



Operation and Maintenance Manual for the
ST 45 & ST 55 Soldering Systems

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Rev D

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Introduction

Thank you for purchasing the PACE model ST 45 or ST 55 Digital Soldering System. This manual will provide you with the information necessary to properly set up, operate and maintain the ST 45 or ST 55.

The ST 45 and ST 55 systems are available in either 115 VAC or 230 VAC versions, which incorporates a highly responsive SensaTemp (closed loop) control system providing up to 80 Watts of total power to a single output channel. The 230 VAC version system bears the CE Conformity Marking, which assures the user that it conforms to EMC 89/336/EEC.

The 115 VAC version systems conform to 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.

Specifications

System Power Source Power Requirements

ST 45 or ST 55	Operates on 97-127 VAC, 50/60Hz, 90 Watts maximum at 115 VAC, 60Hz
ST 45E or ST 55E	Operates on 197-253 VAC 50/60Hz, 80 Watts maximum at 230 VAC, 50Hz

Temperature Specifications

Handpieces	Tip Temperature Range: 204 to 455°C (400 to 850°F) nominal. Temperature Stability: $\pm 1.1^{\circ}\text{C}$ ($\pm 2^{\circ}\text{F}$) at idle from set tip temp.
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NOTE: Actual minimum and maximum Operating Tip Temperatures may vary depending on Handpiece, Tip Selection and application.

EOS/ESD Specifications

The specifications shown below apply except on "Soft Ground Systems" which have a 1meg ohm current limiting resistance and a label placed on the power source front panel referring to EN 100015-1.

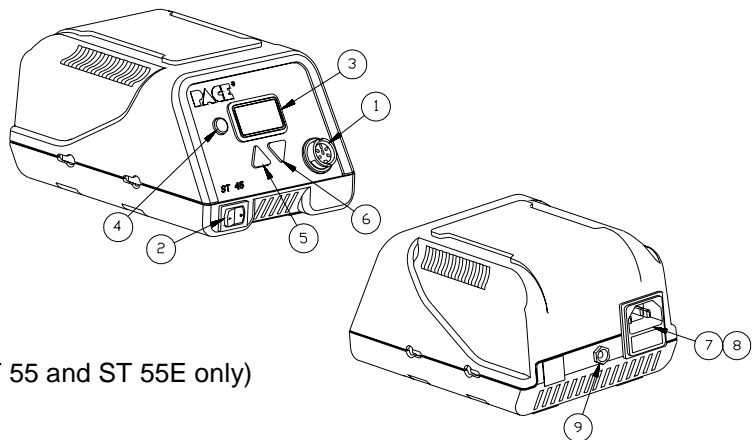
Tip-To-Ground Resistance: Less than 2 ohms.

AC Leakage: Less than 2 Millivolts RMS from 50Hz to 10MHz.

Transient Level: Less than 500mV peak, out to 100MHz.

Parts Identification (ST 45 shown)

- ① Power Receptacle
- ② Power Switch
- ③ LED Display
- ④ Program Key
- ⑤ Scroll Up Key
- ⑥ Scroll Down Key
- ⑦ AC Power Receptacle/Fuse Holder
- ⑧ Fuse
- ⑨ Earth Ground Receptacle (ST 45E, ST 55 and ST 55E only)



English Language Safety Guidelines

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

1. **POTENTIAL SHOCK HAZARD** - Repair procedures on PACE products should be performed by Qualified Service Personnel only. Line voltage parts may be exposed when the equipment is disassembled. Service personnel must avoid contact with these parts when troubleshooting the product.
2. To prevent personnel injury, adhere to safety guidelines in accordance with OSHA and other applicable safety standards.
3. SensaTemp handpiece heaters and installed tips are hot when the handpiece is powered on and for a period of time after power off. **DO NOT** touch either the heater or the tip. Severe burns may result.
4. PACE Tip & Tool Stands and handpiece cubbies are designed specifically for use with the associated handpiece and houses it in a manner that protects the user from accidental burns. Always store the handpiece in its holder. Be sure to place the handpiece in its holder after use and allow for cooling before storing.
5. Always use PACE systems in a well ventilated area. A fume extraction system such as those available from PACE are highly recommended to help protect personnel from solder flux fumes.
6. 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.

Directives de Sécurité, Française Langue

Les précautions suivantes, sont celles que le personnel doit comprendre et suivre lorsqu'il utilise, effectue la maintenance ou se sert d'un produit PACE.

1. **Danger potentiel de choc électrique** - Les procédures de réparation sur les produits PACE doivent être effectuées seulement par du personnel qualifié. Des parties de l'équipement désassemblées peuvent être sous tension. Le personnel de maintenance doit éviter tout contact avec ces parties en réparant le produit.
2. Pour prévenir tout préjudice, le personnel adhère au guide de sécurité en accord avec OSHA (équivalent à des normes françaises de sécurité) et d'autres standards de sécurité applicable.
3. La mise sous tension des outils SensaTemp comporte des éléments chauffants (buse). Ces derniers, gardent la chaleur même après la mise hors tension pendant un certain temps. **Ne pas** toucher les parties chaudes aux extrémités des outils. Des brûlures sévères peuvent en résulter.
4. Les outils PACE et leurs panes ainsi que le support sont dessinés de manière spécifique afin de protéger l'utilisateur/opérateur de brûlures accidentelles. Reposer toujours les outils après chaque utilisation dans leurs étuis/supports afin de permettre leur refroidissement.
5. Utiliser toujours les stations Pace dans un lieu bien ventilé. Des extracteurs de fumée Pace sont hautement recommandés pour protéger votre personnel des vapeurs de soudure/flux.
6. Prenez les mesures nécessaires quand vous utilisez des produits (ex: solder paste) chimiques. Reportez-vous au document (fiche technique/sécurité) du fabricant fourni avec chaque produit. Respectez toutes les procédures de sécurité recommandées par le constructeur.

