

Shenzhen Southern Machinery Sales and Service Co.,Ltd

*Meet the Needs of the **SMT** Age*

Please read this Operation Manual carefully before starting the machine.

Wave Soldering Machine

Operation Manual



Tel: (86-755) 83203237

Fax: (86-755) 23240492

Web: www.smthelp.com

Add: Rm 1806,Block 3, Jinyun COFCO, Qianjin 2 Road,

Xixiang,Baoan District, Shenzhen City, China



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1. Lead-free wave soldering machine series

1.1 Summary

Southern Machinery's automatic wave soldering machine can perform all process such as flux spraying, preheating, soldering and cooling of PCB, widely applied in SMT, inserting components and mixed PCB soldering.

Controlled by computer, this machine employs many protection devices and modularized design with high reliability and automatization. Soldering system complies with advanced technicians with superior soldering design.

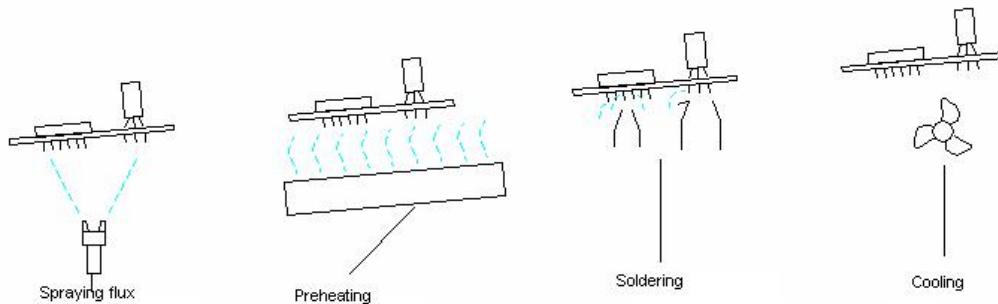
Main functions:

- With reasonable design, simple operation and convenient maintenance, this machine can be connected with correlative equipment on-line.
- Two waves can be controlled separately by transducer, suitable for all types of PCB.
- Flux spraying system can be maintained easily with long life.
- Flux is airproofed without volatilization, pollution and maintenance.
- Spraying area can be adjusted automatically according to the size of PCB, or set manually.
- Preheating system and soldering system are controlled by PID&SSR with high precision.
- Two preheating zones are controlled separately to ensure high soldering technics..
- Conveyor system is controlled by gear motor through PID with stable speed.
- Width adjustment pole with protection cover avoids pollution and distortion.
- Economically working can reduce oxidation.
- Equipped with light and sound alarm, urgency stop system and overload protector.
- Heat compensation and cooling system meet the demand of lead-free soldering and process.
- It can work automatically or manually.
- It can start work according to settings of customers.



1.2 Working flow chart

See below flow chart



Graph 2 (Soldering process)

PCB board, which has inserted or placed components, firstly, enters the machine from connecting devices from certain angle, then caught by running Titanium fingers and covered by flux, completes 1st preheating, 2nd preheating, 1st wave soldering, 2nd wave soldering and cooling process. Finally, it is sent out by Titanium fingers.

In preheating stage, the flux become active and the volatilization has been removed, PCB should be preheated, at the same time, That PCB should be controlled between 80°C~150°C ensures less heating impact.

The 1st wave with quick speed has more upright impact on SMT components, and better penetrability, which overcome blight and reduce soldering defect.

The 2nd wave with smoothness and low speed, can remove excessive tin and keep interface in good condition, and can remedy soldering defect sufficiently.

1.3 Working condition:

- 1) This machine should be located in a flat, dry and ventilating factory.
- 2) Working temperature: 5~45°C
- 3) Humidity: 20~95 %
- 4) Power supply: steady 380VAC (60A) 3 phase, 5 lines, make sure the ground wire is well connected.
- 5) Air source: purified source: 0.5~0.8 MPa
- 6) Compelled exhausting system: air flow in exhausting tube: ≥ 15 stere/ min

1.4 Installation and Calibration

(1) Installation

- 1)After unpacking, lay the machine and equip entrance connecting devices.
- 2)Move the machine to the designated installation place using casters.



-
- 3) Adjust the wheels of the machine, make it to be in horizontal position.
 - 4) Adjust the height of soldering wave, average: 5mm~10mm
 - 5) Adjust the width of rail, you can adjust it by a hand wheel, you can move the PCB board smoothly along conveyor direction.
 - 6) Power supply: (3P, 380V, 60A), air supply (lower to 0.4MPa)
 - 7) Put flux in flux bath to 3/4 level, and cover it.
 - 8) Put the alcohol in alcohol bath, and cover it.

(2) Calibration

- 1) Rail width: adjusted by software according to PCB width (the minimum width is 50mm)
- 2) Adjusting the inclination of the rail: adjusting the handwheel under the rail on the exit side of the wave to adjust the inclination, so that the soldering angle is adjusted, and the normal soldering angle is 6-8 degrees; (Note: when the solder angle is turned down, the pot should be lowered first to avoid damage by touching the chain)
- 3) Solder pot height adjustment: adjust the height through the knob on the pot.
First adjust the height of the wave: the height during normal short pin operation is 8-12mm (the wave height at the exit); the height can be as low as possible under the premise of meeting the soldering requirements, which can greatly reduce the amount of oxidation of the solder;
After confirming the wave height, the height of the solder pot can be adjusted through the manual control box. The best height of solder pot is: when the PCB runs to the upper side of the wave, the solder level is immersed to 1/2-2/3 of the PCB thickness, but not higher than the PCB surface;
Note: When adjusting the height of the solder pot, the proper distance between the two nozzles and the chain of the pump should be ensured;
- 4) Solder pot in and out: The pot can be moved in or out of the machine through the adjustment knob on the box. It is convenient for maintenance, repairing and adding solder bar; (Note: When moving the pot in or out, it is necessary to reduce the pot to the lower position in order to prevent damaging chain and rails)
- 5) Tilt adjustment: Rotate the handwheel on the lower side of the entrance guide, to adjust the tilt angle of the conveying system. If the entrance handwheel is adjusted with the exit handwheel, the guide rail can be moved up and down in parallel.

1.5 Power on operation

(1) Check follow items before power on

1. Check whether the power supply is 3 phase 5 wires
2. Check whether the equipment is connected with the ground well
3. Check whether the solder capacity reaches standard.(the surface of solder must be



10mm lower than the pot)

4. Check whether air supply reaches standard.(0.4-0.5Mpa)
5. Check whether the urgency stop key is ready.
6. Confirm that total adjustment has been completed.
7. Check capacity of flux and alcohol.

(2) Power on



- 1) Close the main switch in the panel, turn on the “ power ” button.



- 2) There is a timer to control the automatic power on and off,
This can be set according to the power on/off demand (it is recommended to use the automatic operation mode to save the time of melting tin) as shown below



3) On the small panel, there is a switch "LIGHT" knob for the lighting control, and the light is the status indication.

4) After the computer is started, the control system runs automatically. After the system is running, the devices can be controlled according to the requirements;

2. Explanation of software

2.1 Menu instructions



1) Operation manu: after switch on computer, this system runs automatically:

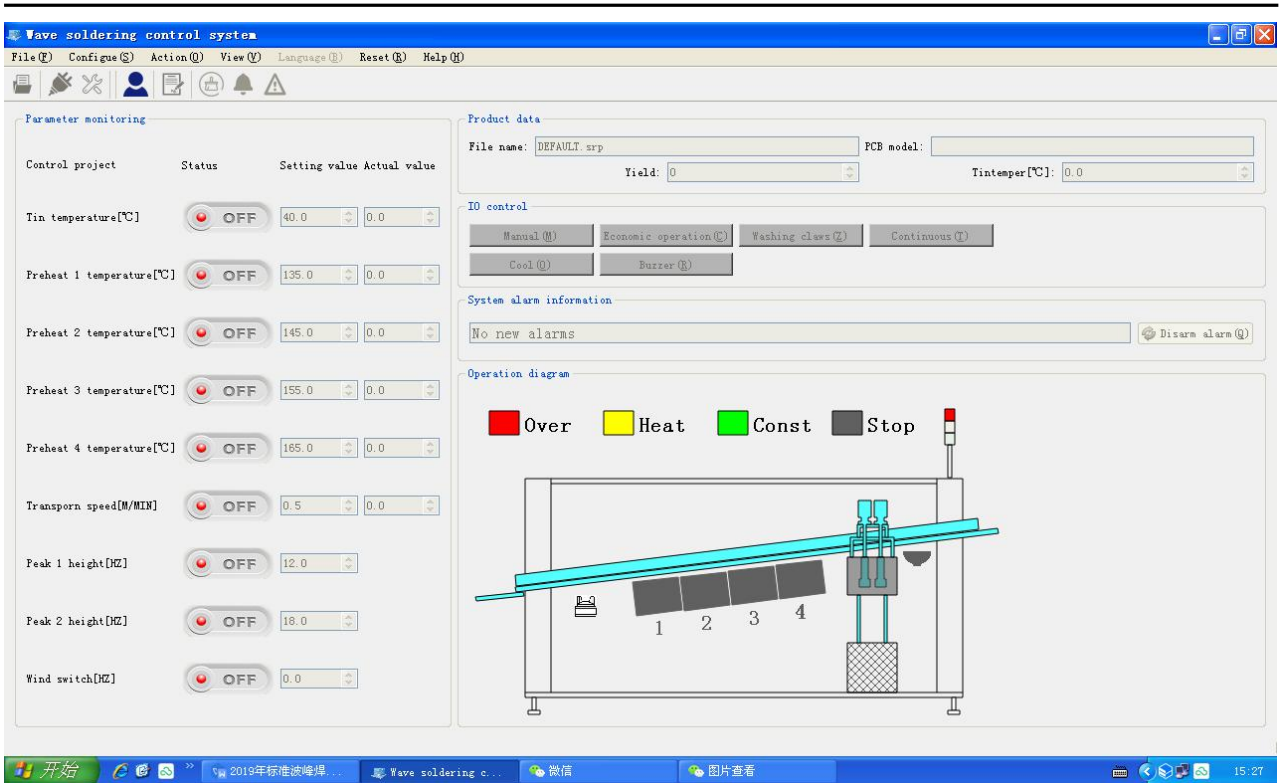
After the main interface is started, the drop-down menu of the display interface setting toolbar is as follows:



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2) The interface of unlock



Click the login icon to prompt for the password dialog. If you don't set the password, press "Enter" on the keyboard .



