MDAWB SERIES

AUTOMATIC

HEAVY

WIRE

BONDER

OPERATION MANUAL

Preface

First of all, thanks for chosen our MDAWB Series ultrasonic automatic heavy wire bonder, thanks for your trust, and thanks for your support!

This model is specially used at auto sensor model inner connection wire bonding, also we get a full series of bonder for lithium battery pack wire bonding. This bonder is the achievements by the hard work of technic engineer, and strive creating of them. the MDAWB Series devoted the pressure automatic control technics、high power ultrasonic metal welding technics.

The excellent of the performance and the rich of the function represented our rich experience and professional on ultrasonic wire bonding field. it is also represented the domestic milestone of micro-semiconductor inner wire bonding.

so:

we are confident———providing good product, makes you leading the competitor.

we are confident———providing good service, make you fell satisfied and no worry.

we are confident———we work together, can make more value.

Please read this operation manual before operation the machine!

CONTENT

1 Summary

1.1 usage

MDAWB Series type ultrasonic heavy wire bonder is specially designed for auto sensor inner connection wire bonding, also this series wire bonder can suit for lithium battery pack wire bonding and semiconductor inner connection wire bonding by changing some fixture or enlarge the platform. we get full solution of ultrasonic wire bonding.

1.2 character

The Y Z axis is computer controlled motor driving and by precision guide transmission, bonding force also automatically digital controlled and the ultrasonic is very reliable, which get good bonding quality. also we can bonding dual points at first and second bonding, this will reduce the resistance when produce high power product.

1.3 main specification

power :AC 220V +-10% 50Hz, connecting to ground, consumer power 1000W.

1.4 ultrasonic generator

output power:0-30w+-10% adjustable. time:10-500ms+-10ms.

frequency:58-63kHz auto capture and tracking transducer resonant frequency >=5kHz. start capture less than in 5ms.

1.5 transducer

resonant frequency: 60+-2kHz

frequency drift range:<=0.5kHz

continuously max input power:3w

pulse max input power:50w

1.6 bonding tool and bonding wire range

bonding tool range: 5-20mil; wire diameter range:5-20mil

1.7 bonding force: adjust range:0.30-12N+-10%(30-120g)

control mode: automatic tracking closed-loop control.

1.8 worktable stroke:XY-200*250mm.

1.9 environment requirement

clean no dust, temperature:20-28 degree,humidity <70%RH

no other vibration, machine must be fixed stable.

we should be care for the environment requirement, if too much dust, the precision will be down, and the lifetime will be shut

down,if the temperature too high and other vibration, also reduce the bonding quality.

weight:~500kg

dimension:810mm*620mm*1558mm(L*W*H)

2,working principle and main structure

2.1 ultrasonic bonding principle

The ultrasonic generated by the ultrasonic generator, translate to high frequency vibration by the transducer, go through the amplitude rod to the bonding tool, the bonding tool contact the wire, under the pressure and the vibration, the wire and the bonding pad friction, the oxidation film was broken, and the wire and pad perform plastic deformation, two metal face contact closely, joint in atom distance, at last, a solid metal bond was formed.

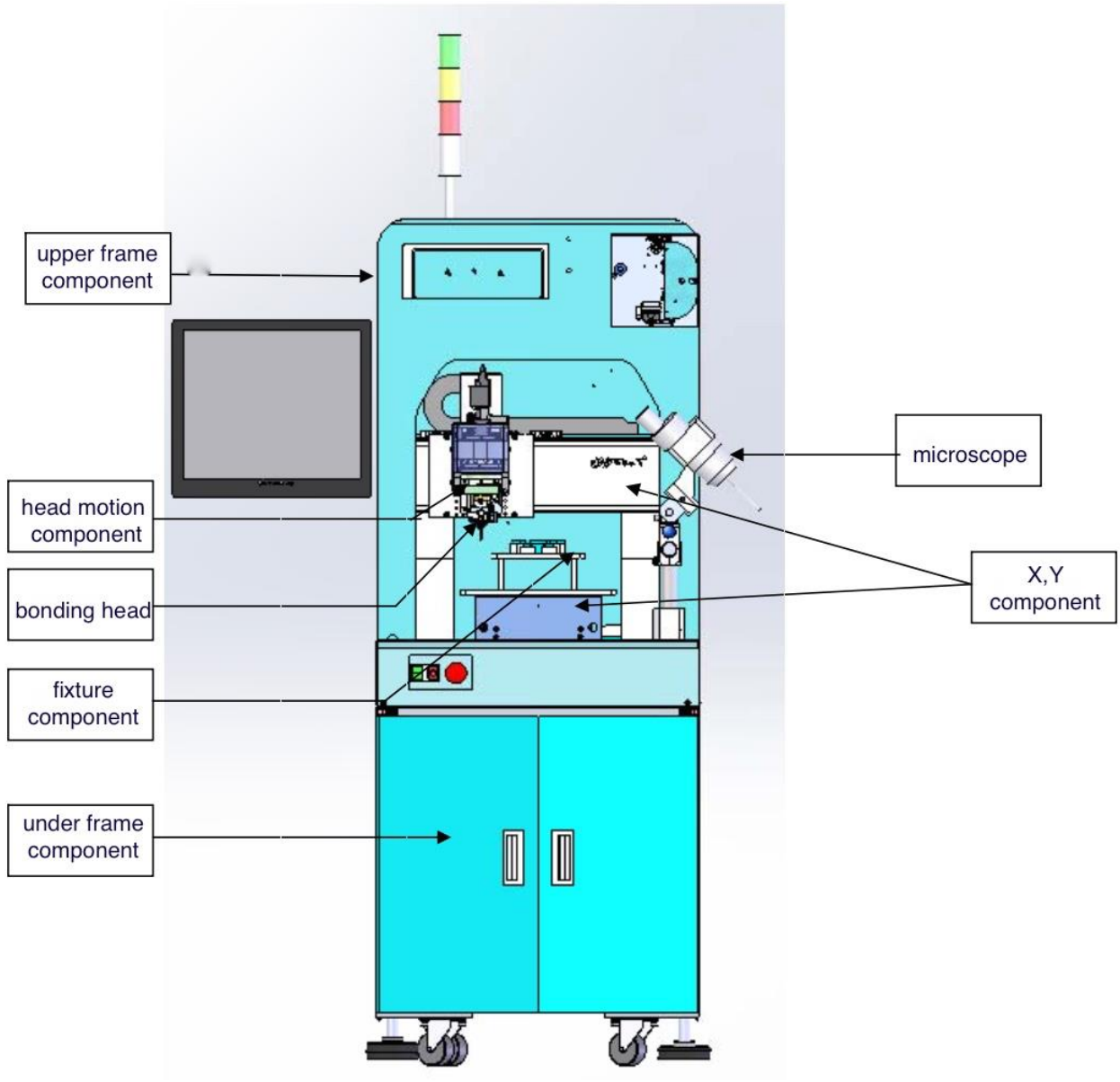
2.2 machine working cycle

working cycle defined as bonding 1 wire. after bonding head detect the height,it will start the process, bonding head goes to the 1st bonding aiming position, then the bonding head slowly goes down, the wire contact the pad, the contactor on the machine open, the bonding happen at the set power and pressure and time. this is the 1st bonding. after that, bonding head goes up, the

contactor on the machine close, the bonding head goes to the height we set, and the Y axis move the head to the 2nd bonding position, the bonding head goes down to the 2nd aiming position, and then goes slowly down, make the wire contact the pad, the contactor on the machine open again, the 2nd bonding happen under the parameter we set. then the bonding head goes back and up, pull the tail wire a little, then the cutter working to cut the aluminum wire, the bonding head goes up to the initial position, the bonding cycle finished. repeat to goes next cycle.

