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Operation and Maintenance Manual for the SODRTEK® ST 325 Digital Convective Soldering/Desoldering System

P/N 5050-0537

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General Information

Introduction

Thank you for purchasing the PACE SODRTEK® model ST 325 Analog Convective Soldering/Desoldering System. This manual will provide you with the information necessary to properly set up, operate, and maintain the ST 325. Please read this manual thoroughly before using the unit. The ST 325 unit is a complete system designed for hot air removal and installation of SMD components, including Ball Grid Arrays (BGAs). The following key features allow process controlled placement and reflow of BGAs and SMD components. The ST 325 will store up to 20 profiles on its own. A PC can be used to store additional profiles and to collect the thermocouple data.

Microprocessor Control

The microprocessor system offers precision control of temperature (closed-loop control), cycle time (adjustable by one second increments), and blower speed provides consistent, repeatable results in successive reflow operations. Utilizing the Quiet Flo (low noise) turbine blower, pressure/flow rate is easily controlled and maintained at optimum levels for the particular task. A multi-level password lock-out prevents unauthorized changes and an audible countdown timer indicates end of cycle.

ST 325 Handpiece

The user-friendly ST 325 static-safe handpiece incorporates a powerful heater and has easy-access heat cycle and vacuum pick switches on the handle. A built-in, self-adjusting vacuum pick has a push-pull action, allowing components to be lifted automatically after solder reflow. When utilized with the ST 325 System work platform, the handpiece is easily converted to a precision reflow head.

The ST 325 unit is available in either the 115 VAC or 230 VAC version. The 115 VAC version system bears the FCC Conformity Marking which assures the user that it conforms to all the requirements of FCC Emission Control Standard, Title 47, Subpart B, Class A. This standard is designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. The 230 VAC version system bears the CE Conformity Marking which assures the user that it conforms to all the requirements of (EU) directive EMC 89/336/EEC & 73/23/EEC.

Specifications

- ST 325 - Operates on 97-127 VAC, 60 Hz (115 VAC version)
  575 Watts maximum at 120 VAC, 60 Hz
- ST 325E - Operates on 197-264 VAC, 50 Hz (230 VAC version)
  575 Watts maximum at 230 VAC, 50 Hz
- Air Temperature Range - 149°C - 482°C (300°F - 900°F)
- Timing Control - 10 to 999 seconds with 1 second resolution. (does not include preheat time)
- Blower Air Flow Rate (measured at heater) - 20 SLPM (0.7 SCFM) minimum at highest speed (9).
  - 5 SLPM (0.18 SCFM) minimum at lowest speed (1).
- Vacuum (at Pik-Vac Port) - 7.6 cm Hg. (3 in. Hg.) minimum.

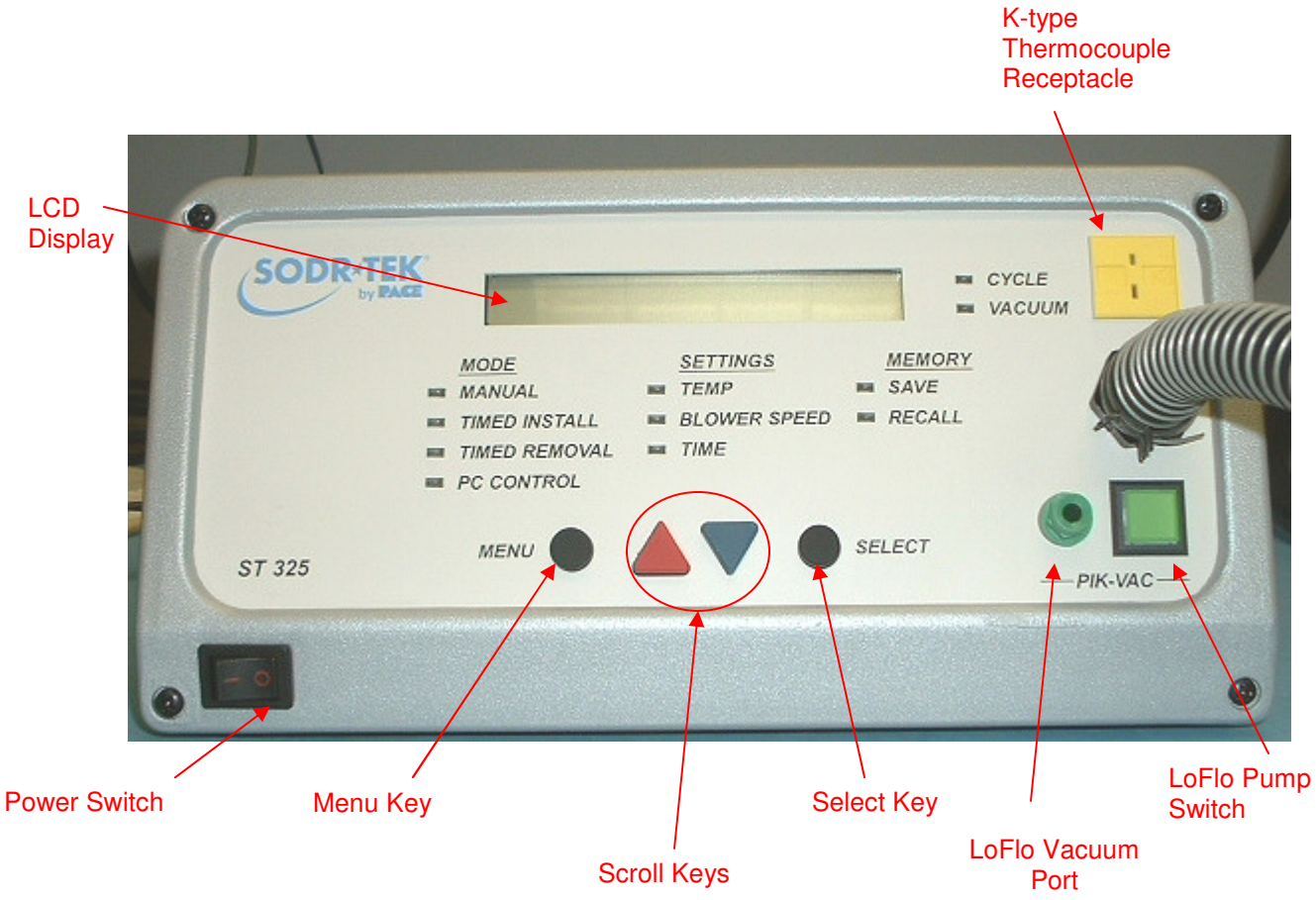
NOTE: The ST 325 is designed for cyclical usage. Attempts to use in continuous operations by taping the handpiece Cycle Switch or other methods may void Blower Assembly warranty.

