SMTmax

IR LEAD-FREE REFLOW OVEN

Model: AS-5001

User manual

Manufacturers: OMIE Corporation

http://www.smtmax.com

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Introduction

The **"IR LEAD-LESS REFLOW OVEN"** is equipment that used for electron production and maintain of SMT technique. The product adopts the far-infrared heating components and excellent sense temperature materials. Through the precise control of the microcomputer, make the temperature control curve match to the request of the SMT production technique completely. The "temperature control curve" of the equipment can be adjusted accurately, so it can satisfy the request of many kinds of soldering paste which are different material parameters. It can shut down and alarm the faults automatically. Also it has many functions, such as soldering, maintenance and drying.

The structural performance and operation has been upgraded and improved. Using Chinese-English bilingual operating system and efficient and convenient power switch.

Main technique parameter

1、 Working voltage: AC220V(AC110V order)

2、 Working frequency:50-60Hz

3、 Maximum output power: 600W

4、 Heating methods: infrared radiation and hot air mix heating

5、 Operating system: Chinese-English operating system

6、 Working mode: automatic soldering mode, maintenance mode adjustable

7、 Temperature curve paragraph: warm-up, heating, soldering, heat preservation and cooling segment.

8、 Range of temperature and time on warm-up: 70~150℃, 0~5Min

9、 Range of temperature and time on heating: warm-up temperature to 220℃, 0~5Min

10、 Range of temperature and time on soldering: heating temperature to 300℃, 0~30s

11、 Range of temperature and time on heating preservation: soldering temperature －(0~50℃)

12、 Effective soldering area: 180×120mm

13、 Size: 300×250×160mm

Structure introduction

Power jack, fuse, and power switch

Main body

Work salver

Display

Operate button

Salver pull

Fig 1

Work salver: placed PCB board and other drying goods

Salver pull: pull the salver to placed things

Power jack, fuse and power switch: supply power for main body and suddenness protect

Display: display the setting parameter and working state

Operate button: operate the machine and setting parameter
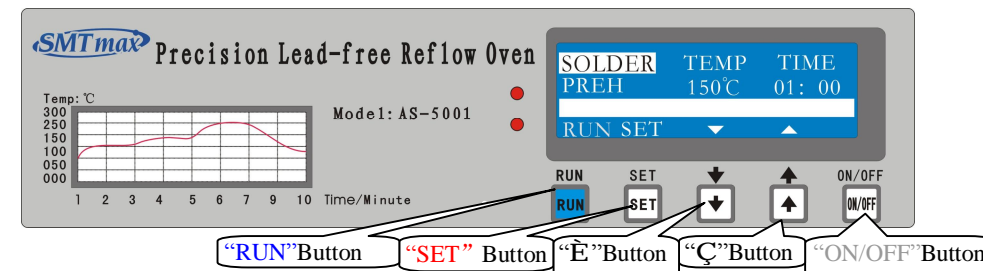
Function key introduction

"RUN"Button   "SET" Button   "È"Button   "Ç"Button   "ON/OFF"Button

Fig 2

ON/OFF: press the key to turn on or turn off the machine. If the working state hasn't quit or the temperature hasn't declined to safety the system can't force quit.

"Ç" "È": using to change the setting parameter.

SET: running setting parameter and save the setting.

RUN: running the machine, exit running state or exit setting state.

The function of temperature curve

In the SMT production process，adjust the temperature curve according to different alloy formula or tin solder paste, which make the better quality of product. Usually the reflow soldering has five temperature segments. The temperature and the time can be set to satisfy the request of different PCB board. In order to better explain the requirements of the various temperatures and the role we will describe every temperature segment in the follow.

1. The purpose and role of the warm-up

Heating the PCB board from room temperature to 120~150℃ which make the moisture fully volatile and eliminate the internal stress and some residue gas of the PCB board. It is a gentle transition of next temperature paragraph also, setting the time 1~5Min in this segment. You also can set the time by the size of the board and the number of the components.

2. The purpose and role of the heating

Activated the liquid flux of tin pulp; under the role of the liquid flux remove

the oxide of surface components inside the tin pulp; preparation for soldering. In this section the temperature of the lead alloy solder and precious metal alloy solder should be set (150℃~180℃). eg: Sn42%-Bi58% Indium tin alloy low temperature Lead Solder, Sn43%-Pb43%-Bi14% low-temperature lead solder and so on. Set the Mid-temperature lead solder alloy temperature between (180~220℃); Set the high temperature lead-free solder alloy temperature between (220~250℃). If you have solder and tin pulp information, the temperature of the heating can be installed in less than tin pulp melting point temperature of 10 ° C is the best around.

3. The purpose and role of the soldering

The purpose is to complete the SMT soldering. As this stage is the highest temperature in the whole soldering process, the components is easy to damage. This process the solder physical and chemical changes of the largest are also to the improvement of soldering process. The solder dissolves very easily in the high temperature oxidation in air. If you have solder and tin pulp information, you can installed the temperature of the soldering higher than tin pulp melting point temperature of (30~50° C). We divided the solder into three: low temperature solder（150~180℃），mid-temperature solder（190-220℃），high-temperature solder(230~260℃). Now commonly used lead-free solder materials for high-temperature solder, low-temperature solder is generally precious metals lead-free solder and the special requirements of low-temperature lead solder，General electronic products use rarely, it often use in specific requirements for electronic equipment. At present, many lead-free solder are also no substitute for lead solder as the mid-temperature leaded solder has excellent electrical properties, mechanical properties, impact resistance properties of hot and cold, the antioxidant properties, therefore, in a common electronic products also large-scale use.

In this segment you can set the time according to the requirement in the following. After high temperature melting solder shown as liquid all the components of SMT floating on the surface of the liquid solder. In the surface tension effects of the flux and liquid, floating components will be move to the center of the solder pad have the role of reform automatically. Also in the humid of the solder flux the solder tin and surface metal of components formed alloy layer infiltrated into components structural organization, which form the ideal soldering structural. Setting the time about (10~30s), a large area and the larger components shade of PCB should be set much longer time. The small area or less parts PCB set shorter time generally. In order to ensure quality of

back solder in this stage should shorten the time as much as possible to protecting components.

4. The purpose and role of the heat preservation

Let high-temperature liquid solder solidified into solid-state soldering points. Solidification quality has a direct impact the crystal structure of the solder and mechanical properties. If the solidification to fast will lead the solder formation of crystalline rough, solder joint is not bright, mechanical properties decrease. Under high temperature and mechanical impact, soldering points easily crack lose mechanical and electrical connections role, lower product durability. We always use to stop heating methods and heat preservation for some time. In the temperature slow decline process the solder can solidification and crystal good. Generally set the temperature point lower than the solder point 10-20 ° C around. Use of natural cooling when the temperature dropped to the temperature point it will enter cooling paragraph.

5. The purpose and role of the cooling paragraph

This cooling segment is simple, usually cooled to the temperature will not scalding the people. To speed up the process of operation, may also stop the process when the temperature fell to below 150℃. To avoid burns to use tools, hand belt or heat resistant grove take out the PCB board.

6. Note

General temperature curve set from the low-temperature, after satisfy the soldering requirements as much as possible to reduce the soldering temperature. Also can through extend back soldering time to reduce the temperature, this will be conducive to the protection of low-temperature components, especially some connectors and plug. Some components can not satisfy temperature requirement, can be used to after soldering to solve.

Common alloy solder temperature curve and adjustment parameters

Solder Type	Proportion	Warm-up ℃/1min	Heating ℃/1min	Soldering ℃/30s	Keep ℃	Cool ℃
Low-temperature ,leaded	Sn43-Pb43-Bi14	100-120	130-150	200-210	170	150
Lead-free low temperature	Sn42-Bi58	100-120	120-130	180-200	150	150
Lead-free low temperature	Sn48-In52	100-120	120-130	180-200	150	150
Lead, mid-temperature	Sn63-Pb37	130-150	170-180	230-240	180	150
Lead, mid-temperature	Sn60-Pb40	130-150	170-180	230-240	180	150
Lead, mid-temperature	Sn62-Pb46-Ag2	130-150	170-180	230-240	180	150
Lead-free, mid-temperature	Sn96.5-Ag3.5	130-150	180-190	240-250	240	150
Lead-free, mid-temperature	Sn87-Ag3-Cu3-In7	130-150	180-190	240-250	240	150
Lead-free, mid-temperature	Sn91-Zn9	130-150	180-190	240-250	230	150
Lead-free mid-temperature	Sn95.4-Ag3.1-Cn1.5	130-150	180-190	250-260	240	150
Lead-free mid-temperature	Sn99.3-Cu0.7	130-150	180-190	270-280	260	150
Lead-free high temperature	Sn94-Ag3-Cu3	130-150	190-220	240-250	240	150
Lead-free high temperature	Sn97-Cu3	130-150	190-220	270-280	250	150
Lead-free high temperature	Sn95-Sd5	130-150	190-220	270-280	250	150

Common alloy solder physical constant and characteristics

Sn	Pb	Ag	Sb	Bi	In	Au	Cu	Zn	Liquidus (℃)	Push Strength (MPa)	Elongation (%)	rigidity (HB)	conductivity
63	37								183	61	45	16.6	11.0
60	40								183	60	43	16.0	11.0
10	90								299	41	45	12.7	8.2
5	95								312	30	46	12.0	7.8
62	36	2							179	64	39	16.5	11.3
1	97.5	2.5							309	31	50	9.5	7.2
96.5		3.5							221	45	55	13	13.4
	97.5	2.5							304	30	52	9.0	8.8
95			5						245	40	38	13.3	11.9
43	43			14					163	55	57	14	8.0
42			58						138	77	20-30	19.3	5.0
48				52					117	11	83	5	11.7
	15	5			80				157	17	58	5	13.0
20						80			280	28	-	118	75
	96.5					3.5			221	20	73	40	14.0
87		3			7		3		221	45	60	14	9.0
91								9	199				
95.4		3.1					1.5		217				
99.3							0.7		227				
95			5						240				

Running operation

There are two working mode to select in this equipment, which are **"Solder"** and **"Repair"**. The mode **"Solder"** is designed to solder the circuit board components, the whole process are **"PREH"** (warm-up), **"HEAT"** (heating), **"SLDR"** (solder), **"KEEP"** (heat preservation) and **"COOL"** (wait for the machine to cool down); the mode **"Repair"** is designed to dismantle circuit board components, there is only one temperature setting segment. Before you enter the working mode, make sure the parameters whether right or not.