Sicherheit Korrekturlinien, Deutsche Sprache

Die nachfolgenden Sicherheitsvorschriften sollten vom Bedien- und Servicepersonal verstanden und befolgt werden.

1. **Entladung spannungsfuehrender Teile** - Reparaturen an PACE Produkten sollten nur von qualifizierten Personal durchgefuehrt werden. Spannungsfuehrende Teile koennen sich bei gezogenen Netzstecker entladen. Servicepersonal muss den Kontakt dieser Teile vermeiden.
2. Um moegliche Gefahren fuer Personen auszuschliessen, muessen alle Sicherheitsvorschriften in Uebereinstimmung mit OSHA und anderen anwendbaren Sicherheitsstandards eingehalten werden.
3. Angeschlossene SensaTemp Heizelemente von Handwerkzeugen und installierte Loetspitzen sind heiss wenn das System eingeschaltet ist oder erst vor kurzer Zeit ausgeschaltet wurde. Heizelement und Loetspitze nicht beruehren. Verbrennungsgefahr.
4. PACE Tip & Tool und andere Handwerkzeugablagen sind so konstruiert, dass ein versehentliches Beruehren des dazugehoerendes Handwerkzeuges vermieden wird. Bewahren Sie das Handwerkzeug nach Gebrauch stets in der Ablage auf. Bevor das Handwerkzeug an einem anderen Ort gelagert werden muss, lassen Sie es in der Werkzeugablage vollstaendig abkuehlen.
5. Benutze PACE Systeme nur in gut beluefteten Raeumen. Ein Loetrauchabsaugsystem, wie es z.B. von PACE erhaeltlich ist, hilft Bedienpersonen von den Gefahren von Loetrauch zu schuetzen.
6. Wenn Chemikalien (z.B.: Lotpaste) verwendet werden, muessen alle die in den Sicherheitsdatenblaettern des Herstellers ausgewiesenen Sicherheitsvorschriften eingehalten werden.

Misure di Sicurezza, Italiana Lingua

Le seguenti istruzioni sono misure di sicurezza che il personale deve comprendere e seguire quando utilizza o ripara I prodotti PACE.

1. **EVENTUALI RISCHI DI SHOCK ELETTRICO**- Si consiglia di far eseguire le operazioni di riparazione dei prodotti PACE, da un servizio di personale qualificato. Quando la stazione non é assemblata le parti sottoposte alla tensione di linea potrebbero essere scoperte. Il personale deve evitare il contatto con queste parti durante manutenzione del prodotto.
2. Per evitare eventuali pericoli al personale, attenersi alle norme di sicurezza previste dalla guida, in conformita' all'OSHA e agli altri Standard di Sicurezza applicabili.
3. Le resistenze PACE Sensatemp e le punte installate sono calde quando la stazione é accesa e per un periodo successivo allo spegnimento. Non toccare la resistenza e la punta. Può comportare gravi ustioni.
4. I supporti PACE sono specificamente costruiti insieme alla corrispondente impugnatura e progettati per un uso che protegge gli utenti da ustioni accidentali. Mettere sempre l'impugnatura nel proprio supporto dopo l'utilizzo e lasciarla raffreddare prima di riparla.
5. Utilizzare sempre I stazioni PACE in una zona be aerata per proteggere il personale dai fumi. É fortemente raccomandato un sistema di aspirazione (dei fumi) come quello disposta dalla PACE.
6. Usare precauzioni quando si utilizzano sostanze chimiche (es. Pasta di stagno). Fare riferimento al Material Safety Data Sheet (MSDS) fornita con ogni sostanza chimica e seguire tutte le misure di sicurezza raccomandate dal fabbricante.

Guidelines de Segurança, Portuguese Lingua

Segeum-se precauções de segurança que os operadores devem compreender e seguir ao utilizar ou reparar produtos PACE.

1. **Perigo de choque eléctrico** - Os procedimentos de reparação em produtos PACE, devem ser apenas efectuados por pessoal qualificado. Linhas de alimentação podem ficar expostas ao desmontar o equipamento. Pessoal de reparação deve evitar o contacto com essas partes ao reparar o produto.
2. Para evitar danos pessoais, siga as normas de segurança OSHA ou outras normas aplicáveis.
3. Resistencias de aquecimento dos ferros e as pontas instaladas estão quentes quando o ferro está alimentado, e mesmo durante algum tempo após ser desligado. **NUNCA TOCAR** nem na resistencia de aquecimento nem na ponta. Pode resultar em queimaduras severas.
4. Os suportes para pontas e ferros da PACE, foram concebidos para uso específico, e para proteger o operador de queimaduras acidentais. Coloque sempre os ferros nos respectivos suportes. Tenha a certeza de colocar sempre o ferro no respectivo suporte após cada utilização e deixe-o arrefecer antes de o guardar.
5. Utilize sempre os sistemas da PACE em locais bem ventilados. Um Sistema de extracção de fumos, como os Sistemas disponíveis na PACE, são altamente recomendados para a protecção dos utilizadores contra os fumos produzidos pela solda e fluxo.
6. Tenha precauções apropriadas ao utilizar produtos químicos (ex. pasta de soldar). Lêr sempre atentamente os normas de segurança fornecidas com cada produto químico e siga sempre todas as precauções de segurança recomendadas pelo fabricante.

Guias de Consulta de Seguridad, Español Lenguaje

Lo siguiente es precauciones de seguridad que el personal debe entender y debe seguir al usar o reparar productos de PACE.

