TF 1000 BGA/CSP Rework Station

Operation Manual

MANUAL NO. 5050-0501

REV. A

Safety

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

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 all other applicable safety standards.
3. Always use PACE systems in a well ventilated area. A fume extraction system, such as those available from PACE, is highly recommended to help 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.
5. The following safety precautions cover use of PACE hot air systems/hand pieces (e.g., ThermoFlo®, ThermoJet®).
    a) Be careful when using in places where there are combustible materials.
    b) Do not use in the presence of an explosive atmosphere.
    c) A fire may arise if a hot air hand piece is not used with care. Do not leave the hand piece unattended when in use.
    d) The heater assembly housing and any installed nozzle are hot when the system is being cycled and for a period of time thereafter. DO NOT touch the heater assembly housing, nozzle or heated air stream. Severe burns may result.

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TF 1000 BGA/CSP Rework Station

A. Introduction

As electronic assemblies get smaller and lighter, PCB's are steadily decreasing in size, and semiconductor devices are slowly being replaced by smaller area array packages such as BGA's and CSP's. The TF-1000 has been specifically designed for the rework of these devices, with an emphasis on small boards and components.

B. Regulation

The TF-1000 is in conformity with the European Machinery Directive 98/37/EC and EMC Directive 89/336/EMC, modified 92/31/ECC, 93/68/EEC.

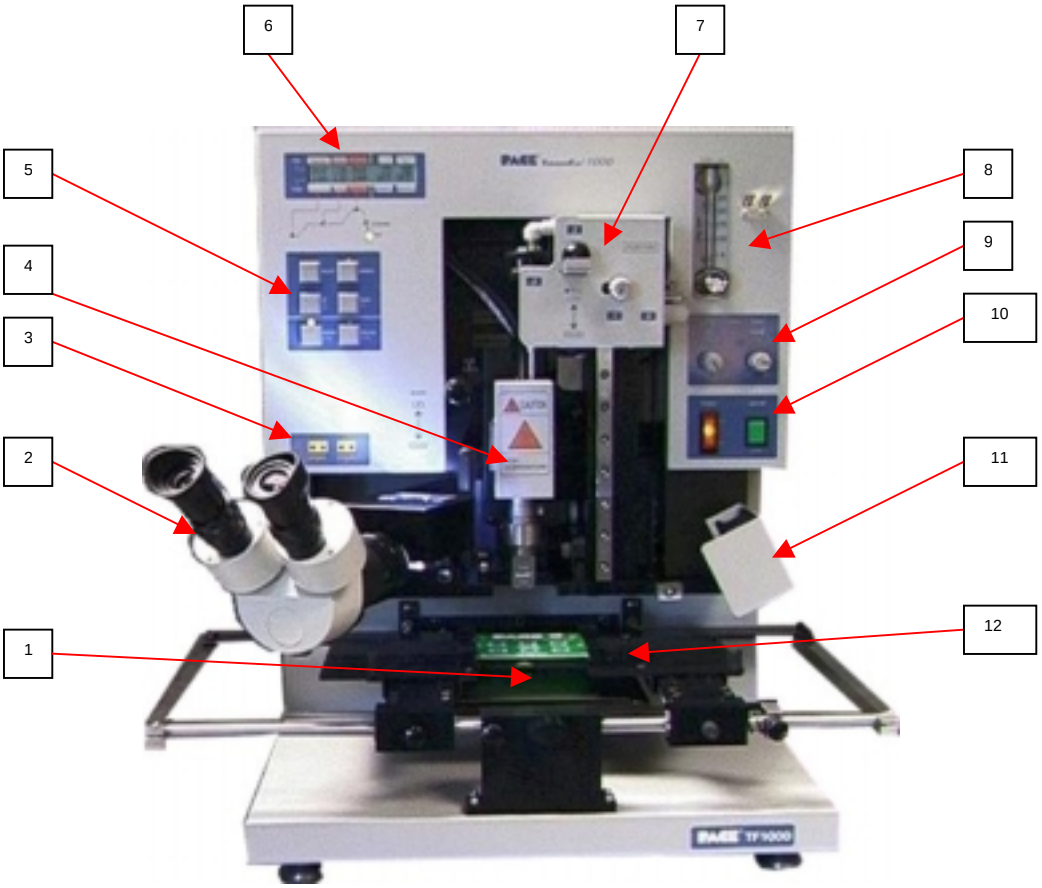
Caution!

During normal operation, the top heater, nozzle, bottom-side-heater(s) and halogen lamps will get hot. Contacting them directly may result in serious injury.