You must set the parameter of the machine when you first time use it or the tin pulp formula has been changed. You also can change the language Chinese or English which you want.

1. power on

Turn on the main power switch back of the instrument, on the left top of the display have red light lighted, then press the key **"ON/OFF"** on the panel, to enter the standby state, as shown in figure "Fig 3"、"Fig 4"

Fig 3：   Fig4
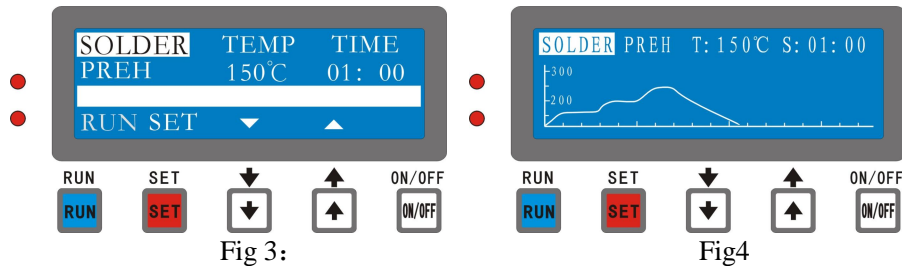
2. System setting

Turn on the main power switch and then press the key **"RUN"** first while pressing the key **"ON/OFF"**, to enter the system setting mode. As shown in figure 5, the display shows the language and the display mode, You can press
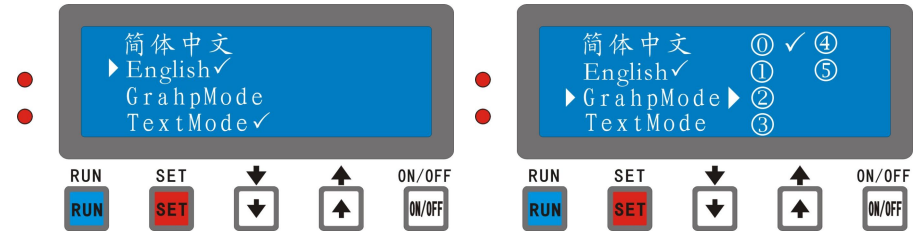
Fig5 system setting   Fig6 Curve selection

the key **"Ç"** or **"È"** to select it, press the key **"SET"** to make sure your change, and press the key **"RUN"** to save the setting.

As shown in figure 6, there are six curves can be selected, the curve of selection 0 is use define, you can change the temperature and the time. And the parameters of others curves are unchangeable. You can find the parameters of each curve in the table on page 36.

3. Select working mode

Under the standby screen, the display will be show the work state **"SOLDER"** or **"REPAIR",** press the key **"È"** to select the work mode. As shown in figure3, press the key **"RUN"** to enter the working state, press the key **"SET"** to enter the parameters setting, press the key **"ON/OFF"** to exit the operation system.

4. Setting parameters

On the standby menu press the key **"SET"** to enter the parameter setting state. The mode column displayed the current mode **"SOLDER"**. The segment column displayed the current selective segment, press the key **"Ç" or "È"** to select segment you want to setting. Press the key **"RUN"** returns back the standby menu, and press the key **"SET"** to enter the temperature setting state. As shown in figure 5.

Note: Except the displayed, the mode of the graphics display and the text display are the same.

※ Setting parameters of the segment "PREH"

Press the key **"SET"** once to enter the setting state of preheat segment, as shown in "**Fig 7**"、"**Fig 8**" Press the key **"SET"** again enter the temperature setting state, as shown in "**Fig 9**"、"**Fig 10**" press the key "**Ç**" or "**È**" change the temperature between (70~150℃). Press the key "SET" to saving or press the key "RUN" to discard modification.

After temperature setting, press the key "SET" once to enter the time parameter setting state, as shown in **"Fig 11"**、 **"Fig 12"** Press the key **"Ç" or "È"** setting the time between (0~5Min), press the key "SET" to saving. After saving the parameter, press the key **"RUN"** enter the standby state.

Under the graphics display mode, the curves will auto redraw after return to the standby state.
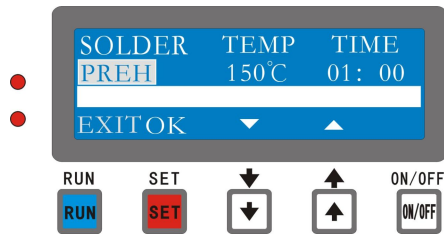
Fig7 Text Pre-heat settings
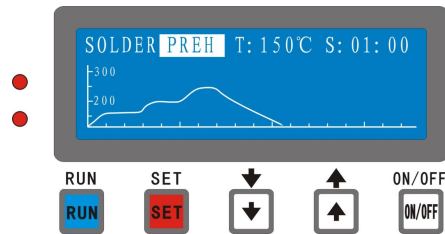
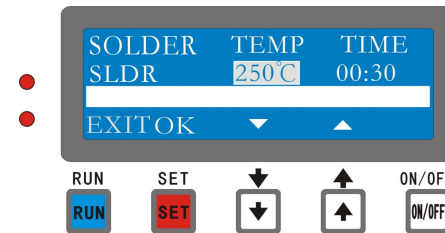**Fig8   Curve Pre-heat settings**
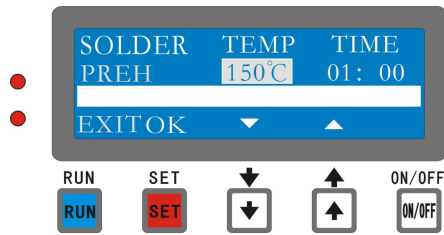
Fig9   Text Temperature settings
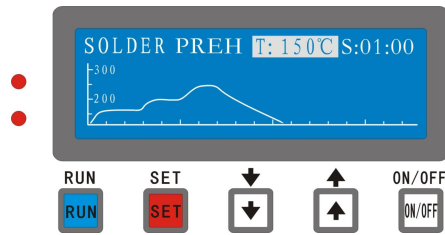
Fig10 Curve Temperature settings
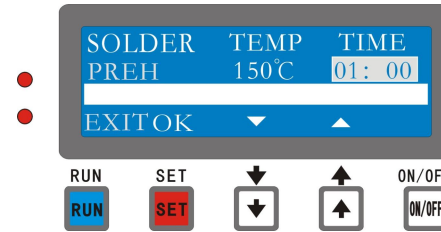
Fig 11 Text Time Settings
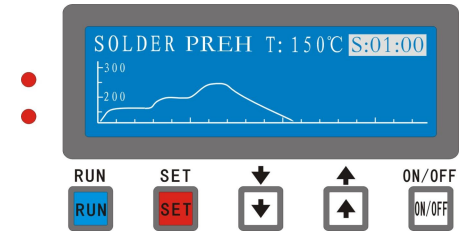
Fig 12 Curve Time Settings

※ Setting parameter of segment "HEAT"

As shown in **"Fig 13"**、" **Fig 14**" press the key **"È"** select the heating segment, the screen display **"HEAT"**, press the key **"SET"** enter the

temperature setting state. As shown in "**Fig 15**"、"**Fig 16**"press the key **"Ç"** **or "È"** setting the temperature between (preheat segment~**220℃).** Press the key **"SET"** save the temperature setting and enter the time setting state. As shown in "**Fig 17**"、"**Fig 18**" press the key **"Ç" or "È"** setting the time between (0~5Min), press the key **"SET"** to saving and return back mode select or press the key **"RUN"** enter the operation standby state, as shown in
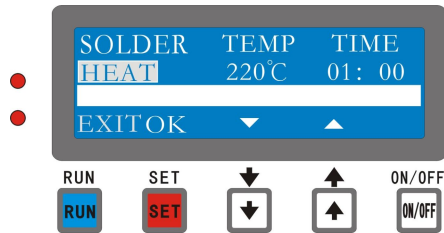
Fig 13 Text Heat settings   **Fig 14 Curve Heat settings**
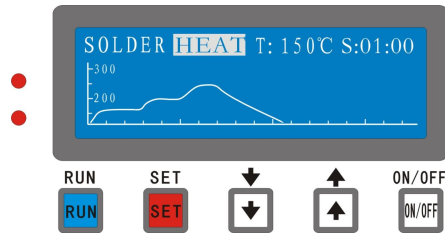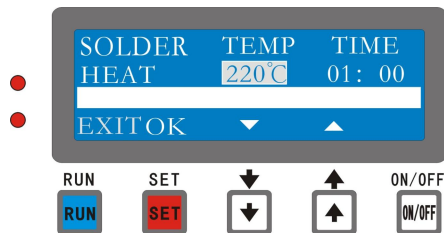
Fig 15 Text Temperature settings   **Fig 16 Curve Temperature settings**
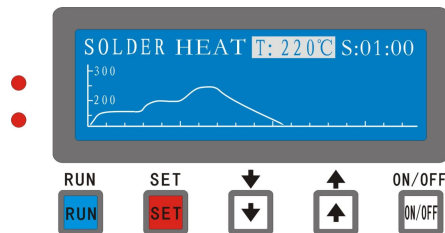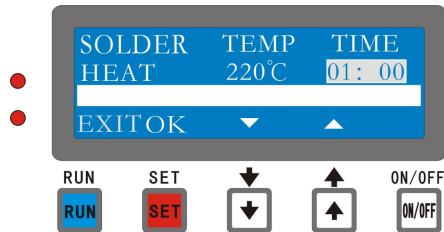
Fig 17 Text Time Settings   **Fig 18 Curve Time Settings**
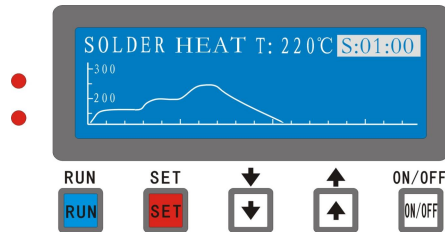
※ **Setting parameter of segment "SLDR "**