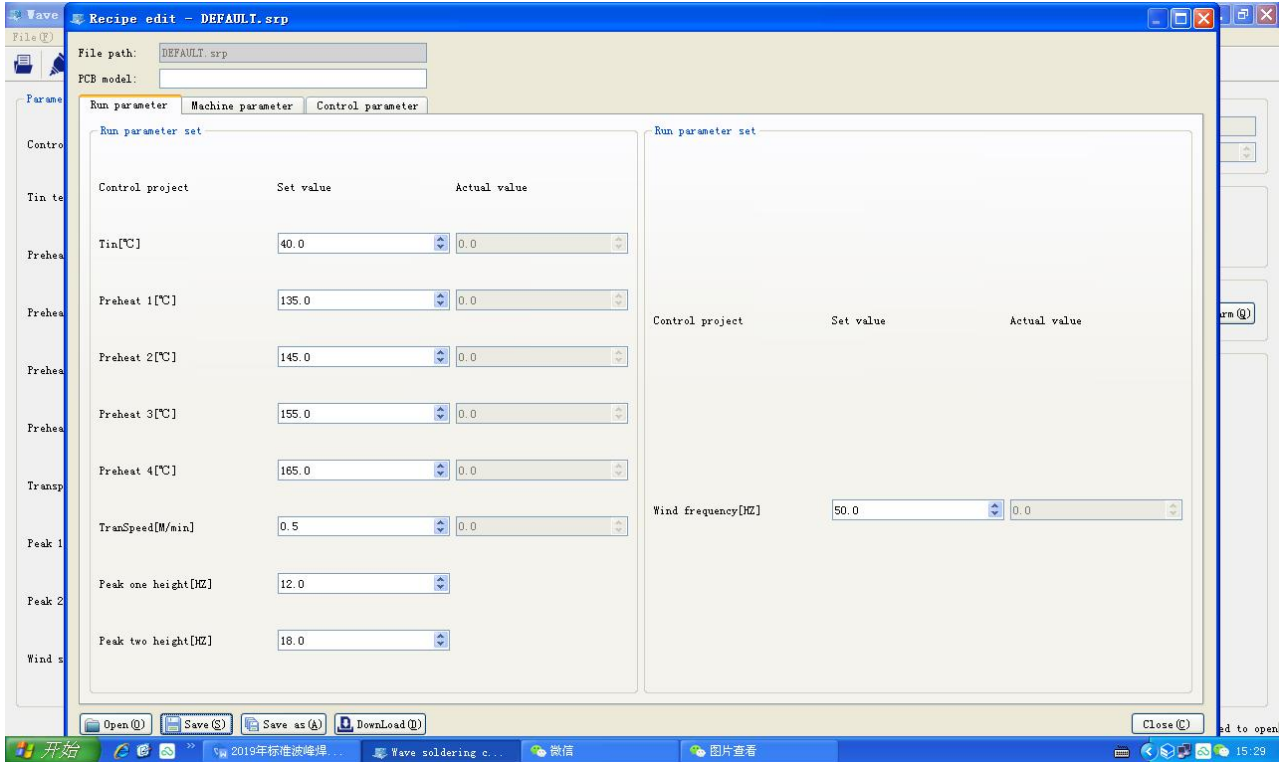
3) The status after unlocking is as follows:



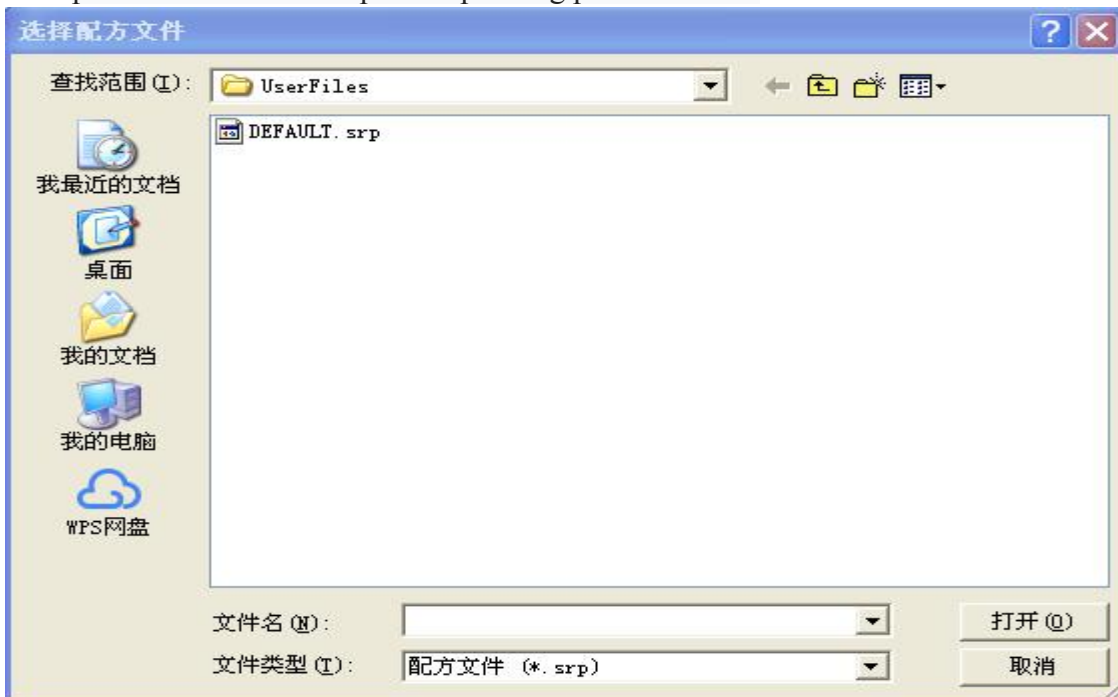


2.2 Drop-down menu description

1) File: drop-down menu

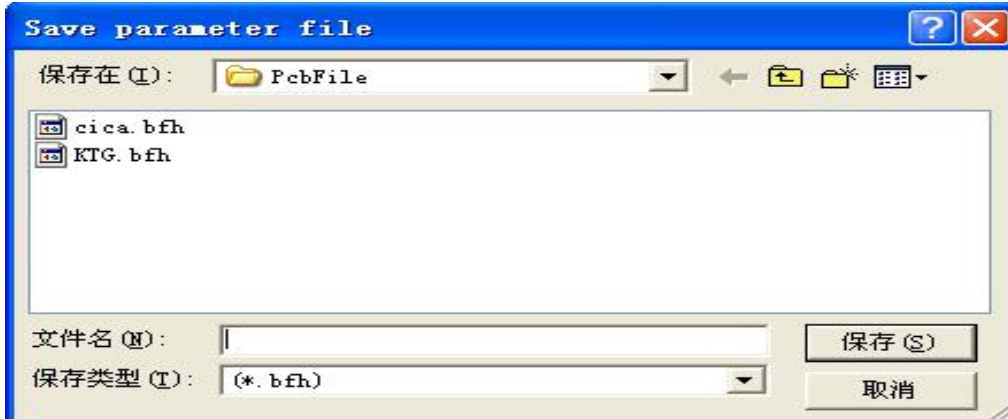


(1) Open: Open the system configuration file (*.KTG), which includes the running parameters of each setting. After opening, the system will control according to the parameters set in the opened operating parameter file.

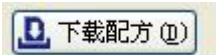




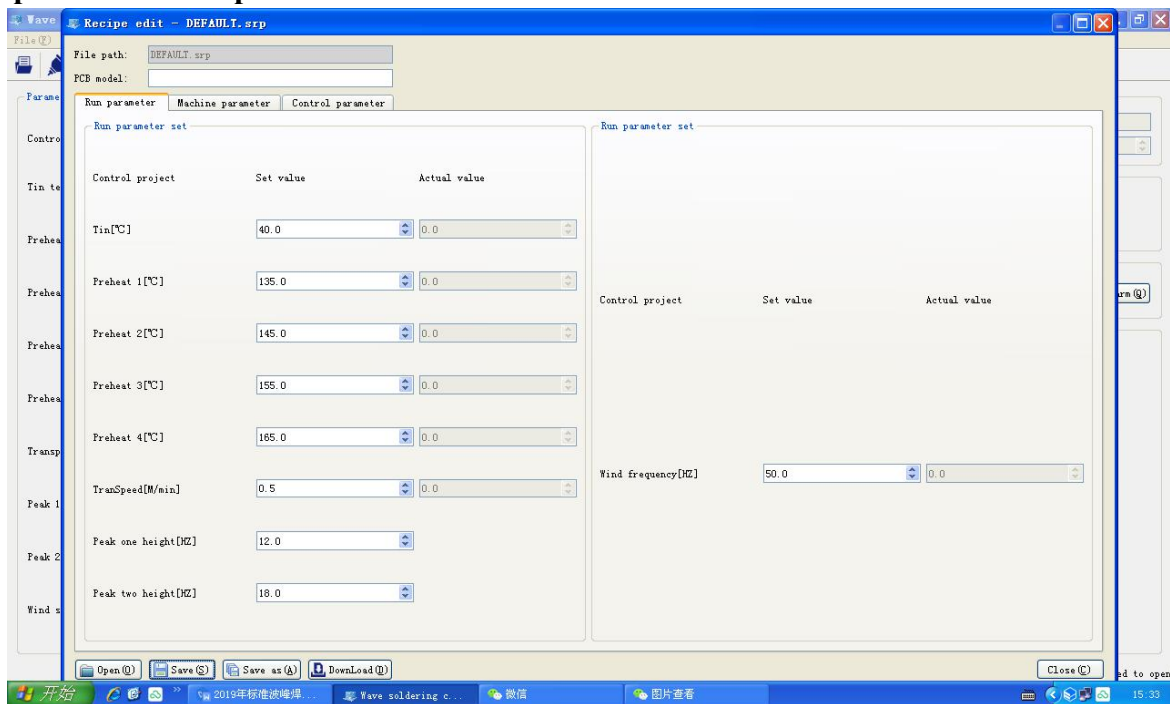
(2) Save: the parameter file (*.KTG) and save the currently set system parameters. It is convenient to directly call the parameters when the next model is reproduced next time.