C. Features

1. The TF 1000 System is lightweight and compact, with the placement station and reflow station combined in one unit
2. Up to 40 reflow profiles can be stored by the TF 1000. Saved profiles can be recalled at the touch of a button and are displayed on the LCD display panel.
3. A colored LED indicates each phase of the reflow cycle so the status of each operation can be easily seen and monitored.
4. Placement of small BGA/CSP is easily accomplished through the use of microscope optics with image overlay.
5. A highly efficient, 700-watt topside heater used in conjunction with a truly unique nozzle design insures the uniformity of the temperature across the assembly.
6. The infrared bottom side heater with a wide heating area is incorporated to prevent warping of the PCB, and to enhance the reflow of BGA/CSP.
7. The blower and vacuum pumps are self-contained. No external air supplies are required.
8. A cooling fan automatically activates at the end of the reflow cycle to cool the component, PCB, and nozzle.
9. The TF 1000 is versatile and ensures repeatable results

D. Structure

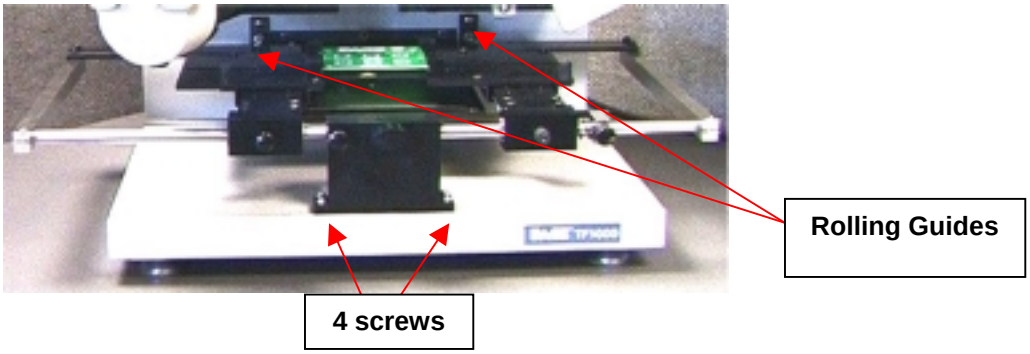


1. Infrared Bottom-Side heater
2. Microscope Optics
3. Thermocouple inputs 1 and 2
4. Top-Side Heater Assembly
5. Control Panel
6. LCD Display
7. Component Alignment/Placement apparatus
8. Airflow control/Indicator
9. PCB and Component light adjustment
10. Power and Vacuum On/Off switch
11. Cooling Fan
12. PCB Holder

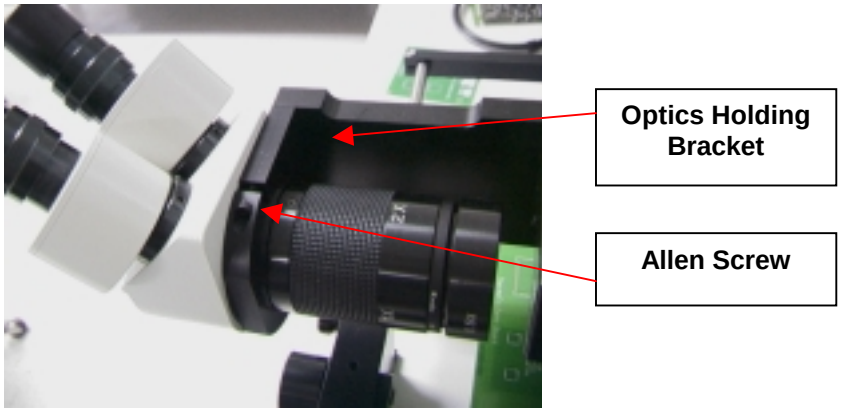
Operation Manual

E. TF 1000 Setup

1. Place the TF 1000 on a flat and stable work surface.
2. Install the PCB Holder assembly by inserting the rear rail of the PCB holder into the rolling guides on the TF 1000 housing and installing and tightening the four screws shown in the figure below.



3. Insert the Microscope Optics into the Optics Holding Bracket and tighten the Allen Screw after centering the Optics as shown below.



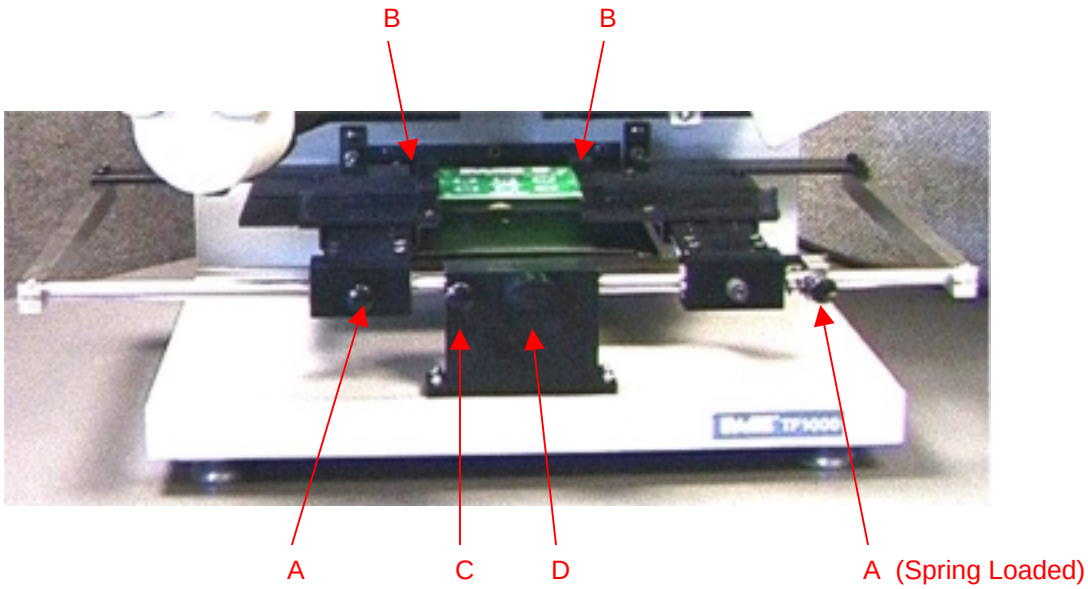
4. Connect the power cord to the AC power receptacle on the rear panel of the TF 1000 and to the proper AC power source.