Under the interface in **"Fig19"**、**"Fig20"**、" **Fig21**"、" **Fig22**"、

"**Fig23**"、" **Fig24**"press the key **"È"** select soldering segment, and then press the key **"SET"** to enter the temperature setting state. Press the key **"Ç"** or **"Ç"** setting the temperature between (heating segment~300℃). Press the key **"SET"** save the setting and enter the time setting state. When the temperature setting between (250~300℃)setting the time between (0~30s); when the temperature lower than 250℃ setting the time (0~1Min). After that press the key **"SET"** to save the setting or press the key **"RUN"** to discard modification.
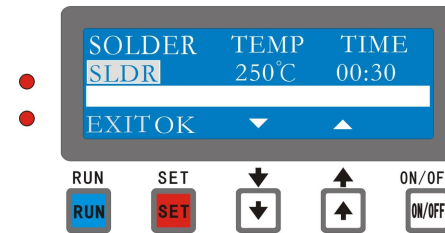
Fig 19 Text Welding set   **Fig 20 Curve Welding set**
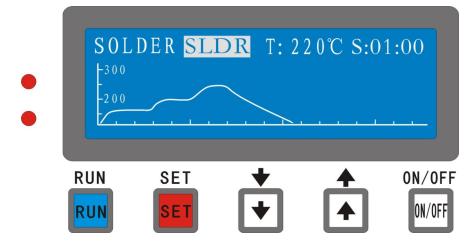
Fig 21 Text Temperature settings   **Fig 22 Curve Temperature settings**
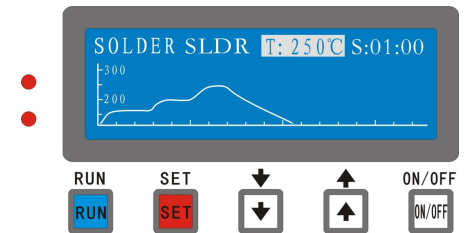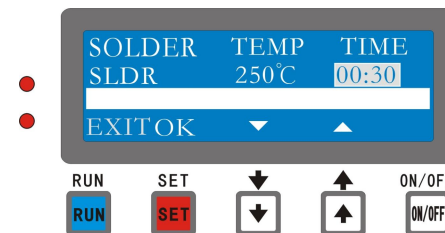
Fig 23 Text Time Settings   **Fig 24 Curve Time Settings**
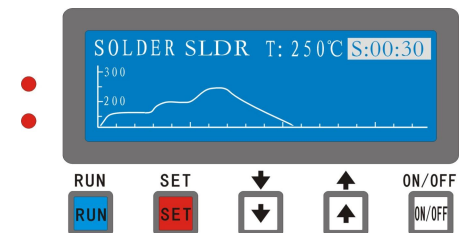
※ **Setting parameter of segment "KEEP"**

Under the interface in **"Fig25"、 "Fig26"、 "Fig27"、 "Fig28"、** press the key **"È"** select temperature keeping segment, and then press the key **"SET"** to enter the temperature setting state. Press the key **"Ç" or "È"** change the setting value and then press the key **"SET"** to save it, or press the key **"RUN"** to discard the modification. You can't change the setting temperature lower **50 ℃** than the last process.
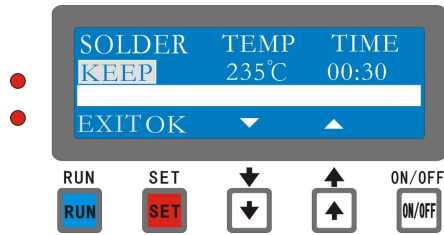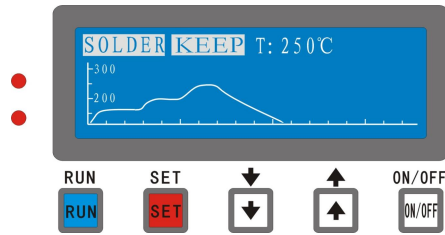
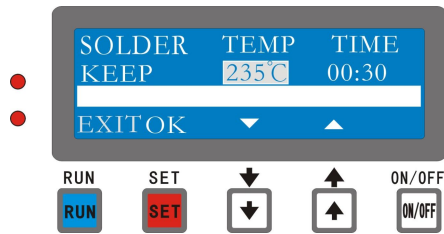

Fig 25 Text   Insulation set

Fig 26 Curve   Insulation set

Fig 27 Text Temperature settings
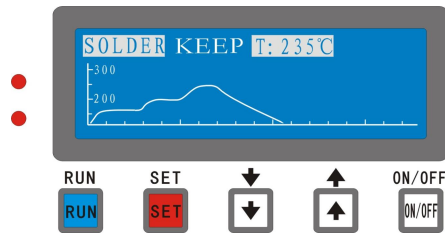
Fig 28 Curve Temperature settings

※ **Setting parameter of segment "COOL"**

Under the interface in **"Fig29"、"Fig30"、 "Fig31"、"Fig32"** press the key **"È"** to select cooling segment, and press the key **"SET"** to enter the temperature setting state. Press the key **"Ç"** or **"È"** change the setting value from **70℃** to the setting last process, and then press the key **"SET"** to save it, or press the key **"RUN"** to discard the modification.
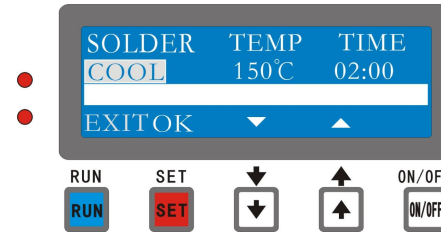
Fig 29 Text Cooling settings
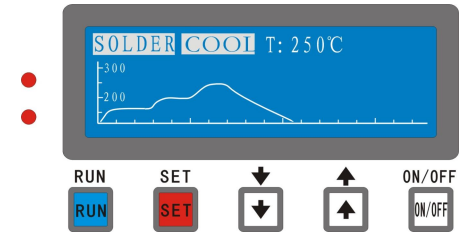
Fig 30 Curve Cooling settings
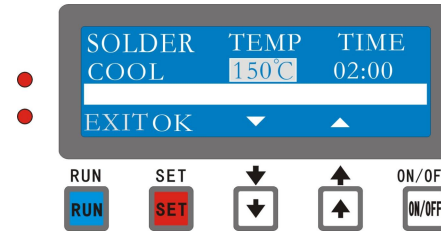
Fig 31 Text Temperature settings
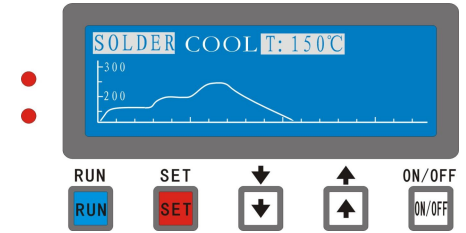
Fig 32 Curve Temperature settings

※ **Setting parameter of repair mode**

Under the interface of standby as shown in , **"Fig 33"、"Fig 34"、"Fig 35"、"Fig 36"、"Fig 37"、"Fig 38"** press the key **"È"** to select the repair mode, press the key **"SET"** to enter the temperature setting state as shown in . Press the key **"Ç"** or **"È"** to change the temperature, press the key **"SET"** to save. On the repair mode the temperature range is divided into three parts, when the temperature setting between (70~150℃) no need to setting time; when the temperature setting between (150~200℃), setting the time between (0~20Min). When the machine operation set time will shut down automatically.
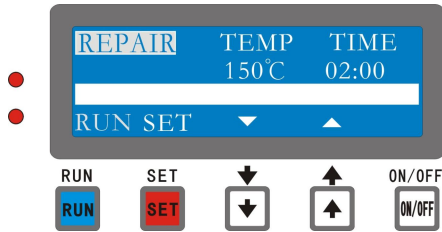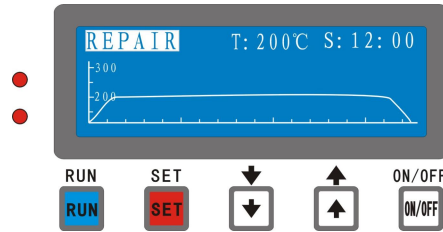
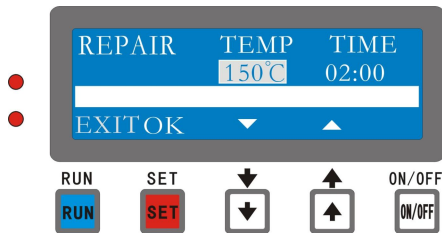**Fig 33Text Maintenance**