1. **RIESGO de SHOCK POTENCIAL** - Los procedimientos de la Reparación en productos de PACE sólo deben ser realizados por Personal de Servicio Calificado. Pueden exponerse partes de voltaje de línea cuando el equipo se desmonta. El personal de servicio debe evitar contacto con estas partes al arreglar el producto.
2. Para prevenir lesión del personal, adhiera a las reglas de seguridad de acuerdo con OSHA y otras normas de seguridad aplicables.
3. Las herramientas SensaTemp tienen sus calentadores y las puntas instaladas calientes cuando la herramienta esta encendida y por un periodo de tiempo después de apagar el equipo. **No toque el calentador o la punta.** Las quemaduras severas pueden resultar.
4. El Soporte de punta y Herramienta PACE se diseñan específicamente para el uso con las herramientas asociadas y las almacena de una manera que protege al usuario de las quemaduras accidentales. Siempre guarde la herramienta en su soporte. Está seguro de poner la herramienta en su soporte después del uso y permita que la herramienta enfríe antes de guardar.
5. Siempre use sistemas de PACE en una área bien ventilada. Un sistema de extracción de humo como esos disponibles de PACE se recomiendan para ayudar a proteger al personal contra los humos de flujo de soldadura.
6. Ejercicie las precauciones apropiadas al usar químicos (ej., pasta de la soldadura). Refiérase a la Hoja de Datos de Seguridad de Material (MSDS) proporcionado con cada químico y adhiere a todas las precauciones de seguridad recomendadas por el fabricante.

Säkerhetsföreskrifter, Svenska

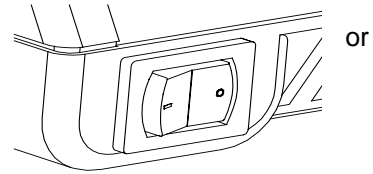
Följande säkerhetsföreskrifter måste förstås och följas av personal som använder eller utför service på PACE produkter.

1. **RISK FÖR STRÖMSTÖT** - Service / Reparation av PACE produkter får endast utföras av aktoriserad service personal. Strömförande delar kan komma åt när produkten är isärplockad. Iakttag akksamhet när felsökning görs för att undvika strömstötar.
2. För att undvika personskada rekommenderas att OSHA eller andra liknande arbets säkerhets standarder följs.
3. SensaTemp verktygselement och installerade spetsar är heta när strömmen är påslagen och en tid efter att strömmen slagits av. **RÖR EJ** element eller spets. Risk för brännskador!
4. PACE Spets och Verktygshållare är speciellt utformade för att passa PACE respektive verktyg så att risken för brännskador kan undvikas. När verktyget ej används bör det alltid förvaras i sin hållare.
5. Tillse att ventilationen är god där PACE System används. Ett lödröksugs system som t.ex. PACE tillhandahåller rekommenderas för att skydda användaren för giftig lödrök.
6. Tillse att gällande säkerhetsföreskrifter följs vid användning av kemikalier, t.ex. lodpasta. Se säkerhetsdatabladerna som medföljer kemikalierna och följ de rekommenderade säkerhetsföreskrifterna från respektive tillverkare.

System Set-Up

Set up the ST 45 or ST 55 system using the following steps and associated drawings.

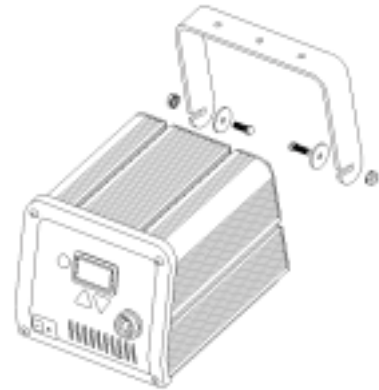
1. Store the shipping container in a convenient location. Reuse of these containers will prevent damage if you store ship your system.
2. Place the Power Switch in the "OFF" or "0" position.



Mounting Options

The ST 45 and ST 55 can be placed directly on a workbench and can be stacked if more than one system is used. The ST 55 can also be mounted under a workbench or shelf to conserve space. To mount the system in this way:

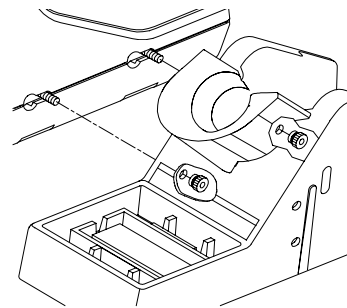
1. Mount the bracket in the desired location (fasteners not supplied).
2. Insert the 2 Mounting Screws (head first) into the power source mounting slots.
3. Place the washers over the screws.
4. Fit the power source between the bracket's support arms and place the screws into the slots on the support arms.
5. Place the nut on the screw and tighten by hand.
6. Angle the power source so the operator can see the display easily and tighten the nuts with a wrench or pliers.



Tip & Tool Stand

The Tip & Tool Stand can be mounted to the power source. If the system will be placed on the workbench, this is recommended. If the ST 55 is to be mounted under the workbench or shelf, the Tip & Tool Stand should not be mounted to the power source.

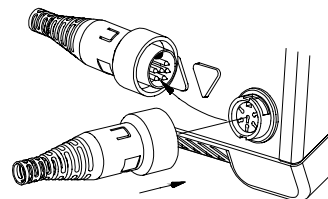
1. To attach the stand to the power source:
 - a) Insert the 2 Mounting Screws (head first) into the power source mounting slots (plastic case shown). Slide the screws toward rear of the power source.
 - b) Place the Tip & Tool Stand beside the power source. Insert ends of the 2 Mounting Screws into the 2 Tip & Tool Stand mounting holes as shown.
 - c) Install a Thumb Nut onto the end of each Mounting Screw and tighten Thumb Nuts.
2. Place the handpiece into its Tip & Tool Stand.