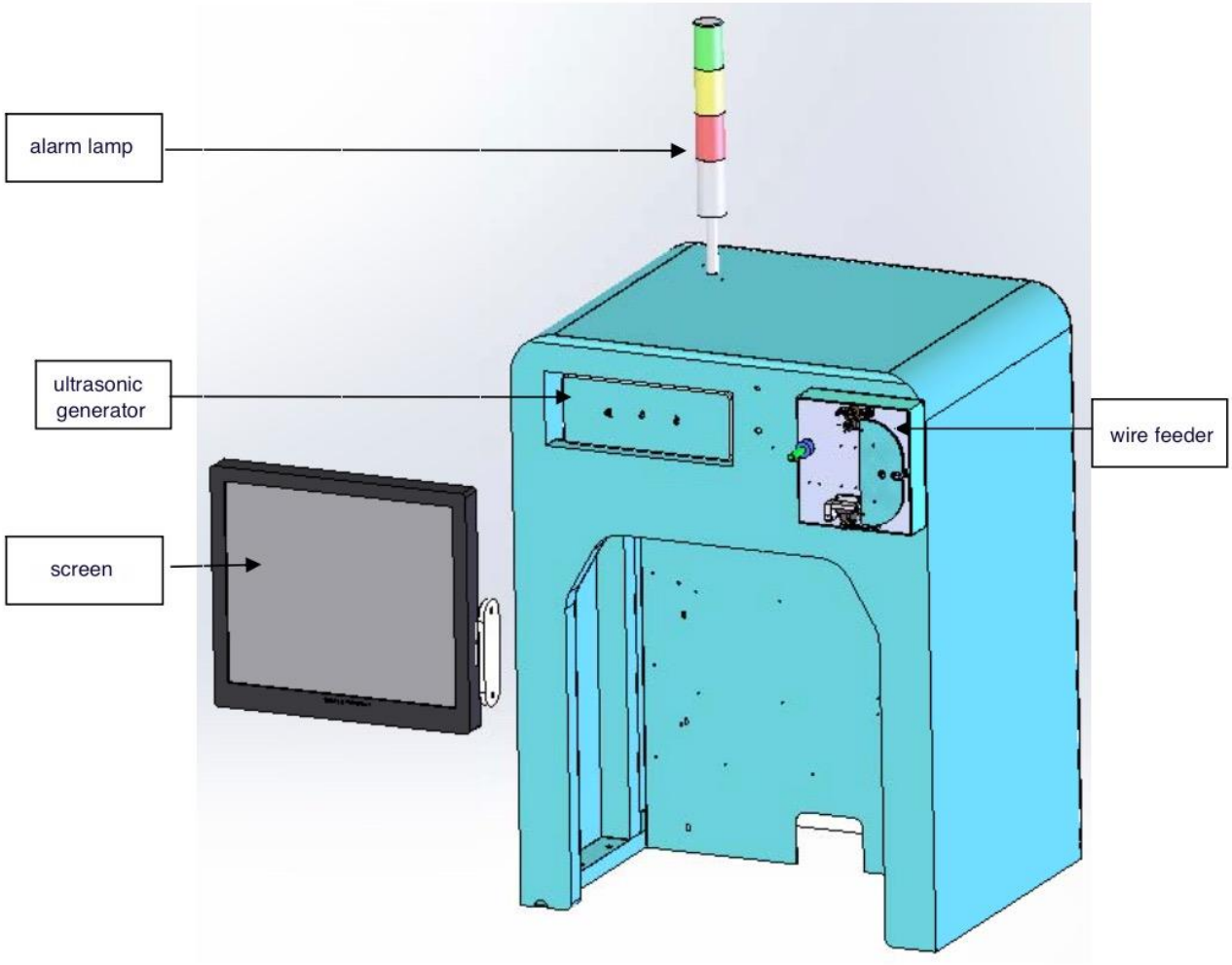
2.3 main structure

MDAWB Series main including 4 parts, they are upper frame component;under frame component;bonding head;XY aixs module.

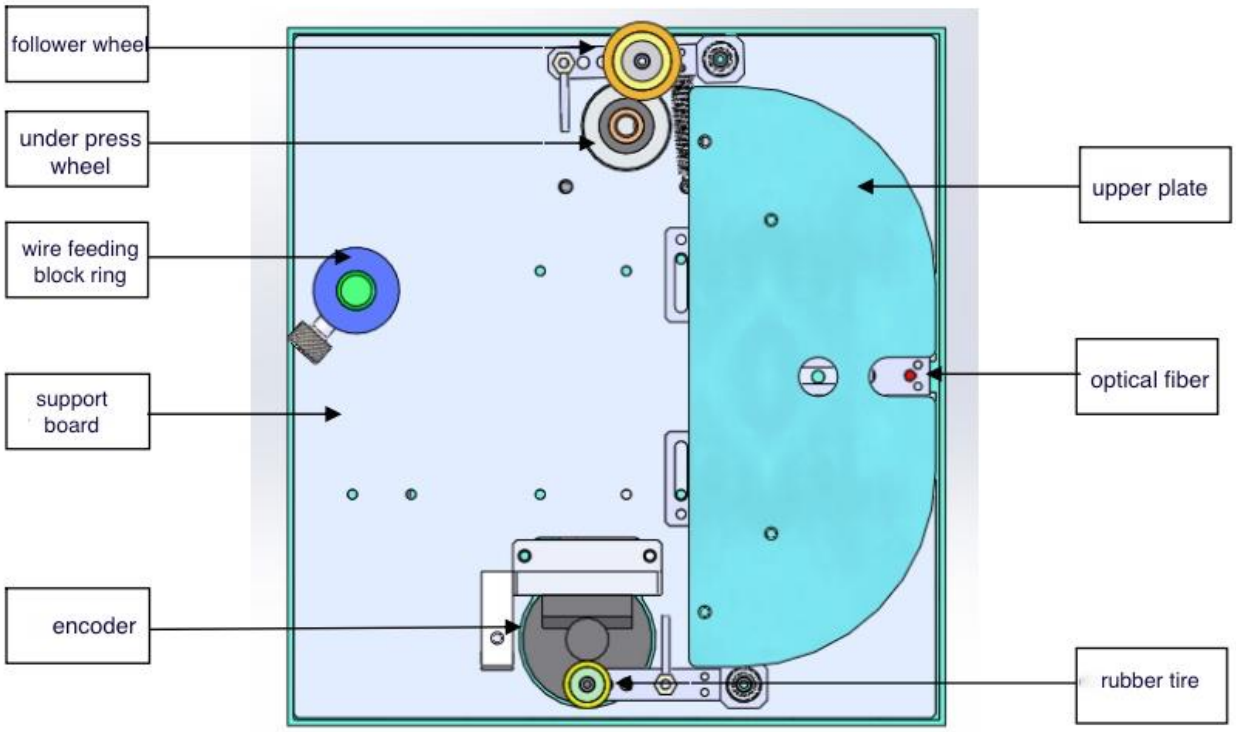


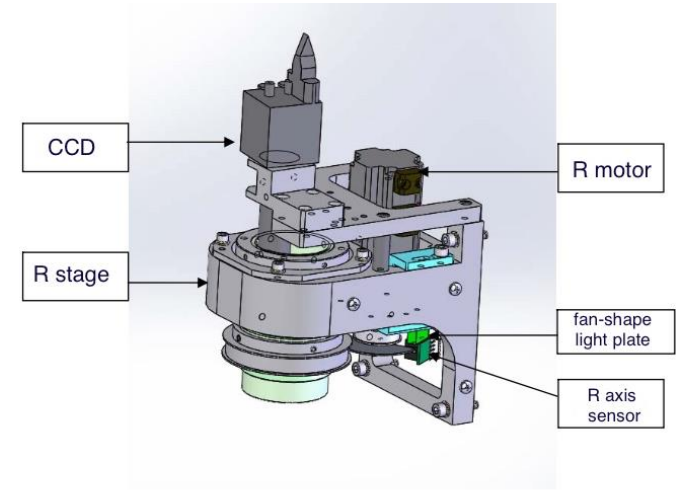
MDAWB-3030S

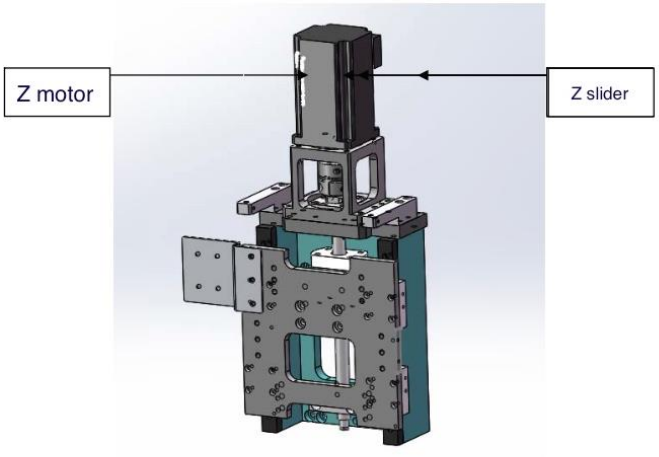
2.3.1 upper frame component: including frame,ultrasonic generator fix area, display fix area, alarm lamp fix area.