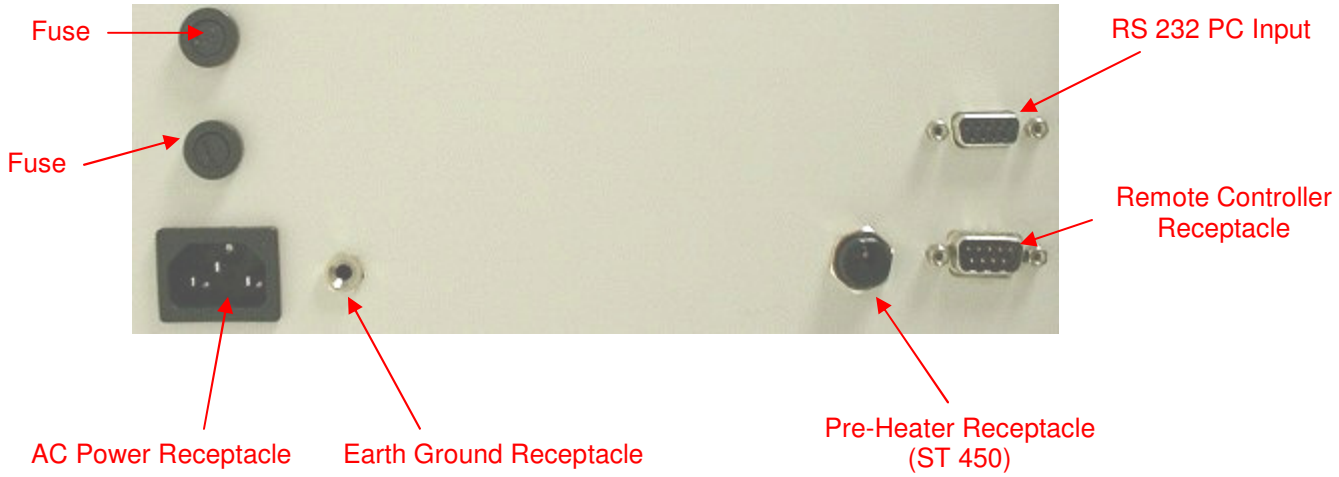
- Component Capacity - (maximum size) **-** 5.1 cm x 5.1 cm (2" x 2")

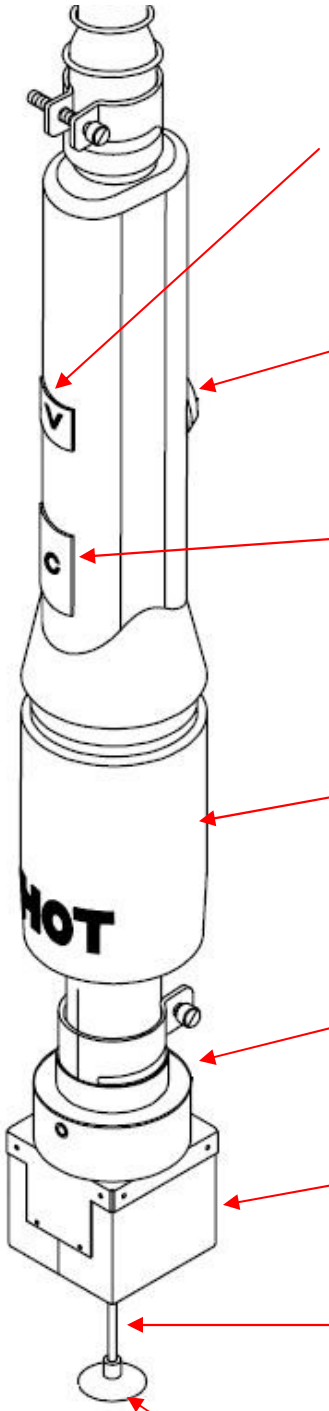
Physical Parameters

Size - 133 mm H x 260 mm W x 248 mm D (5.25" H x 10.25" W x 9.75" D)
Unit Weight - 4.3 Kg. (9.5 lbs.)

Parts Identification







Vacuum Pick Switch - Activates & deactivates vacuum pump supply to the Vacuum Pick Assembly. Switch must be depressed for a period of 0.5 second before circuit deactivation; activation is immediate.

VACUUM PICK ADJUST CONTROL – Provides adjustment for height of Vacuum Pick Assembly (& Vacuum Cup). Turn clockwise to raise pick or counterclockwise to lower pick.

CYCLE SWITCH - Activates reflow cycle (heat & airflow). Switch must be held to maintain activation in Manual Mode; in Timed & Program Modes, switch is pressed & released to initiate set cycle time. Switch can be used to abort cycle in Timed or Program Mode operation.

HEAT SHIELD-Protects the operator from unintentional contact with the heater.

QUICKFIT NOZZLE ADAPTER - Allows quick nozzle attachment and release.

NOZZLE ASSEMBLY - Directs heated air from the heater assembly to the solder joint areas for soldering or desoldering of components. Nozzles are optional parts ordered for a specific application.

VACUUM PICK ASSEMBLY - Provides a means to lift or place components.

VACUUM CUP - Provides positive holding of components for positioning during the replacement process and for lifting of the component during the removal process.

Safety

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 ST 325 is used improperly.
2. Do not use the ST 325 in the presence of an explosive atmosphere.
3. Be careful when using the ST 325 in places where there are combustible materials. Heat may be conducted to combustible materials which are out of sight.
4. Do not apply heat from the ST 325 to one place for a long time.
5. Do not leave the ST 325 unattended while powered on.

CAUTIONS

1. The ST 325 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 either 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 ST 325 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.

4. 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.

Servicing Precautions

DANGERS

POTENTIAL SHOCK HAZARD - Repair procedures performed on this product should be performed by qualified service personnel only. Line voltage parts will be exposed when equipment is disassembled. Service personnel must avoid contact with these parts when troubleshooting.

Precautions

The following are general safety precautions which personnel must understand and follow when using or servicing this product. These precautions may or may not be included elsewhere in this manual.

Safety

Electrical Requirements

The ST 325 unit draws approximately 575 Watts, which is listed on the nameplate on the power source rear panel. A separate, dedicated AC supply line circuit may be required to adequately power the unit/system. If your power outlet cannot provide suitable power, arrange for a qualified, licensed electrician to install one for you.

System Set-Up

Set up the ST 325 system using the following steps and associated drawings.

1. Remove the ST 325 from its shipping container(s). Store the shipping container(s) in a convenient location. Reuse of these containers will prevent damage if you ship or store the system.

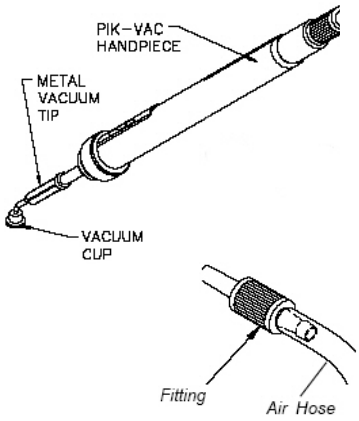
2. Set the ST 325 unit on a convenient workbench.

3. Place the **POWER** Switch (on power source front panel) in the "OFF" or "0" position.

4. Inspect all system components to check for shipping damage and to ensure that all purchased components (standard and options) are present. Use the drawings provided in the following pages as a guide for checking the parts that come with the unit.

Vacuum Pick

Set-Up

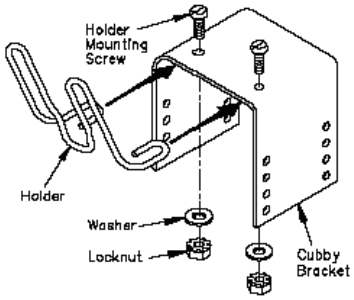


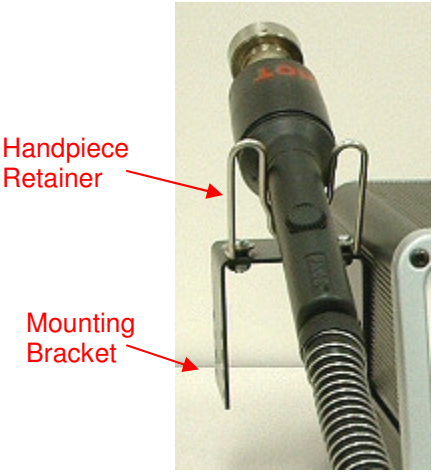
1. Locate the Pik-Vac (P/N 7027-0001-P1) and the Vacuum Cup Kit (P/N 6993-0154) supplied with the system.
2. Attach the ridged end of a male quick connect hose mount Fitting to each end of the Air Hose.
3. Attach one male quick connect hose Fitting (with attached Air Hose) to the rear of the Pik-Vac Handpiece.