Fig 34Curve Maintenance

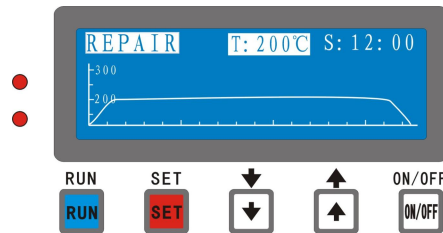**Fig 35Text Temperature settings**
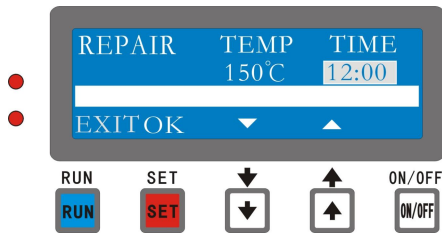

Fig 36Curve Temperature settings
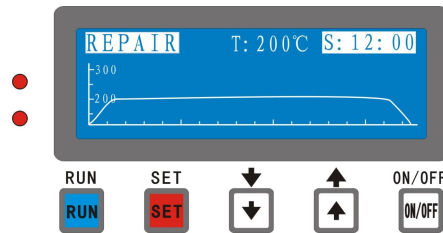

Fig 37Text Time Settings

Fig 38Curve Time Settings

NOTE: On the setting the mode, if the machine have nothing operate it will return back to the standby state; on the standby state, the machine have nothing operate over 30Min will shut down automatically.

Back Soldering operation

After setting the equipment have safety conduction to operation. Put the circuit board in the middle of the tray, closed chassis, press the key "RUN" enter the working state, as shown in "**Fig 39**"、"**Fig 40**" The working lamp of machine will be light, and the screen will be display: working…" the

temperature display current temperature, the time display setting time. When the temperature reaches the set point, the time start to countdown, after the completion of the countdown the machine will enter the next section. When the machine is working the working lamp will be shut down or flashing. Under the graphics display mode, the curve will become broken line as the time goes by, as shown in

When the machine is running you want to exit please press the key "RUN". You also can press the key **"RUN"** to stop exhaust and return to standby mode.
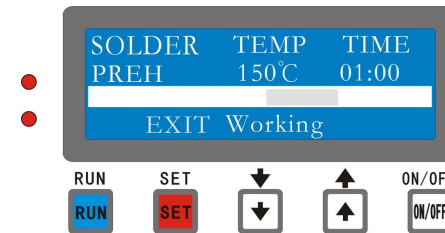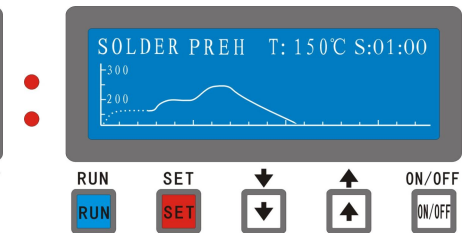

Fig 39Text Operation

Fig 40Curve Operation

When the machine running to cooling segment, fan starts and full exhaust. When the temperature cooling to setting value the buzzer will be alarm, status bar shows that the "complete", you can press the key **"RUN"** to rerun.

Faults alarm

1. Dangerous temperature

There is a highest safe setting-temperature on each process while the machine working. After you switch on the machine it will detect the current temperature. If the temperature exceeds the safe temperature 10℃, the display will show **"Dangerous Temperature!"** and blink. The buzzer alarm and then the fan start to work. The alarm will be stop and the machine running normally when the temperature decline to safety. As shown in "**Fig 41**"、"**Fig 42**"
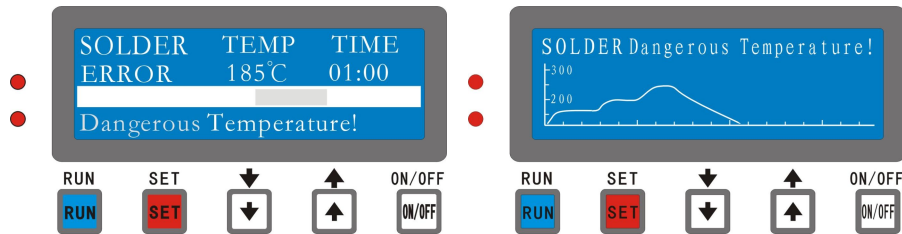
Fig41Text Dangerous Temperature! Fig42Curve DangerousTemperature!

2. Failure of detecting element

When there is something wrong of the temperature-detecting element, the screen displayed **"Detecting Element!"** as shown in "**Fig 43**"、"**Fig 44**"; the machine alarm and the fan start to work. You can also press the key **"SET"** or **"RUN"** to quit and return standby menu.
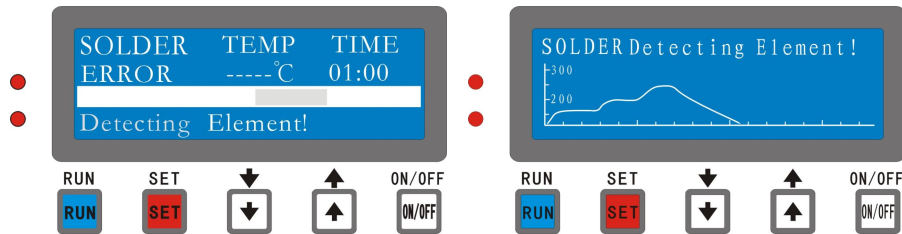

Fig43Text Detecting Element!   **Fig44Curve Detecting Element!**

3. Failure of heating element

When there is something wrong of the heating element, the machine will alarm, and then the fan start to work, the screen displayed **"Heating Element!"** as shown in "**Fig45**"、"**Fig46**" You can press the key **"SET"** or **"RUN"** to quit and return standby menu.
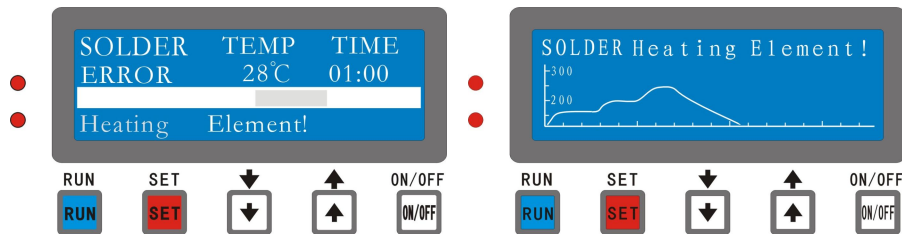
Fig45Text Heating Element!   **Fig46Curve Heating Element!**

When the machine alarm, it will enter the safe mode automatically. If the fan did not work or the heating element working continues, you had better turn off the power immediately and check the fault.

Attentions

1. Please use the special power supply outlet that is over 15A solely, never used the same outlet with other electrical appliance. Must ensure the grounding well.

2. The Infrared Reflow Oven should be set horizontally; there should be over 20cm between its periphery and walls.

3. Don't use the machine on wet or high temperature environment.

4. Don't use the water to clear the machine body directly.

5. Don't use the iron wire or other tools insert or plug up the air intake and the air outlet.

6. Don't make the dangerous goods that is combustible、explosive near the machine. Don't dry the goods which have combustible gas.

7. Don't hit the body; avoid damaging the heat pipe. If detects the heat pipe had been break, should turn off the power supply and repaired it.

8. Don't stretch your hand into the cabinet when the machine has not fall to the safe temperature.

9. Don't use the machine on tablecloth, to prevent plug up the air intake.

10. If the heat pipe damaged, must replace it with the same manufacturer production.

Parameters of the fixed curves

SEG	PREH		HEAT		SLDR		KEEP	COOL
NO	Tempt /℃	Time /s	Tempt /℃	Time /s	Tempt /℃	Time /s	Tempt /℃	Tempt /℃
1	120	60	160	58	200	30	190	150
2	130	60	180	58	220	30	200	150
3	130	60	210	58	250	30	230	150
4	140	60	220	58	280	30	260	150
5	150	60	220	58	300	30	270	150

NOTE: SEG—segment, PREH—preheat, HEAT—heating, SLDR—soldering,
Tempt—temperature.