F. Before Operation

1. Confirm the safety of the machine and the surrounding work area before turning the power on.
2. The bottom heater will take approximately 5-6 minutes to warm up to the desired temperature once power is applied. During this time the HEATER START light will flicker on and off. Once the desired temperature is reached the HEATER START light will remain lit, indicating the TF 1000 is ready to use.
3. Confirm that components/devices mounted to the PCB do not exceed the following height restrictions:

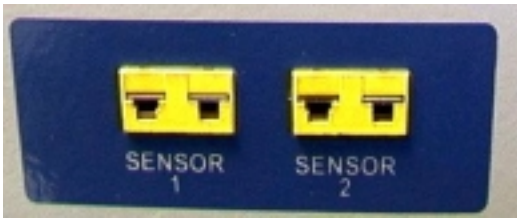
    A. Top-side of PCB – 30 mm maximum height
    B. Bottom-side of PCB – 15 mm maximum height

G. Installing PCB



1. Loosen both (A) knobs to allow the PCB holders to glide freely in the X-axis, and set the distance between them so that the spring loaded PCB holder will hold the PCB firmly. Tighten the (A) knob on the left first, and then slide the spring-loaded PCB holder into position and tighten the (A) knob on the right.
2. Pull back on the spring-loaded board holder and insert the PCB.
3. Once the PCB is in place, loosening knob (C) will allow the entire PCB to glide freely in the X-axis using the fine adjustment job (D). The PCB will also slide freely in the Y-axis. Tighten knob (C) to lock the PCB in place.

NOTE: If profiling a PCB/Component and when using thermocouple(s), attach the thermocouple(s) to the desired position on the PCB and plug them into the Sensor 1 or 2 positions as shown below, **before** inserting PCB into PCB holder.



Thermocouple Inputs

H. Preparation for Component Rework

1. The reflow nozzle to PCB standoff height can be established prior to component placement. Pull the Reflow Nozzle Control Handle out from the housing and slide the Reflow Assembly down to the PCB as shown below.

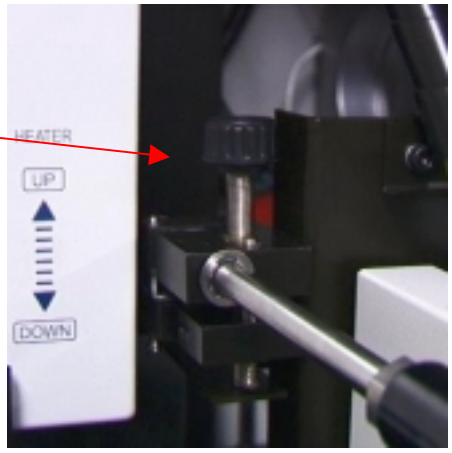
Reflow Nozzle Control Handle

Start

Finish

2. Fine placement of the reflow nozzle down to the PCB can be achieved by setting the Nozzle to PCB Offset Limiter and twisting the nozzle control handle in either direction as shown below.

Nozzle to PCB Offset Limiter



With the handle twisted so the mechanics look like this…

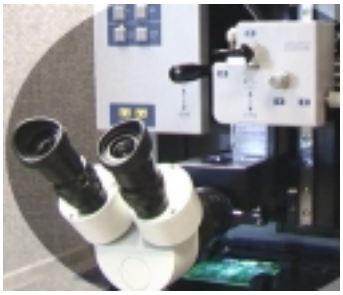
…the Reflow Nozzle will float slightly off the PCB.

3. The Reflow Nozzle can now be lowered gently to the PCB by twisting the Reflow Nozzle Control Handle back to the lowered position.

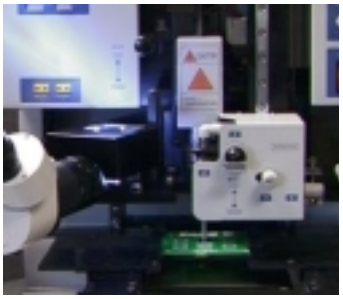
I. Component Alignment

1. The TF 1000 has three positions for the alignment apparatus: Standby, Alignment, and Placement. The positions are shown below.

Standby



Alignment



Placement

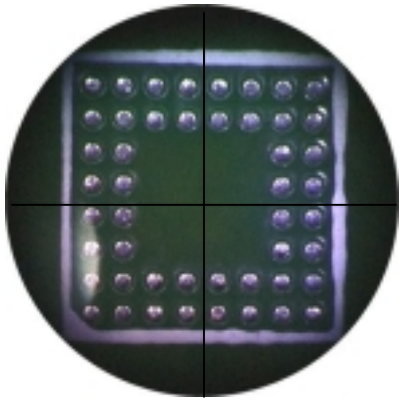
2. The alignment apparatus is released by pulling the Z-Axis adjustment knob out as shown below.