Handpiece Connection

Connect the handpiece connector plug into the Power Receptacle in the following manner.

1. Align guide on connector with slot on power receptacle.
2. Insert connector into power receptacle.
3. Turn the connector housing clockwise to lock in place.



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.

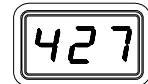
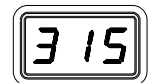
CAUTION: To insure operator and ESD/EOS safety, the AC power supply receptacle must be checked for proper grounding before initial operation.

NOTE: Ensure that the system is placed in a well-ventilated area. Smoke will be generated during the burn in cycle and while soldering. Fume extraction equipment is recommended

Burn In Procedure

Use the following instructions to perform the Heater Burn In procedure.

1. Place the Power Switch in the "OFF" (0) position.
2. Ensure that the handpiece is connected to the power source. If a plastic cap is present on the heater assembly, remove it and discard. The cap is used for shipping purposes only.
3. Press and hold the Program (Ⓢ) and Scroll Up (▲) keys together.
4. Place Power Switch in "ON" (I) position.
5. The display will read "brn" when the Program (Ⓢ) and Scroll Up (▲) keys are released.
6. Press the (▲) Key to initiate the Burn In Mode. The handpiece heater will begin to heat. The temperature of the heater will stabilize at 315°C (600 °F) for 10 minutes.
7. At the conclusion of the 10-minute period, the heater temperature will increase to 427°C (800°F) for 15 minutes.
8. At the conclusion of the 15-minute time period, the heater is turned off and the Display will read "End". Press and release the Scroll Up Key (▲) to exit Heater Burn In and return the to normal operation.



CAUTION: The heater will be hot at the conclusion of the Burn In procedure.

The microprocessor circuitry within the unit monitors the system and if any abnormalities are encountered, the Burn In cycle will be interrupted and an error message displayed. Should this occur, turn the system off and perform the procedure again. If the cycle is interrupted a second time, refer to the Corrective Maintenance section of this manual.

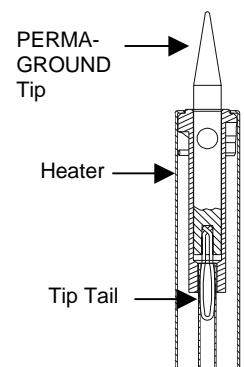
This procedure should be performed whenever a new handpiece or heater is connected to the system.

PS-70/PS-90 Tip Installation

For maximum productivity and proper fit, install tips into your soldering iron when the heater is hot. **CAUTION:** To avoid burns or potential injury, always hold the handpiece with the heater pointed at an angle up to prevent injury.

Installing PERMAGROUND Tips

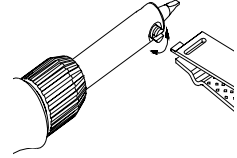
1. PERMAGROUND Tips should be inserted into the heater with the tail of the tip pointing towards the heater.
2. PERMAGROUND Tips can be used once the tip has been fully inserted into the heater. The setscrew is not required to hold the



- PERMAGROUND Tip in the heater.
3. If proper Tip orientation is required, the setscrew can be tightened to hold the tip in place. Also, heat transfer will improve when the setscrew is used.

Installing Non-PERMAGROUND Tips

1. Insert the Tip fully into heater bore using the supplied Tip Tool.
2. Gently tighten the heater Set Screw.
3. Recheck the tip Set Screw periodically to insure that it remains snug.



NOTE: Periodically, clean the heater bore with a properly sized wire brush (3/16" O.D. to insure optimum heat transfer and proper tip grounding when non-PERMAGROUND tips are used.

Definitions

Please read and become familiar with the definitions of each of the following terms that are used repeatedly in the following operational procedures.

Auto-Off: Safety feature that turns power off (10-90 minutes, settable in 10 minute increments) after the system has entered Temperature Setback.

Normal Operation: Normal operating mode of the system in which the Operating Tip Temperature is displayed.

Set Tip Temperature: The operator selected idle tip temperature entered into the system memory.

Set-Up Mode: Mode of operation in which the operator can quickly and easily adjust the system parameters (e.g., temperature limits, password, setback time).

Temperature Adjust Mode: Mode of operation where the Set Tip Temperature may be adjusted.

Temperature Display Impedance (TDI) Mode: Stabilizes the tip temperature shown on the LED Display by ignoring minor temperature fluctuations. Displayed changes in temperature are delayed (impeded) for two seconds when a load is applied to the tip. Two seconds after the load is removed, the displayed temperature will begin rising to set temperature. Particularly useful in a production environment for monitoring of set temperatures, since under most production circumstances the temperature will not deviate.

Temperature Setback: System feature that will independently set back the Set Tip Temperature to 177°C (350°F) after a user selected period of handpiece inactivity (10 to 90 minutes, settable in 10 minute increments). This feature is enabled (or disabled) in the Set-Up Mode.

Tip Offset Constant: Specific value for a given handpiece/tip combination upon which the system automatically calculates the correct Tip Temperature Offset at any entered Set Tip Temperature. This value is the temperature loss (Tip Temperature Offset) at 371°C (700°F) and is set in the Set-Up Mode. A value of 0-115°C (0-240°F) may be entered in the Set-Up Mode.

Password: The Password feature of the ST 45 or ST 55 system will prevent unauthorized alteration of stored system temperature parameters and feature settings (refer to Table I, "Factory Settings"). If a Password has been installed, the LED Display will display an instruction to enter the Password (a 5 key sequence of the keys on the system front panel) when a setting change is attempted.