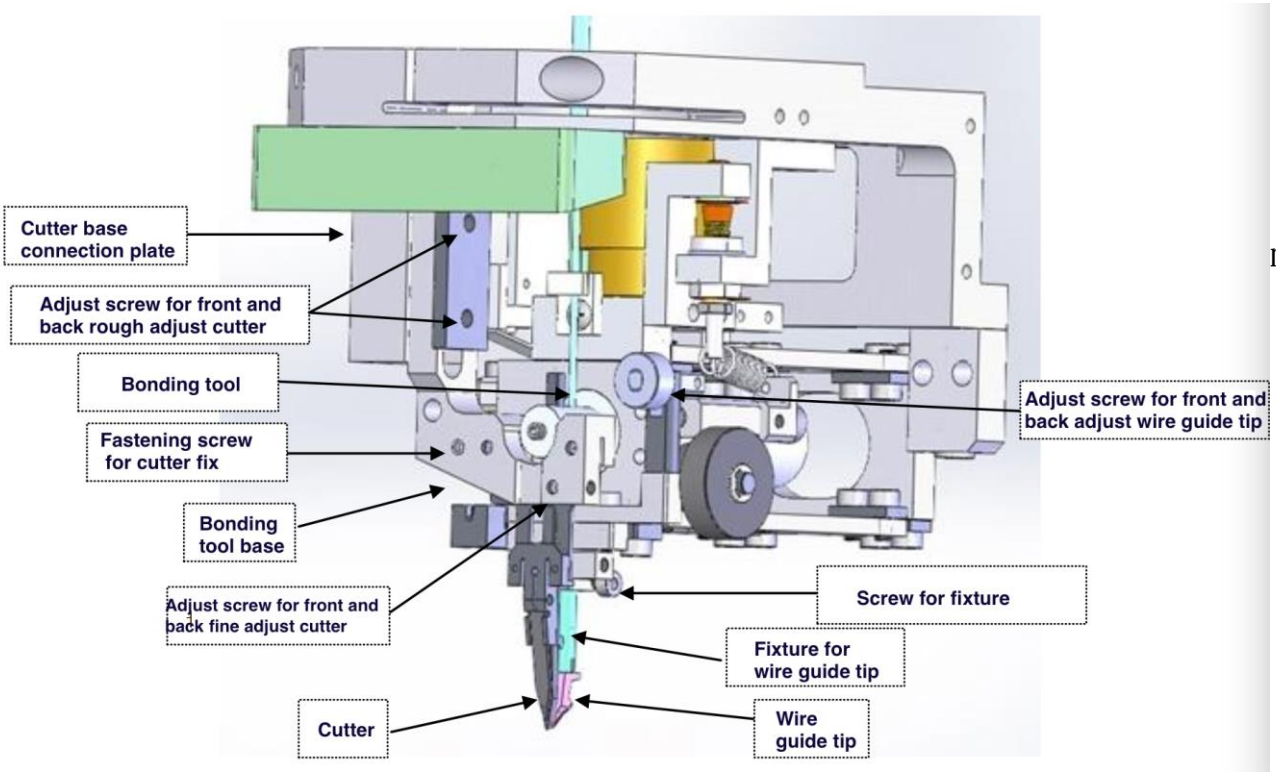


2.3.2 bonding head component: including Z axis component, R stage, wire feeding system and others. bonding head is the core part of the machine.


follower wheel
under press wheel
wire feeding block ring
support board
encoder
upper plate
optical fiber
rubber tire

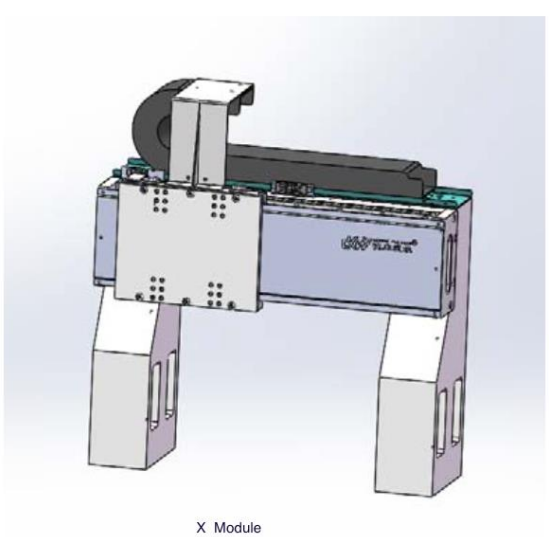

CCD
R motor
R stage
fan-shape light plate
R axis sensor

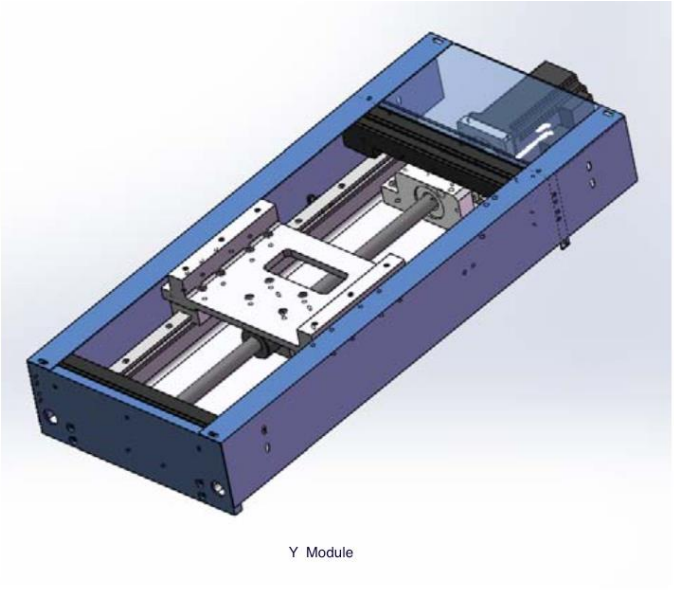

Z motor
Z slider



2.3.3 XY module component:

including X and Y module, this decided the bonding area.