Apparatus release

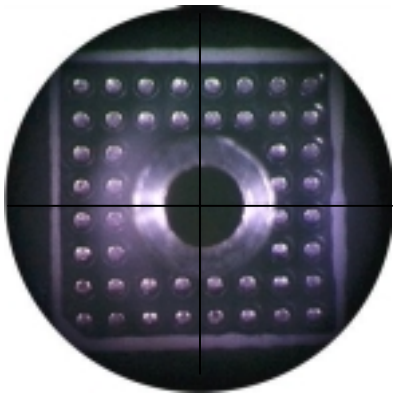
3. Bring the microscope into position by swinging the microscope into place. Release the alignment apparatus from the standby position and slide it down to the alignment position as shown above.

CAUTION: Do not let the alignment apparatus drop freely to the position below at any time. Damage to the TF 1000 or PCB may occur.

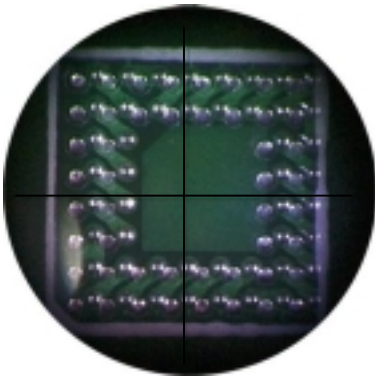
4. Using the microscope, center the component pattern of the PCB in the viewer as shown below. The crosshairs and focus are adjusted by turning the eyepiece(s) on the microscope.



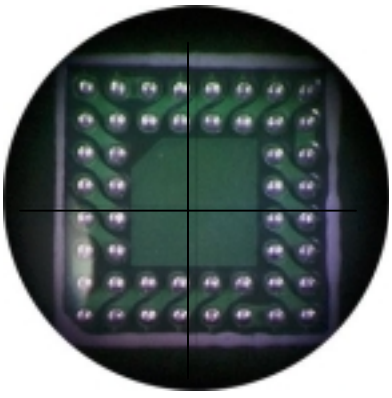
5. Center the vacuum pick so that it fills the viewer as shown below.



6. Press the “Vacuum On” button and attach the component to the vacuum pick. Using the X, Y, and Theta adjustment knobs, align the component over the PCB as shown below. Use the PCB/Device light adjustments to increase or decrease the contrast as needed.



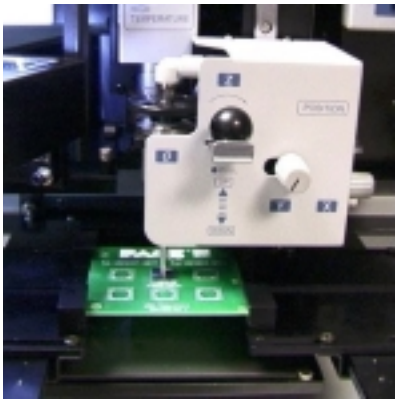
Misaligned



Aligned

J. Component Placement

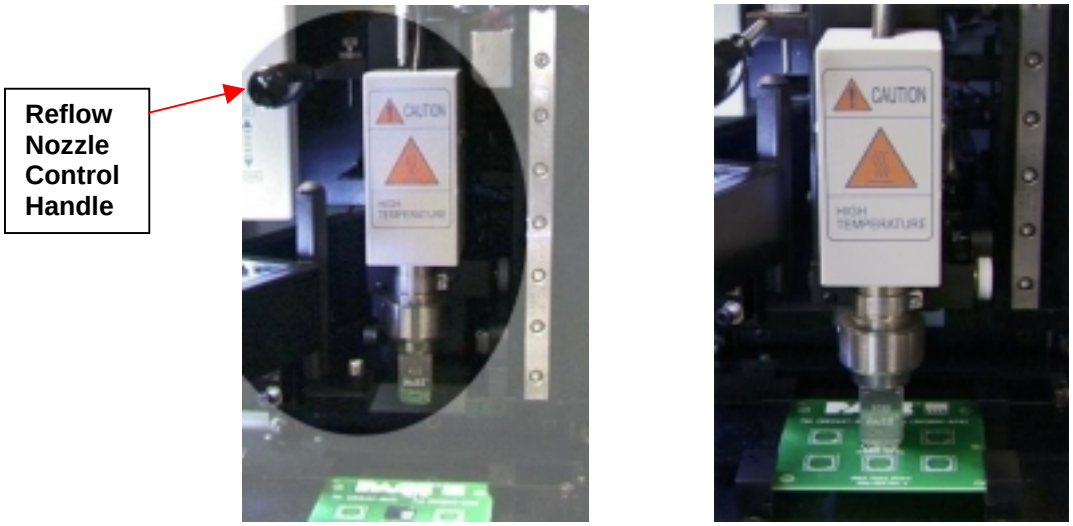
1. Swing the Microscope out to the standby position. Release the alignment apparatus and slide it down until the component gently touches the PCB as shown below.