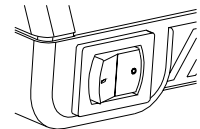
Tip Temperature Compensation: Differences between the temperature settings and true tip temperatures are negligible when using Thru-Hole, single point soldering tips. With any heating system however, True Tip Temperatures can differ greatly from temperature settings when using larger SMT soldering tips. This difference is called Tip Temperature Offset. The ST 45 or ST 55 Auto Tip Temperature Compensation feature lets you set and display true tip temperatures regardless of size and type of tip or handpiece. PACE recommends the use of the Tip & Temperature Selection System booklet (PACE P/N 5050-0251) as a guide to accurately set and maintain a true tip temperature for any size and type of SMT tip. The booklet contains a listing of PACE tip information including the Tip Offset Constant (for each tip), which must be stored in system memory to ensure tip temperature accuracy. Refer to the "Set-Up Mode" section of this manual for instructions on using this feature.

The ST 45 or ST 55 system is very easy to adjust and operate. The following instructions detail system features and operation of the system. Also included is a "Quick Start" procedure. Information regarding changing of system options (e.g., Temperature Setback time, Auto Off) is contained in the "Customizing Your System" portion of this manual.

Quick Start Procedure

As received from the factory, the system can be quickly set up for use in standard soldering operations. Simply perform the following Quick Start Procedure to begin using the system. The systems can be stacked on each other for convenience and to preserve bench top space.

1. Ensure that the Set-Up procedure has been performed; including the Heater Burn In procedure. Check for the following:
 - a) Handpiece connection to the power source.
 - b) Proper tip installed in handpiece.
 - c) Power cord connection between an appropriate AC supply receptacle and the power source.
2. Turn the Power Switch "On" ("I").
3. Press the Scroll Up (▲) Key to enter the Temperature Adjust Mode.
4. Press the Scroll Up (▲) Key to increase the desired Tip Temperature. Press the Scroll Down (▼) Key to decrease the desired Tip Temperature.
5. Press the Program Key (Ⓞ↶). The system will now return to normal operation.
6. Observe the Digital Readout as the temperature reaches and stabilizes at the Set Tip Temperature



NOTE: Read the "Operation" and "Customizing Your System" sections of this manual to utilize the full capabilities of the system. This is especially important when using large soldering tips or other SensaTemp handpieces.

IMPORTANT: PACE recommends that you not read the "Customizing Your System" section until after you feel comfortable with system operation. Please read the following "Operation" section thoroughly before changing the system settings.

Operation





1. Ensure that the Set-Up procedure has been performed; including the Heater Burn In procedure. Check for the following:
 - a) Handpiece connection to the power source.
 - b) Proper tip installed in handpiece.
 - c) Power cord connection between an appropriate AC supply and the power source.
2. Turn the Power Switch On ("I").

3. Press the Scroll Up (▲) Key. The Set Temperature is now displayed, immediately perform step 4. If a Password has been previously programmed into the system, "EPO" will be appear on the LED Display at this point. When this message appears, the operator must enter the correct Password before adjusting the temperature.
4. Adjust the temperature by pressing and holding Scroll Up (▲) Key or Scroll Down (▼) key. Observe the display as the Set Temperature increases first in increments of 1° and then in increments of 10°. When the desired temperature is reached, release the key. **NOTE:** The Set Temperature can only be within the set temperature limits. If the lower limit is reached, the display will read off. If the upper limit has been reached, the display will read "HiL". Temperature limits can be adjusted in the Set-Up Mode
5. Press the Program Key (Ⓞ) and the system will return to normal operation.
6. Observe the Digital Readout as the temperature reaches and stabilizes at the Set Tip Temperature
7. Manually force the system into Temperature Setback by pressing and holding the Scroll Down (▼) Key and the Scroll Up (▲) Key.
8. When the display begins to blink, the system is in Temperature Setback mode and will reduce the set temperature to 177°C (350°F). **NOTE:** If Auto Off has been enabled in the Set-Up Mode, the system will enter Auto Off (temperature Off and LED Display flashing "Off") after the preset time of handpiece inactivity. Auto Off can be exited by pressing any key.
9. To exit Temperature Setback mode, perform any one of the following:
 - a) Press and release a Key (any of the 3 keys). This is the preferred method.
 - b) Wipe the hot handpiece tip on a wet sponge to lower the tip temperature.
 - c) Turn the Power Switch Off ("0") and then back on ("I").
10. The system is now in normal operation. Observe the LED Display as the tip temperature reaches and stabilizes at the Set Temperature. Allow time for the temperature to stabilize at the Set Temperature before using.

NOTE: Read the "Customize Your System" sections of this manual to utilize the full capabilities of the system.

LED Display, Normal Operation

The LED Display provides a 3-digit display of temperature information. The LED Display will show:

1. A display of "888" on initial power up to ensure that all LEDs on the display are working. 
2. A display of the software version of the installed microprocessor (e.g., "1-2") for 2 seconds on initial power up after the "888" is displayed.
3. Actual tip temperature of the connected handpiece during normal operation.
4. The tip temperature displayed will flash when the system is in Temperature Setback. 
5. The displayed temperature will decrease and stabilize at 177°C (350°F) when the system is in Temperature Setback.
6. "OFF" when the Set Tip Temperature has been set to Off (below minimum set tip temperature). Refer to the "Set-Up Mode" portion of this manual. 
7. "OFF" plus the LED Display will be flashing when the unit has entered Auto Off. Refer to the "Set-Up Mode" portion of this manual.
8. Error messages ("OSE", "SSE" or "OCE") if a system fault is detected. Refer to the "Corrective Maintenance" portion of this manual. 