一、产品简介

"AS-5100 精密无铅红外线回焊炉"(回焊炉)是一种用于生产和维修 SMT 等各种工艺产品的台式回焊设备。该产品采用高效率远红外线加热元件以及分布式热电偶测温装置。通过微电脑的精密控制,使回焊炉的温度曲线控制更为精确和回焊平面的温度更均匀。完全适应各种不同合金和无铅焊料的回焊要求。其温度曲线精密可调,此外设备还具有自动故障检测报警、自动关机等功能。本产品具有回焊、维修、烘干等多种用途。适合于小批量的 SMT 电子产品生产、试制、电子产品开发部、学校培训班等单位的使用。

操作软件为最新升级的中英文双语双显示可选操作系统。电路结构上采用高效、便捷一体化的开关电源,采用硅酸铝耐高温环保保温棉,在性能结构和操作等各方面上进行了改良和升级。

二、主要技术参数

1、输入电源:AC220V/(AC110V 定购)

2、工作频率:50～60Hz

3、最大功率:600W

4、加热方式:红外线辐射和热风混合加热方式

5、操作系统:AS-5001 中英文双语操作系统

6、显示模式:图形模式/文本模式可选显示模式

7、工作模式:自动回焊模式、可调恒温维修模式

8、温度曲线段:预热段、加热段、焊接段、保温段和冷却段共五段

9、预热段温度设置范围和时间:70～150℃、时间:0～5min

10、加热段温度设置范围和时间:预热段温度～220℃、时间:0～5min

11、焊接段温度设置范围和时间:加热段温度～300℃、时间:0～60s

12、保温段温度设置范围和时间:焊接段温度-(0～50℃)

13、有效焊接面积:180×120mm

14、外型尺寸: 300×250×160mm

三、各部分名称及功能简介

电源开关、插座、保险盒
功能：为主机提供电源及意外保护

主机机箱
功能：构成主机的机械结构部分

工作托盘
功能：在托盘的中间放置要回焊的PCB板及其它烘干物品。

显示屏
功能：显示设置状态和参数及当前运行状态和参数

操作按钮
功能：进行机器操作和运行参数的设置。

托盘拉手
功能：拉出托盘放置物品的作用。

图 1 整机结构图

四、功能按键说明

图 2 操作面板

在设备的操作面板上共有 **5** 个按钮，分别为 **"运行"键、"设置"键、**
"È"键、"Ç"键 和 **"ON/OFF" 开关键。** 其中运行键和设置键是多功能键，不同操作界面的屏幕下方会有对应的键盘功能显示。

五、温度曲线的作用与功能

在 SMT 的生产过程中，可根据不同合金配方钎料或锡浆调整温度曲线，也是保证产品优质的一个主要参数。典型的回流焊通常有五个温区的，在箱式的回焊炉中通常设置五个温度段来模拟隧道式回焊炉的五个温区。为了保证 SMT 的 PCB 板不同要求，来设计的各个温度段的温度点和相应的时间。为了更好地说明各个温度段的要求和作用，现分开各温度段来描述。

1、预热段的目的和作用

目的是在室温下将 PCB 板加热到 120-150℃，可充分挥发 PCB 板的水分，消除 PCB 板内部的应力和部分残留气体，是下一个温度段的平缓过渡。时间一般控制在 1-5 分钟。具体的情况看板的大小和元器件的多少而定。

2、加热段的目的和作用

通过预热段处理后的 PCB 板，是要在加热段的过程中激活锡浆中的助

焊剂，并在助焊剂的作用去除锡浆里面和元器件表面的氧化物。为焊接过程做好准备。在这一阶段有铅合金钎料和贵金属合金钎料的温度通常设置在 150-180℃ 之间，如 Sn42%-Bi58% 锡铟合金的低温无铅钎料、Sn43%-Pb43%-Bi14% 有铅低温钎料等。中温的有铅合金钎料一般设置在 **180-220℃**。高温的无铅合金钎料一般设置在 **220-250℃** 之间。如果你手头上有所用钎料和锡浆资料的话，加热段的温度可以设置在低于锡浆的溶化温度点的 **10℃** 左右为最佳。

3、焊接段的目的和作用

焊接段的主要目的是完成 SMT 的焊接过程，由于此阶段是在整个回焊过程中的最高温段，极容易损伤达不到温度要求的元器件。此过程也是一个回焊的完善过程，焊锡的物理和化学的变化量最大，溶化的焊锡极容易在高温的空气中氧化。此阶段一般是根据锡浆资料提供的溶化温度高30-50℃ 左右。不管有铅或无铅的钎料，我们一般把它分为低温钎料（150-180℃）、中温钎料（190-220℃）、高温钎料（230-260℃）。现在普遍使用的无铅钎料为高温钎料，低温钎料一般为贵金属的无铅钎料和特殊要求的低温有铅焊料，在通用的电子产品中比较少见，多用于特殊要求的电子设备上。而有铅的中温钎料有优异的电气性能、物理机械性能、耐冷热冲击性能、抗氧化性能。这些性能目前的各种无铅钎料还无法替代，所以在通用的电子产品中还大量使用。

此阶段的时间一般是根据下面的几个要求进行设定。焊锡在高温熔化后显示为液态，所有的 SMT 元件会浮在液态焊锡的表面，在助焊剂和液态表面张力的作用下，浮动的元器件会移到焊盘的中心，会有自动归正的作用。另外在助焊剂的湿润下焊锡会和预案件的表面金属形成合金层。渗透到元件结构组织里面，形成理想的钎焊结构，时间一般设在 10-30s 左右，大面积和有较大元件遮阴面的 PCB 板应设置较长的时间；小面积的少零件的 PCB 板一般设置时间较短就可以了。为了保证回焊质量尽可能地缩短这个阶段的时间，这样有利于保护元器件。

4、保温段的目的和作用

保温段的作用是让高温液态焊锡凝固成固态的焊接点，凝固质量的好坏直接影响到焊锡的晶体结构和机械性能，太快的凝固时间会使焊锡形成结晶粗糙，焊点不光洁，机械物理性能下降。在高温和机械的冲击下焊接点容易开裂失去机械连接和电气连接作用，产品的耐久性降低。我们采用的是停止加热，用余温保温一短时间。让焊锡在温度缓慢下降过程中凝固并结晶良好，这个温度点一般设置在比焊锡溶点低 10-20℃ 左右，利用自然降温时间的设置，下降到这个温度点后就可以进入冷却段。

5、冷却段的目的和作用

冷却段的作用比较简单，通常是冷却到不会烫人的温度就可以了。但为了加快操作流程，也可以下降到 **150℃** 以下时结束该过程。但取出焊好的 **PCB** 板时，要用工具或用手带、耐温手套取出以防烫伤。

6、注意事项

温度曲线一般从低温调起，满足回焊要求后尽可能地降低回焊温度。也可以通过适当的延长回焊时间来降低温度。这样有利于保护不耐温的低温元件，接器和接插件。有些元件确实达不到温度要求，可以采用后焊的方式来解决。

六、常用合金钎料的温度曲线调整参数

钎料类型	配方比例	预热段 ℃/1min	加热段 ℃/1min	焊接段 ℃/30s	保温段 ℃	冷却段 ℃
有铅低温钎料	Sn43Pb43Bi14	100 120	130 150	200 210	170	150
无铅低温钎料	Sn42Bi58	100 120	120 130	180 200	150	150
无铅低温钎料	Sn48In52	100 120	120 130	180 200	150	150
有铅中温钎料	Sn63Pb37	130 150	170 180	230 240	180	150
有铅中温钎料	Sn60Pb40	130 150	170 180	230 240	180	150
有铅中温钎料	Sn62Pb46Ag2	130 150	170 180	230 240	180	150
无铅中温钎料	Sn96.5Ag3.5	130 150	180 190	240 250	240	150
无铅中温钎料	Sn87Ag3Cu3In7	130 150	180 190	240 250	240	150
无铅中温钎料	Sn91Zn9	130 150	180 190	240 250	230	150
无铅中温钎料	Sn95.4Ag3.1Cu1.5	130 150	180 190	250 260	240	150
无铅中温钎料	Sn99.3Cu0.7	130 150	180 190	270 280	260	150
无铅高温钎料	Sn94Ag3Cu3	130 150	190 220	240 250	240	150
无铅高温钎料	Sn97Cu3	130 150	190 220	270 280	250	150
无铅高温钎料	Sn95Sb5	130 150	190 220	270 280	250	150

七、附表一：配方曲线参考参数

序号	预热段 温度/℃	预热段 时间/s	加热段 温度/℃	加热段 时间/s	焊接段 温度/℃	焊接段 时间/s	保温段 温度/℃	降温段 温度/℃
1	120	01:00	160	01:00	200	00:30	190	100
2	130	01:00	180	01:00	220	00:30	200	100
3	130	01:00	210	01:00	250	00:30	230	100
4	140	01:00	220	01:00	280	00:30	260	150
5	150	01:00	220	01:00	300	00:30	270	150

八、常用合金钎料物理常数和特征

锡Sn	铅Pb	银Ag	锑Sb	铋Bi	铟In	金Au	铜Cu	锌Zn	溶化温度 液相线（℃）	拉伸强度（MPa）	延伸率（%）	硬度（HB）	导电率
63	37								183	61	45	166	11.0
60	40								183	60	43	16	11.0
10	90								299	41	45	127	82
5	95								312	30	46	120	7.8
62	36	2							179	64	39	165	11.3
1	97.5	2.5							309	31	50	95	7.2
96.5		3.5							221	45	55	13	13.4
	97.5	2.5							304	30	52	90	8.8
95			5						245	40	38	133	11.9
43	43			14					163	55	57	14	80
42				58					138	77	20 30	193	50
48					52				117	11	83	5	11.7
	15	5			80				157	17	58	5	130
20					80				280	28	-	118	75
	96.5					3.5			221	20	73	40	140
87		3			7		3		221	45	60	14	90
91								9	199				
95.4		3.1					1.5		217				
99.3							0.7		227				
95			5						240				

九、运行参数设置

第一次使用机器或锡浆的配方改变时一般都要对运行参数进行设置来满足使用要求。还可根据不同的语言习惯对机器进行设置，进入系统设置模式可进行语言和显示模式的选择。设备设有"回焊"和"维修"两种工作模式。"回焊"模式是针对焊接 SMT 电路板元件而设计的，整个过程分为预热、加热、焊接、保温和降温五个温度设置段；"维修"模式是针对拆卸电路板元件或烘干物品而设计的，其只有一个温度设置段。在设备进入加热工作前，请确认所设置的温度值和时间值是否合理。