4. Insert the other male quick connect hose Fitting (with attached Air Hose) into the LoFlo Vacuum Port.
5. Attach the Metal Vacuum Tip, with the appropriate vacuum cup, to the end of the Pik-Vac Handpiece.

Handpiece Stand

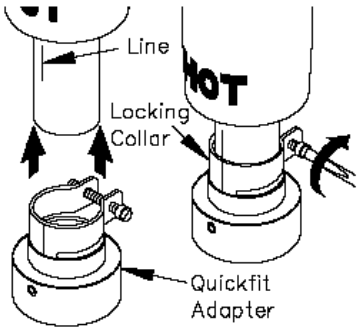
Using the supplied hardware, attach the Handpiece Retainer and the Mounting Bracket as shown.





QuickFit Nozzle Adapter

The ST 325 QuickFit Adapter allows you to easily change out any PACE ST 325 Nozzle. Attach the adapter to the handpiece heater using the following instructions.

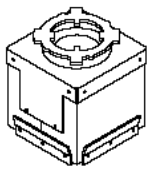


1. Insert the QuickFit Adapter into the end of the handpiece heater as shown.
2. Position the QuickFit Adapter so the Line on the heater is aligned with one of the 3 lines (1 long & 2 short lines) on the Locking Collar. Tighten Collar Locking Screw to secure adapter in position.

Nozzle Selection
Selection of the proper Nozzle is essential for achieving a quality component removal or installation. Each ST 325 Nozzle is designed to properly direct the heated air. Custom nozzles are available upon request. ST 325 Nozzles are available in 4 basic configurations.

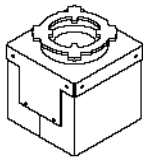
Vented Air Nozzles (V-A-N)

Are used for removal/replacement of BGA components.



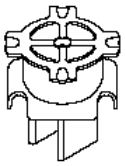
Box Nozzles

Used for removal/replacement of surface mount components having solder connections on 4 sides of the component (e.g., QFPs & PLCCs).



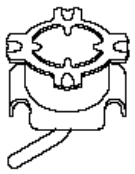
Pattern Nozzles

Used for removal/replacement of surface mount components having solder connections on 2 sides of the component (e.g., SOICs).



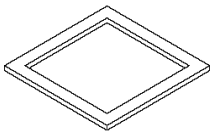
Single Jet Nozzles

Available in straight, curved and flat end versions, these nozzles are used for removal/replacement of small surface mount components (e.g., chip components), small QFPs, Land Grid Arrays (e.g., those used on pagers & cellular telephones) or for reflowing solder on single solder connections.



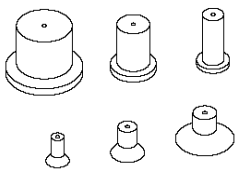
Template Selection

Alignment Templates are used as an aid in aligning V-A-N Nozzles to the PCB Assembly when installing Ball Grid Arrays (BGAs). The I.D. (Inside Dimension) of the template should match the perimeter of the BGA land pattern.



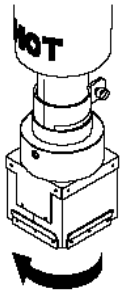
Vacuum Cup Selection

Selection of the proper size vacuum cup is important for achieving an adequate holding force for each component. The cup selected should be as large as possible without exceeding the body size of the component. Vacuum cups are consumable items which deteriorate over a period of time.



Nozzle Changeout

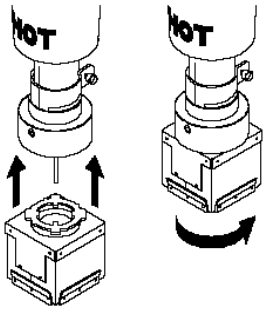
Removal



WARNING: Never remove a heated nozzle using bare hands. Use the Rubber Pad. Never use a wrench or pliers when removing a nozzle.

1. While holding the Rubber Pad, gently twist the nozzle as shown. The nozzle will easily release from the Nozzle Adapter.
2. Place the nozzle (still hot) on a heat resistant surface.

Installation



1. Select the proper Nozzle for your application.
2. Orient the Nozzle for best use on the component.
3. Insert the Nozzle up into the Nozzle Adapter (use Rubber Pad if nozzle is hot). Gently twist the nozzle as shown to lock nozzle in place.

Definitions

Please read and become familiar with the definitions of each of the following terms that are used repeatedly in the following Operation, Set-Up Mode, and Program Mode procedures.

Manual Mode: Mode of operation in which the operator sets only Operating Temperature and Blower Speed parameters. The operator then manually performs a rework operation.

Operating Temperature: The true air stream temperature as it exits the handpiece heater assembly. This temperature is displayed on the Digital Readout during any given rework cycle where air is flowing through the handpiece.

Password: The password feature, when activated will prevent unauthorized alteration of stored system parameters. If a password has been installed, the Digital Readout will display an instruction to enter the password (a 4 key numerical sequence stored in Set-Up Mode) when a setting change is attempted.

Preheat: A preliminary process in which the work is heated at a predetermined rate from ambient to a desired elevated temperature in order to reduce the risk of thermal shock and to reduce cycle time during the Reflow (primary heating) process.

Profile: An established procedure for rework which includes all parameters (e.g., operating temperature, cycle time, preheat) required for optimum rework of a particular component/pcb combination. Any established Profile can then be utilized by entering it into system memory; the Profile can then be easily recalled and used in the system Program Mode.

Program Mode: Mode of operation in which a profile can be stored, altered (edited), or recalled and used to automatically sequence through the established procedure once the cycle is initiated.

Set Temperature: The operator selected air stream temperature for the particular rework cycle.

Set-Up Mode: Mode of operation in which the operator can quickly and easily enter, change or delete system parameters (e.g., password, ℃/℉ display, profile deletion).

Timed Mode: Mode of operation in which the operator enters the Operating Temperature, Cycle Time, vacuum operation and Blower Speed parameters. When the reflow cycle is initiated, the system will operate as per those parameters and turn off at the end of the cycle time. The operator manually performs any other required procedures (e.g., vacuum operation, preheat) of the rework operation.

Vacuum Release Time: Time delay from the start of a Reflow cycle (in Program Mode, Install only) until vacuum terminates to release component.

V-A-N Nozzle: Vented Air Nozzle.

System Power Up

1. Insert the female end of the power cord into the AC Power Receptacle on the rear panel of the power source.

2. Plug the prong end (male end) of the power cord into an appropriate 3 wire grounded AC supply receptacle.

   CAUTION: To insure operator and ESD/EOS safety, the AC power supply receptacle must be checked for proper grounding before initial operation.

Set Up Mode

The set up mode provides the option to select from the following items:

1. Password Entry
2. Temperature scale selection (°C or °F)
3. Auto Vac
4. Deletion of profiles

1. Turn Power Switch Off.

2. Turn the ST 325 On while holding the Menu Button. Release the Menu Button when the LCD displays the Development Date (e.g., "Dev 4/06/04"). The LCD will now display "Password Needed?" if there is no password currently stored in the system. If a password is stored, the LCD will display "Enter Password" and "Password = 0000." Notice that the question mark is no longer present.