LED Display, Temperature Adjust Mode

The LED Display will show the following when adjusting the desired Set Tip Temperature.

1. The Set Tip Temperature.

2. "HiL" (High Temperature Limit) when adjusting the set tip temperature and the maximum allowable temperature is exceeded. Refer to the "Set-Up Mode" portion of this manual.
3. "OFF" (Low Temperature Limit) when adjusting the set tip temperature and the minimum allowable temperature is exceeded. Refer to the "Set-Up Mode" portion of this manual.
3. "EPO" will be displayed if a Set Tip Temperature adjustment is attempted and a Password has been stored in system memory. As the Password is entered, the zero will increase by one as each key entry is made. Upon entry of the fifth password key, the display will change to the Set Tip Temperature if the entered Password matches the stored Password.
5. "no" will be displayed if the entered password does not match the stored Password.



Temperature Setback Mode

To preserve tip life and save energy, the ST 45 or ST 55 system can be programmed to automatically set back its Tip Temperature to 177°C (350°F) after a selected period of handpiece inactivity (adjustable 10-90 minutes in Set-Up Mode). As received from the factory, this feature is enabled. Refer to the "Set-Up Mode" section of this manual to disable or adjust the time-out period of this feature. The operator can also force the system into Temperature Setback.

Activating Temperature Setback: There are two ways to activate the Temperature Setback feature.

1. **AUTOMATIC ACTIVATION:** The system can be programmed so that this feature will automatically activate after a preselected period (10-90 minutes) of handpiece inactivity. See the "Customizing your System" section for details on programming this feature.
2. **MANUAL ACTIVATION:** The operator can manually force the system to place the system in Temperature Setback by performing the following procedure.
 - a) Press and hold the Scroll Down (▼) Key.
 - b) Press the Scroll Up (▲) Key.
 - c) Release both keys.

Exiting Temperature Setback: Listed below are 3 ways to exit Temperature Setback.

1. Press and release either Scroll Key (▲ or ▼). This is the preferred method.
2. Wipe the hot handpiece tip on a wet sponge to lower the tip temperature.
3. Method "1" is preferred but you can turn the Power Switch "OFF" (0) and then back "ON" (1).

Set Tip Temperature and Tip Offset Constant values will be simultaneously restored. For optimum performance, do not attempt to use the attached handpiece until the Set Tip Temperature is achieved.

Auto Off Safety System Mode

When enabled, the Auto Off safety system of the ST 45 or ST 55 system turns off the power to the handpiece 10-90 minutes after entering Temperature Setback. When the system has entered Temperature Setback, an Auto Off timer within the system circuitry will start running (if Auto Off is turned on in Set-Up Mode):

1. If any key is pressed during the selected time out period, the Auto Off timer is reset. The system will return to normal operation.
2. At the end of the time out period, the system will enter Auto Off. Power is turned off to the heater and the LED Display will show a flashing "OFF".

Exiting Auto Off: Auto Off can be exited; returning to normal operation by:

1. Pressing and releasing a Key (either of the 3 keys), or
2. By turning the Power Switch OFF ("0") and then back ON ("1").

Customizing Your System

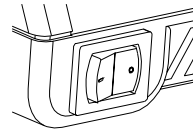
The menu driven LED Display of the ST 45 or ST 55 system allows you to easily customize your system. In Set-Up Mode, you can:

- Enter, remove or change a Password.
- Set the Default Temperature scale to °F or °C as desired.
- Change the Upper and Lower Temperature limits.
- Enter a Temperature Offset Constant (Auto Tip Temperature Compensation).
- Enable or disable the Temperature Setback feature and adjust the time-out period (if enabled).
- Enable or disable the Auto Off feature and adjust the time-out period (if enabled).
- Enable or disable the Temperature Display Impedance (TDI) mode.

The following instructions should be performed to familiarize the operator with the system.

Entering Set-Up Mode

1. Place Power Switch in the "OFF" ("0") position.
2. Press and hold the Program Key (⌘) while turning on the Power Switch ("I" position).



Password

3. The LED Display will display the version of the microprocessor and change to read "P--".
4. If the display reads "EP0", a Password has been stored in system memory. Enter the 5 key sequence Password (the 5 key sequence is made up from the up, down, and program keys). If the Password entered is incorrect, "no" appears on the display and the system then returns to normal operation. If this occurs, repeat steps 1 through 5 and enter the correct Password.
5. The LED Display reads "P--". Choose one of the following options:
 - a) Press the Program Key (⌘) to keep the currently stored Password (including no Password).
 - a) Press and release the Scroll Up (s) Key to enter a new Password.
 - b) Press and release the Scroll Down (t) Key if you wish to remove a stored password or do not wish to store a Password.
6. If the LED Display now reads "EP0", select and enter a 5 key password sequence. Make a note of the entered Password. As the Password is entered, the last digit of the display will count up with each key entry. After the fifth key entry, proceed to step 8.

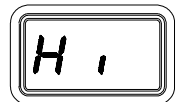
Temperature Scale

8. The LED Display now shows the stored default Temperature Scale (°C or °F temperature shown on LED Display). Choose one of the following:
 - a) Press the Program Key (⌘) to keep the stored default Temperature Scale.
 - b) Press and release the Scroll Up (▲) Key to change the default Temperature Scale. Press and release the Program Key.



Temperature Limit

9. The LED Display now shows the stored default High ("Hi") Temperature Limit with the display alternating to show "Hi" and the stored limit. Choose one of the following:
 - a) Press and release the Program Key (⌘) to keep the stored High Temperature Limit.
 - b) Press and release the Scroll Up (▲) Key to increase the stored High Temperature Limit (up to 454°C, 850°F). Press and release the Program Key to proceed to the next step.