(3) Exit: Exit the current control system and click to exit the wave soldering operation interface.



2) Operation for drop down menu



1) Zero clearing: Set zero at current capacity of PCB.

3) drop-down menu setting

(1) Operating parameter settings: Set all operating parameters of this machine.

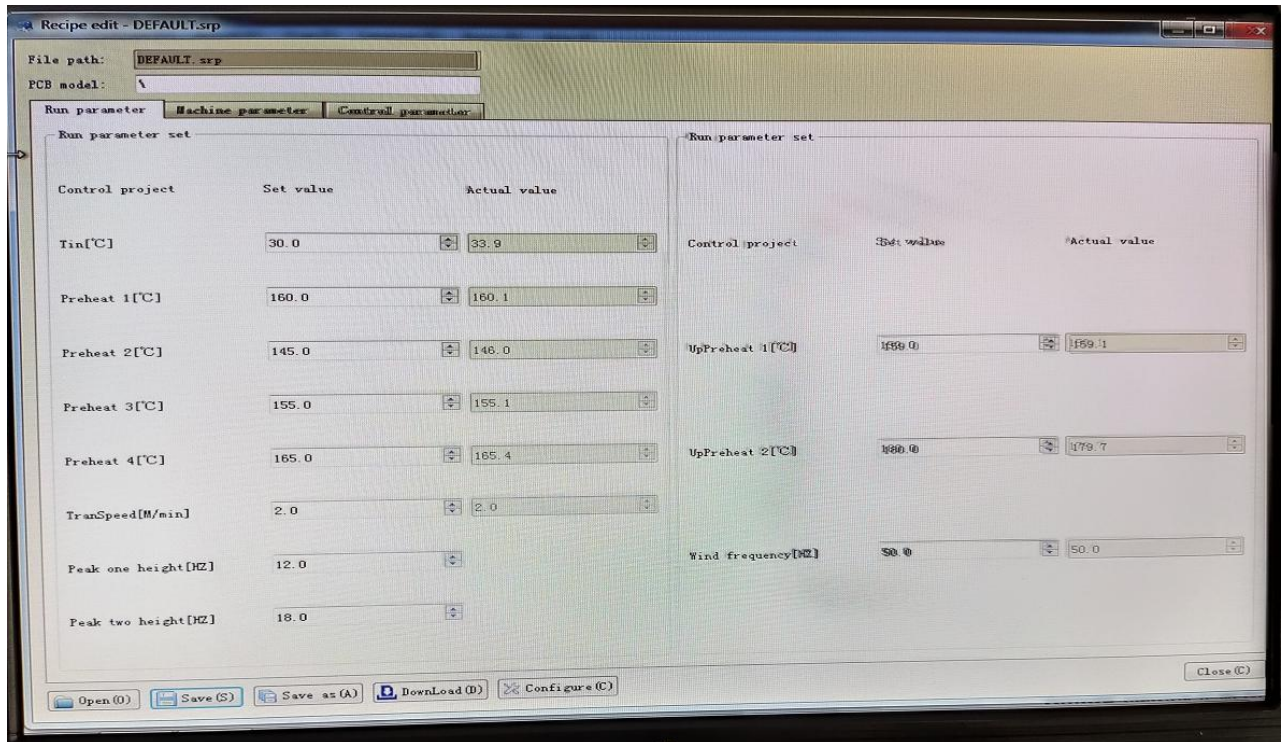


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The operating parameter settings include: solder pot temperature setting, preheating 1,2,3 temperature setting, compensation temperature setting, conveying speed, wave 1 height, wave 2 height. For the set value, please refer to the figure below.



[Default]: Click this button to open the default setting value of the device, and its value can be used as the factory default value of the machine.

[Save the default value]: When installing the operation interface for the first time, set all the parameters and click to save it as the default value.

[Open]: Click this button to open the previously saved setting parameters to the current operating parameters.

[Save]: Click this button to save the current run

[Confirm]: Save and download the current setup parameters to the PLC (it is recommended to save the newly set operation parameters before downloading to the PLC)

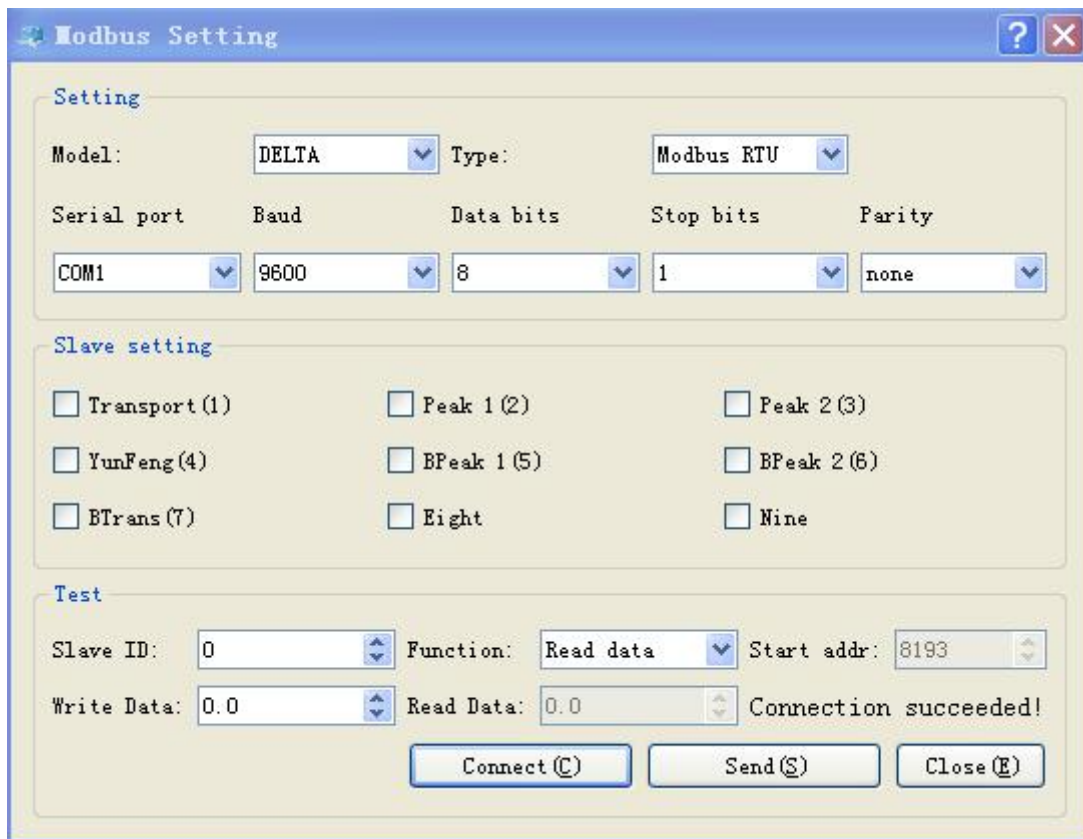
[Cancel]: Cancel current setting parameters

[Password]: Set the password to open this screen. When this password is set, you must input the correct password to open this screen to prevent unauthorized users from setting this parameter to avoid malfunction. No password is set at the factory



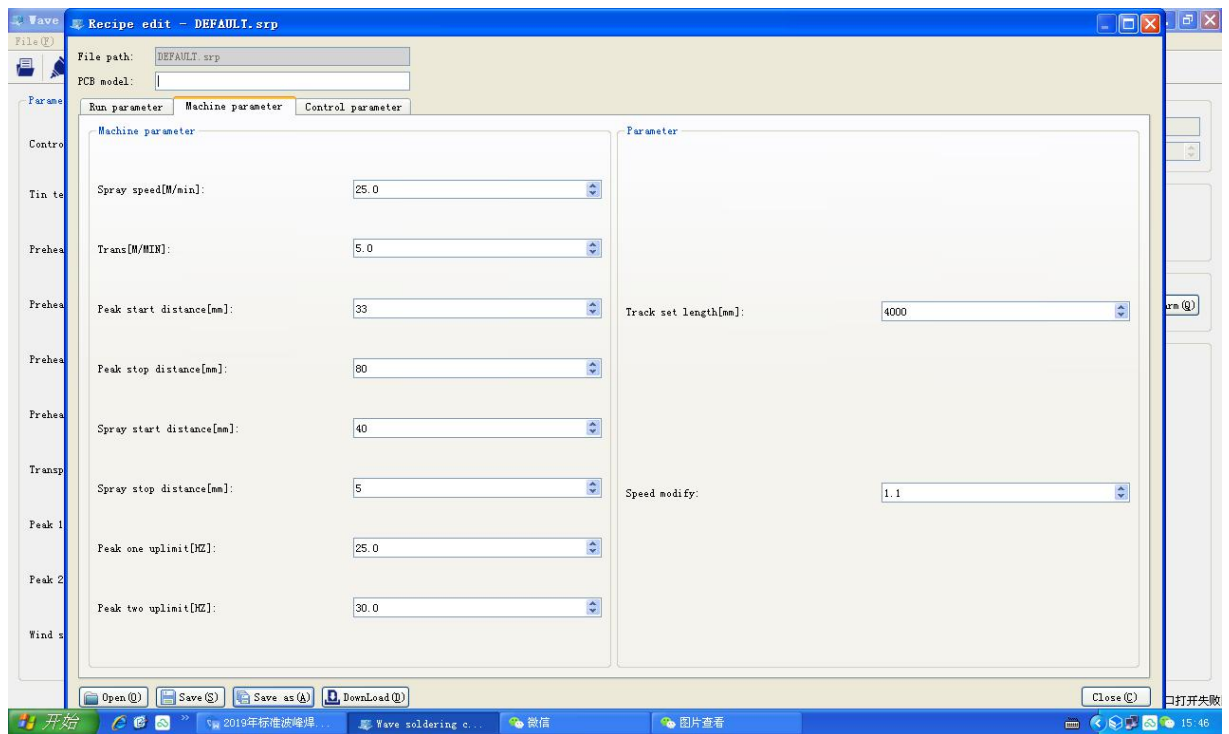
4) Communication port setting

Set the communication port of this machine. If the communication is not normal, it will be difficult to start the software, please check the communication port setting. The factory setting is “COM1”.



