal injury risk is present.

Usage Warnings/Cautions**WARNINGS**

1. A fire hazard may arise if the ST325 is used improperly.
2. Do not use the ST325 in the presence of an explosive atmosphere.
3. Be careful when using the ST325 in places where there are combustible materials. Heat may be conducted to combustible materials that are not in sight.
4. Do not apply heat from the ST325 to one place for a long time.
5. Do not leave the ST325 unattended while powered on.

CAUTIONS

1. The ST325 handpiece heater assembly housing and any installed nozzle are hot when the system is being cycled and for a period of time thereafter. DO NOT touch the heater assembly housing, nozzle or direct heated air stream. Severe burns may result!
2. Utilize all standard electrical safety precautions when using this or any other electrical equipment.
3. Always use the ST325 with the Heat Shield installed. The Heat Shield helps to prevent unintentional contact with the heater.
4. Always use this system in a well-ventilated area. A fume extraction system such as those available from PACE are highly recommended to protect personnel from solder flux fumes.
5. Exercise proper precautions when using chemicals (e.g., solder paste). Refer to the Material Safety Data Sheet (MSDS) supplied with each chemical and adhere to all safety precautions recommended by the manufacturer.

Features

The ST325 is ideal for post assembly rework, repair, and low volume/short run production operations. The ST-325's dynamic software will store criteria to remove and install PBGAs, CSPs, FCs, LGAs, LCC's and other SMDs.

Featuring unparalleled thermal performance, the ST 325's flexibility and state of the art process software means no other system is easier to use. The ST 325 requires a Pentium ® 4 PC featuring Windows XP® Professional Operating System.

Software Installation

- 1 Rev 1.22 or higher firmware is required to work with the ST 325 / 350 PC software. The firmware revision is displayed on the front panel when the unit is turned on.
- 2 Look at the specifications in section 1 on page 3 and ensure that the computer you choose is suitable.
- 3 Ensure that you have installation rights on the computer, and that none of the drives on which you will load PACE ST325 / ST350 Software (A: and hard drives such as C: or D:) are shared in any way, or locked by a virus checker.
- 4 Put the PACE ST325 / ST350 CD into the CD drive.
- 5 Wait for instructions to appear on the screen, and follow them. (If no instructions appear, find the CD drive containing the PACE ST325 / ST350 CD using My Computer or Explorer. Then open the CD directory, and double-click on setup or setup.exe).

Connecting the ST325 / ST350 to your PC

Your personal computer communicates to the ST325 or ST350 through the RS-232 (9 pin) connection located on the back of the ST325 / ST350. Before connecting, make sure cable and panel connections are clean and straight. Do not over tighten cable connection. From the “link” menu, select a COM port to connect the ST325 / ST350.

Main Screen Controls

When creating a profile the operator may select from two profile types. The “timed” profile limits the profile controls to applying heat to the nozzle for a specific temperature and time duration. The “zoned” profile will control temperature and time durations for three independent zones that consist of the pre-heat, soak, and reflow. Each zone may be customized to fit the component requirement for installation or removal. Please see page 15 for instructions on creating a zoned profile.

File Menu

The image shows a screenshot of the 'File' menu in the PACE ST325/350 software. The menu items are as follows:

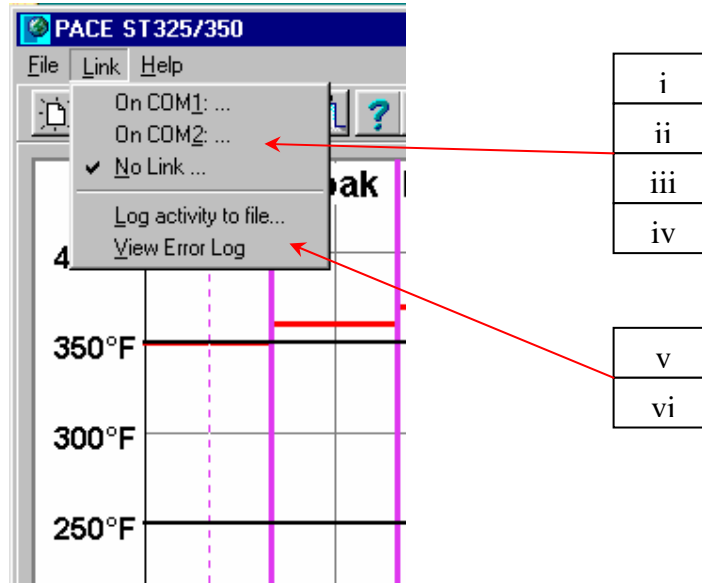
- New
- Open a Timed Profile file...
- Open a Zoned Profile File...
- Save Profile
- Save Profile As...
- Print Setup...
- Print Graph
- Export Graph to PDF
- Print a BLANK Profile Chart
- Print Profile Parameters
- Export Profile to PDF
- Export BLANK Profile Chart to PDF
- Print a BLANK Profile Log Sheet
- Print Profile Log
- Export Data to Spreadsheet
- Exit