2. Press the “Vacuum Off” button to release the component onto the PCB.
3. Slide the alignment apparatus up to the standby position.

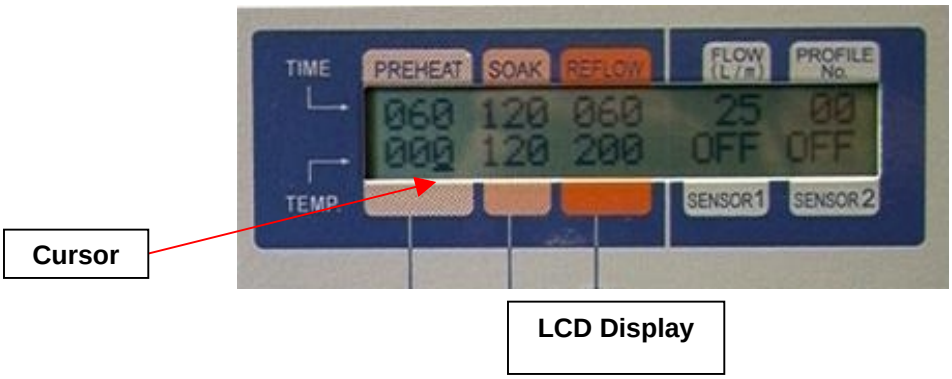
K. Component Reflow

1. Using the Reflow Nozzle Control Handle, pull the reflow assembly out from the housing and slide it gently down to the PCB as shown below. Use the Nozzle to PCB Offset Limiter if necessary.



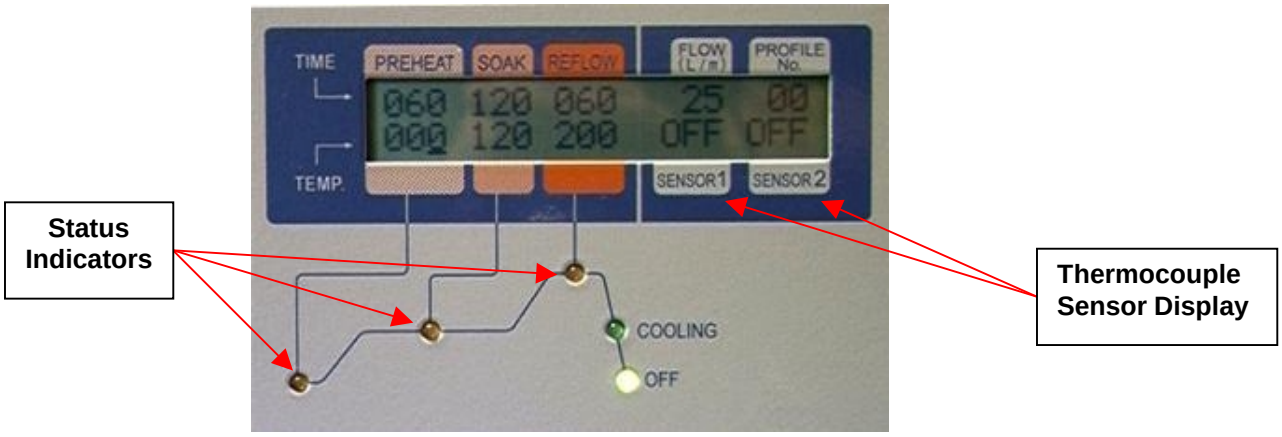
Start **Finish**

4. Select the desired profile using the LCD display. Push the Select button until the flashing cursor is located under the “Profile No.” position and push the Up and Down button until the desired profile number is displayed.

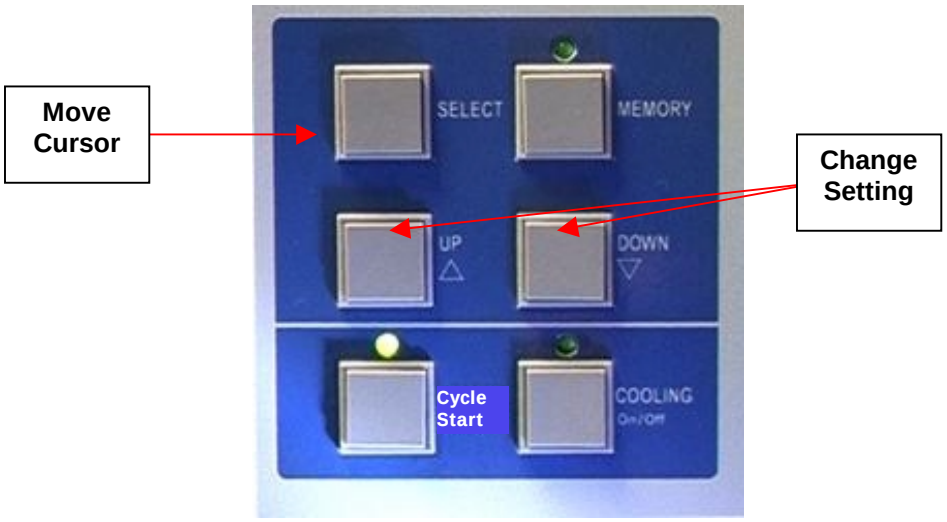


5. Push the “Cycle Start” button to start the reflow process. If needed, lifting the nozzle back up to the standby position will automatically stop the cycle at any time.