- c) Press and release the Scroll Down (▼) Key to decrease the stored High Temperature Limit. Press and release the Program Key to proceed to the next step.
10. The LED Display now shows the stored default Low ("Lo") Temperature Limit with the display alternating to show "Lo" and the stored limit. Choose one of the following:
- a) Press and release the Program Key (Ⓞ) to keep the stored Low Temperature Limit (204°C, 400°F).
 - b) Press and release the Scroll Up (▲) Key to increase the stored Low Temperature Limit. Press and release the Program Key to proceed to the next step.
 - c) Press and release the Scroll Down (▼) Key to decrease the stored Low Temperature Limit. Press and release the Program Key to proceed to the next step.



Offset Constant

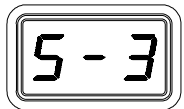
11. The LED Display now shows the stored Offset Constant with the display alternating to show "OF" and the stored Offset Constant. Choose one of the following:
- a) Press and release the Program Key (Ⓞ) to keep the currently stored Offset Constant.
 - b) Press and release the Scroll Up (▲) Key to increase the stored Offset Constant. An Offset Constant of 0-133°C (0-240°F) can be stored. Press and release the Program Key to proceed to the next step.
 - c) Press and release the Scroll Down (▼) Key to decrease the stored Offset Constant. Press and release the Program Key to proceed to the next step.



NOTE: If the attached handpiece is disconnected when the system is powered up, any stored Offset Constant is reset to zero. The Offset Constant must be entered again in the Set-Up Mode.

Temperature Setback

12. The LED Display now shows the stored Temperature Setback time as "S-X" (x=0 thru 9). Time is shown as tens of minutes (e.g., "S-3" equals 30 minutes). A display of "S- 0" indicates that Setback is disabled. Choose one of the following:
- a) Press and release the Program Key (Ⓞ) to keep the currently stored Temperature Setback time.
 - b) Press and release the Scroll Up (▲) Key to enable and/or increase the stored Temperature Setback time. Press and release the Program Key to proceed to the next step.
 - d) Press and release the Scroll Down (▼) Key to decrease or disable the stored Temperature Setback time. Press and release the Program Key to proceed to the next step.



Auto Off

13. The LED Display now shows the stored Auto Off time as "AOx" (x=0 thru 9). Time is shown as tens of minutes (e.g., "AO3" equals 30 minutes). A display of "AO0" indicates that Auto Off is disabled. Choose one of the following:



- a) Press and release the Program Key (Ⓞ) to keep the currently stored Auto Off time.
- b) Press and release the Scroll Up (▲) Key to enable and/or increase the Auto Off. Press and release the Program Key to proceed to the next step.
- e) Press and release the Scroll Down (▼) Key to decrease or disable the stored Auto Off time. Press and release the Program Key to proceed to the next step.

Temperature Display Impedance

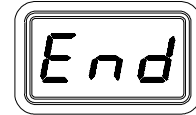
14. The LED Display now shows the Temperature Display Impedance mode as Enabled or Disabled ("AC0" = Disabled and "AC1" = Enabled). Choose one of the following:
- Press and release the Program Key (Ⓞ) to keep the currently stored setting (Disabled or Enabled).
 - Press and release the Scroll Up (▲) Key to change the stored setting (Disabled or Enabled). Press and release the Program Key to proceed to the next step.



Exiting Set-Up Mode

15. The LED Display now reads "End". The Set-Up Mode procedure is now complete. Choose one of the following steps:

- Press and release the Scroll Up (▲) Key to exit Set-Up Mode and return to normal operation.
- Press and release the Scroll Down (▼) Key to return to the start of the Set-Up Mode procedure. Go back to step 4.



Factory Settings

The ST 45 and ST 55 systems come equipped with a number of features, which may be adjusted as desired by the user. Listed below are the features and factory settings of each. To change and/or learn about any of these features, refer to the applicable part of the "Customizing Your System" section of this manual.

Feature	Factory Setting
Password	None Entered
Default Temperature Scale (°C/°F)	°F for 115 VAC Systems °C for 230 VAC Systems
"HI" (Upper) Temperature Limit	454 °C (850 °F)
"LO" (Lower) Temperature Limit	204 °C (400 °F)
Set Temperature	"OFF"
Tip Offset Constant	"0"
Temperature Setback	Enabled, 30 minutes
Auto Off	Enabled, 30 minutes
Temperature Display Impedance Mode	Enabled

Table 1: Factory Settings

Corrective Maintenance

System Accuracy and Calibration

No calibration adjustments are necessary to maintain the accuracy of the system.

LED Display Message Codes

Listed below are message codes, which, may be shown on the LED Display if a mistake is made by the operator (e.g., wrong Password entry) or if the system has malfunctioned.

LED Display Message	Description
	The incorrect password has been entered. The displayed message will time out after 6 seconds and revert to normal operation. Enter the correct password.
	No handpiece is connected to the power receptacle. Connect handpiece.



	The handpiece heater assembly sensor is open. Refer to table 4 to check handpiece.
	The handpiece heater assembly sensor is shorted. Refer to Table 4 to check handpiece.
	The handpiece heater assembly may be defective. Refer to Table 4 to check handpiece.
	Power source malfunction. Contact PACE or your authorized local representative for assistance.

Table 2: LED Display Message Codes

Power Source

Most malfunctions are simple and easy to correct. Refer to Table 3.