3. If there is no Password stored and you would like to create one, press the Scroll Up Button (▲) for yes and go to step 5. If there is no Password stored and you do not want to create one, press the Scroll Down Button (▼) or the Select Button for no and go to step 6.

4. If there is a Password stored, use the Scroll Keys (▲▼) to select the stored password.

   NOTE: If an incorrect password is entered, the system will display "Wrong Password" and exit out of the Set Up Mode.

5. Enter the Password using the Scroll Keys (▲▼).

   NOTE: Please copy the chosen password and keep in a safe place.

6. Press the Select Button after the password is selected. The LCD will now display the desired temperature scale (e.g., "Display is °F?").

7. Use the Scroll Down Button (▼) to select the desired temperature scale.

8. Press the Select Button or the Scroll Up Button (▲) to save. The LCD will now display the status of the Auto Vac, (e.g., “Auto Vac = On”).

9. Use the Scroll Down Button (▼) to select the desired Auto Vac state.

10. Press the Select Button or the Scroll Up Button (▲) to save. The LCD will now display “Delete Profiles?”. If you want to delete a profile, press the Scroll Up Button (▲). If you do not want to delete a profile, press the Scroll Down Button (▼). The LCD will now display “Exit Setup?”

11. Use the Scroll Up Button (▲) for yes and the Scroll Down Button (▼) for no. If no is selected, the program will cycle to the beginning and the LCD will display “Password Needed?”.

12. If the Scroll Up Button (▲) is selected, the LCD will flash “Delete Profile and Number -- ?”

13. Use the Scroll Keys (▲▼) to select the desired profile number (1-40) and then press the Select Key. The Screen will now ask you to confirm the deletion, (e.g., “24 are you sure?”).

14. Use the Scroll Up Button (▲) for yes and the Scroll Down Button (▼) for no.

15. If no is selected, the system will prompt the user to exit the set up mode. Use the Scroll Up Button (▲) for yes and the Scroll Down Button (▼) for no. If no is selected, the program will cycle to the beginning and the LCD will display “Password Needed?”.

Automatic Calibration

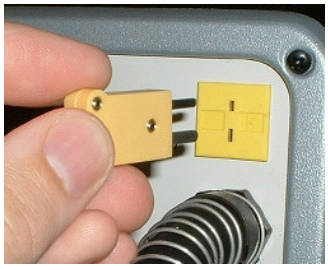
The ST 325 System provides precision control of temperature thanks to the closed-loop controlled circuit design. The temperature sensor is located in the heater but utilizing the PACE Thermocouple Nozzle can yield more accurate results due to moving the temperature sensor closer to the component. The Automatic Calibration Procedure allows the system to calibrate for various style components as well as to adjust for any minor offsets in temperature due to heater differences and blower speeds. Doing this will ensure the most accurate temperature readings.

NOTE: For best results, hold a PCB up to the Thermocouple Nozzle at the same distance as the nozzle would be from the PCB during the removal or installation process. During the calibration it is important to avoid holding the PCB in one position too long; this will avoid board damage during the Automatic Calibration Procedure.

Entering the Automatic Calibration Mode

1. Turn the Power Switch Off.

2. Install the Thermocouple Nozzle.



3. Press and hold the Scroll Up Button (▲) and Select Button while turning the Power Switch On. Release these buttons when software development date appears, e.g., “Dev Date 8-20-04.”

4. The LCD will flash, displaying “Ent Auto Temp” and “A - Temp = ___ °.”

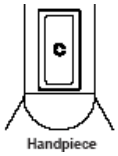
NOTE: The “A - Temp = ___ ° “ will display the current temperature that is set in the Manual Mode (e.g., “A -Temp = 700 °F”).

5. Use the Scroll Keys (▲▼) to select the desired temperature and press the Select Button to accept the entry. If the Scroll Keys are not pressed for a duration of 5 seconds, the LCD will return to the flashing of the “Ent Auto Temp” and “A - Temp = ___ °.”

6. The LCD will flash, displaying “Auto Blower = 7” and “Ent Auto Blower.”

   NOTE: The “Auto Blower = ___ “ will display the current temperature that is set in the Manual Mode (e.g., “Auto Blower = 7”).

7. Use the Scroll Keys (▲▼) to select the desired blower speed and press the Select Button to accept the entry. If the Scroll Keys are not pressed for a duration of 5 seconds, the LCD will return to the flashing of the “Auto Blower = 7” and “Ent Auto Blower.”

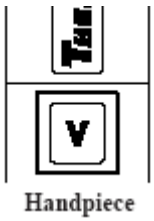


8. Press the Cycle Button to start the Calibration Process.

   NOTE: Anytime during this operation the Vacuum Button can be pressed to escape the process.

9. Once the process is completed, the LCD will display “Save Offset?” At this time, the offset may be saved by pressing the Up Button (▲) or the Offset Calibration Mode may be exited by pressing the Vacuum Button on the handpiece. Either selection will exit the Offset Calibration Mode and place the system into the previously used menu for regular operation.

   NOTE: If during the procedure the LCD displays “ Auto Cal Error,” repeat the Auto Calibration Procedure again.



Operation

The PACE ST 325 unit is easy to operate and can be quickly set up for operation. The following steps provide basic guidelines for rework using the PACE ST 325.

Password

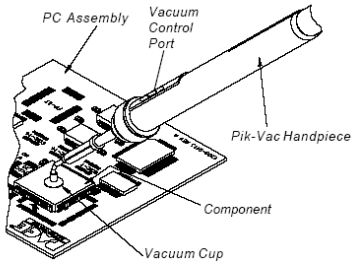
The Password feature of the ST 325 system, when activated, will prevent unauthorized alteration of stored system temperature parameters and custom settings (refer to the “Set Up Mode Section”). If a Password has been installed, the LCD Display will display an instruction to enter the Password (a 4 digit number) when a setting change is attempted. Entry of the correct Password at this point will allow the operator to proceed with the desired changes.

Front Panel Selections

The front panel on the ST 325 contains a four button interface which allows easy operation of the system, including creating and modifying profiles. There are four different selections within the **Mode** column. They are **Manual**, **Timed Install**, **Timed Removed**, and **PC Control**. The following pages will provide step-by-step procedures for the various modes.

Pik-Vac Operation

1. Use of the Metal Vacuum Tip without a Vacuum Cup attached for removal/replacement of very small component works well but for larger components, install one of the supplied Vacuum Cups onto the tip. For best results, use a size slightly smaller than the body of the component to be removed or placed. For very large components, use the largest Vacuum Cup.
2. Press the LoFlo Pump Switch to activate vacuum at the handpiece. The LoFlo Pump Switch will illuminate whenever the switch is activated.



3. Grasp the handpiece as you would a pen, with the Vacuum Cup (or tip) pointing down and the Vacuum Control Port pointing up.
4. Place the Vacuum Cup and/or the Metal Vacuum Tip gently onto the top surface of the Component body. Exercise caution to avoid bending of leads on fine pitch devices.
5. Place one finger over the Vacuum Control Port. Vacuum is now being applied to the Component body.
6. Gently lift the Component off the PC Assembly (removal operation) or out of the component holder (placement operation).
7. Lower the Component gently into position onto the PC Assembly (placement operation) or component holder (removal operation).
8. Lift finger from the Vacuum Control Port to release the Component.
9. Press the Illuminated LoFlo Pump Switch again to turn off the LoFlo Pump when all Component handling operations are completed.