Numbered callouts (i-xvi) are placed to the right of the menu, with red arrows pointing to the corresponding menu items:

- i. New.
- ii. Open a Timed Profile file.
- iii. Open a Zoned Profile file.
- iv. Save Profile.
- v. Save Profile As.
- vi. Print Setup.
- vii. Print Graph.
- viii. Export Graph to PDF
- ix. Print a BLANK Profile Log Sheet.
- x. Print Profile Parameters
- xi. Export Profile to PDF
- xii. Export BLANK Profile Chart to PDF
- xiii. Print a Blank Profile Log Sheet
- xiv. Print Profile Log
- xv. Export Data to Spreadsheet
- xvi. Exit

Link Menu

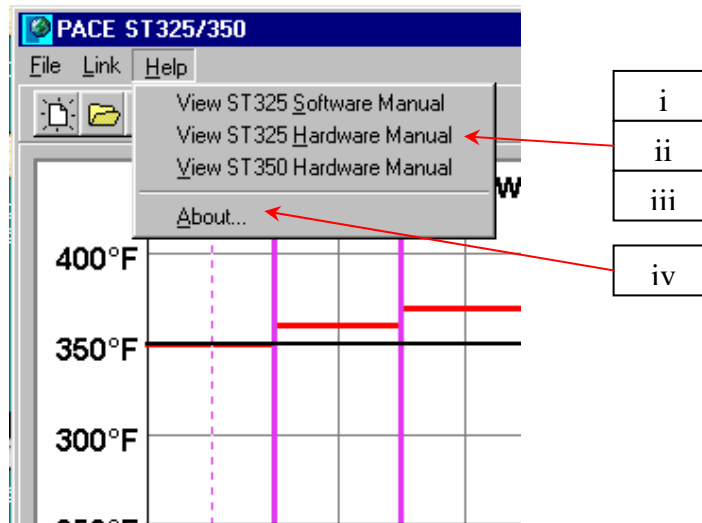
Clicking on the link menu will reveal the options to connect your PC to the PACE unit. It is important to select an active COM port before attempting to save profiles to the ST325 or ST 350.



- i. COM 1
- ii. COM 2
- iii. COM 3
- iv. No Link.
- v. Log activity to file
- vi. View Error Log

Help Menu

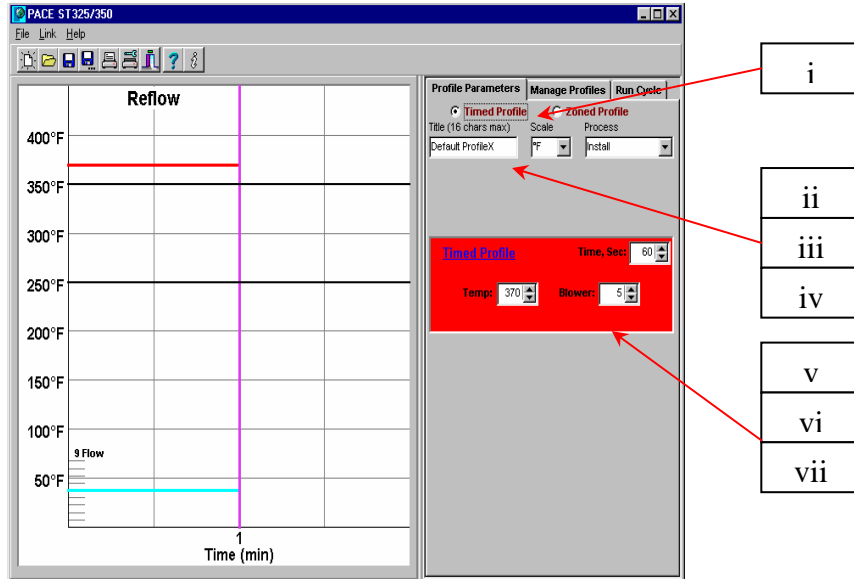
The Help Menu drop down box contains links to the software and hardware manuals in PDF form. Please read and understand all safety instructions before operating the PACE ST325 or ST350.