1、开机

打开设备背面的电源主开关，屏幕左边最上的红色风扇指示灯亮。按面板的"ON/OFF"按键开机，开机后进入待机画面，如"图 3"、"图 4"所示。
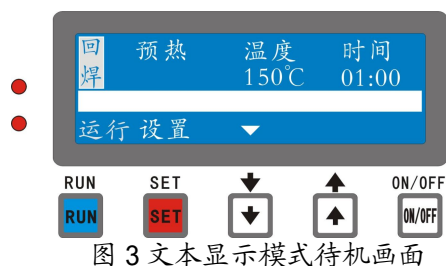
图 3 文本显示模式待机画面
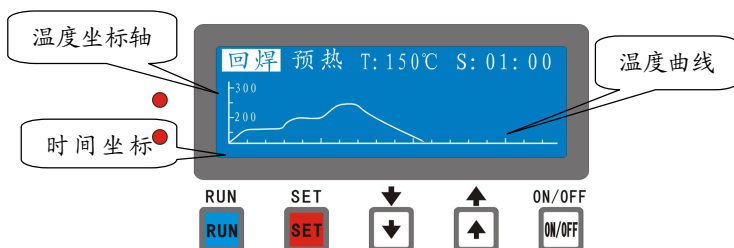
图 4 图形显示模式待机画面

2、系统设置

设备在电源主开关打开后，未进入待机前按住蓝色"运行"键再按"ON/OFF"开关键，可进入系统设置模式。

图 5 系统设置

图 6 曲线选择
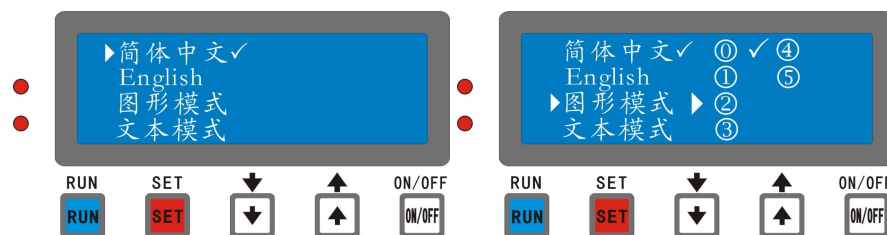
屏幕显示如"图 5"所示，按"Ç"、键或"È"键选择语言和显示模式，屏幕箭头所指就是当前所选项，打勾的为已选项。选好后按"设置"键确定，按"运行"键保存，按"ON/OFF"键退出。保存后下一次开机默认为本次设置。

如"图 6"所示，图形模式下可选择六条曲线，曲线 0 为自定义曲线，温度、时间参数由用户设定；其余五条曲线为固定配方曲线，当选择配方曲线时，在工作界面显示配方序号，其曲线参数可在待机画面下按"设置"键进入查询。配方曲线详细参数参考附表一。

3 工作模式选择

待机画面下，显示屏的反白字"回焊"或"维修"为当前的工作模式。如"图 7"、"图 8"所示，按"È"键可进行工作模式选择，按"运行"键进入工作状态，按"设置"键进行参数设置，按"ON/OFF"键进行系关机。
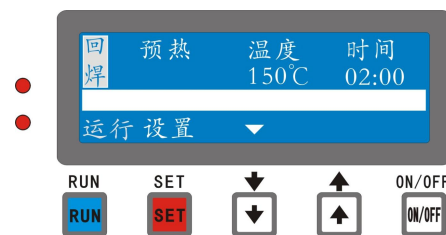
图 7 回焊模式选择
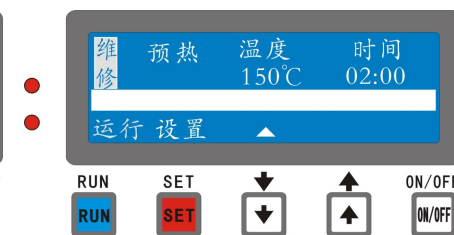
图 8 维修模式选择

4 参数设置

在待机画面下按**"设置"**键进入参数设置状态画面，如"图 7"、"图 8"所示。工作模式栏显示**"回焊"**为当前工作模式，段指示栏显示当前选择的段，按**"Ç"**或**"È"**键可选择所要设置的段。屏幕反白显示处为可选择、修改项。按**"退出"**键返回待机画面。按**"设置"**键进入温度设置状态。设置完成后返回待机状态，设备自动根据设置值和当前温度重绘温度曲线。

注：图形显示模式与文本显示模式操作方法相同仅显示部分有异。

1）预热段的参数设置

按**"设置"**键，进入预热段的设置状态下，选择所要修改的段，如"图 9"（文本显示模式）、"图 10"（图形显示模式）（下同）所示，然后按**"设置"**键进入温度设置状态，温度显示值被选中反白，如"图 11"、"图 12"所示。此时按**"Ç"**或**"È"**键可设置本段的设置温度值，按**"设置"**键确定并保存设置或按**"退出"**键放弃修改。预热段温度设置范围为 70-150℃。

温度设置完成后，进入时间参数设置状态，时间值会反白选中，如"图 13"、"图 14"所示。再按**"Ç"**或**"È"**键设置预热段段的恒温时间，时间设置范围为 0~5min，按**"设置"**键保存设置时间参数后，返回到选择段的设置状态。也可以在保存参数后，按**"退出"**键进入运行待机状态。

图形显示模式下返回待机画面时，设备根据设置值自动重绘曲线,如"图 16"所示。
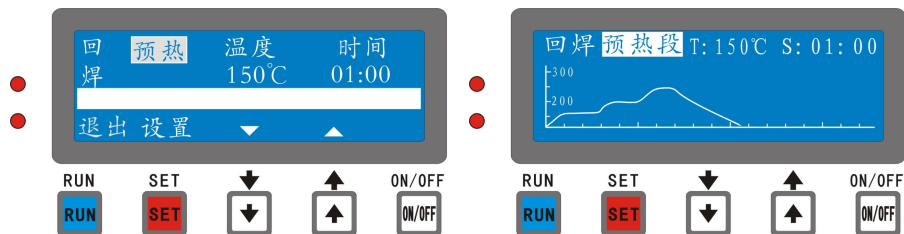
图**9**文本回焊模式预热设置
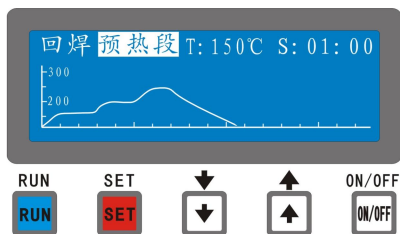
图**10**曲线模式预热段设置
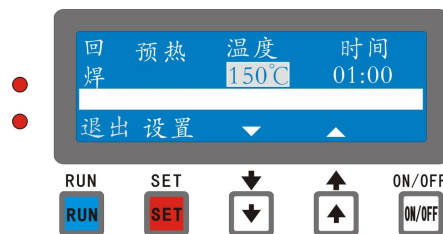
图**11**文本模式预热段温度设置
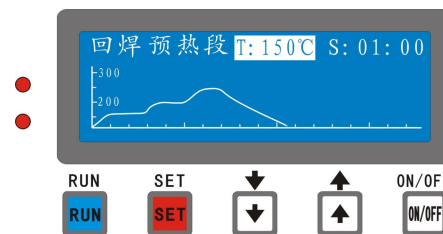
图**12**曲线模式预热段温度设置

图**13**文本模式预热段时间设置
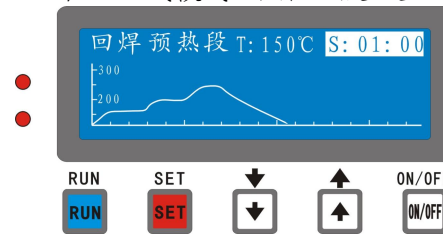
图**14**曲线模式预热段时间设置

图**15**文本模式的待机界面
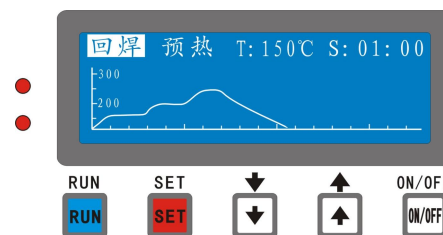
图**16**曲线模式下的待机界面

2)加热段的参数设置

在"图 17"、"图 18"画面下，按**"È"**键选择加热段，屏幕显示**"加热"**两字反白选中，再按**"设置"**键进入加热段温度设置状态，如"图 19"、"图 20"温度设置值反白选中。按**"Ç"**或**"È"**键设置加热段温度。加热段可设置的最低温度是预热段的设置温度，最高为 220℃。按**"设置"**键保存温度设置值进入时间设置状态。如"图 17"、"图 18"时间值反白显示，按**"Ç"**或**"È"**键设置加热段的恒温时间，时间设置范围为 0~5min。按**"设置"**键保存设置时间参数后。返回到段的选择界面下。也可以在

