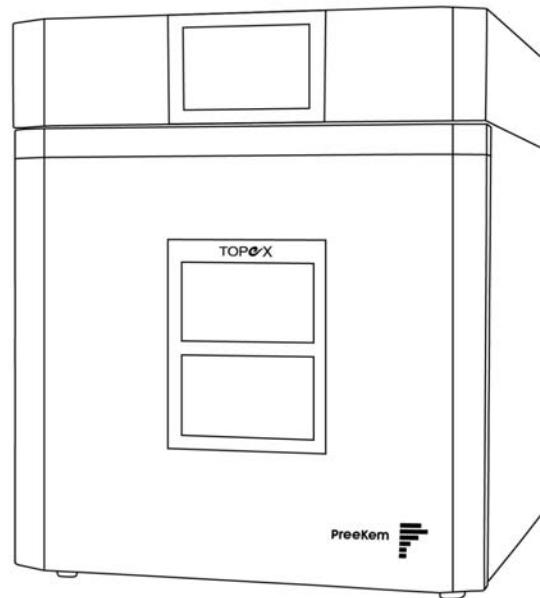




Service Manual

TOPEX

Ver 1.0



Preface

This manual is aim to guide maintenance engineer to solve instrument faults on spot.

Maintenance engineer need to understand the knowledge of electrical safety and electrical theory,that will ensure the life safety in the process of maintenance.

Before troubleshooting , maintenance engineer should be familiar with instrument wiring diagram,fully understand the components' work voltage and working mechanism.

Please give special attention to the bold part of this manual.

Our company will not be responsible for any losses caused by secretly scrap build.

Please feel free to contact us if you confront problems via E-mail: support@preekem.com. We will response your question as soon as possible.

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1 Introduction

1-1 Summarize

TOPEX adopts the ultramodern appearance design, with high-tech color touch screen and color humanized graphical interface, real-time imaging techniques, these all embody convenient and comfortable in modern laboratory. TOPEX adopted microwave directional compression technology, that based on microwave vector reflex design, Directional change field intensity distribution, Will be highly uniform microwave energy gathered in the sample areas, improve the reaction of parallelism.

1-2 technical parameters

- Microwave mode: dual magnetrons
- Power supply: 50Hz, 220-240V
- Microwave power: 0~1700W
- Microwave frequency: 2450MHz
- Power control: PID
- Vessels type: 10\15\40
- Work temperature: 0~260℃
- Work pressure: 0~6MPa

1-3 Safety precautions

- Dual interlock switches.
- Pressure sensor: Pressure sensor is used to monitor pressure produced by sample reaction. Microwave can only be generated when the real-time pressure is under the setting value.
- Temperature sensor: Temperature sensor is used to monitor samples' temperature. Microwave can only be generated when the real-time temperature is not beyond setting value.

1-4 Safety standards

Troubleshooting should not be dealt with power on, please refer to the following rules if the condition needs the power on:

- Open the door to avoid microwave started by mishandling.
- Make sure that you are clearly familiar with wiring diagram, understanding various electronic components described on wiring diagram, understanding their working voltage and features.

- Directly measuring the output of high voltage transformers and filament transformers with the power on is forbidden.
- Directly measuring the high voltage diodes with the power on is forbidden.
- Directly measuring the magnetrons with the power on is forbidden.
- Directly measuring the high voltage diode with the power on is forbidden.
- Replacing the high voltage components need the time elapsed 5 minutes after the power is turned off, because of high voltage capacitor discharge.

1-5 Application rules

Samples of dangerous chemical reaction or explosive characteristic of atomic groups must be pay serious attentions. Before make clear of microwave control ability and chemical reaction intensity, TOPEX can not be put in use.