- i. View ST325 Software Manual.
- ii. View ST325 Software Manual.
- iii. View ST350 Software Manual.
- iv. About.

Profile Parameters Tab “Timed”

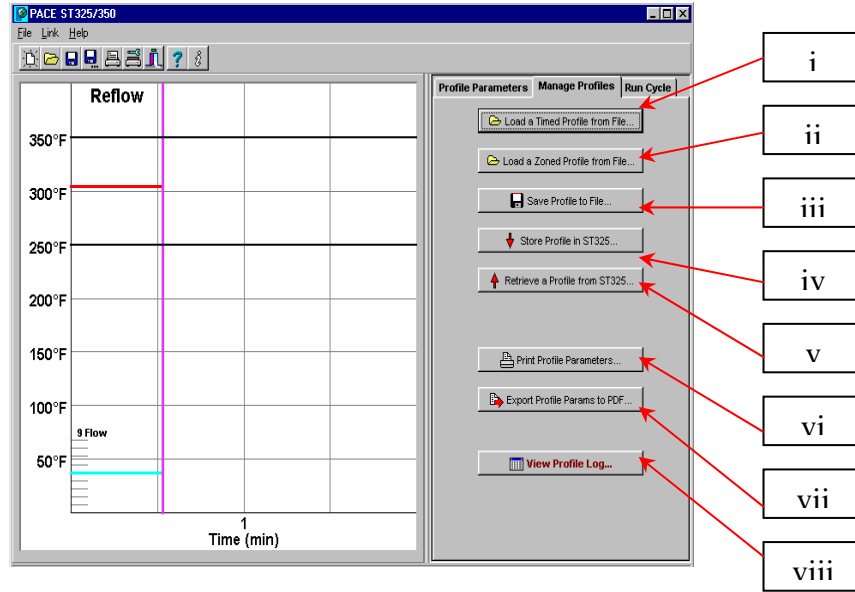
The Timed Profile menu allows the operator to create and save profiles that are time driven. Settings are changed by use of the drop down menus to the right of the graph window. The graph window is also interactive. The operator may increase or decrease temperature settings by using the cursor to click and drag the horizontal bar. The vertical time bar may also be adjusted by click and dragging with cursor.



- i. Timed Profile. Indicates currently selected profile.
- ii. Title. Use defined name given to profile.
- iii. Profile name assigned by profile developer will be shown here.
- iv. Scale. Drop down box for selecting Fahrenheit or Celsius scale.
- v. Process. Drop down box for selecting install or removal.
- vi. Time, Sec. Temps. Sets temperature at nozzle.
- vii. Blower. Scroll box that sets blower speed. (1-9)

Manage Profiles Tab “Timed”