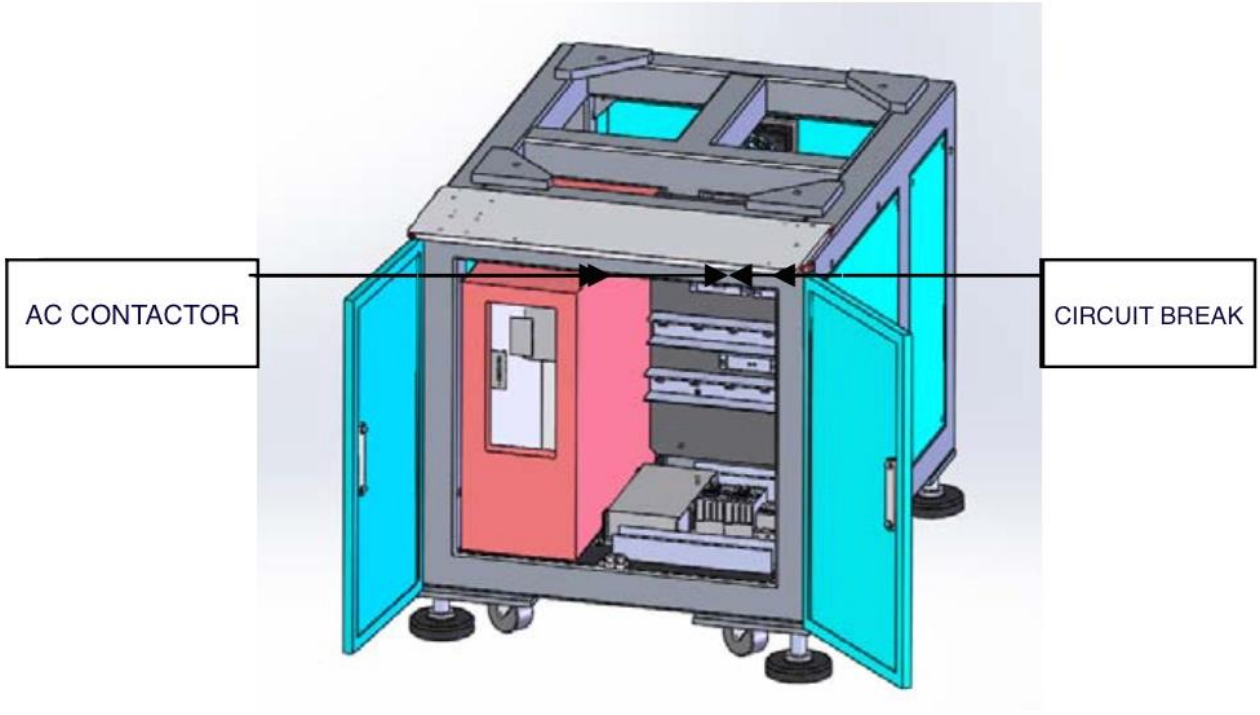


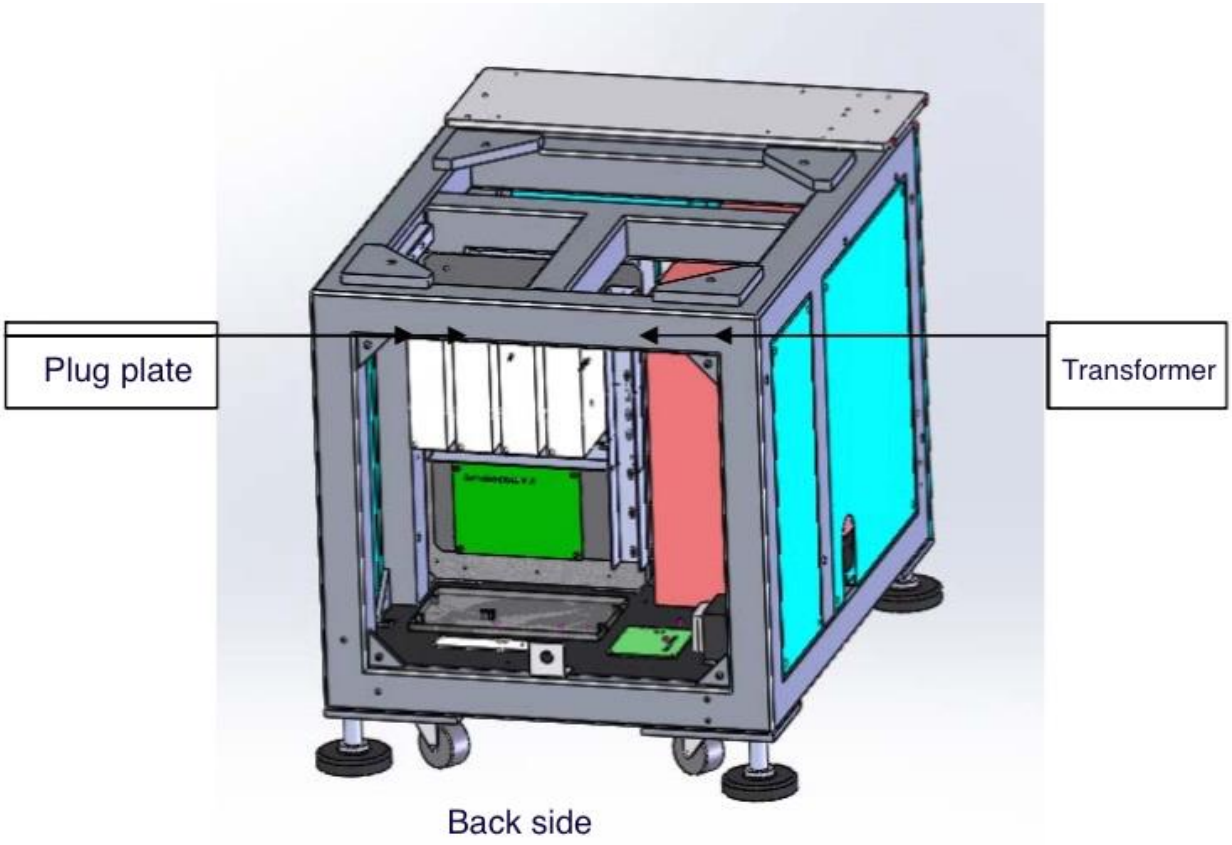


2.3.4 under frame component:

including marble bass, electrical component and computer. behind the under frame, it is the electrical control system and the power

supply area.





Back side

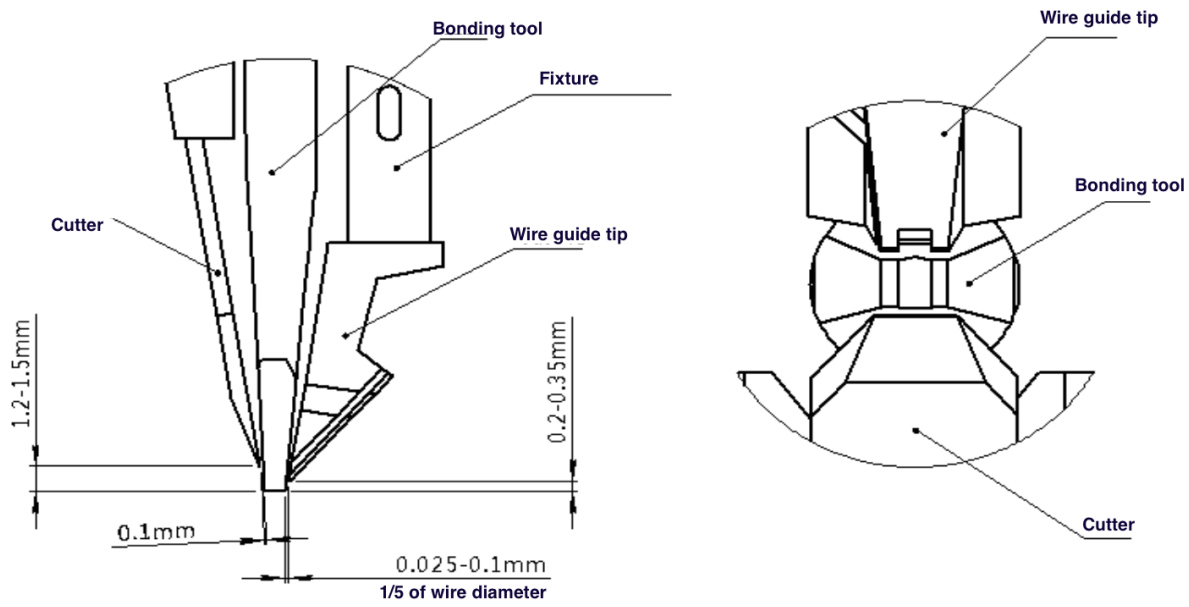
2.3.5 fixture module component

if for electronics product, need to make fixture according the products, if for battery pack, only the pallet holder.

3 assembly and adjustment

3.1 aluminum wire assembly

be sure the diameter of the wire is right, put the wire to the rod, and lock the block ring(the block ring should not be too close to the wire, make sure the wire roller can rotary easily). the wire goes through the guiding device/wire break detect sensor/guide tube/guide hole on transducer/and the guiding tip, the wire cross is finished.



Cutter/bonding tool/wire guide tip position

3.2 bonding tool,guide tip, cutter assembly: like below picture:

for better understanding, see below bonding head structure:

3.2.1 bonding tool assembly

step 1, put the bonding tool through the hole on the transducer(the flat side face operator), make sure the feeler block contact the bottom of transducer and be vertical.

step 2, press from the top of bonding tool,make sure the bottom of bonding tool contact to the top of the feeler block, fasten the screw to lock the bonding tool. the screw must be locked tightly. tight reference : use our thumb lightly press the corner of the screwer, make sure the screwer contact the bottom of the screw, we hold the longer side of the screwer, clockwise rotary the screwer, until the screwer goes to 15 degree, then release the screwer. repeat 2 times.

NOTICE:

1, make sure the screwer will contact the bottom of the screw, to protect the screws thread from being damaged.

2, the screw of lack the bonding tool must be replaced to a new one after using 10 times, if the thread is lightly broken during 10times, it need to be replaced earlier. or, if the thread broken, the screw will stay in the hole of transducer, will be hard to move out and the bonding quality will be reduced.

3.2.2 wire guide tip assembly

after cross the wire from the wire tube to wire guide tip, put back the wire guide tip to the wire tube, and then put the wire guide tip to the tip fixture, make sure the assemble line been

marked on it contact to the fixture.

3.2.3 cutter assembly

step 1, assemble the cutter to the cutter base from the left side, adjust the cutter height comparing the bonding tool, the bottom of cutter should be 0.2-0.5mm higher than the wire.

step 2, lock the screw to fix the cutter(notice, when we fasten the screw, mack sure the cutter is vertical, and the cutter and the bonding tool is aligned) .

3.3 wire guide tip and cutter adjustment

3.3.1 wire guide tip adjustment

step 1,loosen the screw on wire guide tip fixture tube, then the tube can rotary and can be moved up and down, adjust the tube, make sure the tube and the bonding tool is aligned, and the bottom of the wire guide tip is little higher(a wire diameter higher) , then fasten the screw.

step 2, clockwise adjust the adjust screw for front and back adjust the wire guide tip, the distance between bonding tool and wire guide tip will be bigger. or it will be smaller(notice: the distance smaller the better, but the wire guide tip can not touch the bonding tool).

step 3, cross the wire from wire guide tip to the hole of bonding tool, make sure when we pull the wire, it is smoothly and no block, and no injury the wire surface.

3.3.2 cutter adjustment

step 1: rough adjust. loosen the adjust screw for front and back

to rough adjust the cutter(front and back, upper and lower), when the cutter is about 0.5mm to the bonding tool, fastening the screw.