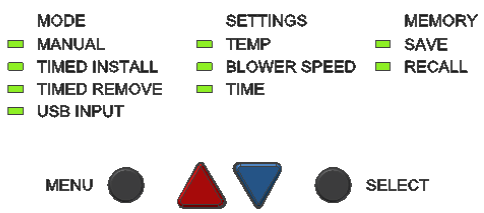
Component Removal; Manual Mode

The following procedure will step through the set up procedure in the Component Removal Manual Mode.

1. Install the proper Nozzle Assembly and Vacuum Cup onto the Reflow Head. Ensure that the PCB assembly to be reworked and any replacement component have been properly prepared.

   NOTE: Any required preheating operation should be completed before advancing beyond this point.

2. Set unit POWER Switch (on power source front panel) to the ON position.
3. Use the Scroll Keys (▲▼) to select the Manual Mode LED.
4. Press the Menu button once. This will toggle you to the Settings column. The LCD screen will display the temperature and the Temp LED will be flashing.



5. Press the Select Button once.

6. Now select the desired temperature with the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held. Press the Select Button when complete.

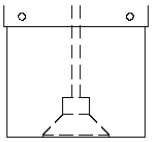
NOTE: The minimum temperature is 149°C (300°F) and the maximum temperature is 482°C (900°F).

7. Next, press the Scroll Down Button (▼) once. The Blower Speed LED will now be flashing.

8. Press the Select Button and select the blower speed (1-9 or 5-20 SLPM) by using the Scroll Keys (▲▼). Press the Select Button when complete to save the selections.

9. If using a Single Jet Nozzle, no vacuum cup is used; proceed to step 14.

10. Using the Vacuum Pick Adjust Control, adjust the vacuum cup to a point where the bottom of the vacuum cup is flush with the bottom edge of the nozzle.



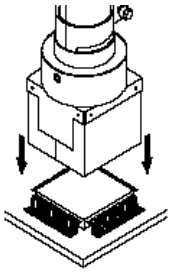
11. Hold the handpiece vertical to the PCB.

12. Lower the nozzle:

    a) To an approximate distance of 1mm (.040") above the PCB when using a Box nozzle.

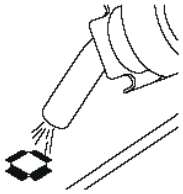
    b) To an approximate distance of (depending on component) 1mm (.040") above the PCB when using a Pattern nozzle.

    c) Contacting the BGA component when using a V-A-N nozzle.

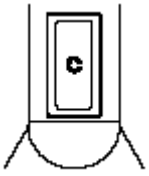


13. Press and release handpiece Vacuum Cycle Switch to activate vacuum.

14. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.



15. Press and hold the Handpiece Cycle Switch to activate the heat cycle.



16. When complete solder melt is observed, gently lift the handpiece to remove the component from the PCB. When using a Curved, Single Jet nozzle, use a vacuum pickup device or tweezers to lift the component from the PCB; steps 17 & 18 are not used.

17. Position the nozzle (with component) over a heat resistant surface.

18. Press and hold the Vacuum Cycle Switch for 0.5 second (minimum) to deactivate vacuum and release component.

WARNING: The component is HOT! DO NOT remove or catch the component with bare hands. Allow the component to drop onto the heat resistant surface. Allow sufficient time for the component and PCB to cool to room temperature before handling.

Component Installation; Manual Mode

Install the proper Nozzle and Vacuum Cup (if not using Single Jet nozzle) onto the handpiece.

1. Set the unit POWER Switch (on power source front panel) to the ON position.

2. Use the Scroll Keys (▲▼) to select the Manual Mode LED.

3. Press the Menu button once. This will toggle you to the Settings column. The LCD screen will display the temperature and the Temp LED will be flashing.

4. Press the Select Button once.

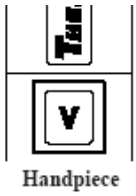
5. Now select the desired temperature with the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held. Press the Select Button when complete.

6. Next, press the Scroll Down Button (▼) once. The Blower Speed LED will now be flashing.

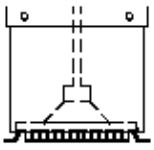
7. Press the Select Button and select the blower speed (1-9) by using the Scroll Keys (▲▼). Press the Select Button when complete to save the selections.

NOTE: As an alternative to the component placement methods shown below in steps 9 through 13, the component (except BGAs) may be positioned and solder tacked in place on land pattern. See “Component Positioning Section”.

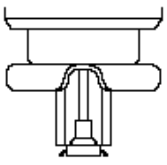
8. Actuate the vacuum by pressing the Vacuum Button on the Handpiece.



9. Position the replacement component directly beneath and square to nozzle. When using Box or V-A-N nozzles, insert component body into the bottom of the nozzle. BGA components will rest against the walls of the nozzle.



When using Pattern nozzles, position component leads beneath and in line with the air jets on the nozzle.



When using a Curved, Single Jet nozzle, position the component on its land pattern (prefilled or with solder paste deposition). Solder tack lead(s) if necessary.

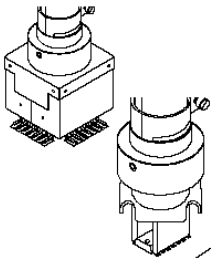
10. If using a Single Jet nozzle proceed to step 15.

11. Using the Vacuum Pick Adjust Control on the handpiece, adjust the vacuum cup to a point where the bottom of the vacuum cup touches the component body. The component is now held in position with the vacuum cup.

12. Using the Vacuum Pick Adjust Control, adjust the position of the component:

    a) To an approximate distance (depending on component) of 1-1.5mm (.040-.060") between the bottom of the component and the bottom of the nozzle when using a Box or Pattern nozzle.

    b) Contacting the BGA component when using a V-A-N nozzle.



13. Lower nozzle (with component) to a point where the component leads/contacts rest gently on or just above the component land pattern.

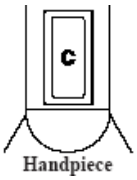
    NOTE: If component has been pre-positioned on land pattern, lower nozzle to desired height above PCB. A height of 1-1.5mm (.040-.060") above the PCB when using Box or Pattern nozzles is recommended.

14. Ensure that the handpiece is held vertical to the PCB (except with Single Jet nozzles).

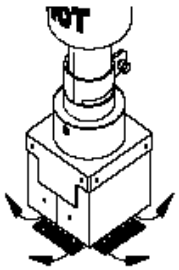
15. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

    NOTE: Any required preheating should be completed before advancing beyond this point.

16. Press and hold the Handpiece Switch to activate the heat cycle.



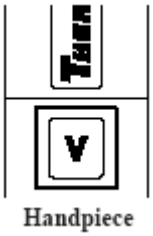
    (Heated air is now being applied to the rework area)



17. If using a Single Jet nozzle in a hand held operation, move the handpiece as necessary to direct air flow to the solder areas requiring reflow.

18. If vacuum is being used to hold component, depress and hold the Vacuum Cycle Switch for 0.5 second (minimum) to stop vacuum and release the component. Release the Vacuum Pick Switch.

19. When complete solder melt is observed, release the handpiece Cycle Switch (to stop heating) and gently lift the handpiece from the PCB.



Timed Removal

The **Timed Mode** offers added process control with the addition of a user-specified cycle time and automatic vacuum pickup/release.