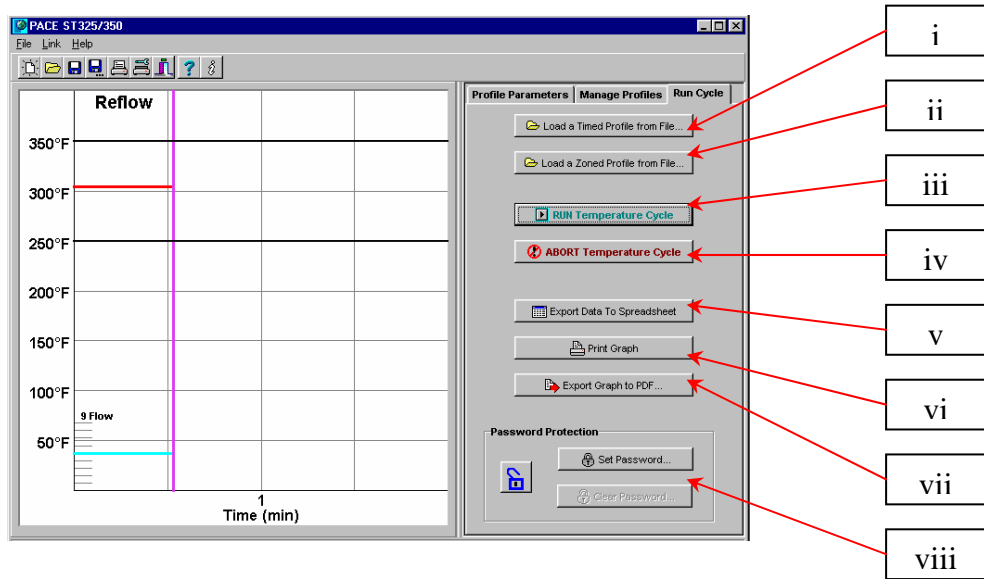
The Manage Profile menu gives the operator the ability to load, save, and export profiles. This menu will also allow the operator to store and retrieve profiles from the ST325. The ST325 / ST350 hardware is capable of storing 20 zoned profiles and 20 timed profiles and the PC software will manage all saved profiles. Profiles are easily exported to PDF file format. Accessing the profile log will show all of the saved profiles within the ST325 / ST350.



- i. Load a timed profile from File.
- ii. Load a Zoned Profile from File.
- iii. Save Profile to File. Saves current profile.
- iv. Store Profile in ST325 / ST350. Saves current profile to ST325 / ST350
- v. Retrieve Profile from ST325 / ST350.
- vi. Print Profile Parameters. Sends current profile to selected printer.
- vii. Export Params to PDF. Saves current profile to Adobe PDF file.
- viii. View Profile Log. Opens profile log stored within the ST325 / ST350 software.

Run Cycle Tab “Timed “

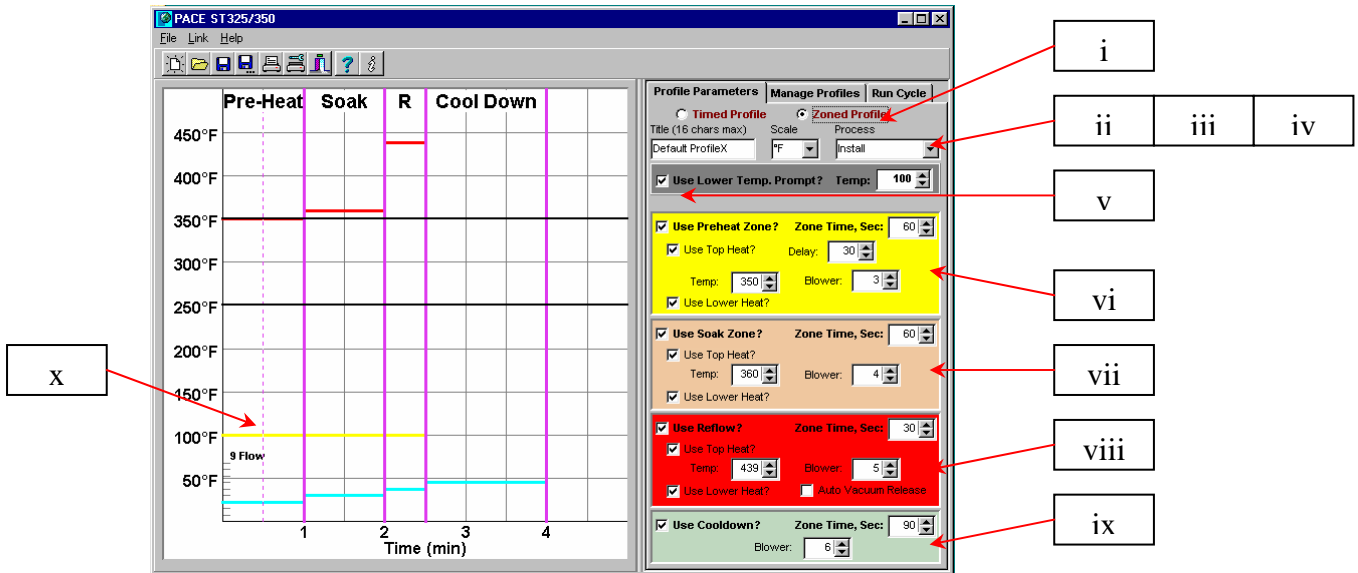
The Run Cycle executes the selected or newly developed profile. At any time the operator may choose to abort the profile and return the to the ready mode. The operator may also choose to export the selected profile to a spreadsheet the “Export Data to Spreadsheet ” button creates a Comma Separated Value (CSV) file that can be opened by any standard spreadsheet software. The “Print Graph” button will send the current record to the selected printer. The “Export Graph to PDF” button created a (PDF) file of the record on the PC hard drive. Password Protection allows the operator to “lock out” other users.