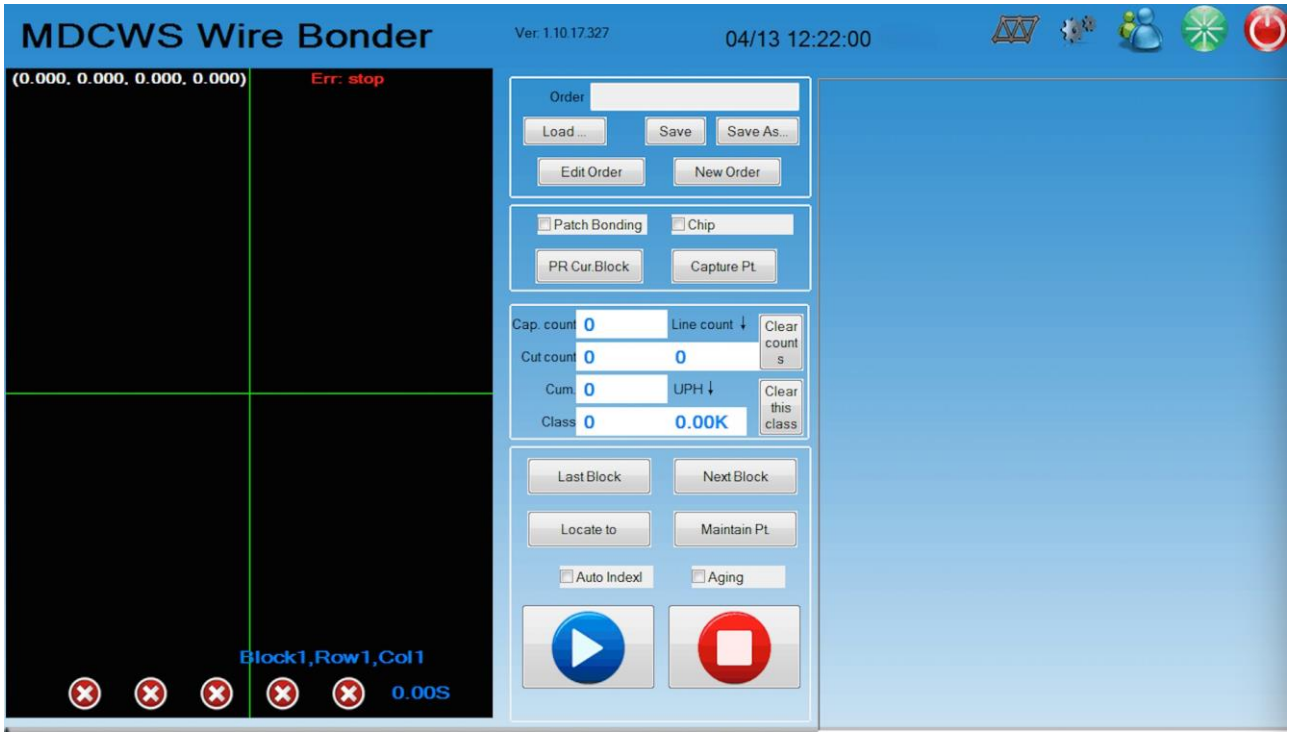
step 2: fine adjust. turn the adjust screw to fine adjust the the cutter, make the cutter as close as to the bonding tool, but when the wire diameter is thicker than 300um, we should keep a little distance between the bonding tool and cutter, to improve the reliability, how long we keep the distance is decided by how long we want the tail wire at 1st bonding.

step 3: after adjust the bonding head . take a full check,make sure every detail is ok, then goes to next process.

4 software interface introduction

double click the software then we can go into the interface. it is divided in 3 area: picture display area, work order

area,bonding point ranking display area.



4.1.1 picture display area:

The picture display area is for pattern collection by the CCD system, it is useful to location the bonding position, operator can program the bonding process.

4.1.2 work order area

The work order area is used for edit files according product, we can collect the pattern and recognition and location, and we can set the life time of the bonding tool/cutter/wire guide tip and even the productivity. when reached the life time, the machine will alarm us.

4.1.3 bonding point ranking display area

This area is show the bonding track which we programed at work order profile. and it shows all the bonding point we will do.

5,software introduction

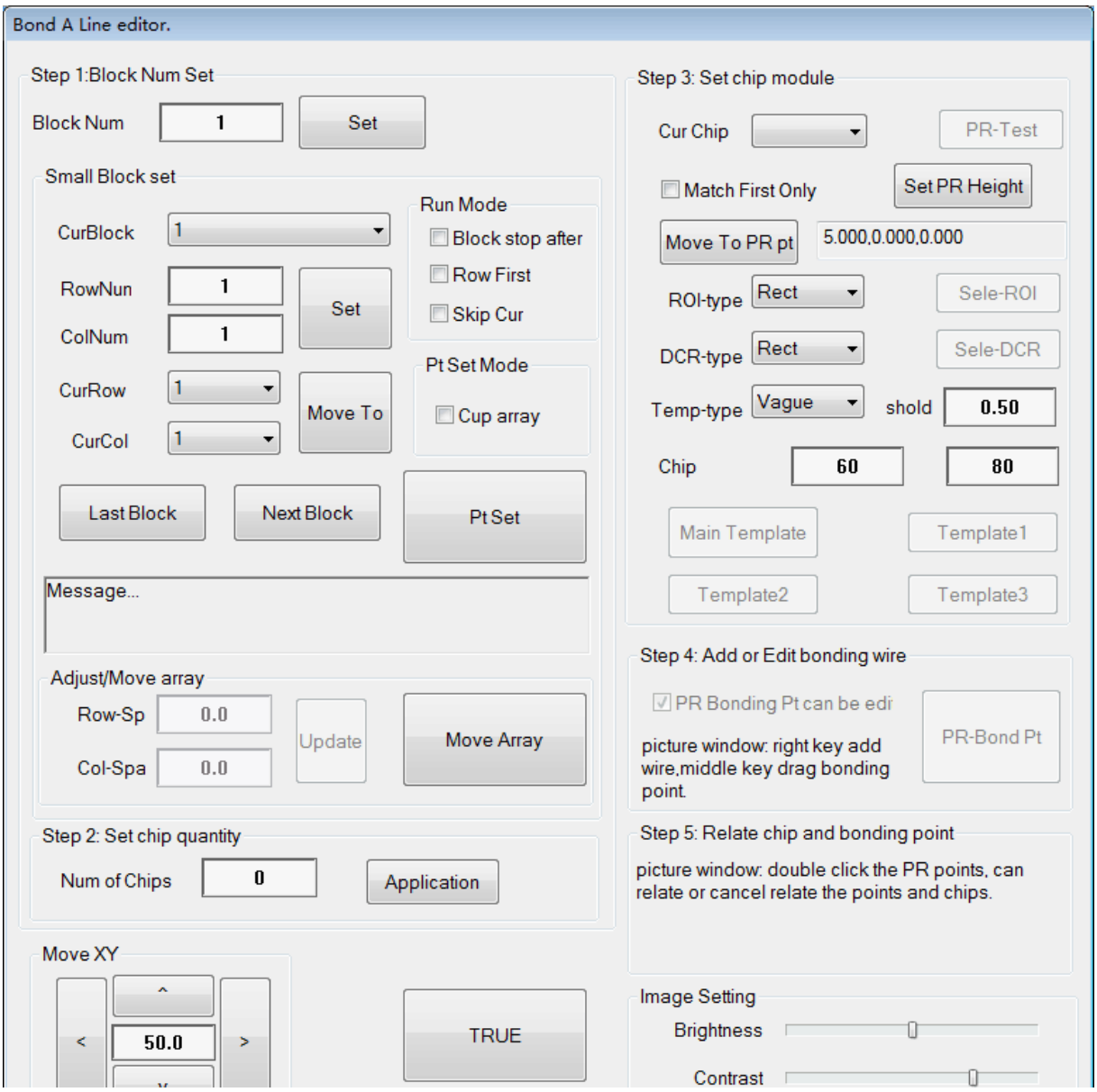
5.1 CCD capture position set

After bonding tool was assembled, first we need to set the capture position, move the cursor to the red “+”, press the left button of the mouse, not release, move the mouse, the XY axis will move following the mouse motion, when move to the suitable position, release the left button. then put the cursor to the red “+”, press the right button of the mouse, not release, lower move the mouse and the Z axis will goes down, when we can see clearly the product on the screen, release the right button. then click once the right button on the picture display area, a menu will show out, choose the “reset the capture height” .(this step is for the big bonding area and for what we can not see the picture clearly).

5.2 work order profile set

After set the capture position,the picture display area can show the bonding area clearly, this time, we can program for the present product, click the work order edit button on the screen, goes into work order profile interface:

step 1: block set



According product, we can divided into different block by different regular division, max 20 modules, each block is independent, and set the block quantity, click “set” to set the value of each manual. after set M rows and N ranks, click “set” to confirm, then move the cursor to the unit of 1st rows and 1st rank, after chosen a special point, click “position set”, it will show a window, if we want reset the position, click “yes”, if not, click ”no”, if we clicked “yes”, it will show

a window to ask whether has been moved to the 1st row and 1st rank, click “yes”, this time, the position of 1st row and 1st rank has been set, then click the “direction” on the interface, after the bonding head goes to the 1st row and last rank, click “set 1st row and last rank” , after that, move to the last row and last rank, click “set last row and last rank”, then the module unit matrix is set.

step 2: set the chip quantity. details according the chip quantity(battery pack or auto connectors need not set this, or set the quantity to “0”.)

step 3: after set the chip quantity, at the “present chip” drop-down menu will show the chip quantity, every chip need to edit module. usually we use “rectangle” type to set main module, use “vague” type to set candidate module. be careful the threshold value set, if value too high, the matching degree is good, but maybe PR fail, if value too low, maybe can not focus precisely.(battery pack do not need set).