6. The status indicator located below the LCD display will track the reflow process. Thermocouple readings are displayed at Sensor 1 and Sensor 2 as shown below.



7. Changes can be made during the reflow process by pressing the “Select” button to move the cursor to the desired setting to be changed and then pressing the Up/Down buttons until the desired setting is achieved.



8. At the end of the reflow process, an audible tone will be heard and the Reflow display will count down to 0. The cooling fan will activate automatically and can be turned off by pressing the “Cooling Off” button. Additionally, the angle of the fan can be adjusted so that the fan does not blow towards the PCB/Component at all. This may be required for CBGA to ensure the cooling process does not occur too rapidly.

9. The Reflow Nozzle assembly may now be returned to the standby position by lifting the Reflow Nozzle Control Handle up and in. If performing component removal, remove the component using the provided vacuum pick wand.

10. Pressing the “Memory” button twice will now save changes made to the profile during the reflow process. To save the changed profile as a new profile, press the “Memory” button once, select the profile number to save as, then press the “Memory” button again. An audible tone verifies the profile has been saved.

L. Specifications

1. Heater (top-side)	Convective style, 700 W
2. Pre-heater (bottom-side)	IR Heater, 450W (TF1000E 400W)
3. Heating Control	K type thermocouple with closed loop control
4. Applicable Devices	BGA/CSP/SMT 42mm x 42mm (1.65” x 1.65”) Max
5. Applicable PCB	280 mm x 450 mm (11” x 17.5”) Max
6. Hot Air Flow	16 LPM Max
7. Adjusting Range of X, Y, Z	± 10 mm (.4”)
8. Adjusting volume of X, Y, Z	0.5 mm (.02”) per revolution
9. Positioning Accuracy	± 25 µm (0.001”)
10. Maximum Vacuum	450 mm Hg
11. Power Source	100-120 VAC, 220-230 VAC (Export)
12. Power Consumption	1.1 KW
13. Dimensions	400 mm W x 400 mm L x 520mm H 15.74” W x 15.74” L x 20.47” H
14. Weight	25 Kg (55 lbs.)

M. Accessories

Note: Nozzle dimensions are the outside diameter of the nozzle. Please allow for 1.5 mm clearance between the edge of the component and the nozzle wall.

Example: The 30mm x 30mm nozzle will fit a 27mm x 27mm component.

Note: Component Stenciling Tool Kits dimensions: - 2 are for PBGA and - 4 are for CBGA. Other components are specified as listed.

Example: 27mm – 2 will fit a 27mm x 27mm PBGA
27mm – 4 will fit a 27mm x 27mm CBGA

Description	Dimensions	Part Number
Nozzle	47.5mm x 47.5mm (1.87” x 1.87”)	4028-5034
Nozzle	44mm x 44mm (1.73” x 1.73”)	4028-5030
Nozzle	43mm x 43mm (1.69” x 1.69”)	4028-5029
Nozzle	42.5mm x 42.5mm (1.67” x 1.67”)	4028-5013
Nozzle	40mm x 40mm (1.57” x 1.57”)	4028-5012
Nozzle	37.5mm x 37.5mm (1.48” x 1.48”)	4028-5018
Nozzle	35mm x 35mm (1.38” x 1.38”)	4028-5003
Nozzle	33mm x 33mm (1.29” x 1.29”)	4028-5033
Nozzle	32mm x 32mm (1.26” x 1.26”)	4028-5020
Nozzle	31mm x 31mm (1.22” x 1.22”)	4028-5014
Nozzle	30mm x 30 mm (1.18” x 1.18”)	4028-5027
Nozzle	27mm x 27mm (1.1” x 1.1”)	4028-5001
Nozzle	26.4mm x 26.4mm (1.04” x 1.04”)	4028-5026
Nozzle	25mm x 32.3mm (.98” x 1.27”)	4028-5028
Nozzle	25mm x 25mm (.99” x .99”)	4028-5011
Nozzle	23mm x 23mm (.91” x .91”)	4028-5002
Nozzle	22mm x 14mm (.87” x .55”)	4028-5023
Nozzle	21mm x 21mm (.83” x .83”)	4028-5016
Nozzle	19.25mm x 19.25mm (.76” x .76”)	4028-5024
Nozzle	19mm x 19mm (.75” x .75”)	4028-5019
Nozzle	18.5mm x 18.5mm (.73” x .73”)	4028-5025
Nozzle	17mm x 17mm (.67” x .67”)	4028-5015
Nozzle	16.25mm x 17.75mm (.64” x .70”)	4028-5006
Nozzle	16mm x 16mm (.63” x .63”)	4028-5022
Nozzle	15mm x 15mm (.59” x .59”)	4028-5005
Nozzle	13.45mm x 14.97mm (.53” x .59”)	4028-5007
Nozzle	13mm x 13mm (.51” x .51”)	4028-5004
Nozzle	11.97mm x 13.21mm (.47” x .52”)	4028-5009
Nozzle	10.42mm x 10.42mm (.41” x .41”)	4028-5008
Nozzle	8.64mm x 8.90mm (.34” x .35”)	4028-5010