- i. RUN Temperature Cycle. Starts profile.
- ii. ABORT Temperature Cycle.
- iii. Export Data To Spreadsheet.
- iv. Print Graph. Export Graph to PDF.
- v. Export Date To Spreadsheet.
- vi. Print Graph.
- vii. Export Graph To PDF.
- viii. Password Protection.

Profile Parameters Tab “Zoned Profile”

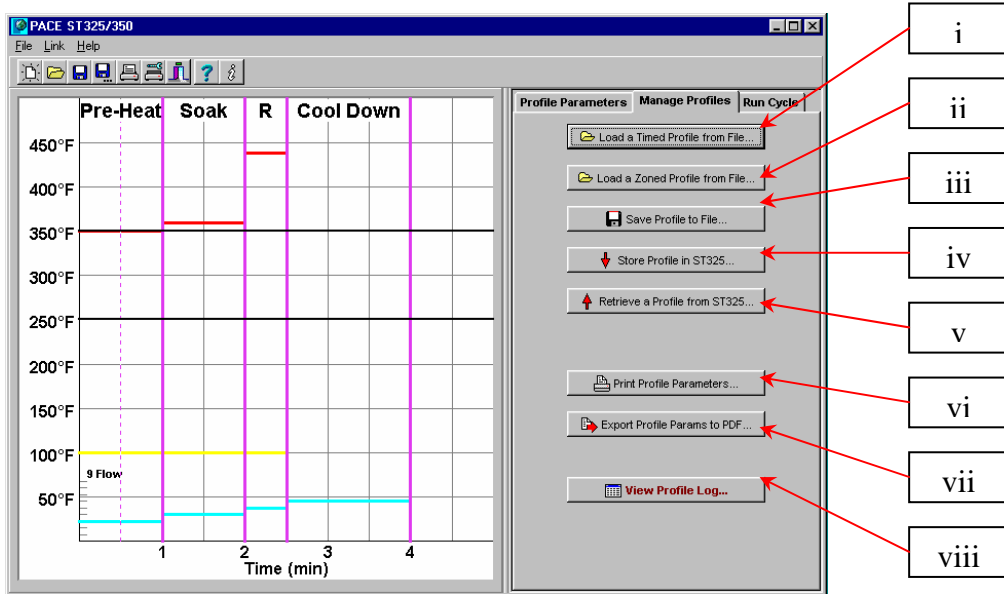
The profile parameters menu allows the operator to set and control all aspects of the profile cycle. In addition to the menu controls, using the cursor to click and drag the vertical and horizontal bars in the process graph will also change settings. By selecting the “Use lower Temp. Prompt” feature, the user is prompted to set the manual temperature control for an optional under board heater. See section 12, Profile Creation “step profile” for detailed information on zone and temperature settings.



- i. Zoned profile. Indicates currently selected profile.
- ii. Title. Profile name assigned by profile developer will be shown here.
- iii. Scale. Drop down box for selecting Fahrenheit of Celsius scale.
- iv. Process. Drop down box for selecting install or removal.
- v. Use Lower Temp. Prompt? Prompt user to set temp on optional under board heater.
- vi. Preheat Zone. Set preheat time and temperature limit.
- vii. Soak Zone. Set soak time and temperature limit.
- viii. Reflow Zone. Set reflow time and temperature limit.
- ix. Use Cool down?
- x. Process graph. Display of profile setting.