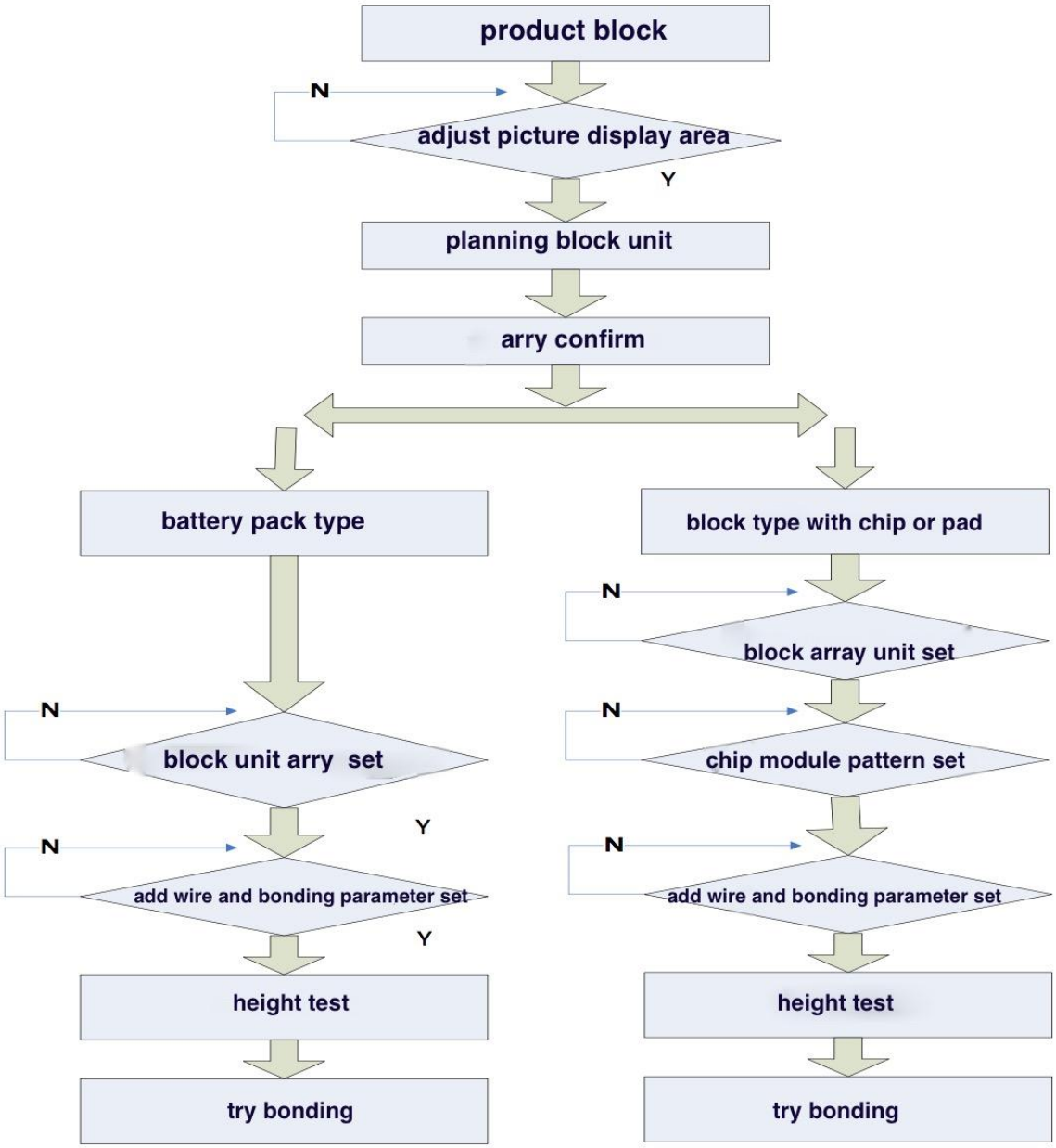
step 3: add bonding wire. click the right button of mouse on the picture display area, will show a menu, we can add or delete wire. after add wire, at the work order edit menu, move the cursor to the wire end, press the middle button of mouse, not release, move the mouse can move the bonding point to the position we want.

5.3: bonding height testing

after programed the work order profile, at the main interface, double click the bonding point , to do bonding height test, the

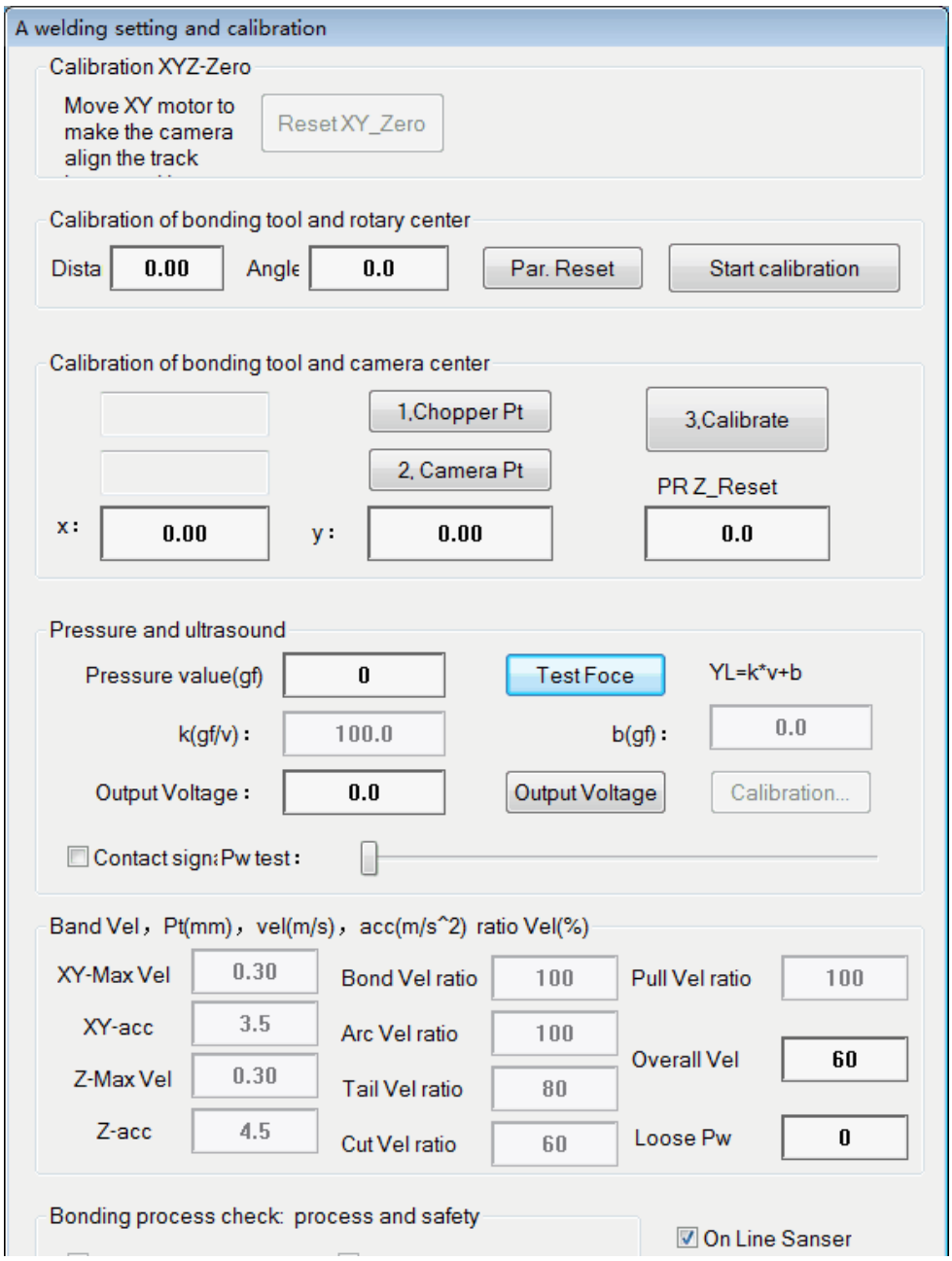
1st bonding and 2nd bonding height testing is done automatically.

to help understanding, the flow is below:



5.4 system parameter setting and calibration

after login in with “engineer” authority, click the left button of mouse on the picture display area, at the menu shows out, choose the “system parameter and calibration”, to enter the interface of system parameter set and calibration. like below:



5.4.1 calibration of the bonding tool and camera centre

when we assembly the camera and bonding tool, the center of bonding tool and camera is with a deviation, only after we calibration the deviation,we can get the real position of the bonding tool from the picture captured by the camera.

step 1: move XY axis by mouse, when the bonding tool move to the center of bonding area, click “remember bonding tool

position”, the system will show out a window to remind whether we go to the camera center, we click “no”. bonding a sign point at the position, and the system will remember the position.

step 2: after the sign bonding, move the XY axis, align the “+” of the camera center to the sign point.

step 3: click “calibration”, the system will automatic calibrate and show the X Y coordinate. like in below picture:(if we change a bonding tool, or the 1st bonding indicated ring is not aligned with the real bonding position,we need to do the calibration).