5) Machine parameters setting

Please refer to the following settings for the machine configuration settings:



The machine parameter configuration setting contains:

Wave upper limit value: that is, the wave cannot be turned on below the safe value (automatic protection in the program)

Wave start distance: the automatic wave distance from the PCB to the nozzle during economic operation running (this function reduces the oxidation of the solder). If the PCB has not reached, the wave starts or stops, please increase the wave start distance value and the stop wave distance value, and vice versa.

Wave stop distance: set the stop distance of the wave motor

Spray start distance: Set the opening distance of the nozzle opening and atomizing valve

Spray speed setting: Set the number of pulses of the spray stepper motor (i.e. the number of spray motor pulses, the cylinder control does not need to set this value)

Spray stop distance: Set the stop distance of the spray valve

Wave upper limit: the biggest frequency setting. After the upper limit is set, the running wave frequency will not be higher than this frequency.

The password function is the same as the parameter setting.

6) Limit temperature setting

See below pic



Limit parameter

Tin uplimit[°C]:	10.0	Speed uplimit[M/Min]:	2.0
Tin lowlimit[°C]:	10.0	Speed lowlimit[M/Min]:	0.5
Preheat 1 uplimit[°C]:	10.0		
Preheat 1 lowlimit[°C]:	10.0		
Preheat 2 uplimit[°C]:	10.0		
Preheat 2 lowlimit[°C]:	10.0		
Preheat 3 uplimit[°C]:	10.0		
Preheat 3 lowlimit[°C]:	10.0		
Preheat 4 uplimit[°C]:	10.0		
Preheat 4 lowlimit[°C]:	10.0		

Limit temperature setting includes the alarm of upper and lower limit of the solder pot temperature, the preheating temperature and the heating compensation temperature. When the temperature is lower than the limit or higher than the upper limit deviation value, the machine gives an alarm and cuts off the power supply (factory value is the upper limit: 10 ° C, lower limit: 10 ° C)

7) Temperature compensation setting

The temperature compensation setting includes the solder pot temperature, the preheating temperature, and the compensation temperature. This function is the detection error adjustment of the probe. When there is difference between the detected temperature and the actual temperature, this parameter needs to be set. When the actual temperature is greater than the display temperature, it is set to a positive value, and vice versa. The factory value is zero.



Compensation parameter

Tin[°C]: 0.0

Preheat 1[°C]: 0.0

Preheat 2[°C]: 0.0

Preheat 3[°C]: 0.0

Preheat 4[°C]: 0.0

2.3 Main interface of Control system

(1) Automatic operation: when the temperature of the solder pot reaches the constant temperature value, other actions are output accordingly.

After selecting "automatic operation", the system will automatically start each device, the sequence is: first open the solder pot heating, when the temperature reaches lower limit (the wave starting temperature value), then open preheating, heat compensation, conveying and cooling devices;

When the solder is heated to the soldering temperature, normal operation can be performed; in normal operation, the system will automatically track the PCB, and automatically spray or generate wave according to the real-time position of the PCB, thereby achieving energy saving effect;



1) **Manual operation:** Manual operation is one of the two modes of system operation. If the it displays “automatic operation”, clicking once will change to manual operation mode;

When it is in manual operation, all devices will not start automatically. You must click the relevant buttons to control the start or stop of the devices.

Continuous spray button: if the spray is “OFF”, the automatic tracking of the PCB will be automatically performed. If the button is “ON”, the spray works all the time;

2) **Fault reset:** After the fault alarm occurs, first check the cause of the fault, after the fault is solved, click “Fault Reset”, the system will continue to run;

3) **Attention on operating the main interface:**

(1). The finger-washing device is operated manually whether it is under “economic operation” or “manual operation”. The user can open the washing according to the actual situation of production; If the conveying is not started, the opening of the washing is invalid.

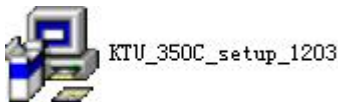
(2).If it is in “economic operation”, the waves will be automatically started. When the PCB reaches the starting value, the wave motor outputs until the waves stop.

2.4 Steps of Software installation

1).Double click the file“ `KTU_350C_setup_1203` ”



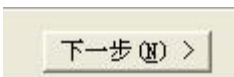
This file include: “FILES” and “SETUP”



2). Double click this icon [Setup.exe] for enter into below interface





Click  , for next step and showed as below:



Click: 



Click: 



Click:

Finally click  to finish the installation



After installed the software, enter into , double click  :

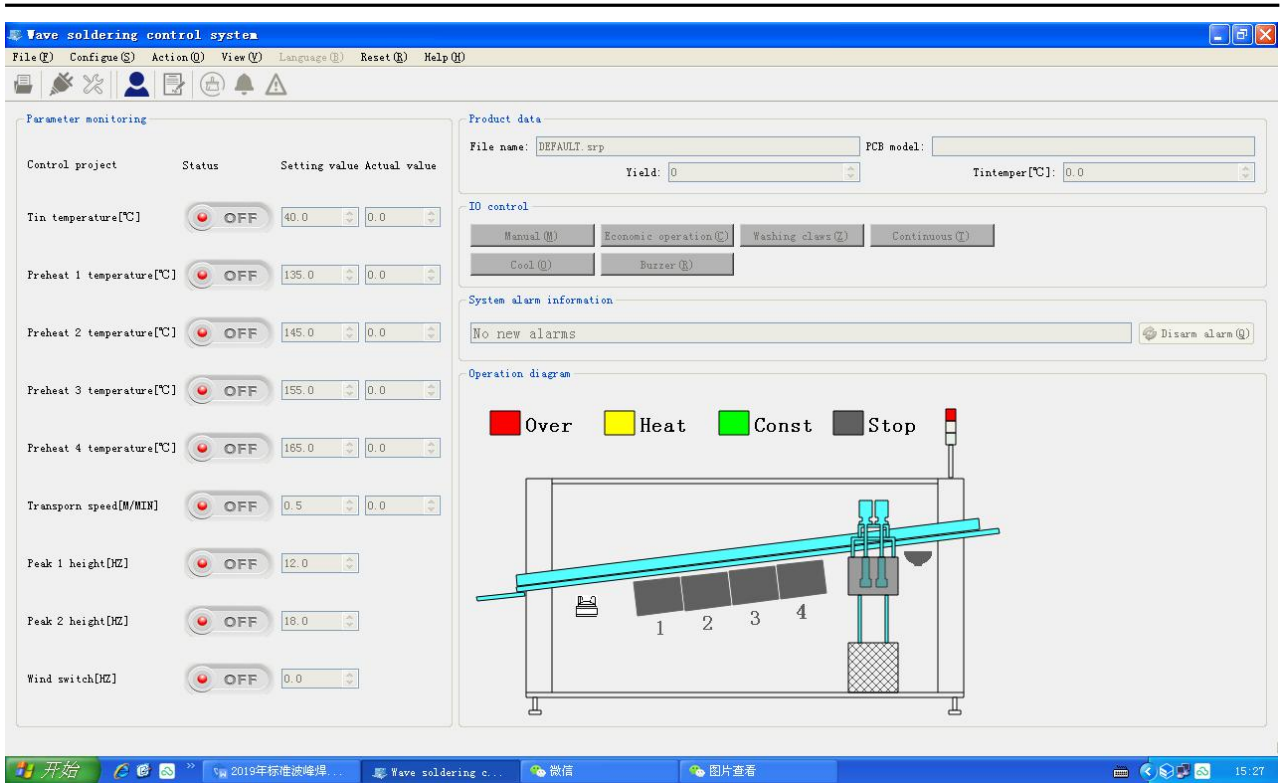


Double click  and find this , add a shortcut on the desk.

3. Explanation of control interface

3.1 monitoring screen

The monitoring screen will appear after starting up as shown below



- 1). Equipment information:** prompt the working status and fault condition of the current equipment. In case of equipment fault, judge the fault location according to the information prompt status.
- 2). The actual temperature and set temperature of each temperature zone will be displayed on the interface. To change the set temperature, press the set button to set the temperature on the setting interface.
- 3) transportation speed:** the transportation speed displayed on the interface is the actual transportation speed of the equipment: the transportation speed is calculated by the number of pulses in unit time of the encoder, so it must be ensured that the encoder works normally.
- 4). Current output: the total output of the current equipment. It will be accumulated automatically. To change or clear, you only need to modify the output initialization parameter in the parameter setting interface.
- 5). The control interface is equipped with the transport, wave peak 2, heating quick switch, which has the same function as the switch on the control screen, mainly for the convenience of the user for quick operation.
- 6). Press the control button on the interface: switch to the control mode screen automatically, and the control mode screen can operate all the opening functions.
- 7). press the operation parameter button: it will automatically switch to the parameter setting screen to set the basic parameters.
- 8). auto / manual button: when the button is set to auto, the equipment will run automatically, (automatic operation by default when starting up). When the button is running automatically, the tin furnace will be heated in advance, and all other switches will not run if the temperature does not



rise to the lower limit; when the temperature reaches the lower limit, preheating, transportation, wave peak and cooling will run automatically.

Manual state: when this switch is in the state of manual switch, each button and corresponding functions will not automatically operate, and it needs to be manually operated one by one, note; the wave peak switch is only effective when the temperature of the tin furnace reaches the lower limit.