2 Components describe

2-1 Axonometric views

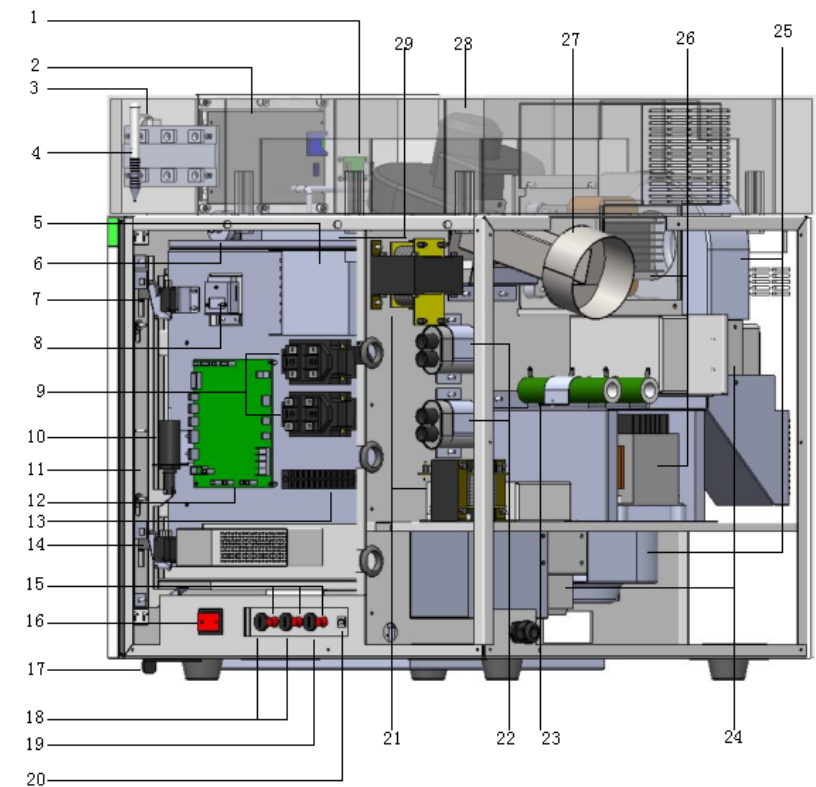


Fig 2.1 axonometric view

No.	Describe	Inventory code
1	LCD connector	26ea002
2	LCD	00fa715
3	Stop button	00ca809
4	Touch pen	26t.j202
5	Power adapter (5/12V)	00fb310
6	Pressure sensor	00fa602
7	Interlock switch	00ca801
8	Pin hole camera	00fz005
9	Thyristor	00ca211

No.	Describe	Inventory code
10	Electromagnet	00fb808
11	Door bracket	26aa003
12	Main control board	26ea001
13	Terminal board	00ce802
14	Interlock switch	00ca801
15	Error indicator light	00ca904
16	Switch	00ca806
17	Latch handle	23aa015
18	Fuse holder\10A fuse	00ca704\00ca606
19	Fuse holder\5A fuse	00ca704\00ca615
20	PC connector board	26ea003
21	Filament transformer	00fa311
22	High voltage capacitor	09t.j222
23	Resistor	00ca521
24	Magnetron	26t.j207
25	Cooling fan	00fa111
26	High voltage transformer	09t.j210
27	Exhaust pipe	22aa006
28	Exhaust fan	09t.j206
29	Power adapter (24V)	00fb308

Note: We normally obey the rules that from left to right, front to back,upper to lower to define the first microwave components and the second microwave components.

For example , we define the left fuse holder and fuse belong to the first microwave group, and the second microwave group belongs to the second part, refer to fig 2.2.

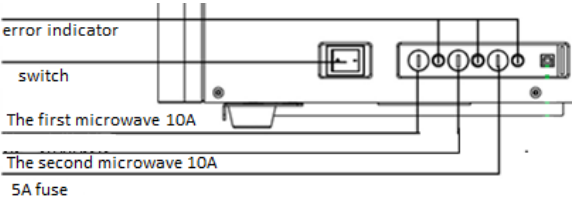


Fig 2.2 Fuse holders

We define the above thyristor belongs to first group, and the bellow one belongs to the second group.

Other components like magnetrons,high voltage items can be define like this way.