5.4.2 calibration of the bonding tool and rotary axis

after calibrate the bonding tool center and the camera center, we need to calibrate the bonding tool center and the rotary axis center. 4 steps:

step 1: move XY axis by mouse, to make the bonding tool align the welding center area, go into “system entire parameter set and calibration” interface, click “start calibration”, bonding tool will bond one point, move XY to let the “+” of camera align

to the bonding point, click “record sign point 1”, this point be recognized as “0 degree” point, system will record its position.

step 2: repeat step 1 to record a second sign point, recognized as “-90 degree” sign point.

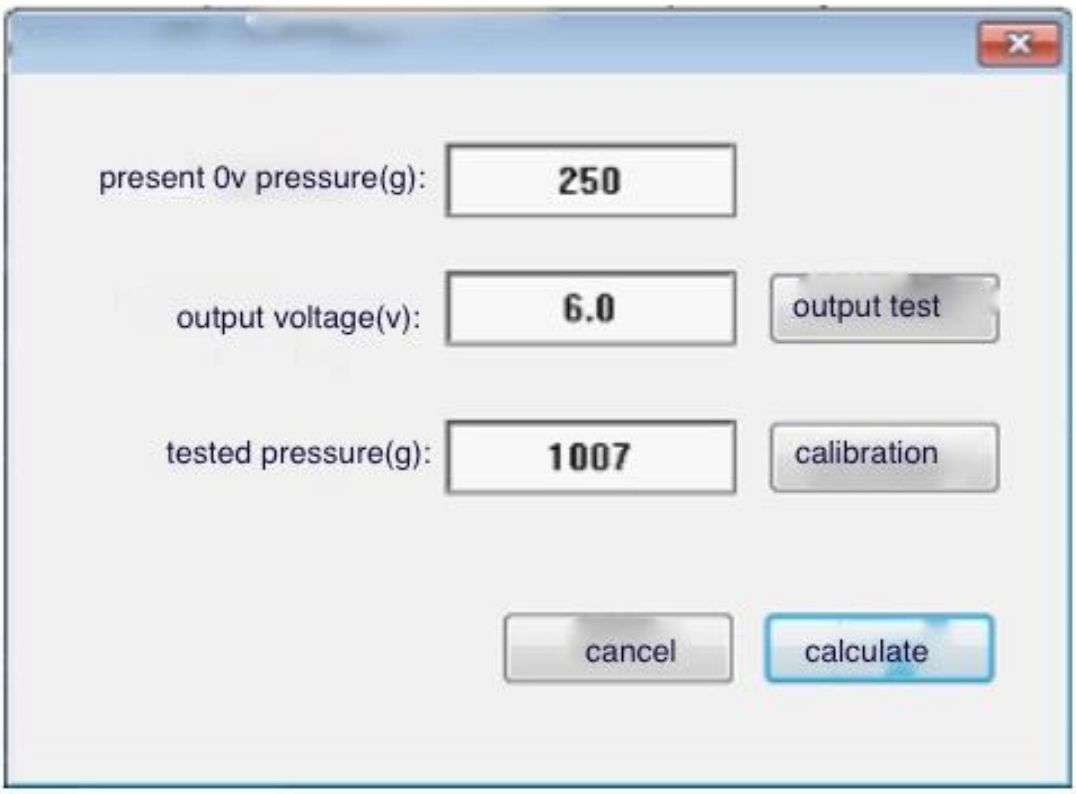
step 3: repeat step 1 to record a third sign point,recognized as “120 degree” sign point.

step 4: click “calibration”, system automatically calibrate and will show the distance and angle value.(if we change a bonding tool, or the 2nd bonding indicated ring is not aligned with the real bonding position,we need to do the calibration).

5.4.3 calibration of bonding force

calibration of bonding force is much simple, first confirm the contact : move the bonding head upward, to let the contact open, the buzzer will speak. first calibrate the 250g force, use the gram meter tip to test the bonding tool, see whether it is 250g, if not, adjust the pressure spring to make it 250g. then click “parameter calibration” to goes into the calibration interface(see below picture), click “automatic calibration”, system will calibrate automatically till show out a “calibration success” interface. and will calculate a coefficient and show to the window.(when the bonding force is too different we need to

do calibration).



5.5 bonding head speed setting

first set a basic speed, then set a ratio. like below picture, normally, “XY max speed”, “XY acceleration”, “Z max speed”, “Z acceleration” were set before delivery from factory, usually we do not adjust it, except like the motor can not driving and alarm, this time we need to adjust the value few down. the total wire loop speed means the speed when the bonding head perform the loop after 1st bonding. other speed can set the ratio of total speed. according the speed adjustment, it may optimize the bonding process.

5.6 machine safety setting

5.6.1 check the Z negative limit, the proximity switch sensor

protect the Z axis, if the bonding head goes a wrong position, the Z axis should be stopped.

5.6.2 contact open during bonding. during the time the bonding head goes down, if Z axis is disturbed, or get to the bonding point earlier than what it should be, system will stop. then we check the wire feeding system, if the bonding head goes to 2nd bonding position, and the wire did not feed successfully, the system may recognize it as 1st bonding failed, then the system stopped.

5.6.3 cutting check. if the wire is not cut successfully, the motion behind will pull the additional wire out, once the system detect this signal, it will stop. so the “wire feeding sensor” is very important, we need to test its function. click “wire feeding test” clear status, then we pull the wire out, this time the “wire feeding sensor” should turn to “V” status, if not, we need to check the wire feeding system.

after all the parameter were set, double click the bonding point ring, to set the bonding parameter, according different wire set different bonding parameter, and next process bonding height test, then try bonding, and re-adjust the parameter.

6, machine maintain

to make sure can be good condition and long life time,some maintain is needed.

6.1 wash bonding tool

6.1.1 every day we should wash 1 times bonding tool. use ultrasonic

washer to wash it, we can add 20%NaOH to the water. for 10 minutes. if no ultrasonic washer, change the time to 2 hours. after the NaOH, put the tool to clean water, wash again for 2 times.

6.1.2 NaOH is strong alkalinity, and strong corrosion, when we use it should be very carefully, be careful not splash to any cloth, equipment, and human skins , eyes, if it happen, should wash with plenty of water immediately.

6.2 clean the wire path

we should clean the wire path every week, clean all the component on the wire path, like wire guide tube, wire guide ring, wire clamp, wire guide tip, pressure roll, contact etc. also the hole in the transducer should also be cleaned, we use cotton wire be soaked with alcohol to cross the hole, and move the wire to clean the hole, try more wires if one can not clean it , till the wire not be black. during we cross the wire, the wasted wire should be placed in a fix place, do not through it to anywhere, if it goes into the machine, may make the machine broke if the wire make short circuit happen.

we should open the back cover of the machine every half year, use the compress air blow away the dust inside the machine.

6.3 main part maintain

every half year,oven the upward cover, add lubrication oil to the guide screw.

check the lubrication status at the friction component, add some

lubrication grease if needed.

6.4 CCD system maintain

6.4.1 the camera has been precisely checked, do not disassemble it. if there is dust on the camera, can blow it away or use clean brush to get it away. if something stick on camera, can use lens paper with alcohol to clean it.

6.4.2 when we maintain the mechanic part with lubrication grease or oil, make sure not pollute the optical parts.

6.5 operation safety protection

6.5.1 when we operation, adjusting, maintain or repair the machine, be care of below item.

6.5.2 before use the machine, read the manual carefully.

6.5.3 do not change the mechanic or electrical part at will, do not copy and paste the program between different model of machine.

6.5.4 before open the machine cover, we should shut off the power for at least 3 minutes, do not power on and then power off too often.

6.5.5 make sure the machine is ground connected, and if the power is not reliable, we should add a voltage regular.

6.5.6 if the machine did not use or no one take care, the power plug should be turned out.

6.5.7 make sure the machine back and bottom is with good aeration, make sure machine working not at high temperature.

6.5.8 keep the fans and dust cover clean all the time.

6.5.9 when the machine is working, do not let our head or hands

under the bonding head, if in emergency, we can press the power switch to stop the machine.