Manage Profile Tab “Zone Profile”

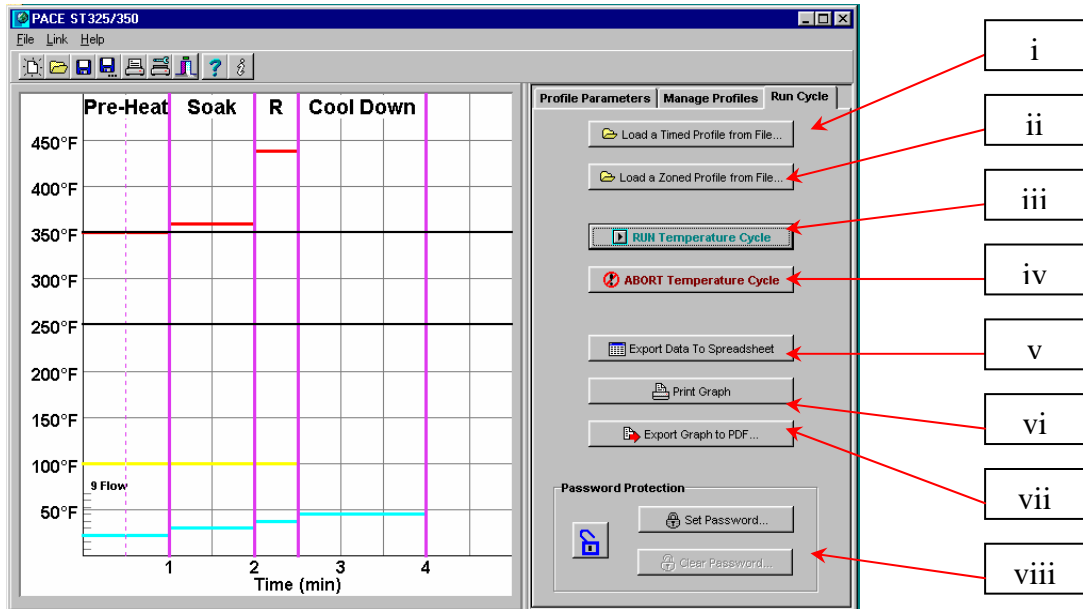
The “Manage Profile” menu gives the operator the ability to load, saves, and export profiles. This menu will also allow the operator to store and retrieve profiles from the ST325 or ST350. The ST 325 and ST350 are capable of storing up to 20 profiles. The ST325 / ST350 software has the capacity of storing 40 profiles with a single profile set. Multiple set maybe stored on the PC for later use. Profiles are easily exported to PDF file format. Accessing the profile log(s) will show all of the saved profiles.



- i. Load a timed profile from File.
- ii. Load a Zoned Profile from File.
- iii. Save Profile to File. Saves current profile.
- iv. Store Profile in ST325 / ST350. Saves current profile to ST325 / ST350.
- v. Retrieve Profile from ST325 / ST350.
- vi. Print Profile Parameters. Sends current profile to selected printer.
- vii. Export Params to PDF. Saves current profile to Adobe PDF file.
- viii. View Profile Log.

Run Cycle Tab “Zone Profile”