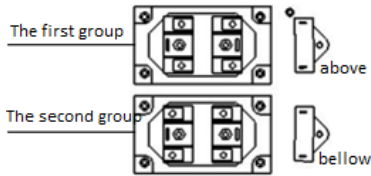


Fig 2.3 Thyristor define

2-2 Safety door disassemble

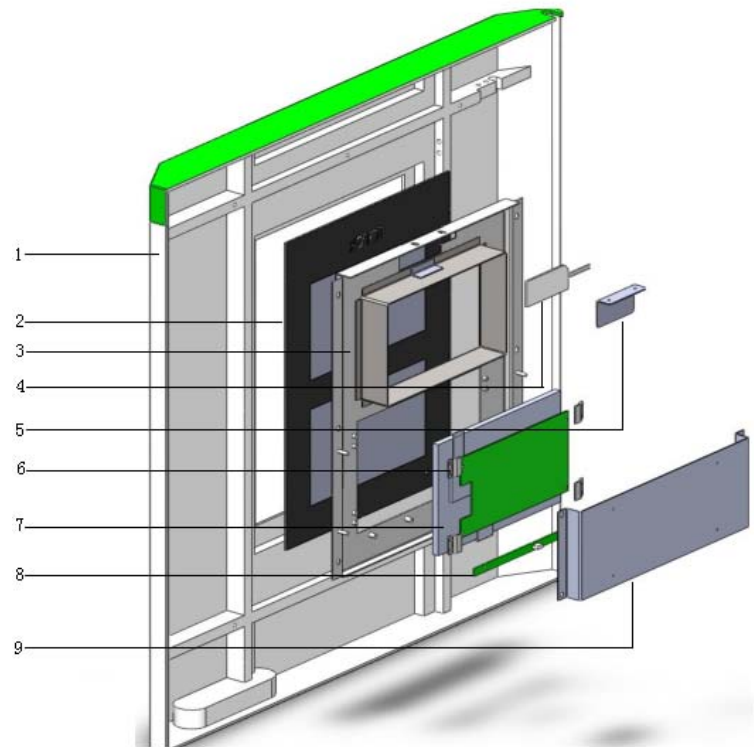


Fig 2.2 safety door

No.	Describe	Inventory code
1	Door shell	26da005
2	Window board	26da011
3	Bracket	26aa013
4	LED light	00cz021
5	Pressure plate	26aa015
6	PCB board	Built in monitor
7	monitor	00fa704
8	Power PCB	Built in monitor
9	Holder	26aa014