Nozzle	7.75mm x 5.6mm (.31” x .22”)	4028-5501
Nozzle	4.1mm (0.16”) Jet Spacing x 6.1mm (0.24”) Jet Length	4028-4001
Nozzle	4.1mm (0.16”) Jet Spacing x 10.9mm (0.43”) Jet Length	4028-4002
Nozzle	7.9mm (0.31”) Jet Spacing x 10.9mm (0.43”) Jet Length	4028-4003
Nozzle	7.9mm (0.31”) Jet Spacing x 13.5mm (0.53”) Jet Length	4028-4004
Nozzle	7.9mm (0.31”) Jet Spacing x 16mm (0.63”) Jet Length	4028-4005
Nozzle	7.9mm (0.31”) Jet Spacing x 18.5mm (0.73”) Jet Length	4028-4006
Nozzle	11.68mm (0.46”) Jet Spacing x 20.83mm (0.82”) Jet Length	4028-4007
Nozzle	11.42mm (0.45”) Jet Spacing x 27.17mm (1.07”) Jet Length	4028-4008
Nozzle	18.6mm (0.73”) Jet Spacing x 12.8mm (0.50”) Jet Length	4028-4505
Nozzle	10.4mm (0.41”) Jet Spacing x 21.35mm (.84”) Jet Length	4028-4506
Component Stenciling Tool Kit, 40mm - 2		7016-0016
Component Stenciling Tool Kit, 35mm - 4		7016-0006
Component Stenciling Tool Kit, 35mm - 2		7016-0030
Component Stenciling Tool Kit, 33mm - 4		7016-0021
Component Stenciling Tool Kit, 31mm - 2		7016-0028
Component Stenciling Tool Kit, 31mm - 4		7016-0032
Component Stenciling Tool Kit, 27mm - 4		7016-0007
Component Stenciling Tool Kit, 27mm - 2		7016-0029
Component Stenciling Tool Kit, 25mm - 2		7016-0017
Component Stenciling Tool Kit, 25mm - 4		7016-0020
Component Stenciling Tool Kit, 23mm - 2		7016-0008
Component Stenciling Tool Kit, 23mm - 4		7016-0013
Component Stenciling Tool Kit, 17mm - 2		7016-0009
Component Stenciling Tool Kit, 17mm - 4		7016-0012
Component Stenciling Tool Kit, 15mm - 2		7016-0010
Component Stenciling Tool Kit, 15mm - 1		7016-0023
Component Stenciling Tool Kit, 13mm - 2		7016-0011
Component Stenciling Tool Kit, 13mm x 10mm		7016-0027
Component Stenciling Tool Kit, 12mm CSP		7016-0014
Component Stenciling Tool Kit, 11mm x 8mm CSP		7016-0015
Component Stenciling Tool Kit, 19mm		7016-0018
Component Stenciling Tool Kit, 19mm Socket		7016-0026
Component Stenciling Tool Kit, 16.5 x 8mm, CSP		7016-0019
Component Stenciling Tool Kit, 22mm x 14mm		7016-0022
Component Stenciling Tool Kit, 4mm LCC		7016-0024
Component Stenciling Tool Kit, 8mm x 10mm		7016-0031
Component Stenciling Tool Kit, PLCC 28		7016-0033
Component Stenciling Tool Kit, 9mm		7016-0034
Component Stenciling Tool Kit, 24mm - 4		7016-0035
Component Stenciling Tool Kit, 6mm		7016-0036
Stencil, 40mm x 503		1040-0503-P1
Stencil, 40mm x 432		1040-0432-P1