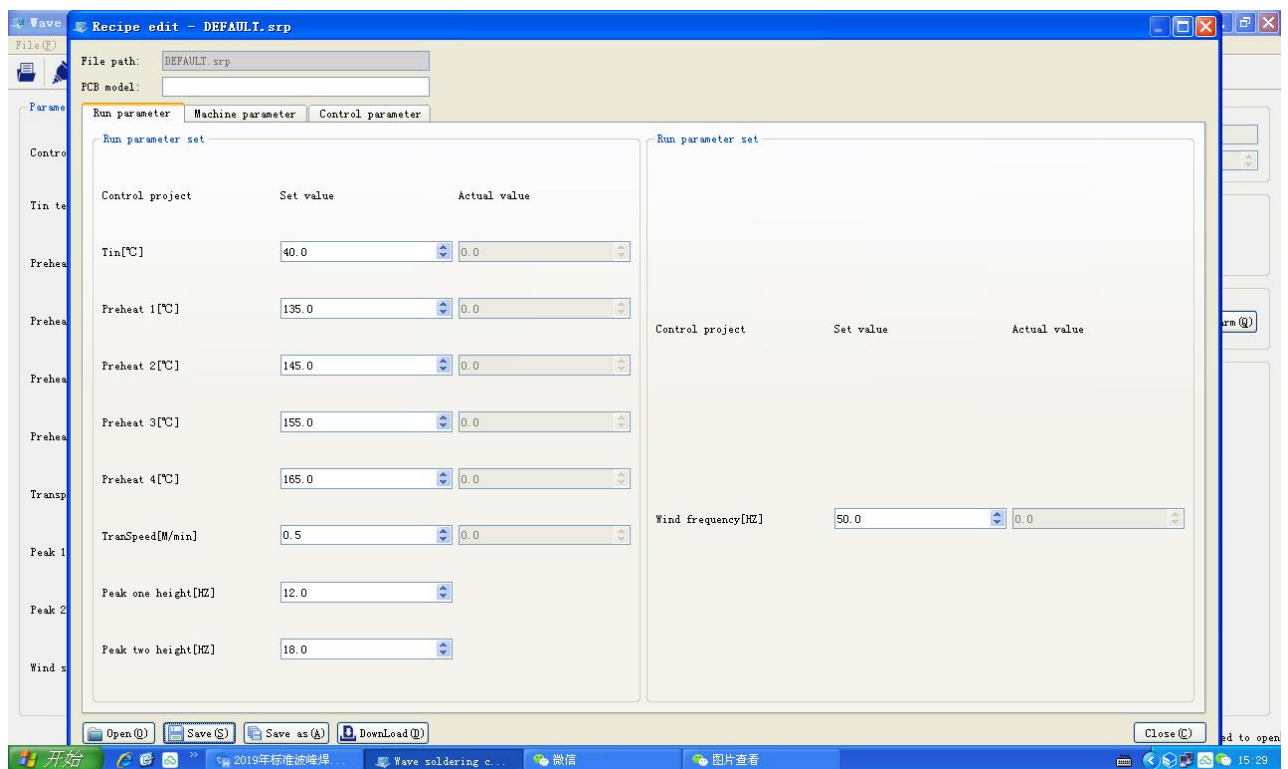
9). continuous spraying: press the continuous spraying sprayer to move the spray left and right, or there will be PCB to spray. (the secondary function is generally used when debugging the sprayer).

10). economic operation switch: when the economic operation switch is "on", only when there is PCB in the wave crest machine can the wave crest be automatically opened.

On the contrary: as long as the temperature of the tin furnace reaches the lower limit, the wave peak keeps running. This function can minimize the oxidation of solder. (automatic operation by default when power on).

11) . alarm switch: in case of equipment failure, the fault alarm can be turned off. Note: Although the fault alarm is turned off, the equipment failure still exists. Please remove the failure before using (the default automatic operation is when starting).

3.2 operating parameter setting

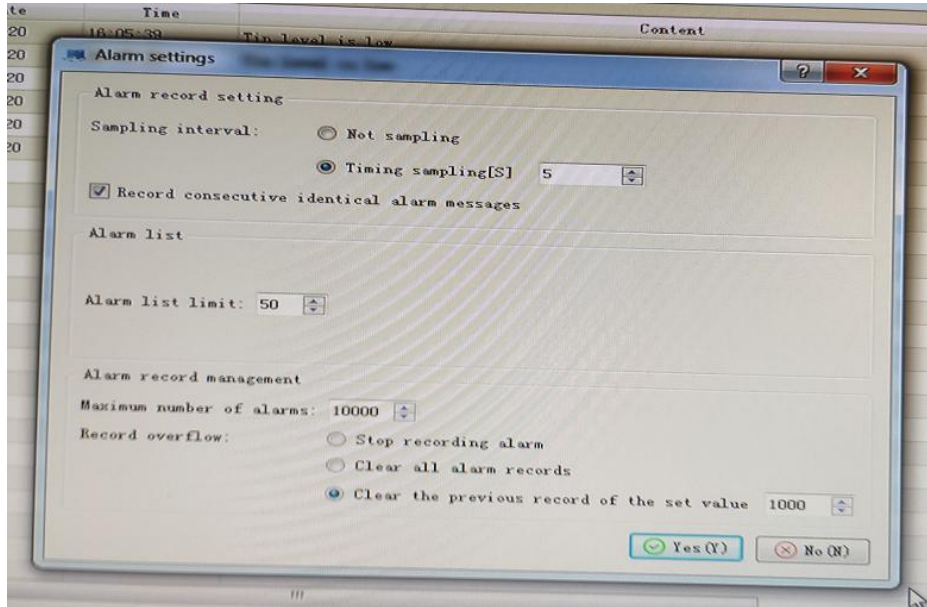


1. The parameter operation screen can easily set preheating: 1. Preheating 2. Preheating 3. Preheating 4. The set temperature of the tin furnace, as well as the set values of the transportation speed and fan speed. After setting the parameters, input the file name and product model in the input box of the working file and click the Save button to facilitate the transfer of the production process.



2. Production initialization: the production initialization is to reset or set the current cumulative production. If it is necessary to reset, it can be set to "0".

3.3 Alarm parameter setting



Upper limit alarm temperature: the upper limit alarm temperature is an absolute value temperature, for example, the set working temperature is 250 °C; the upper limit temperature is 20; the lower limit temperature is 15, that is, when the actual temperature is higher than the upper limit of 270 °C, the alarm will be given when the temperature is 235 °C; when the upper limit alarm is given, the over temperature protection contactor will be cut off automatically, so as to prevent the equipment from heating up. When the lower limit alarm is given, the low temperature indicator will be on It indicates that the temperature is too low. Note: if the temperature of the tin furnace or the preheating temperature is over temperature at the beginning of heating, please set the lower limit temperature to a large value so that it can conduct PID heating in advance.

3.4 Temperature compensation setting

The temperature compensation setting includes the solder pot temperature, the preheating temperature, and the compensation temperature. This function is the detection error adjustment of the probe. When there is difference between the detected temperature and the actual temperature, this parameter needs to be set. When the actual temperature is greater than the display temperature, it is set to a positive value, and vice versa. The factory value is zero.



Compensation parameter

Tin[°C]:	0.0
Preheat 1[°C]:	0.0
Preheat 2[°C]:	0.0
Preheat 3[°C]:	0.0
Preheat 4[°C]:	0.0

3.5 Machine parameters setting

Please refer to the following settings for the machine configuration settings:

PCB model: \

Run parameter Machine parameter Control parameter

Machine parameter

Spray speed[M/min]:	35.0
Trans[M/MIN]:	16.0
Peak start distance[mm]:	14
Peak stop distance[mm]:	37
Spray start distance[mm]:	27
Spray stop distance[mm]:	26
Peak one uplimit[HZ]:	25.0
Peak two uplimit[HZ]:	30.0

Open (O) Save (S) Save as (A) Download (D) Configure (C)



Machine parameters are the most important parameters of the equipment. Please do not set them casually. If the settings are wrong, the equipment may not work properly. The transportation data rate is used to check the transportation speed; when the transportation speed is different from the actual speed, this parameter can be modified; if the transportation speed is too large, this parameter will be reduced; otherwise, this parameter will be increased. The spray start distance is the distance from the calibration PCB to the nozzle start spray; the wave peak start distance is the distance from the calibration PCB to the tin wave. When spray or start the wave in advance, increase this parameter; otherwise, decrease it. The upper layer stop heating temperature is mainly used to control the parameters of the upper layer stop operation of the tin furnace. For example, when the set temperature is set to 260 degrees and the lower layer stop temperature is set to 30, it means that when the tin furnace temperature reaches 230 degrees, the lower layer heating contactor is disconnected, and the lower layer heating stops working.

3.6 PID parameter setting

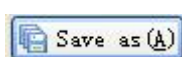
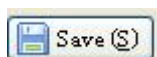
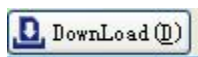
PID is the positive feedback control mode of temperature control. Accurately setting the PID parameters will be necessary to accurately control the heating temperature.

* When the P value is set (>50): Set the I value to between 30% and 50% of the D value. For example, when the D value is set to 300, set the I value between 150 and 200.

* When the P value is set (<50): it is manually controlled. When the D value is larger, the heating is faster, and the accuracy of the temperature control may be lower. On the contrary, the slower the heating, the higher the control accuracy (it is recommended that the D value should be as small as possible without falling off the temperature, the maximum value of preheating D should not exceed 50, and the maximum D value of solder pot should not exceed 100)-see **blow pic**

PID		
Tin:	P	30.0
	I	150.0
	D	30.0
Preheat 1:	P	30.0
	I	1.0
	D	30.0
Preheat 2:	P	30.0
	I	1.0
	D	30.0
Preheat 3:	P	30.0
	I	1.0
	D	30.0
Preheat 4:	P	30.0
	I	1.0
	D	30.0

Note: The formula must be downloaded after all parameters are set.





4. Inverter operation

4.1.Parameters setting

The parameters of the inverter have been set at the factory, generally do not need to be reset; if you need to reset, please refer to the inverter manual and the following factory default settings;

*There are 3pcs of inverter in the machine, which respectively control conveyor, wave 1 and wave 2; For normal operation, its parameters can be set in software; wherein the conveyor speed is a dynamic value, the system will adjust automatically according to the set conveyor speed. The wave speed is a frequency value (Hz); when normal, the internal parameters of the inverter are set at the factory, no need to reset; If the frequency is abnormal, the data lost, please refer to the followings to restore the data:

1. Press the “STOP” button on the control panel of the inverter to stop the motor;
2. Press the “MODE” button on the control panel of the inverter to enter the programming state.

The screen displays the following function number starting with “P”.

3. Press“▼”button or “▲”to select the function to be modified.
4. Press“E N T E R”button, The screen displays the current parameters of the function
5. Press“▼”button or “▲”to change the current parameter and press “ENTER” to confirm.