保存参数后，按**"退出"**键进入运行待机状态。

图 17 文本模式加热段选择
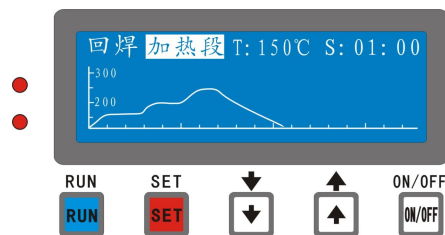
图 18 曲线模式加热段选择
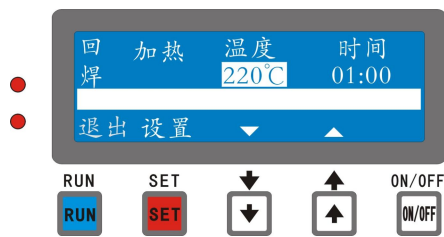
图 19 文本模式加热段温度设置
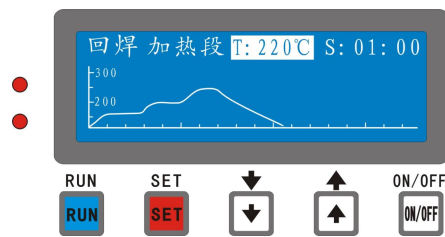
图 20 曲线模式加热段温度设置
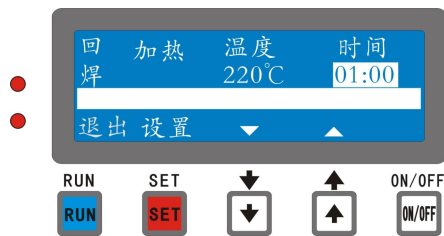
图 21 文本模式加热段时间设置

图 22 曲线模式加热时间设置

图 23 文本焊接段设置

图 24 曲线焊接段设置

图 25 文本焊接段温度设置
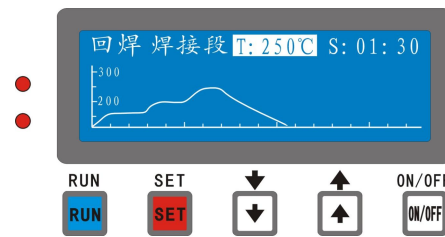
图 26 曲线焊接段温度设置
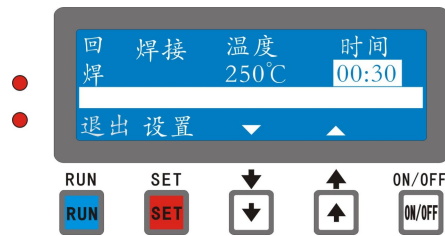
图 27 文本焊接段时间设置

图 28 曲线焊接段时间设置

3) 焊接段的参数设置

在"图 23""图 24"界面下，按**"È"**键选择"焊接段"，按**"设置"**键后进入"焊接段"温度设置状态，温度设置值反白选中。如"图 25"、"图 26"按**"Ç"**或**"È"**键设置焊接段温度。焊接段可设置的最低温度是加热段的设置温度，最高为300℃。按**"设置"**键保存温度设置参数后，进入时间设置状态。焊接段的时间设置范围为1~60s，如"图 27"、"图 28"完成后按**"设置"**键保存设置参数并返回到段的选择界面下，或按**"退出"**键进入运行待机状态。
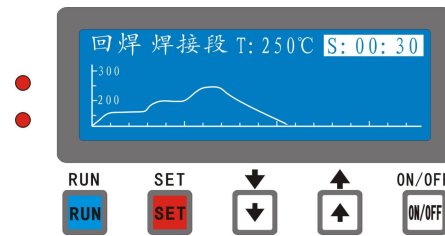
4) 保温段的参数设置

在"图 29"、"图 30"待机界面下，按**"È"**键选择"保温段"，按**"设置"**键后进入温度设置状态，温度设置值反白选中。如"图 31"、"图 32"的界面下，按**"Ç"**或**"È"**键设置该段温度值。保温段的设置温度是从焊接段自然降温到强制降温的温度点。一般的设置在焊接段温度到低于焊接段 50℃，此段不用设时间。设置温度完成后按**"设置"**键保存设置

参数并返回到段的选择界面或按"退出"键进入运行待机状态。
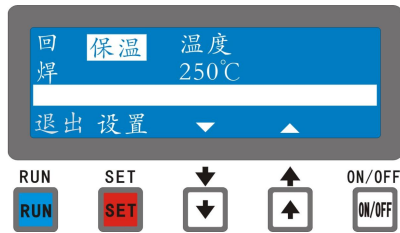
图 29 文本保温段设置
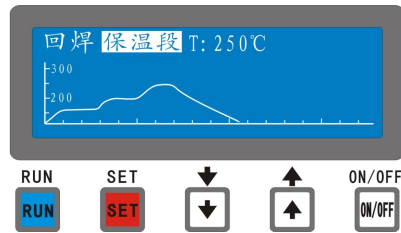
图 30 曲线保温段设置
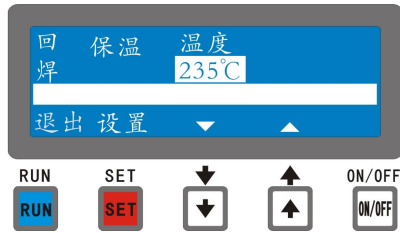
图 31 文本保温段温度设置
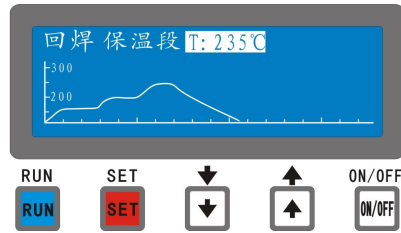
图 32 曲线保温段温度设置

5) 冷却段的参数设置

在"图 33"、"图 34"界面下，按"È"键选择"冷却段"，按"设置"键后，进入降温段的温度设置状态，如"图 35"、"图 36"温度设置值反白选中，按"Ç"或"È"键设置该段温度值。此段的温度值其实是一个自动回焊的一个判断点，程序流程走到这个点时结束自动回焊过程。把焊好的电路板拿出，再放进另一块待焊的电路板。按"运行"键重新运行。降温段设置范围是 70℃到保温段的设置温度，此段不用设时间。设置温度完成后按"设置"键保存温度设置参数或按"退出"键进入运行待机状态。
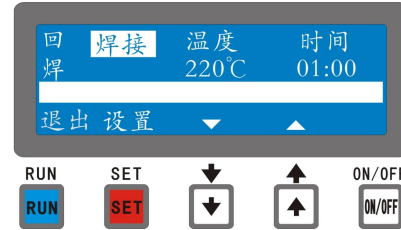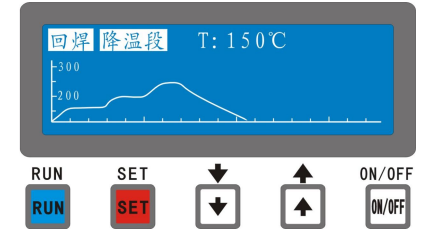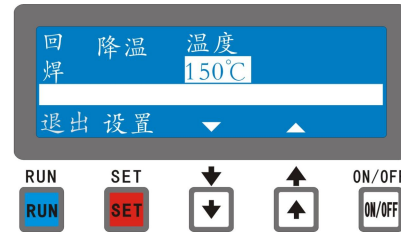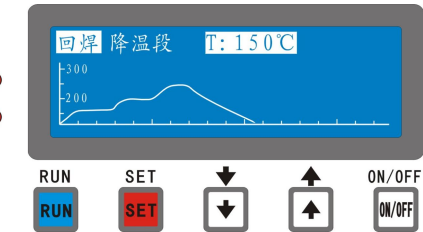

图 33 文本模式冷却段设置

图 34 曲线模式冷却段设置

图 35 文本模式冷却段温度设置

图 36 曲线模式冷却段温度设置

6) 维修模式的参数设置

在开机的待机界面下按"È"键选择"维修"模式如"图 37"、"图 38"，按"设置"键进入维修模式的温度设置状态。温度显示值反白选中，如"图 39"、"图 40"所示；按"Ç"或"È"键可设置维修模式的温度值，按"设置"键保存设置参数。

在维修模式下温度设置范围分为两个部分,70-150℃,可设置有时间限制和无时间限制两种，无时间限制运行时要按"设置"键停止运行。当温度设置在 150-200℃时，时间设置范围为 0-20min,当机器运行到设定的时间时会自动完成。如"图 41"、"图 42"

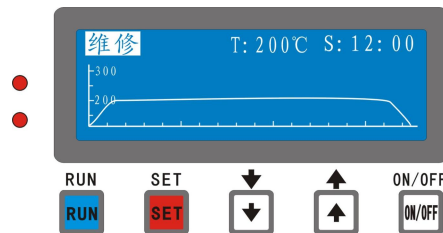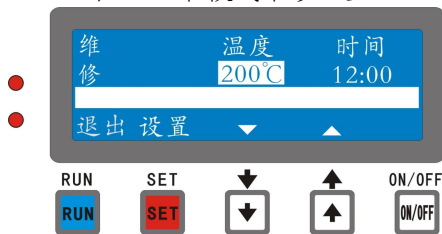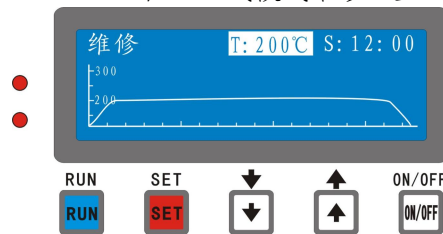在这个模式中，SMT 红胶固化或热固化性也可以在本模式中使用。
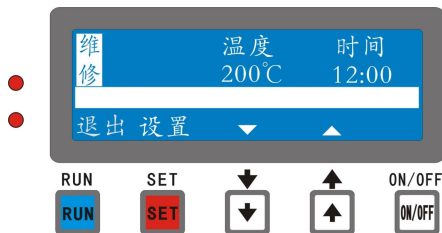
图 37 文本模式维修设置