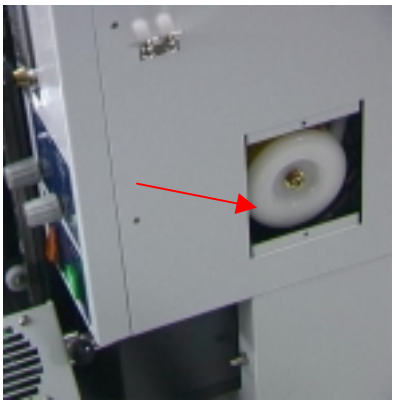
Stencil, 35mm x 388	1035-0388-P1
Stencil, 35mm x 456	1035-0456-P1
Stencil, 35mm x 313	1035-0313-P1
Stencil, 35mm x 352	1035-0352-P1
Stencil, 35mm x 480	1035-0480-P1
Stencil, 33mm x 503	1033-0503-P1
Stencil, 31mm x 304	1031-0304-P1
Stencil, 31mm x 329	1031-0329-P1
Stencil, 27mm x 352	1027-0352-P1
Stencil, 27mm x 316	1027-0316-P1
Stencil, 27mm x 225	1027-0225-P1
Stencil, 27mm x 256	1027-0256-P1
Stencil, 27mm x 272	1027-0272-P1
Stencil, 27mm x 292	1027-0292-P1
Stencil, 27mm x 324	1027-0324-P1
Stencil, 27mm x 328	1027-0328-P1
Stencil, 27mm x 336	1027-0336-P1
Stencil, 23mm x 169	1023-0169-P1
Stencil, 23mm x 288	1023-0288-P1
Stencil, 23mm x 324	1023-0324-P1
Stencil, 23mm x 208	1023-0208-P1
Stencil, 23mm x 256	1023-0256-P1
Stencil, 23mm x 484	1023-0484-P1
Stencil, 17mm x 208	1017-0208-P1
Stencil, 17mm x 256	1017-0256-P1
Stencil, 15mm x 156	1015-0156-P1
Stencil, 15mm x 160	1015-0160-P1
Stencil, 15mm x 196	1015-0196-P1
Stencil, 15mm x 196	1015-0196-P1
Stencil, 13mm x 144	1013-0144-P1
Stencil, 13mm x 64	1013-0064-P1
Stencil, 12mm x 144	1012-0144-P1
Stencil, 12mm x 160	1012-0160-P1
Stencil, 11mmx 8 x 72	1011-0072-P1
Stencil, 25m x 357	1025-0357-P1
Stencil, 25mm x 360	1025-0360-P1
Stencil, 19m x 225	1023-0256-P1
Stencil, 19m x 52	1023-0052-P1
Stencil, 16.5 x 8 x 52	1016-0052-P1
Stencil, 14 x 22 x 119	1014-0119-P1
Stencil, 4mm x 24	1004-0024-P1
Stencil, 4mm x 28	1004-0028-P1
Stencil, 4mm x 24	1004-2024-P1

Stencil, 8mm x 48	1008-0048-P1
Stencil, PLCC 28	1012-0028-P1
Stencil, 9mm x 56	1009-0056-P1
Stencil, 24mm x 241	1024-0241-P1
Stencil, 6mm x 40	1006-0040-P1
Hand Held Vacuum Pick, TF1000	1272-0005-P1
Flux Applicator Tool Kit	6993-0218
K-Type Thermo Couple (2)	1340-0174-P5

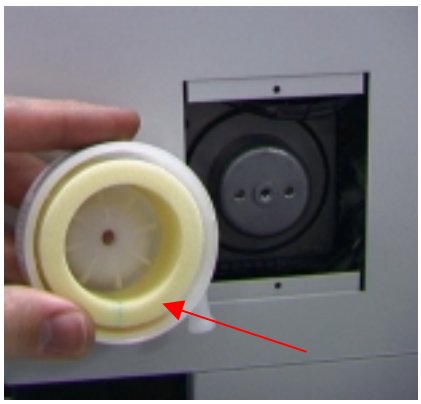
N. Maintenance

The TF 1000 is designed to be basically maintenance free. However, the Top Heater and consumable parts may need to be changed from time to time.

1. The Vacuum filter should be cleaned every three months. Remove the cover on the side of the TF 1000 as shown below. Remove the filter from the filter assembly and clean with mild soap and water. Let the filter dry completely before reassembling.



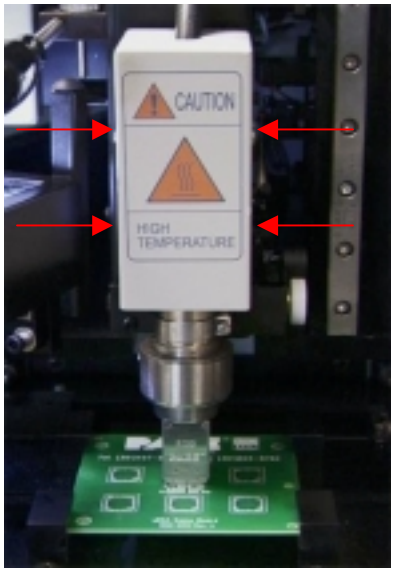
Filter Assembly Location



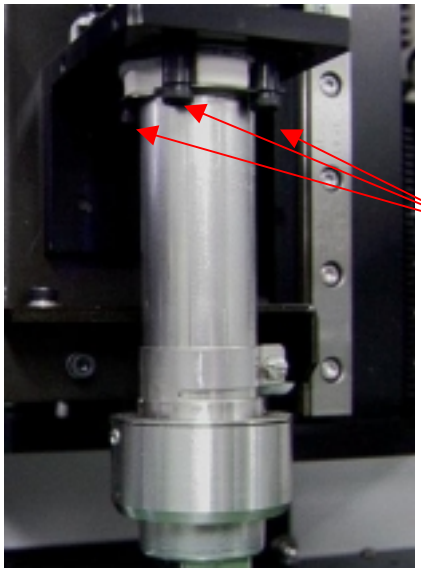
Remove and clean filter

2. The Top Heater is easily replaced. Unplug the TF 1000 from the power source. Ensure the heater is cool. Remove the heater protection cover and remove the four screws that retain the heater assembly. Pull the heater assembly downwards to remove it from the socket and install the new heater. Install the four retaining screws and the protection cover.

Remove 4 Screws



Heater Protection Cover



Remove 4 Screws

Heater Assembly