Modify all parameters as described above;

Press the “MODE” button to exit the programming state.

If you need to manually adjust the running frequency and manually control the operation of the inverter, you can change P00 and P01 to D00.

No.	Function	Original setting (manually adjust)	Default (Automatically control)
Wave parameters setting			
P00	Main frequency input setting	d 00	d 00
P01	Running instruction setting	d 00	d 01
Conveying parameters setting			
2-00	Main frequency input setting	00	01
2-01	Running instruction setting	00	01
9-00	Communication address	01	01
9-04	Communication format	01	01



Above are the settings of our factory Southern Machinery , other parameters are default value of the inverter factory; for more detailed technical description, please refer to the manual of the inverter.

5. Machine main section

5.1. Flux spray system

1) The system function

For this machine, it is recommended to use the clean-free flux (users can also choose other flux according to the actual situation), the nozzle through the compressed air, flux and air mixed after ejected, and from the compressed air will flux atomized into a certain shape. The sprayer is driven by a rodless cylinder (stepping motor) to reciprocate, and the flux is uniformly sprayed on the bottom of the PCB to form a uniform film. When not working, the nozzle needle valve is closed to isolate the flux from the outside air, reduce volatilization, maintain the flux proportion stable, and save flux consumption.

2) Air control box and its functions

There are 4 valves available for adjustment in the flux spray system portion, centrally located in a control box.

(1) The "spray size" regulating valve controls the flow rate of the injected gas, which has ejection effect on the flux. When the spray height is increased, the spray height decreases when the spray height is adjusted. However, if it is set too high, the flux will spray on the circuit board, and it will not easily get on the circuit board. Too small, too little flux injection;

(2) "Spray pressure" adjusting knob controls the spray pressure (generally 0.3Mpa is recommended);

(3) "Needle valve air pressure" adjusting knob controls the opening and closing of needle valve inside the nozzle, which will increase flux and decrease flux. Too large flux too large particles; Too small flux is too thin (the general pressure value is 0.4mpa is appropriate);

(4) The "isolated blade" regulating valve controls the air flow of the isolated blade to prevent flux from entering the preheating system and to evenly distribute flux on the PCB board surface.

3) Attentions

(1) The spray system of the machine has the function of self-cleaning: at the end of each spray, the control system will automatically close the flux passage, but the compressed air and flux



atomization system will remain open for about 1 second, so as to blow the residual flux on the nozzle clean, keep the pinhole on the nozzle clean and smooth;

(2) The counting photoelectric switch (located in front of the spray tank) should be kept clean on a regular basis. After work every day, wipe the photoelectric switch lens surface with a little alcohol soaked in a soft cloth, so as to avoid too much scale, affecting the detection;

(3) Do not change the regulating valves on the fog control box after adjustment, and do not operate the machine by non-local operators to avoid bad spray

5.2. Preheater system

1) The system function

The preheater is a heating cabinet made of high temperature resistant stainless steel. The heating pipe is placed in the heating box. When the power is on, the PCB passing above is pre-heated to activate the flux at the bottom and remove the pollutants (oxides, oil stains, etc.) on the metal surface at the solder joint and the element foot, so that the flux can give full play to the best welding effect. At the same time, the water content in the flux will evaporate, remove the volatile solvent, inhibit the generation of solder bubbles. In addition, the increase of PCB and component temperature helps to reduce the distortion of PCB board during welding and the component damage due to too fast temperature rise

2) System maintenance

(1) Often pay attention to whether the power supply voltage is normal, too high voltage will cause heat pipe overheating and burn out;

(2) When the temperature of the preheater is too high due to abnormality, the control circuit will automatically cut off the power supply of the preheater and give an alarm to protect the temperature control and heater parts.

(3) If the temperature value displayed in the temperature control table exceeds the set value too much to be stable during operation, it may be that the contactless switch has been broken down, or the heating pipe has been burnt out, it shall be replaced and the reason shall be checked.



(4) Regularly test the temperature of PCB substrate bottom with temperature measuring instrument to ensure the best soldering effect;

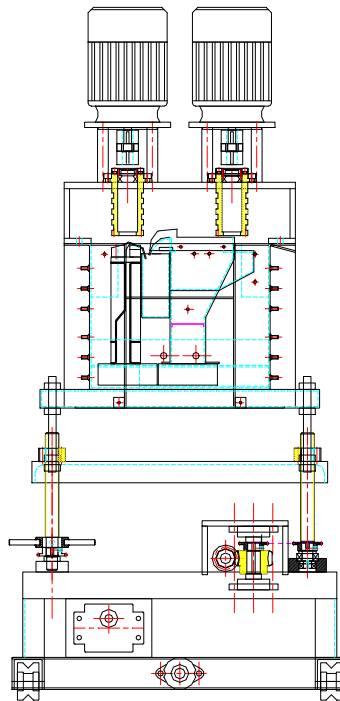
(5) Regularly clean up the impurities deposited on the bottom of the preheater (remove the movable bottom plate of the preheater from the back for cleaning)

(6) Check regularly whether the wire is aging to prevent electricity leakage.

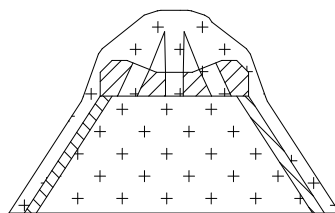
5.3.Soldering system

1) . Function

Dual wave solder pot includes wave 1 pump, wave 2 pump, solder pot and trolley.

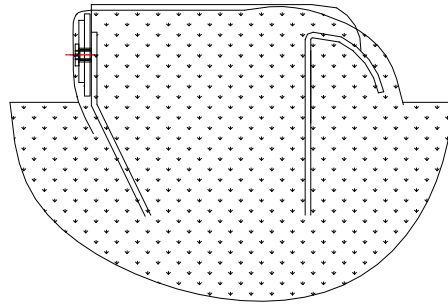


2). Wave 1: the cylinder of the solder pump is a turbulent wave, which is mainly used to wash away the solder flux at the bottom of the PCB and the solder joints.





3). Wave 2: steady tin wave ejected from the tin pump further modifies the wetted but irregular solder joint to make it perfect. The height of the wave crest is regulated by a frequency converter that controls the motor speed of the tin pump. The size of reflux can be controlled by adjusting screw 2, thus the welding quality can be controlled conveniently.



4). Replace the heating pipe of the soldering pot

If the time of the pot rising to the normal working temperature becomes longer, it can be preliminarily concluded that the heating pipe of the pot has been partially damaged, and it shall be replaced by the following steps:

(1) Cut off the power supply, control the manual control box of pot measurement, and remove the pot device;

(note: lower the pot or raise the PCB transmission guide rail before removing the pot)

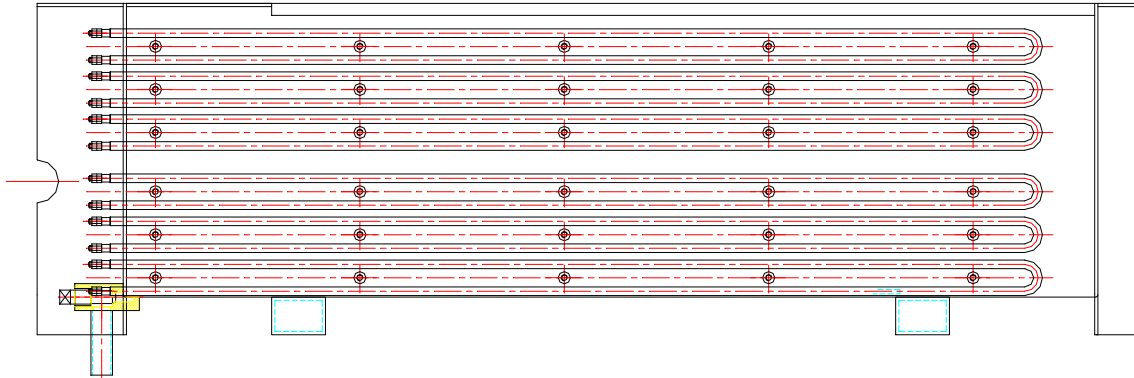
(2) Remove the cover plates on both sides of the pot and take out the heat insulation cotton;

(3) Remove the high temperature connection line of the damaged heating pipe and extract the damaged heating pipe;

(4) Replace with a new heat pipe, restore the line, put back the insulation cotton; Install the cover plate;

(5) Move back to the pot and connect to the power cord;

(6) Adjust the tin furnace and PCB transmission guide rail to the normal working position.



5).Replace the solder

If there are too many impurities in the pot or the solder needs to be replaced after a certain period of time, please follow the steps below

- (1) The pot temperature rises to about 270 ° C, and then cut off power supply
- (2) Open the nozzle and release the liquid solder
- (3) After solder finished, before the solder has not solidified, close and tighten the nozzle (note that the force should not be too strong when closing, just a little force), in order to prevent the flow of solder
- (4) Add fresh liquid solder

Warning : When replacing the new solder, the sprinkler head inside the pot should be removed first and cleaned carefully to prevent the deterioration of the solder strip due to the different composition of the new solder. After the pot is cleaned, it is not necessary to install the nozzle first, but to heat up the pot first, and while heating, apply a new solder strip on the heating side of both sides of the pot to melt it; Try to speed up, do not let it red and dry burning; It is strictly prohibited to throw solder into the pot when adding for the first time, otherwise the pot will be damaged due to dry burning; Keep daub for a period of time, until the pot has more than 1/3 of the molten solder, then stop heating up installed nozzle, and then put the new solder into the pot melting, until the standard level is reached.

6).Maintenance and repair

- (1) There is a nozzle at the bottom of the pot, which is used to drain liquid solder out of the pot when cleaning the pot.
- (2) Always observe the height of the solder surface in the pot, and the liquid level (refers to the state when the pump is not working) shall not be lower than 15mm of the solder surface



(3) Solder temperature is often measured with a mercury thermometer to prevent the temperature controller from showing too much difference from the actual temperature, affecting the quality of welding

(4) .Remove oxides from pot (at least once a day) and replenish anti-oxidation wax

(5) Check the pot power cables every half a year, and replace the aged cable in time

(6) When the temperature of the pot is too high due to abnormality, the control circuit will automatically cut off the heating power and give an alarm to protect the temperature control and heating parts. If there is too much deviation between the display temperature and the set temperature value during operation, it cannot be stabilized, which may be because the contactless switch has been broken down, or the heating pipe has been burnt out, it shall be replaced and the reason shall be checked

5.4. Transmission system

1) .The system function

The transmission system consists of transmission motor, chain and control parts. Its function is to transport PCB smoothly and complete a series of soldering process. The control part is composed of speed governor, speed measuring parts and PC, etc., to realize the adjustment and monitoring function of transport chain speed.