图 38 曲线模式维修设置

图 39 文本模式维修温度设置
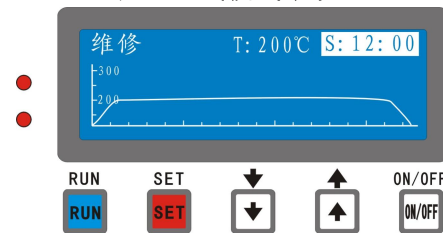

图 40 曲线模式维修温度设置

图 41 文本模式维修时间设置

图 42 曲线模式维修时间设置

注： 设备在设置状态下，一分钟内无任何按键操作则自动返回待机状态；在默认停机状态或待机状态下，不做任何操作时，超过三十分钟，设备自动关机。在待机画面下或软件关机时，按键 **"ON/OFF"** 键为系统开关键，在温度没有下降到安全温度 70℃时，机器会先行强制降温后关机。其它按键操作无效，长期不用时最好关闭设备背后的电源开关。

十、设备回焊运行

设置完成后，设备具备合适和安全的运行条件，这时将贴好元件的电路板放入托盘中间，送入机箱内，按"运行"键进入工作状态，如"图 43"、"图 44" 所示。机器的加热工作灯会亮起。显示屏显示"工作中 ..."或"预热中"字样，温度显示为机箱内当前温度，时间显示设置时间值，

当温度达到设定温度后，时间开始倒计，倒计时完成后进入下一段。设备在运行中每一个温度段中的恒温段时，发热指示灯会关闭或闪动，当实际温度超过设定温度 5℃时机器会打开风机短暂降温。在运行中如需中途退出可按"退出"键退出，如屏幕提示，退出时设备将强行开启风扇进行降温，可按"停止"键停止排风并返回待机状态。为了安全起见，请在温度降至安全值时再手动停止风扇。

如"图 43"、"图 44"，在图形显示模式下,屏幕显示实时温度和相关时间外,同时显示温度曲线。温度曲线实线部分为待完成部分，虚线部分为已完成部分。时间轴每小格平均代表时间 1 分钟，温度坐标轴每小格 50℃。当温度曲线时间超过屏幕显示最大长度时，在运行到过屏时，温度曲线自动左移。
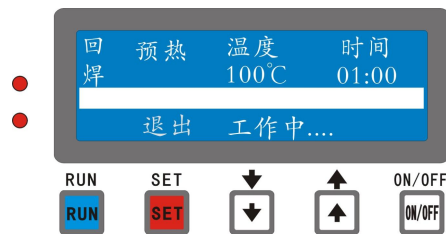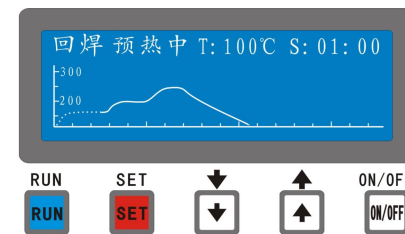

图 43 文本模式运行中

图 44 曲线模式运行中

当设备运行到降温段时，风扇开始全力排风，温度降至设定温度后蜂鸣器报警，状态栏显示"完成"字样。当温度低于 70℃时风扇停止排风，此时按"设置"键可再次强行开启风扇降温，再按"设置"键可手动停止排风并返回待机状态。

十一、故障报警

1、危险温度报警

当设备运行到高于设定温度 10℃时，设备会自动报警，显示屏闪动显示"危险温度"。设备会进入安全处理状态，关闭发热元件工作，打开风扇强制降温，如"图 45"、"图 46"所示。当温度降至安全温度以下时，

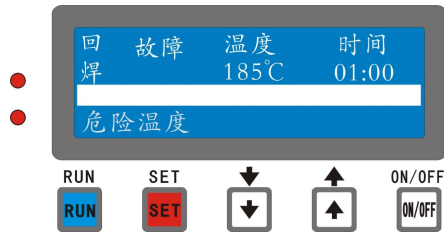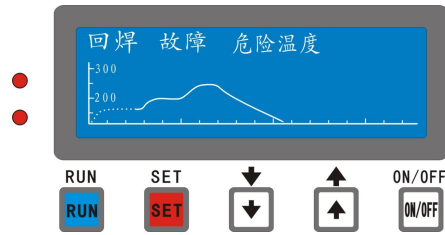报警自动解除，设备返回继续正常工作。也可以按"**运行**"强制退出当前的工作状态。

图 45 文本模式危险温度　　　　图 46 曲线模式危险温度

2、测温元件故障

设备在运行的工作中，如果检测到测温元件损坏，则自动报警，显示屏闪动显示"测温元件故障"，如"图 47"、"图 48"所示，蜂鸣器也以同样的频率报警，发热管元件关闭，风扇开启。可按"**运行**"键或"**退出**"键退出当前工作状态。此种故障一般回厂维修或有资质的维修人员更换测温元件。
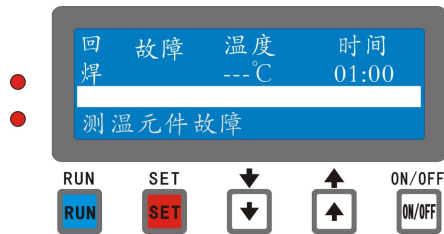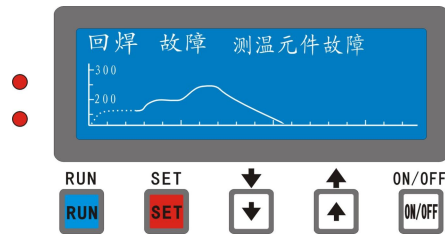

图 47 文本模式测温元件故障　　　图 48 曲线模式测温元件故障

3、发热元件故障

设备在运行的工作中，如果检测不到发热元件的工作电流，则设备会报发热元件故障报警，显示屏闪动显示"发热元件故障"，如"图 49"、"图 50"所示，且蜂鸣器以同频率报警，设备自动关闭退出当前状态。也可按"**退出**"键或"**运行**"键退出并返回待机画面。此种故障一般回厂维修或有资质的维修人员更换发热元件。
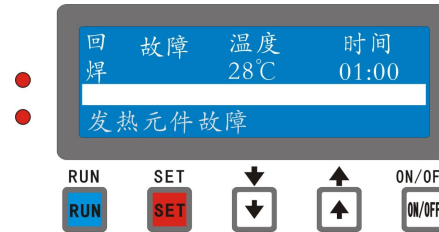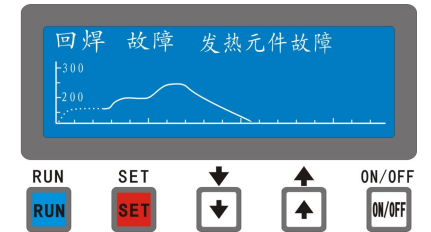

图 49 文本模式发热元件故障　　　图 50 曲线模式发热元件故障

注： 在故障报警状态下，如果风扇不开启或发热管不受控制，应立即切断设备电源，并检查故障原因或送修，以免造成不必要的事故发生。

十二、设备的安装和安装环境

1、设备应安装在方便短距离排气管的地方。电源配备 15A 的大电流三脚插座，接地端必须可靠接地。

2、排气管应选用 φ120mm 的铝制排气管，排气管的出口高度应高于机器安装高度的 1000mm 以上。有利于利用热空气的烟囱排气效应。

3、短时间使用的机器可不安装排气管。但应增加机器的后端的离墙距离（200mm）以上。

4、机器的顶端不要放置其它物品，特别是可燃性的液体。如"洗板水、天那水、酒精、甲醇、汽油"等。

5、机器的清洗可在机器冷却关机的状态下。用擦机布沾洗板水或无水酒精擦洗机器的内部，外部的可水性的清洁机擦洗。待机器完全干燥后方可开机使用。

6、机器在开始使用的阶段会有一些杂味气体排出，这是正常的现象，使用一段时间后这中气味会消失。

7、机器不使用时应关闭机器后面的电源开关。在软件关机的状态中，机器的主控板仍在工作中。长时间不使用时应拆下机器，包装好放回到原包装箱保存。以防潮气和小虫子老鼠之类的东西爬到里面损害机器。

8、回焊炉在回焊小件 PCB 板或 FPC 板时，应使用高温云母制作

的载板，四边至少留有 30mm 的间隙。以保证温度的均匀性。良好的回焊流程要用本机精密测试后保存使用。机器内置的温度曲线只作为参考调整使用。尽量能够做到用低温长时间回焊温度曲线来回焊对温度敏感型的精密器件，如**"LED、激光头、微型连接器、软封装 IC、摄像头"**等。在元件耐温较高的情况下，可适量提高**"焊接段"**温度来减少回焊时间。

十三、使用注意事项

1、 请单独使用 15A 以上的专用电源插座，切勿与其它电器共用同一电源　插座，且电源插座必须可靠接地。回焊炉应水平放置，周边与墙应有 200mm 以上的间隙。

2、 请勿在潮湿或高温的环境中使用回焊炉。

3、 请勿用水直接冲洗机体，以免破坏机体的绝缘性能。

4、 请勿将铁丝等异物插入或堵住进风口和排风口，避免烫伤或影响通风散热。

5、 请勿将易燃、易爆的危险物品靠近本回焊炉；带有易燃易爆气体的物品不能进行烘干，以免发生危险。

6、 请避免碰撞机体，以免损坏发热管，如发现发热管破裂，应关掉电源，并送往修理。

7、 工作时或机器还没有降温到安全温度时，请勿将手伸入机箱内，以免烫伤。

8、 请勿将回焊炉放台布上使用，以防止进风口堵塞。

9、 如有红外线发热管损坏，必须配原厂专用的红外线发热管。

售后维修记录表

用户名称		用户地址	
联系电话		出厂编码	
机器型号			

维修时间	故障原因	更换部件	维修人
售后服务电话			