NOTE: Times can be determined by visual solder melt or by the use of a thermocouple.

1. Install the proper Nozzle and Vacuum Cup onto the handpiece.

2. Set the unit POWER Switch (on front panel of power source) to the ON position.

3. Use the Scroll Keys (▲▼) to select the Timed Remove LED.

4. Press the Menu button once. This will toggle you to the Settings column. At this point the Temp LED will be flashing.

5. Press the Select Button once.

6. Now select the desired temperature with the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held. Press the Select Button when complete.

7. Next, press the Scroll Down Button (▼) once. The Blower Speed LED will now be flashing.

8. Press the Select Button and select the blower speed (1-9) by using the Scroll Keys (▲▼). Press the Select Button when complete.

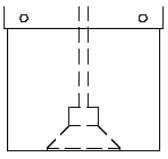
9. Press the Scroll Down Button (▼) again; the Time LED will now be flashing.

10. Press the Select Button and adjust the Cycle Time as desired using the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1 second and then 10 second increments as the key is held. Press the Select Key when finished to save the selections.

    NOTE: Any required preheating should be completed before advancing beyond this point.

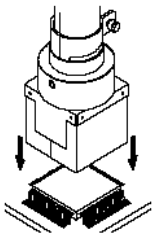
11. If using a Single Jet nozzle, proceed to step 15.

12. Adjust the vacuum cup to a point where the bottom of the vacuum cup is approximately flush with the bottom edge of the nozzle using the Vacuum Pick Adjust Control.

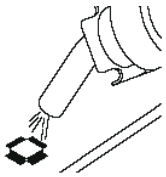


13. Hold the handpiece vertical to the PCB.

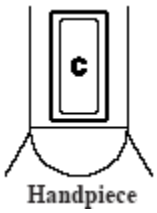
Lower the nozzle to a point approximately 1mm (.040") above the PCB when using Box or Pattern nozzles. Lower the nozzle to contact a BGA component.



14. For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.



15. Press and release the handpiece Cycle Switch to activate heat cycle.

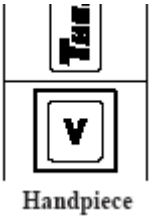


16. The LCD will display the remaining cycle ("Reflo") time counting down. At 5 seconds before the end of cycle, the vacuum will automatically activate.

17. At the end of the cycle, gently lift the handpiece to remove the component from the PCB. When using a Single Jet nozzle, use a vacuum pickup device or tweezers to lift the component from the PCB.

18. Position the component over a heat resistant surface.

19. Depress and hold the Vacuum Pick Switch for 0.5 second (minimum) to deactivate vacuum and release component.



WARNING: The component is HOT! DO NOT remove or catch the component with bare hands. Allow the component to drop onto the heat resistant surface. Allow sufficient time for the component and PCB to cool to room temperature before handling.

Timed Install

The following procedure will step you through the set up procedure in the Timed Install mode. Installation times can be determined by visual solder melt or by the use of a thermocouple.

NOTE: For best results, begin by adding 10% to the removal time.

1. Install the proper Nozzle Assembly and Vacuum Cup (if not using Single Jet nozzle) onto the handpiece.

2. Set the unit POWER Switch (on front panel of power source) to the ON position.

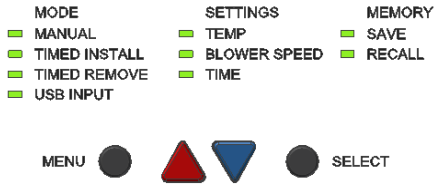
3. Use the Scroll Keys (▲▼) to select the Timed Install LED.

4. Press the Menu button once. This will toggle you to the Settings column. At this point the Temp LED will be flashing.

5. Press the Select Button once.

6. Now select the desired temperature with the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1° and then 10° increments as the key is held. Press the Select Button when complete.

7. Next, press the Scroll Down Button (▼) once. The Blower Speed LED will now be flashing.

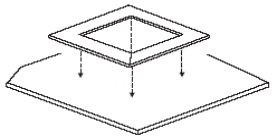


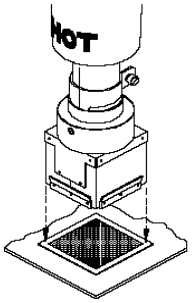
8. Press the Select Button and select the blower speed (1-9) by using the Scroll Keys (▲▼). Press the Select Button when complete.

9. Press the Scroll Down Button (▼) again; the Time LED will now be illuminated.

10. Press the Select Button and adjust the Cycle Time as desired using the Scroll Keys (▲▼). Press and hold the desired key; observe the Digital Readout as the Set Temperature increases (or decreases) in 1 second and then 10 second increments as the key is held. Press the Select Key when finished to save the selections.

11. If installing a BGA component with the ST 325 handpiece mounted on ST 500, do the following:





    a) Place the Alignment Template over the land pattern. Tape in place using a heat resistant tape.

    b) Align the template until the perimeter of the land pattern is centered inside of the template.

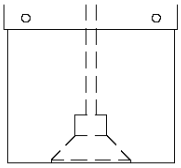
    c) Lower the handpiece (with nozzle) until it is slightly above the PCB assembly rework area.

    d) Adjust the PCB to center nozzle squarely over template.

    e) Raise handpiece from PCB.

    f) Remove Alignment Template.

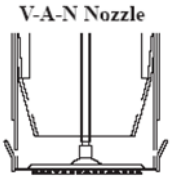
12. Using the Vacuum Pick Adjust Control, adjust the vacuum cup to a point where the bottom of the cup is flush with the bottom edge of the nozzle.

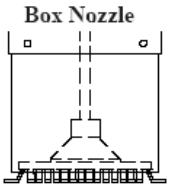


13. Press the Vacuum Pick Switch to activate vacuum.

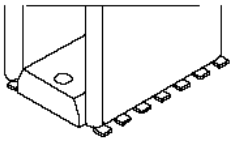
14. Position the nozzle over the component with the component square to the nozzle.

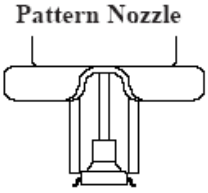
    a) When using Box or V-A-N nozzles, insert component body into the bottom of the nozzle.





    b) When using Pattern nozzles, position component leads beneath and in line with the air jets on the nozzle.





    c) When using a Single Jet nozzle, position the component on its land pattern (prefilled or with solder paste deposition). Solder tack lead(s) if necessary.

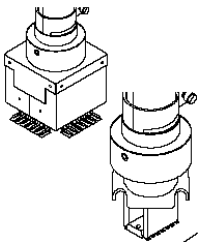
    NOTE: Any required preheating operating should be completed before advancing beyond this point.

15. Using the Vacuum Pick Adjust Control, adjust the height of the component relative to the nozzle as desired. PACE recommends that:

    a) The bottom of the nozzle should be positioned approximately 1mm (0.040") above the PCB when using Box or Pattern nozzles.

    b) BGA components are to be positioned fully into the nozzle. The walls of the V-A-N nozzles will contact the component body.

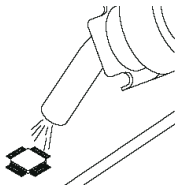
16. Lower nozzle (with component) to a point where the component leads/contacts rest gently on or just above the component land pattern.



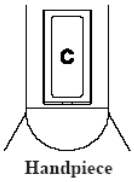
    NOTE: If component has been previously positioned on land pattern, lower any Box or Pattern nozzle to a height of approximately 1mm (.040") above the PCB.