2) .Daily maintenance

①Grease transmission chain and guide rail once a month

②When the transmission system is in operation, do not put hands or sundries into the chain to affect the normal transport;

③In case of emergency, press the "emergency" button immediately to terminate the operation in case of dangerous accident

3) . Replace finger

Note: Remove the chain cover from the PCB conveyor part, start the transmission motor, and close the transmission motor when the finger to be replaced is moved to the convenient place for your operation

1) Lower the spring plate, remove the replaced finger with a new one.

2) Install spring reeds successively and adjust the transport chain

3) Install chain protecting cover.

5.5. The claw cleaner

1) .The function of the finger washer



The finger washer consists of a water pump, a washer and an alcohol tank. It is used to clean the flux that is stained on the transmission finger.

After pressing the "clean " switch on the main control panel, the water pump draws the alcohol in the alcohol storage box into the wash box. When the chain fingers through, alcohol infiltration of the brush to clean the chain finger. The alcohol in the box is filtered and returned to the liquid storage tank for recycling.

Warning: alcohol is flammable. Use with caution to prevent fire.

2) .Daily maintenance

- (1) Always check the amount of alcohol in the washing box, and supplement it in time to ensure the effective cleaning of finger. In addition, the general should be added to the 4/5 position; If less than 1/3, it should be supplemented;
- (2) When the brush wear, should be promptly replaced

5.6. Infeed trail

1) .The function

The loading guide device is located at the entrance of the wave soldering machine. It is divided into two symmetrical parts. Its main function is to connect with the upstream machine online, and guide the PCB into the wave soldering machine at a certain Angle and speed.

2) .Daily maintenance

Whether it is belt drive or chain drive, although the structure is simple, but its operation is stable and smooth, directly related to the performance of the whole machine. Therefore, it is necessary to pay attention to the routine maintenance loading guide device.

3) .Daily maintenance of belt driving loading guide

- (1) Always check the belt and pulley for slipping. If there is skidding, the two connecting belts will not be synchronized, resulting in the PCB cannot smoothly enter the wave soldering machine. It even blocked the whole production line. This phenomenon is caused by wear and tear or elongation of the belt after long-term use. At this time, it can be solved by adjusting the "belt tensioning wheel" and appropriately increasing the belt tension. If not, consider a new belt
- (2) Always check the belt for deflection. Belt deviation will make the belt and pulley off, resulting in the machine cannot work normally, the fault is mainly caused by the belt wheel shaft loose or wear. Just re-tighten the belt wheel or replace the new belt wheel can be solved
- (3) The belt guide is not parallel. If this situation is serious, it will cause the PCB into the board is



not free or card board. When adjusting, first loosen the "tightening screw", and then carefully adjust the "adjusting screw" to make both side guide rails parallel.

(4) Improper width of belt guide rail and PCB will cause board drop phenomenon. According to the width of PCB, loosen the "fixing screw", move the "fixing Angle iron", and coordinate adjustment on both sides to make the width of guide rail 0.5 ~ 1MM wider than PCB (as determined by the size tolerance of PCB).

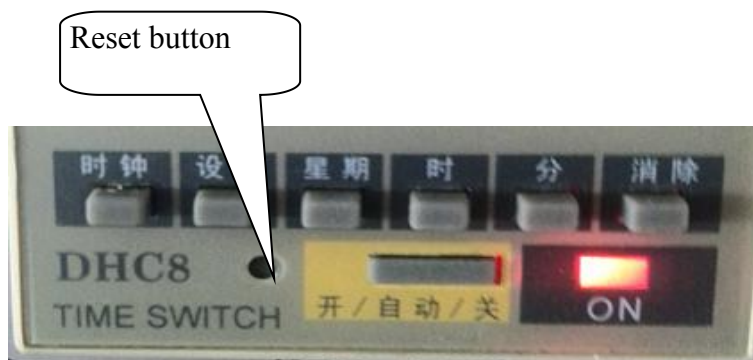
4) Daily maintenance of chain driving loading guide

(1) When the sprocket wheel meshes with the chain, the tooth skipping phenomenon occurs. This situation is generally due to insufficient chain tension or chain wheel and serious wear and tear. Just adjust the "tensioning wheel", increase the tension appropriately (but not too tight) or change the sprocket and chain

(2) If the chain guide rail is not parallel or the width is not appropriate to the PCB width, the board will fall off. The adjustment method is similar to that in item 3 and 4 of the routine maintenance and repair of the flat belt transmission inlet connection device. Put a drop of oil on the sprocket every two days.

6. Instruction of Timer

Instructions for use: (the time controller is not used for a long time, it needs to be charged every three months, and the charging time is more than 12 hours)



1) . If the time controller does not display when it is used for the first time or after long-term use, please open it by pressing the small hole in the lower left corner with a small object after power on.



2). When the machine is turned on, the time controller is in 24-hour system. If 12-hour system is needed, please press and hold the "clock" key for 5 seconds, and am will be displayed in the upper left corner of the display, indicating that it is in 12-hour system. Press 5 seconds to return to the 24-hour system. At this time, the AM display is off. (at 12 hour time, am means morning, PM means afternoon)

3) . Set the switch time: (if the set switch time is the same, the relay of the time controller will engage for 30 seconds)

Step press key to set item

- (1). Press (set) to enter timing on setting (display 1 on)
- (2). Press (week) to set whether every day is the same, or monday-5 is the same, Saturday day is the same, or every day is different (if every day is the same, you can not press this key, at this time, the week will not be displayed, and you do not need to press this key to calibrate the clock)
- (3). Press (hour) (minute) to set the opening time
- (4). Press (set) to enter timing off setting
- (5). Press (hour) (minute) to set the closing time
- (6). Press (week) if the set closing date is the same as the opening date, you can not press this key
- (7). Repeat steps 2-6 to set the time of the 2nd-8th switch
- (8). Press (clock) end time setting

Setting steps:

Steps	Button	Setting items
1	Press(设定)	Enter timing on setting(display 1 ON)
2	Press(星期)	Set the same every day, or the same week, 1-5, the same week, 6-day, or different day(if the day is the same, you don't need to press this key, the week is not displayed at this time, and you don't need to press this key while correcting the clock)
3	Press(时)(分)	Setting the time for automatic turn on
4	Press(设定)	Setting for automatic closing
5	Press(时)(分)	Setting the time for automatic closing
6	Press (星期)	If you set the off date to the same as the on date.don't press this key
7	Repeat steps of 2~6	Set the time for the 2-8th switch
8	Press (时钟)	Time setting is over



*If you do not need 8 switches for timing, press the (clock) key to enter the clock correction

*If the setting is wrong or the setting is cancelled, press the (clear) key once to restore the original setting

*No timing display (- -: --).

4) . Clock correction

(1).press and hold (clock) and press (week) repeatedly until the day. (if the daily setting switch time is the same, you can directly correct the hour and minute without pressing this key.)

MO	TU	WE	TH	FR	SA	SU
星期一	星期二	星期三	星期四	星期五	星期六	星期日

(2). press and hold (clock) and press (hour) or (minute) to correct the time.

5) . After completing the above operations, press the "on / Auto / off" key, please make sure to turn on or off in the set automatic control time according to the current time, so that the downmost display of the display is on at (on / auto) or at off (auto / off)

Note: 设定=Setting; 星期=Week; 时=Hour; 分=Minute; 时钟=Clock

Display	Express
ON AT	It indicates that the timer is in automatic control and is on
AT OFF	It indicates that the timer is in automatic control and is off
ON	It indicates the connect point is on, but the timer cannot follow the setted time to switch on/off
OFF	It indicates time is in the long-off state, and the setting time of Auto Turn on/off is invalid

6) . **Check:** Press (set) key to check whether the set time is correct.

7) . **Modify:** press the (clear) key at the setting position, and then reset the time and week of the timing switch.

8) . **End inspection:** Press (clock) to end inspection and setting, and display the clock.

9) . **Manual control:** Press (on / Auto / off) key to switch at will.

10) . **The physical diagram of time system is as follows:**



Attention

- (1) . The setting of switching time cannot be cross set. It should be set in the order of time.
- (2) . When implementing timing switch control, it is necessary to set the status to reautomatic, that is, display on at or off
- (3) . The use environment shall meet the environmental requirements of the time controller, and shall not be used in the environment of vibration, impact, corrosion, dust, static electricity, high temperature and direct sunlight.
- (4) . Please store and use under rated voltage, specified temperature and humidity.
- (5) . The maximum current refers to the maximum current passing through the resistive load. The lamp current = rated current \times 30%. Please use it within the specified voltage and current range. If it exceeds the specified capacity, please use it directly with the AC contactor.

7. Attentions in wave soldering adjustment

7.1.How to reduce the oxidation of solder

Solder tends to react with oxygen in the air to become tin oxide when the crest is rolling. We can reduce the oxidation of solder by reducing the contact area and contact time between solder and air.

- (1).the use of strong antioxidant tin.
- (2) the wave peak nozzle should be adjusted as small as possible according to the size of PCB board, and the width of wave peak is in theory proportional to the amount of oxidation, but in fact it may be higher, and the part of the wave peak that is sprayed up without flux will have a larger amount of oxidation, which can be used to solder PCB at the minimum.



(3) the wave peak height should be as low as possible to solder PCB, and the flat wave peak should be no more than 8MM.

(4) tin slag should not be too frequent cleaning, clean up the tin slag, only need to put the vents and affect the normal flow channel flow of tin slag can be cleared, the amount of tin slag powder can isolate the oxygen in the air and soldering direct oxidation, cleaning up only when the tin slag, tin slag cleaning powder, the soldering of the package can be dissolved separation, can our tin stove adopts adjustable system, the structure is more complex, clean up the tin slag may need to be more careful.