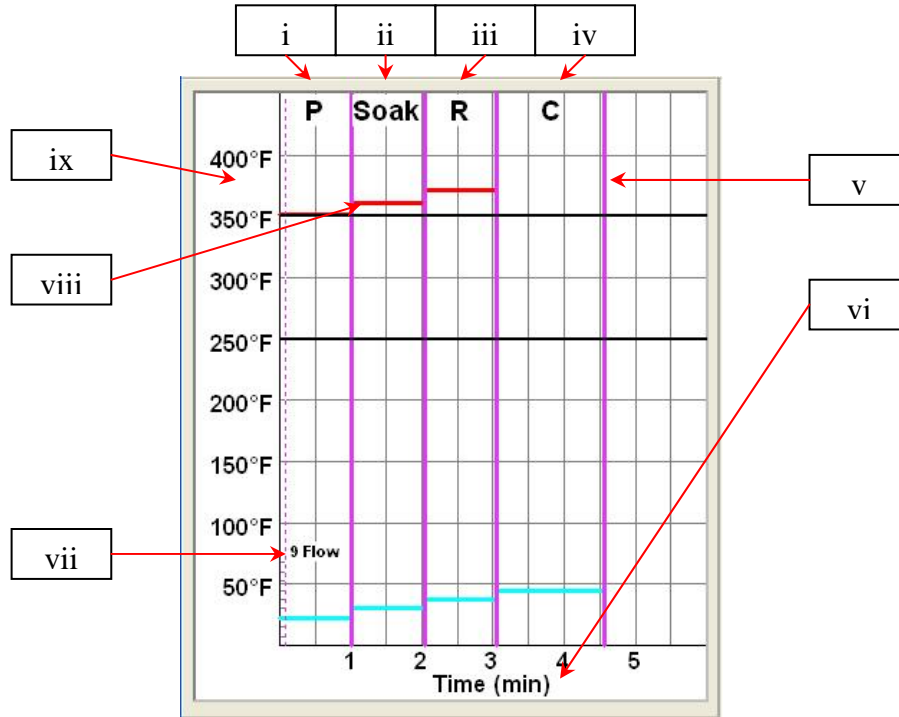
The Run Cycle executes the selected or newly developed profile. At any time the operator may choose to abort the profile and return the ST325 / ST350 to the ready mode. The operator may also choose to export the selected profile to a spreadsheet. The “Export Data to Spreadsheet” button creates a Comma Separated Value (CSV) file that can be opened by any standard spreadsheet software. The “Print Graph” button will send the current record to the selected printer. The “Export Graph to PDF” button created a (PDF) file of the record on the PC hard drive. Password Protection allows the operator to “lock out” other users.



- ix. RUN Temperature Cycle. Starts profile.
- x. ABORT Temperature Cycle.
- xi. Export Data To Spreadsheet.
- xii. Print Graph. Export Graph to PDF.
- xiii. Export Date To Spreadsheet.
- xiv. Print Graph.
- xv. Export Graph To PDF.
- xvi. Password Protection

The Temperature Graph

During profile creation, the operator can adjust most time and temperature settings by dragging the vertical or horizontal bars within the temperature graph. During the run cycle, the graph will plot the temperature setting throughout the cycle. As the cycle advances, the operator can hover the cursor over the moving indicator line to reveal the temperature at that point in the cycle.



- i. Preheat. Show time duration of cycle.
- ii. Soak.
- iii. Reflow.
- iv. Cool down.
- v. Time indicator and adjustment bar
- vi. Time scale in minutes
- vii. Blower speed
- viii. Temperature indicator and adjustment bar
- ix. Temperature scale

Profile Creation

There are 2 recommended methods for developing a profile. The first, involves an actual component installation, while the second uses a previously installed package. Either method can be used to develop a reliable profile. However, there are some issues and considerations to be aware of with each.

When developing profiles through actual component installation, it is critical to make sure the thermocouples remain in contact with the solder throughout the entire process. Unreliable data will be collected should a thermocouple lose contact with the solder.

When using a previously installed package, the placement of the thermocouples is important. They must be in contact with the existing solder joints. This task can be accomplished by either (1) drilling through the bottom of the PCB into a solder joint and attaching the thermocouple or by (2) sliding the thermocouple under the package in the case of a BGA or along side in the case of other SMD's. When sliding a thermo couple under a component, it is critical that the thermocouple be in contact with the solder. Method 2 is the most commonly used. Information from the thermocouples will assist in determining the proper time and temperature parameters. In general, the following guidelines should be adhered to when developing profiles.

Ramp and Maximum Temperatures

Acceptable ramp rates and maximum temperatures should be obtained from the component manufacturer. Typical ramp rates are 2-5 °C/s (4-9 °F/s) for plastic parts and 1 °C/s (2 °F/s) for ceramic parts. It is recommended to select a maximum temperature below the manufacturer's specification to provide for a margin of safety. Typically, 20 °C below maximum specified temperature is selected.