17. Ensure that the handpiece is held vertical to the PCB.

    NOTE: For Single Jet nozzles, hold the end of the nozzle tube above the rework area at a height and angle which gives the best results in your particular application.

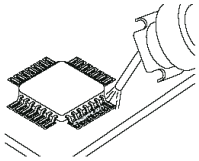


18. Press and release the Handpiece Cycle Switch to activate heat cycle.



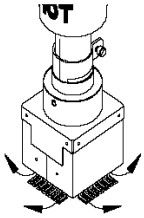
Handpiece

19. If using a Single Jet nozzle in a hand held operation, move the handpiece as necessary to direct airflow to the solder areas requiring reflow.



20. The LCD will display the remaining cycle Reflow ("Reflo") time counting down. At 5 seconds before the end of cycle, the vacuum (if activated in step 13) will automatically terminate and release the component and 5 beep noises will sound until the cycle ends.

21. When cycle is complete, lift the handpiece from the PCB.



PC Control

When additional programming is required such as 4 zone profile creation, optional software (PN 1199-0019-P1) can be purchased to utilize the Remote PC Control. The software further allows the ST 325 to control the ST 450 Preheater when bottom side heating of the PC is required. This manual will include the setup information for the ST 450 Pre-Heater. See manual # 5050-0546 for further details.

Memory

Save

The following procedure will step you through the profile Save procedure in the Memory Column. This can be accessed through the Install or Removed Mode.

1. Press the Menu Button twice to get to the Memory Column.
2. Use the Scroll Keys (▲▼) to illuminate the Save LED and press the Select Button. The LCD will now display the selected profile that is to be saved. (e.g., "Save 22?")
3. Use the Scroll Keys (▲▼) to select the desired profile number.
4. Press the Select Button once to save the profile.

Recall

The following procedure will step you through the profile Recall procedure in the Memory Column. This can be accessed through the Install or Removed Mode.

1. Press the Menu Button twice to get to the Memory Column.
2. Use the Scroll Keys (▲▼) to illuminate the Recall LED and press the Select Button. The LCD will now display the selected profile that is to be recalled. (e.g., “Recall 22?”)
3. Use the Scroll Keys (▲▼) to select the desired stored profile. (26-40 are available)

4. Press the Select Button once to recall the profile.

Process Development

The ST 325 provides the user with the ability to perform non-destructive, repeatable, high quality, component installation or removal operations. The operator can adjust the parameters of air temperature, air flow rate (blower speed), cycle time, nozzle configuration and pre-heating to suit the heating characteristics of the particular component and PCB. Once you have established the desired profile, the process parameter details can then be entered on the Profile Control Chart for future reference and programmed into the ST 325 memory. The Profile Log can be used for summarizing required parameters for profiles in Manual, Timed or Program Modes. Once the Profile is entered into memory, the program can be quickly initiated (in Program Mode). Up to 20 user-defined profiles may be stored in microprocessor memory.

NOTE: When developing Profiles, PACE recommends the use of embedded thermocouples on a test board to ensure optimum process results.

Profile Development

1. The Profile Control Chart details the complete parameters for a developed profile. The Profile Log is a quick reference log sheet detailing basic profile information (including stored profile number) on a number of Profiles.

2. Develop the rework profile that meets your company guidelines.

3. Enter the established Profile parameters on the Profile Control Chart.

4. Enter the Profile in system memory (see the PC Control Section on page 22).

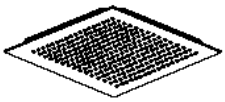
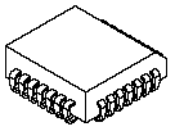
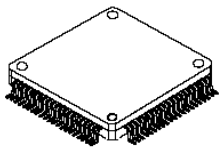
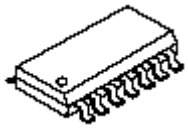
5. Enter the Profile information on the Profile Log.

ST 325 REFLOW PROFILES
SUGGESTED STARTING PARAMETERS

This chart provides a base starting point for the development of exact parameters ("Established Profile Guidelines") for your surface mount rework process. Initial tests using these references may not result in complete solder reflow. Adjust the reference values as necessary to obtain desired results. All results should be verified/validated through the use of thermocouples.

Procedure:
1. Select the Component and Substrate which best matches your application.
2. Perform a test using the base parameters.
3. Adjust parameters as desired and perform additional test runs.
4. When desired results are achieved, record process on a copy of Profile Control Chart or Profile Log.

NOTE: Blower Speed parameter is base reference for Reflow function.

Component		Nozzle	Process	Parameter	Substrate (PCB Type)			Reflow Cycle
Outline	**Type**	**Recommended Type**	**Remove or Install**	**(Temperature and Blower Speed)**	**Low Mass**	**Medium Mass**	**High Mass**	**Time (sec.)**
	PBGA	Appropriate Size V-A-N Nozzle	Remove	Temperature (°C)	371	371	371	77
				Blower Speed	5	5	5	
			Install	Temperature (°C)	371	371	371	90
				Blower Speed	3	3	4	
	PLCC (J Lead)	Appropriate Size Box Nozzle	Remove	Temperature (°C)	371	371	371	30
				Blower Speed	7	8	8	
			Install	Temperature (°C)	371	371	371	30
				Blower Speed	7	8	8	
	PQFP	Appropriate Size Box Nozzle	Remove	Temperature (°C)	316	371	371	18
				Blower Speed	6	7	7	
			Install	Temperature (°C)	316	371	371	18
				Blower Speed	6	7	7	
	SOIC	Appropriate Size Pattern Nozzle	Remove	Temperature (°C)	316	316	371	15
				Blower Speed	7	7	7	
			Install	Temperature (°C)	316	316	371	15
				Blower Speed	7	7	7	
	Chip Component	Appropriate Size Single Jet Nozzle	Remove	Temperature (°C)	371	371	371	11
				Blower Speed	6	6	8	
			Install	Temperature (°C)	371	371	371	12
				Blower Speed	5	6	7	

Profile Control Chart

Duplicate this page and complete the copied form. **DO NOT** fill out the copy in this manual.

PROGRAM MODE PROFILE CONTROL CHART	**Profile #**
Component _____ **Temp. Scale:** F C **Process:** Remove Install **PCB Designation:** _____	
Preheat Yes No **Lower Preheat** Yes No Time _____ Temp. _____	**Top Preheat** Yes No Time _____ Temp. _____ Start _____ (sec.) Blower Speed
Soak Yes No Time _____ (sec.)	Temp. _____ Blower Speed
Reflow Yes No Time _____ (sec.) (Install Only) Vacuum Release	Temp. _____ Blower Speed _____ Lower Pump On Off
Cool Down On Off Time _____ (sec.) Blower Speed	**Approved By:** **Date:**
Comments / Instructions:	

Profile Log

Duplicate this page and complete the copied form. **DO NOT** fill out the copy in this manual.

PCB Designation	Component	Process (Remove or Install)	Mode	Profile #	Set Temperature	Blower Speed	CycleTime (sec.)	Preheating Required

General Process Guidelines

Board Preparation

Prepare the land pattern as per your company specifications. The most widely used methods are as follows:

1. Prefill - The PCB land pattern is prefilled using a soldering iron. Care must be taken to insure that all lands are tinned with an equal deposition of solder (provides a uniform appearance).