7.2.How to improve soldering quality

Wave soldering quality is determined by many factors: PCB design, flux ratio, operator experience, and correct use of wave soldering. Spray flux onto PCB board; Preheat the PCB to the flux of the reactive temperature, as long as more than wave soldering can satisfy several conditions we analyse the situation carefully, serious debugging welding quality to meet our requirements, when the welding quality is not ideal, we should carefully adjust the temperature of the stove, transportation speed, Angle of guide rail, wave height, the whole process is likely to debug a few hours or longer to meet the requirements. Common welding quality problems are as follows:

1) Bridged and sold soldering

Check if there are too much even soldering, and virtual soldering need to consider whether or not the flux suitable (flux affect welding quality ratio is larger, the different PCB, choice of different technology, different temperature and flux of the formula is slightly different, even there are differences between the different batches of flux performance, are likely to affect the soldering quality, the careful selection of the flux can effect will be of great help, in this case can call supplier to debug with wave soldering flux for their goods, they are often easy to debug better soldering effect)

2) Disturbed solder

If there are holes in the solder joints, there are reasons:

(1) : PCB is damp, which means your PCB has been in the air for too long. Warm up a little higher and slow down the chain speed.

(2) : your PCB solder pad may be nickel-plated, because nickel-plated has a strong thermal collision reaction, only the rosin-type flux can stabilize it.

(3) Flux spray is over while preheat is not enough.



3) Tin tip

- (1). Wave soldering tip is mainly caused by solder too late to shrink when cooling, and the fluidity of solder and flux activity. If you cannot change the two, you can improve the tenting phenomenon by increasing the welding Angle and accelerating the chain speed. If there is lead, the time above 183 degrees should be controlled at about 40 seconds, and the time when the maximum peak temperature is above 225 degrees should be 2-3 seconds (refers to the measured temperature of PCBA board surface). In general, the chain speed is directly proportional to the temperature control, that is to say, the faster the chain speed, the higher the temperature will be, and vice versa.
- (2). Flux inactivity: when flux activity is fully stimulated after the first wave, it is insufficiently active by the second wave and thus tends to tip
- (3). High copper content: please test whether the metal elements in the tin composition are within the control, if the copper content is high, the poor flow of tin will also have this phenomenon.
- (4). Solder joints too large: please see if the solder tip is in a large position, in which case the design problem is that the solder tip is formed by too fast heat dissipation.

But basically the main reason for all of this is the flux problem. Try a different flux

4) Bad soldering

If each soldering is in the same place, then the PCB board design should be analyzed

7.3. How to do emergency use

Used in the process, the possible equipment failure happens suddenly, but we can't stop production immediately, this time we need emergency use, so as not to delay the production, the most common problems are

1).wave motor does not turn

First of all we need to know the cause, points out whether it is mechanical or electrical control reasons, the first step: watch the frequency converter operation panel (FWD) and RUN (RUN) of the LED indicator light is bright, if show that the inverter output is normal. Step 2: we can rotate the impeller shaft of the wave crest. If the impeller of the pot is stuck, then we need to loosen the fixed screw of the impeller and adjust it slowly to find a moving interval. We can rotate the wave crest and then fix the screw until it can be tightened and turned normally. If the rotating shaft can rotate normally, it indicates an electrical fault. If the frequency converter can output normally, first measure whether the wave motor is damaged. If it is damaged, change a spare motor for



emergency use. If the indicator light of the frequency converter is not on and other indicators are normal, then you can turn off the economic operation (when the temperature is normal) to see if it can operate normally. If it can run temporarily, you can use it for emergency if there is no other reason. If the running light is still not on, use the m0-gnd ports of the short lead converter (these two terminals have two leads) for emergency use. If it does not rotate properly, the power of the wave crest motor can be replaced to another frequency converter for emergency use.

2). spray does not work properly

The spray cylinder cannot move the spray, which may be because the solder solenoid valve cannot be opened normally; At this time, we only need to observe the flux to that part, then we can preliminarily determine the problem point, and then disconnect the pipe to accurately determine the fault. If there is no emergency material, we can directly connect to emergency use. Spray can't move when the spray cannot meet the into mobile is generally limit switch or operation of the cylinder fine-tuning inspection method: can we look for the origin pick up into the switch and the work of grace position switch, push the nozzle or touched by metal with a screwdriver into the head of the switch indicator light work is normal, if not normal check power or change into the switch. If it is normal, the spray power can be turned off, the spray control box can be opened, and the experimental manual button on the mobile solenoid valve can be pressed by hand to see if it can be moved. Can not move the air supply or cylinder stuck or damaged, further inspection or replacement. If it can move, it means that the air supply or cylinder part is normal, but the problem lies in the electrical control part.

3). the conveyor chain fixed

Conveyor chain is not action, first we need to know the cause is a mechanical failure or electric control, the first step: open the door carefully observe the operation of the frequency converter operation panel lights in electric cabinet (RUN) and (FWD) is normally on, if on show that the inverter output. Step 2: we can take adjustable wrench at the plate up and down the shaft gently pull (, such as the gripper with shaft turn gripper didn't stuck, if not move may be variant serious gripper, and went into the gripper on board and the board is stuck to the steel flat bar, transferring chain jammed into the plate, gear deformation or damage to the mechanical failure, please check the above parts. Step 3: if change screen device haven't stuck a voltage output and gripper, conveyor chain or not, first of all, we first check the motor installed on the board end have no rotation, such as the motor turns the chain is not turn is likely to be caused the slippage 00.of the drive shaft gear or loose, such as motor not turn is likely to be motor burn out, a preliminary judge of the motor can be ohms range multimeter to measure motor phase, the resistance between the



normal motor resistance is almost the same phase to phase, such as the difference is too big that the motor is damaged.

8. Wave soldering machine operation training knowledge

Appendix 1: Soldering problems and solution

PROBLEM	REASON	SOLUTION
Solder sticking	Copper foil surface, component pins oxidized	Clean the oxidized components
	Flux proportion is not correct	Re-distribute flux
	Poor solderability of components	Check the component's quality
	Flux reacts chemically with copper foil	Check the flux quality
	Flux deterioration	Replace flux
	Insufficient immersion	Adjust the height of the wave
	PCB bent	Adjust the height of the wave and temperature
With solder column	Flux oxidation affects its fluidity	Check the flux and temperature
	PCB heat is not enough	Adjust preheating temperature
	Flux proportion is not correct	Check the flux
	Soldering temperature is too low	Check and adjust the temperature of solder pot
	Conveying speed is too slow	Adjust the speed
	PCB immersion is too deep	Adjust the height of the wave
	Copper foil area, the aperture is too large	Improve PCB design
	Poor solderability of components	Avoid long-term storage of components
Joint solder	PCB immersion time is too short	Adjust the wave or convey speed



Shenzhen Southern Machinery Sales and Service Co.,Ltd

Add :Rm 1806,Block 3, Jinyun COFCO, Qianjin 2 Road,Xixiang,Baoan District, Shenzhen City, China

TEL: 0755-83203237; FAX:0755-23240492 website:www.smthelp.com

	PCB heat is not enough	Adjust preheating temperature
	Flux proportion is not correct	Check the flux
	PCB design is not good	Improve PCB design
Poor solder joint gloss	Excessive impurities in solder	Check the solder purity
	Copper foil surface, component foot oxidation	Clean the oxidized component
	Flux quality is too bad	Check the flux
	Soldering temperature is not good	Adjust solder pot temperature
False soldering, air bubbles	Solder pot temperature is low	Check the temperature
	Flux quality is too bad	Check the flux
	Conveyor speed is too fast	Adjust the speed
	PCB moisturized and caused bubbles	Dry the PCB
	Copper foil area, the aperture is too large	Improve PCB design
PCB bent	Solder pot temperature is high	Adjust solder pot temperature
	Conveyor speed is too slow	Adjust the speed

Appendix 2: maintenance and repair

No.	Item	Operation	Cycle
1	Solder pot	Clean the oxide on the nozzle	Once a week
2		Change the solder inside the pot	Once a year
3		Keep the anti-oxidation oil covering the entire surface	Every 4 hours
4		Clean the dross around the nozzle	Once a day



Shenzhen Southern Machinery Sales and Service Co.,Ltd

Add :Rm 1806,Block 3, Jinyun COFCO, Qianjin 2 Road,Xixiang,Baoan District, Shenzhen City, China

TEL: 0755-83203237; FAX:0755-23240492 website:www.smthelp.com

5		Check the solder pot temperature	Once a day
6		Check the heaters connection inside the pot.	Once half year
7		Check if there is any shake or noise in the pump bearings.	Once a week
8		Check if there is any block in wave 1	Every 4 hours
9	Preheating	Open the preheater chassis to remove deposited debris	Once a week
10		Check if the set temperature matches the indicated one	Once an hour
11		Check the heaters connection in the preheating box	Once half year
12	Spraying	Switch alcohol/flux to clean the inside of the nozzle	Once a day
13		Soak the filter above the spray system in alcohol and wash it	Once a day
14	Sensors	Check all sensors if loose or normal sensing	Once a month
15	Cooling& exhausting	Check the cooling and exhaust fans to make sure they are working properly	Once a day
16	Conveying	Lubricate all bearings	Once a month

This manual only gives the regular maintenance time cycle, users can modify according to the specific actual situation

Appendix 4: Notes for users

Warnings:

- This machine can only be operated by professional maintenance and repair personnel or trained qualified personnel
- Before energizing, make sure the external input power is consistent with the rated voltage and current of the machine.
- This machine contains high temperature device and mechanical transmission, when



operating, should pay attention to personal safety

- The flux and cleaning liquid used in this machine are inflammable and must be equipped with necessary fireproof facilities

Attentions:

1. Please read the user manual carefully before operating the machine.
2. Please follow the maintenance instructions in this manual to maintain the machine.
3. Please do not install the machine near the electromagnetic interference source.
4. Do not change the software and hardware settings in the electric cabinet of this machine.
5. Please keep this manual properly for maintenance and inspection.
6. Both ends of the wave soldering machine must be strengthened to exhaust air, and the air flow in the exhaust pipe should be above 15 m³ / min;
7. Please check the equipment carefully before power on.