Pre-Heat Phase

In a "ST325 / ST350 profile," the top of the PCB and package should reach a stable temperature of 95-105 °C. When plotting the temperature curve, the trace will usually level off within this temperature range. If a "linear slope" is desired, pre-heat and soak phases are combined. Both the package and the PCB are warmed at a constant ramp rate (usually 2-4 °C/second) until the desired soak temperature is reached.

Soak Phase

The soak phase is a crucial part of the reflow process. During this period, the flux activates and drives off volatiles and excess flux. A temperature of 145-165 °C (determined by the activation temperature of the flux used) should be maintained for approximately 20-40 seconds. This allows for uniform ramping across the entire package and PCB during reflow.

Reflow Phase

During this phase, the solder reaches solder melt and forms joints between the package and the lands. It is critical for all areas of the component to reach solder melt together and all solder joints remain in a liquid state for at least 10-20 seconds. Generally, plastic packages should not be exposed to temperatures higher than 220 °C. Always consult the device specifications for maximum temperature recommendations. As a rule of thumb, a safe "maximum temperature" is the maximum temp specified by the manufacturer minus 20°C. Lower temperatures and shorter times are common in CSPs and FCs. **The lowest temperatures possible should always be used to ensure safety of the device and PCB.**

Cool Down Phase

The cool down phase is necessary to bring the temperature of the package, solder joints and PCB under the package below solder melt temperatures. Cooling should be controlled. A good reference is to use the same cool down rate as for ramp up.

General

Using one of the two baseline (default) profiles will provide a good starting point for profile development. The reflow graph provides an excellent tool for monitoring profile parameters and fine tuning or perfecting the profile development process. When adjusting profile parameters “on-the-fly,” all changes are reflected immediately on the profile development screen and graph. Parameters may not be changed while profile is running. Operator must “abort” the run cycle before modifying the profile.

Profile Log

When saving a profile, the user will be prompted to select a profile number. Selecting a number that contains an existing profile will over write the previous profile. While viewing the profile log, the operator may open the profile setting menu by clicking anywhere within the profile row. The “Load Profile Set” is a complete set of all the profiles that are saved on the PC hard drive. This is a simple way to load all 40 profiles at once. The Save Profile Set button will open a save window allowing the operator to save the current profile set or rename saving an additional set of forty profiles.

The profile log is also interactive. The user may edit the parameters of a stored profile by right clicking on the selected profile to open the pop up menu shown below. If you want to run the profile you just changed, you will need to select the “make this the current profile” from the right click pop up menu.

Profile #	PCB	Title	Process	Mode	Temperature	Blower	Seconds	Preheat?
1		123456			350;360;370	1;4;5;6	30;60;90;120	No
2		Short Lo			282;304;333	2;4;5;6	21;10;10;30	Yes: 100
3		Short Lo			282;304;333	3;4;5;6	21;10;10;30	Yes: 105
4		- empty						---
5		Short Lo			282;304;333	5;4;5;6	21;10;10;30	Yes: 105
6		- empty						---
7		Short Lo			282;304;333	2;4;5;6	21;10;10;30	Yes: 105
8		- empty						---
9		- empty		zoned				---

Profile Creation using the clipboard feature.

A quick and efficient way of creating a profile is to use the clipboard feature. Here are the steps necessary to create a new profile from an existing one.

- 1) Select a stored profile by clicking on its line in the Profile Log.
- 2) Copy the stored profile to the clipboard. Either:
 - a) Right click, and select the "Copy this profile to clipboard" menu item,
OR
 - b) Just type control-C to copy the selected line in the Profile Log.
- 3) Click on a new line in the Profile Log, where you want to paste the profile.
- 4) Paste the profile from the clipboard to that new line in the Profile Log. Either:
 - a) Right click, and select the "{Paste profile" menu item,
OR
 - b) Just type control-V to copy the selected line in the Profile Log.
- 5) A copy of the profile has now been pasted to the selected line in the Profile Log. Just double-click on this line to bring up the edit window, and change the profile's parameters as desired.

Profile setting menu

By selecting the "Edit this profile" the user is able to adjust all aspects of the selected profile.



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