2. Solder Paste - Apply an equal amount of solder paste on each land. Take care to insure that the proper amount of paste is dispensed. If too much paste is applied, solder bridges will form between the lands. If an insufficient amount of paste is applied, solder joint formation will be

unacceptable (open/starved joints). The PCB assembly (or rework area) should also be preheated (in accordance with your company requirements) after solder paste deposition to remove any volatiles (e.g., solvents) in the paste. The PACE ST 400 & ST 450 systems are highly recommended for this preheating application. Preheating can also be accomplished with top heat.

Component Positioning

The ST 325 has the capability of placing most SMD components properly. In some instances (e.g., fine pitch FlatPack placement) however, the user may prefer to position a component and solder tack it in place prior to final soldering. The following procedure is extremely useful when installing leaded components.

1. Using a PACE Pik-Vac (vacuum holding device) or tweezers for handling or holding, position the component leads to align with the land areas.

   NOTE: A flux paste may be applied to corners of the PCB land pattern to temporarily hold the component in place.

2. Using a soldering iron with a fine pointed tip, tack two or more lead to land locations at opposite corners of the component. This will provide stability during subsequent handling throughout the soldering process.

Preheating

Preheating of a printed circuit assembly is recommended in the repair process when one or more of the following situations exist.

1. Epoxy glass substrate with 4 or more layers.

2. Substrate with large ground planes.

3. Substrate of ceramic, polyimide or other high heat dissipative material.

4. Printed circuit assembly with large metal heat sinks.

Preheating of assemblies such as those listed above will accomplish the following objectives.

1. Minimize thermal shock by elevating the assembly temperature to a level closer to solder melt temperature.

2. Minimize the heat cycle reflow time.

3. Overcome the heat dissipation characteristics of the assembly.

4. Minimize adjacent reflows.

The assembly undergoing repair must be heated for a length of time sufficient to saturate at the preheat temperature required. The PCB preheat temperature normally used is 100°C (212°F) for epoxy glass substrates and 120°C (248°F) for ceramics and polyimides.

Although many different methods such as ovens and bottom side preheaters may be utilized to accomplish the required results, the user must employ a method which heats the assembly as evenly as possible and can be utilized with the ST 325 unit. The preheat temperature should also be maintained throughout the Removal/Replacement process. PACE recommends the use of it's ST 400 or ST 450 Pre-heating systems for this purpose.

Handpiece Vacuum/Pressure

NOTE: The Air Hose and Slide Rod must be positioned to prevent any kinking of the hose. Kinks in the hose will prevent proper airflow when the system is operated and will cause a deterioration in performance.

Corrective Maintenance

Listed below are message codes which may be displayed on the Digital Readout if a mistake is made by the operator (e.g., wrong password entry) or if the system has malfunctioned.

Display Error Message	Description
Wrong Password	The incorrect Password has been entered. The displayed message will time out after 3 seconds and revert to normal operation. Enter the correct Password.
Open Sensor	The heater assembly sensor is open. Replace heater assembly.
Blower Run Error	The power source blower unit is not running. Contact PACE for assistance.

Power Source/Handpiece

Refer to the table below. Most malfunctions are simple and easy to correct.

Symptom	Probable Cause	Solution
No power to system	Blown Fuse	Inspect and replace the fuse(s) located on the power source rear panel.
	Line cord unplugged	Plug line cord into the appropriate AC outlet.
Heater Assembly does not heat. No malfunction indicated on Digital Readout.	Open Heater	Contact PACE for assistance.
Little or no air flow, heater heats and blower is running	Kinked air hose	Change routing of air hose to remove kinks.
Display on Digital Readout indicates a malfunction.		Refer to Display Error Messages.
Little or no vacuum	Worn vacuum pump	Replace vacuum pump. Contact PACE for assistance.
Vacuum Cup will not hold component	Worn or broken vacuum cup	Replace vacuum cup.
Vacuum Pickup Rod binding	Vacuum Pickup rod is bent	Refer to the Vacuum Pick Replacement manual.

Packing List

Item #	Description	Part Number	ST 325 Only	ST 325 E Only
1	System Power Supply	8007-0429	1	0
2	System Power Supply (Export)	8007-0432	0	1
3	Power Cord, 115V	1332-0094	1	0
4	Power Cord, 230V	1332-0093	0	1
5	PV-65 Handpiece	7027-0001-P1	1	1
6	Nozzle Adapter	4028-0001-P1	1	1
7	Hot Grip Removal Pad	1100-0307-P1	1	1
8	Operations Manual CD	CD5050-0459	1	1

Spare Parts

Item #	Description	PACE Part Number
1	Fuse, 7 Amp, 125 V, Fast Acting (ST 325)	1159-0274-P5
	Fuse, 5 Amp, 250 V, Fast Acting (ST 325E)	1159-0266-P5
2	Fuse, 0.5 Amp, 250 V, Time Lag	1159-0213-P5
3	Optional PC Control Software	1199-0019-P1

Service

Please contact PACE or your local distributor for service and repair.

"SODRTEK by PACE" LIMITED WARRANTY STATEMENT

Limited Warranty

Seller warrants to the first user that products manufactured by it and supplied hereunder are free of defects in materials and workmanship for a period of one (1) year from the date of receipt by such user. Monitors, computers and other brand equipment supplied but not manufactured by PACE are covered under their respective manufacturer's warranty in lieu of this Warranty.

This warranty does not cover wear and tear under normal use, repair or replacement required as a result of misuse, improper application, mishandling or improper storage. Consumable items such as tips, heaters, filters, etc. which wear out under normal use are excluded. Failure to perform recommended routine maintenance, alterations or repairs made other than in accordance with Seller's directions, or removal or alteration of identification markings in any way will void this warranty. This warranty is available only to the first user, but the exclusions and limitations herein apply to all persons and entities.

SELLER MAKES NO OTHER WARRANTY, EXPRESS OR IMPLIED, AND MAKES NO WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE.

Seller will, at its option, repair or replace any defective products at its facility or other location approved by it at no charge to user, or provide parts without charge for installation by the user in the field at user's expense and risk. User will be responsible for all costs of shipping equipment to Seller or other location for warranty service.

EXCEPT FOR THE REMEDY ABOVE DESCRIBED, UNLESS OTHERWISE REQUIRED BY APPLICABLE LAW, SELLER WILL HAVE NO OTHER OBLIGATION WITH REGARD TO ANY BREACH OF WARRANTY OR OTHER CLAIM WITH RESPECT TO THE PRODUCTS, OR LIABILITY FOR ANY DIRECT, INDIRECT, CONSEQUENTIAL, OR INCIDENTAL LOSS OR DAMAGE CAUSED BY OR OCCURRING IN CONNECTION WITH ANY OF THE PRODUCTS.

Warranty service may be obtained by contacting the appropriate PACE Company or local Authorized PACE distributor as set forth below to determine if return of any item is required, or if repairs can be made by the user in the field. Any warranty or other claim with respect to the products must be made with sufficient evidence of purchase and date of receipt, otherwise user's rights under this warranty shall be deemed waived.

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PACE products meet or exceed all applicable military and civilian EOS/ESD, temperature stability and other specifications including MIL STD 2000, ANSI/JSTD 001, IPC7711, and IPC A-610.

www.paceworldwide.com

PACE Incorporated
255 Air Tool Drive
Southern Pines,
North Carolina, 28387

Tel: (877) 882-PACE
Tel: (910) 695-7223
Fax: (910) 695-1594

PACE Europe
11 Holdom Avenue
Bletchley, Milton Keynes,
MK1 1QU
United Kingdom

Tel: 011 44 1908 277666
Fax: 011 44 1908 277777