6.6 machine set up protection

make sure the power is ok, and the machine is very heavy more than 400kg, when we move the machine, need to use forklift, be careful of safety.

6.6.1 the machine working or initialization, be careful the head and hands not under the bonding tool or on chucks etc moving part.

6.6.2 do not move the cover when working.

6.6.3 when operate the machine, we should take care the instruction and alarm information.

7 trouble shooting

problem	reason	check
1,no motion or motion not right	1,power plug and power cable not good connected 2,fuse break or power switch break 3,operation button not work 4,main pcb board break 5,no ultrasonic output 6,plugs inside or other connection loose 7, the bonding tool sensor contact not work	1,power plug and power cable 2,fuse, power switch 3,button switches 4,main pcb board 5,ultrasonic pcb borad 6,check plugs inside or other connection 7,a,check the bonding tool and transducer whether be chucked. b,clean the contacter
2, the tail wire length not reliable	1, 2nd bonding point too big or too small 2,bonding tool dirty or blocked	1, adjust the bonding force and time 2,check the bonding tool
3, bonding quality not reliable or fake bonding	1,bonding tool dirty or broken, or fixed too high or too low. 2,the fastening screw for bonding tool loosen 3,ultrasonic pcb board broke, the ultrasonic yellow light not change, or the red light not lighting 4,the contactor dirty 5,chuck vibration 6,the material not flat, or the pad is dirty, or the aluminum wire dirty	1,bonding tool 2,bonding tool fastening screw 3,ultrasonic pcb board 4,bonding tool senser contacter 5,chuck 6,material and aluminum wire

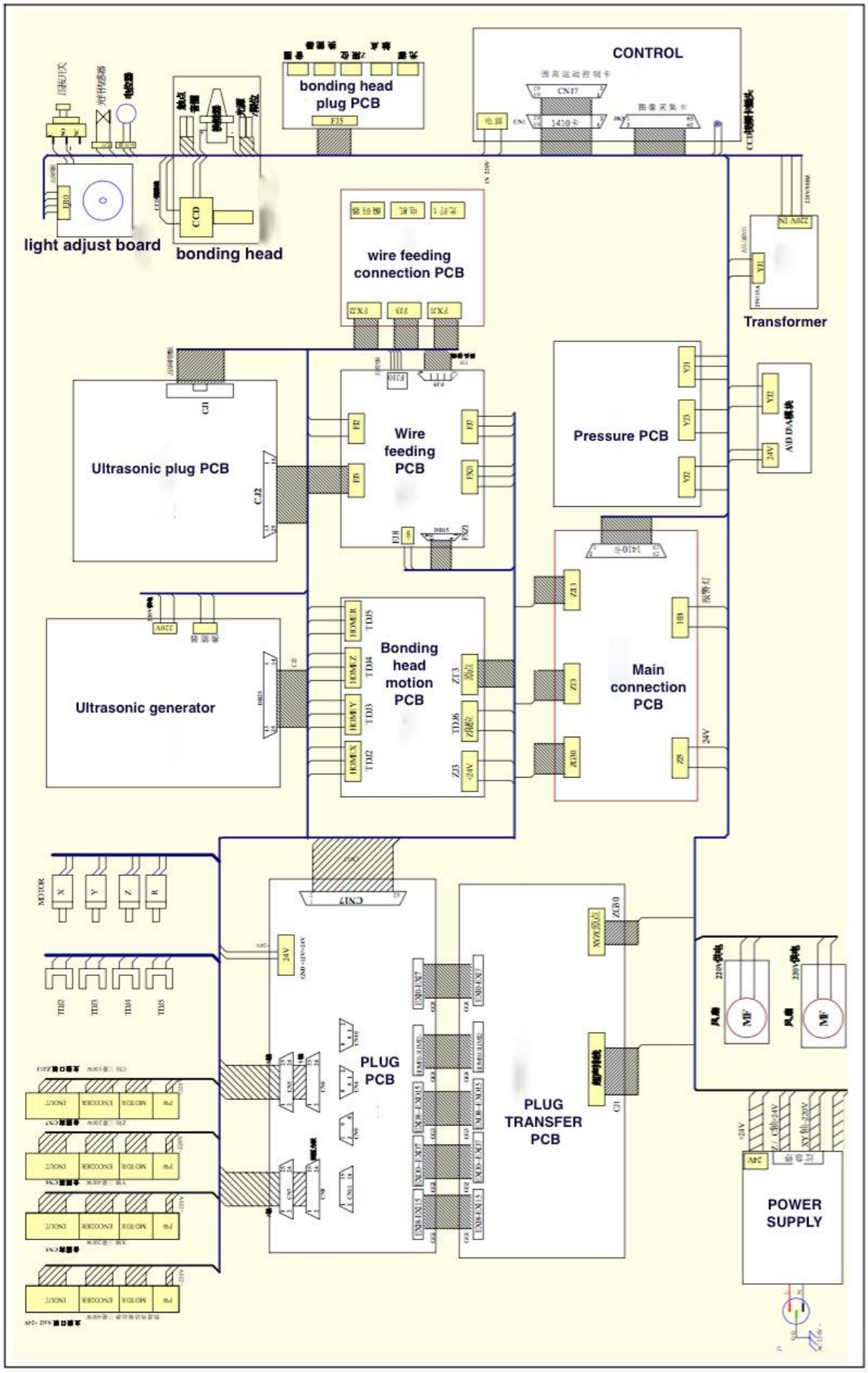
4,the loop not reliable	1,bonding tool block or broke 2,loop set not enough 3,wire clamp too tight 4,the aluminum wire too tight	1,bonding tool 2,loop set 3,wire clamp 4,aluminum wire
5,wire break at the bottom	1,bonding force too high 2,wire clamp too tight 3,wire clamp not reliable 4,bonding tool not good 5,aluminum wire too tight 6,material vibration	1,adjust the bonding force 2,wire clamp 3,bonding tool 4,bonding tool 5,aluminum wire 6,material or chuck
6,stroke not enough	1, the safety area set too small	reset it

8 technic support

contact:sales@minder-hightech.com shunyu.hu@163.com cell:0086-15813334038

SIGNAL DIRECTION			
	NAME	DIRECTION	FUNCTION
A	main connection PCB		
1	ZJ5	———>+24V	24V dc power
2	ZG30	———>D	X,Y,Z,R initial position sigal
3	ZJ13	———> R axis driver	driving pulse and direction
4	ZT3	———> E	initial signal
B	wire feeding PCB		
1	FXZ1	———>D	pressure,ultrasonic,contactor,alarm,Z limit
2	FXJ1	———>C	wire feeding optical fibre signal
3	FJ7	———>C	wire feeding encoder signal
4	FJ3	———>C	wire feeding motor signal
5	FJ10	———>I	mail light adjustment
6	FJ5	———>H	pressure,ultrasonic,contactor,alarm,Z limit signal to H
C	wire feeding connection PCB		

SIGNAL DIRECTION			
1	FJ1	———>B	wire feeding optical fibre signal
2	FJ2	———>B	wire feeding encoder signal
3	FJ3	———>B	wire feeding motor signal
4	FXJ1	———>wire feed optical fibre sensor	wire feeding sensor singal
5	FXJ2	———>encoder	wire feeding encoder signal
D	PLUG TRANSFER PCB		
1	CJ1	———>G	ultrasonic signal
2	ZG30	———>A	XYZR initial signal
E	BONDING HEAD MOTION PCB		
1	ZJ3	———>Power supply	24V dc power
2	TDJ2	———>X initial sensor	X initial signal
3	TDJ3	———>Y initial sensor	Y initial signal
4	TDJ4	———>Z initial sensor	Z initial signal
5	TDJ5	———>R initial sensor	R initial signal
6	TDJ6	———>H	Z axis limited signal
7	ZT3	———>A	X,Y,Z,R initial position sigal
F	PRESSURE PCB		
1	YJ1	———>Transformer	power
2	YJ2	———>D/A A/D module	input singal
3	YJ3	———>bonding head pressure coil	output signal
G	ULTRASONIC PLUG PCB		
1	CJ1	———>D	ultrasonic signal transfer
2	CJ2	———>ultrasonic generator	ultrasonic signal transfer
H	BONDING HEAD PLUG PCB		
1	FJ5	———>B	pressure,ultrasonic,contactor,alarm,Z limit signal to H
I	LIGHT ADJUST PCB		
1	FJ10	———>light adjust pcb	light adjustment


CONTROL
bonding head plug PCB
light adjust board
bonding head
CCD
wire feeding connection PCB
Transformer
Ultrasonic plug PCB
Wire feeding PCB
Pressure PCB
Ultrasonic generator
Bonding head motion PCB
Main connection PCB
PLUG PCB
PLUG TRANSFER PCB
POWER SUPPLY
MOTOR
X
Y
Z
R