Symptom	Probable Cause	Solution
No power to system	Blown Fuse	Check handpiece using table 4. Replace the fuse (located in the AC Receptacle Fuse Holder) with one of the same rated value (see Table 6, Spare Parts)
Handpiece will not heat	Defective Heater	See Table 4.
	Power Source Malfunction	Contact PACE

Table 3: Power Source Corrective Maintenance

Handpieces

The following “Heater Assembly Checkout Procedures” (Table 4) is applicable to all PACE SensaTemp handpieces used with the ST 45 or ST 55 system except for the TT-65 and DTP-80 handpieces. Refer to the applicable manuals for troubleshooting procedures pertinent to these handpieces.

Perform the procedures with the handpiece heater at room temperature. If the heater is warm, resistance readings will be different from those shown in Table 4. Disconnect the handpiece from the power source. Use a meter to check resistance across the handpiece connector plug pins as outlined in the “Checkout Procedure” column.

System	Checkout Procedure	Cause	Solution
Handpiece does not heat	Check resistance: Pin 2 to Pin 5. Refer to heater specifications below if resistance is high, see Solution	Open Heater	Replace Heater Assembly
	Check resistance: Pin 3 to Pin 6. If circuit reads open, see Solution	Open Sensor	Replace Heater Assembly
Handpiece Overheating	Check Resistance: Pin 3 to Pin 6. Resistance should be 110 ohms. If resistance is less than 105 Ohms, see Solution	Shorted Sensor	Replace Heater Assembly
Fuse blows when power source is turned on	Check resistance: Pin 2 to Pin 5. Refer to heater specifications below if resistance is low, see Solution	Shorted Heater	Replace Heater Assembly and Fuse
No Ground on Tip	Check resistance: Pin 4 to a new tip. Resistance should be less than 2 ohms, if not see Solution	Oxidation build-up in heater Bore	Clean Heater Bore using wire brush

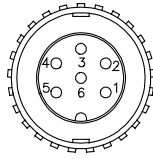
	Defective Heater	Replace Heater Assembly
Heater Specifications: PS-90 = 8-10 ohms PS-70 = 11.3-12.3 ohms		
Connector Plug Pin-Outs		

Table 4: Heater Assembly Diagnostic Procedures

PS-70/PS-90 Heater Replacement

Ensure that the installed heater of the PS-70/PS-90 handpiece is defective by referring to Table 4 (Heater Assembly Checkout Procedures). If replacement becomes necessary, perform the following procedure to ensure optimum performance and maximize the life expectancy of the heater.

1. Allow the heater to cool.
2. Remove the Heater Retaining Nut.
3. Pull the Heater Assembly from the Handle. Discard defective Heater Assembly.
4. Align the connector key on the handle end of the replacement Heater Assembly with the keyway slot on the handle.
5. Push the Heater Assembly fully into the handle.
6. Replace the Heater Retaining Nut and tighten by hand.



Packing List

Item #	Description	Part Number	Quantity Supplied					
			ST 45 or ST 55 with PS-70		ST 45 or ST 55 with PS-90		ST 45 TT	
			ST 45	ST 45E	ST 45	ST 45E	ST 45	ST 45E
1	System Power Supply	-----	1	1	1	1	1	1
2	PS-70 Handpiece Kit (37W)	6993-0236-P1	0	0	1	1	0	0
3	PS-90 Handpiece Kit (51W)	6993-0199-P1	1	1	0	0	0	0
4	TT-65 Handpiece (74W)	7025-0001	0	0	0	0	1	1
5	Power Cord, 115V	1332-0094	1	0	1	0	1	0
6	Power Cord, 230V	1332-0093	0	1	0	1	0	1
7	TT-65 Tip & Tool Stand	-----	0	0	0	0	1	1
8	ST TT Accessory Kit	-----	0	0	0	0	1	1
9	Tip Tool	1100-0206	1	1	1	1	1	1
10	Operations Manual	5050-0453	1	1	1	1	1	1
11	TT-65 Operation Manual	5050-0336	0	0	0	0	1	1

Table 5: Packing List

Spare Parts

Item #	Description	PACE Part Number
1	Fuse, 1.0 Amp Time Lag (ST 45 and ST 55)	1159-0246-P5

	Fuse, 1.0 Amp Time Lag (ST 45E and ST 55E)	1159-0213-P5
2	PS-70 Heater, 21V, 37W	610-0128-P1
3	PS-90 Heater, 21V, 51W	6010-0095-P1
4	Retaining Nut for PS-70/PS-90	1410-0122-P5
5	Tip & Temperature Selection Chart	5050-0251
6	Replacement PCB Assembly	6020-0123-P1

Table 6: Spare Parts

Service

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

Warranty Information:

LIMITED WARRANTY

PACE warrants that this equipment will be free of defects in materials and workmanship for a period of one (1) year from the date of receipt by original purchaser.

This warranty does not cover repair or replacement required as a result of misuse, mishandling or improper storage. Failure to perform recommended routine maintenance, alterations or repairs made other than in accordance with PACE's directions, or removal or alteration of identification plates in any way will void this warranty. This warranty is available only to the original purchaser, but the exclusions and limitations therein apply to all persons and entities.

This warranty does not apply to consumable items, such as tips, filter elements, hoses, collection chambers etc., except that heaters are normally warranted for a period of six (6) months from the date of receipt by the original purchaser.

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

PACE will, at its option, repair or replace any defective equipment or parts at its facility or other location approved by PACE at no charge to the 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 PACE or other warranty location for warranty service.

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

Do NOT return defective equipment or parts to PACE without obtaining prior authorization.

Any warranty or other claim with respect to the equipment must be made in writing and delivered to PACE (or local authorized PACE Distributor outside the U.S.) within a reasonable time of the expiration date of this warranty. Sufficient evidence of purchase and date of receipt must also be included, otherwise user's rights under this warranty shall be deemed waived.

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