2-3 Bottom view

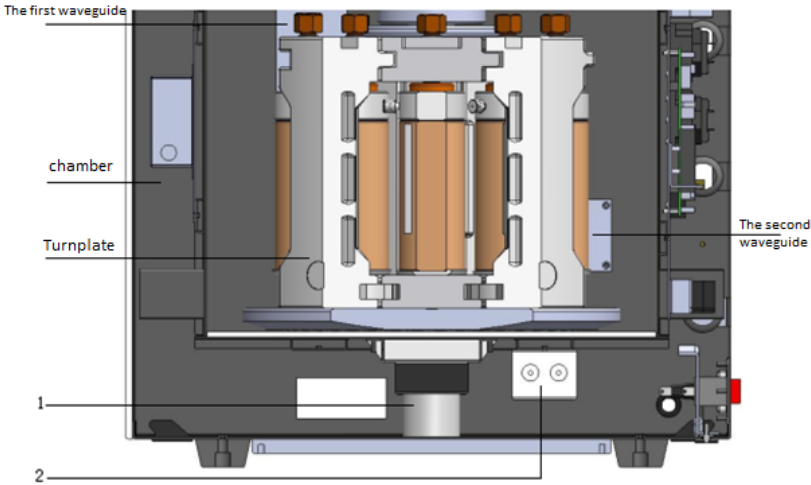


Fig 2.3 bottom components

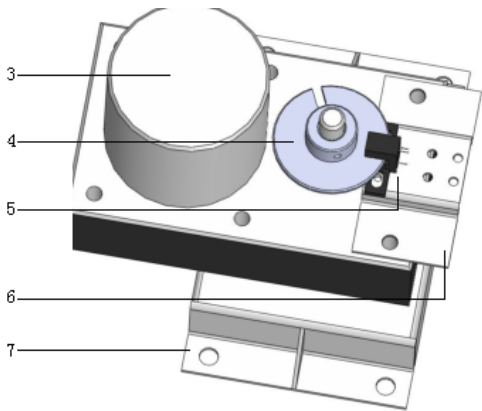
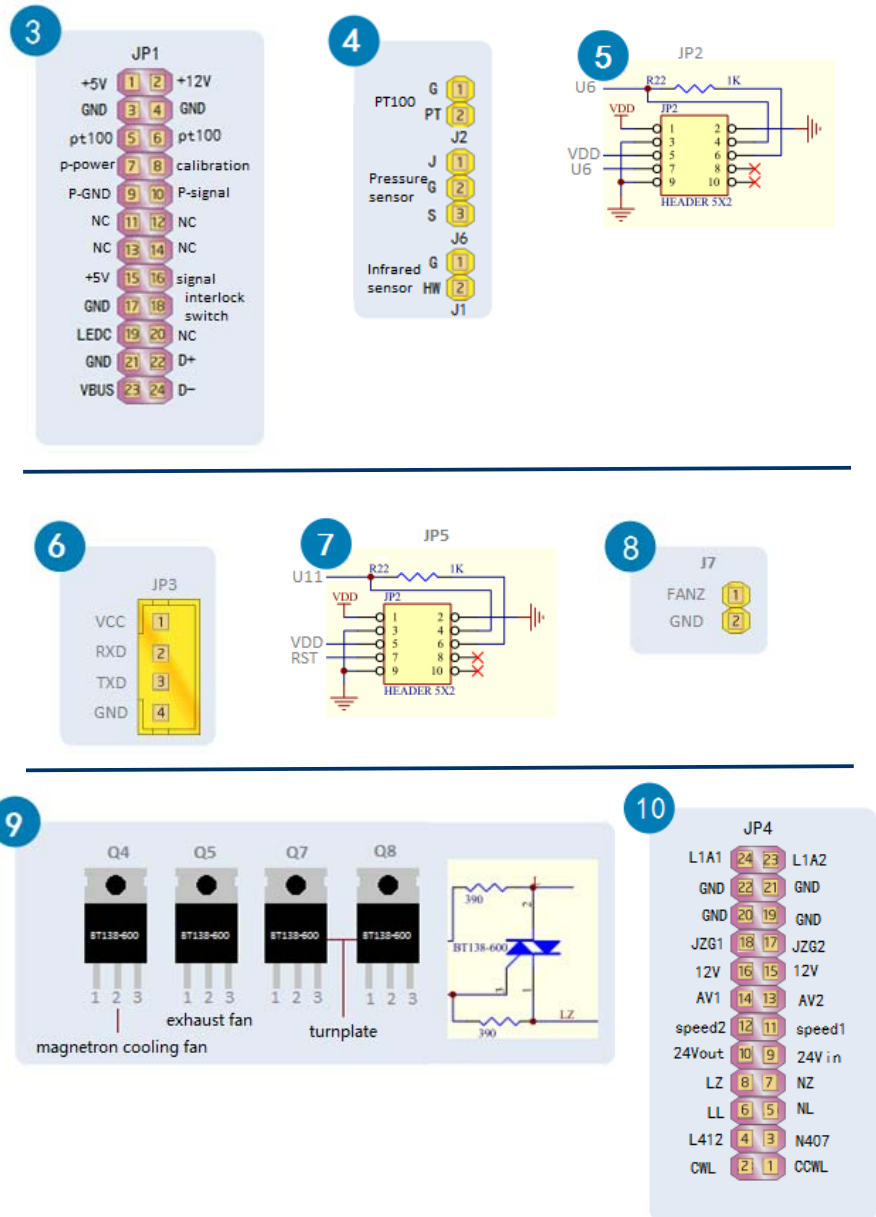
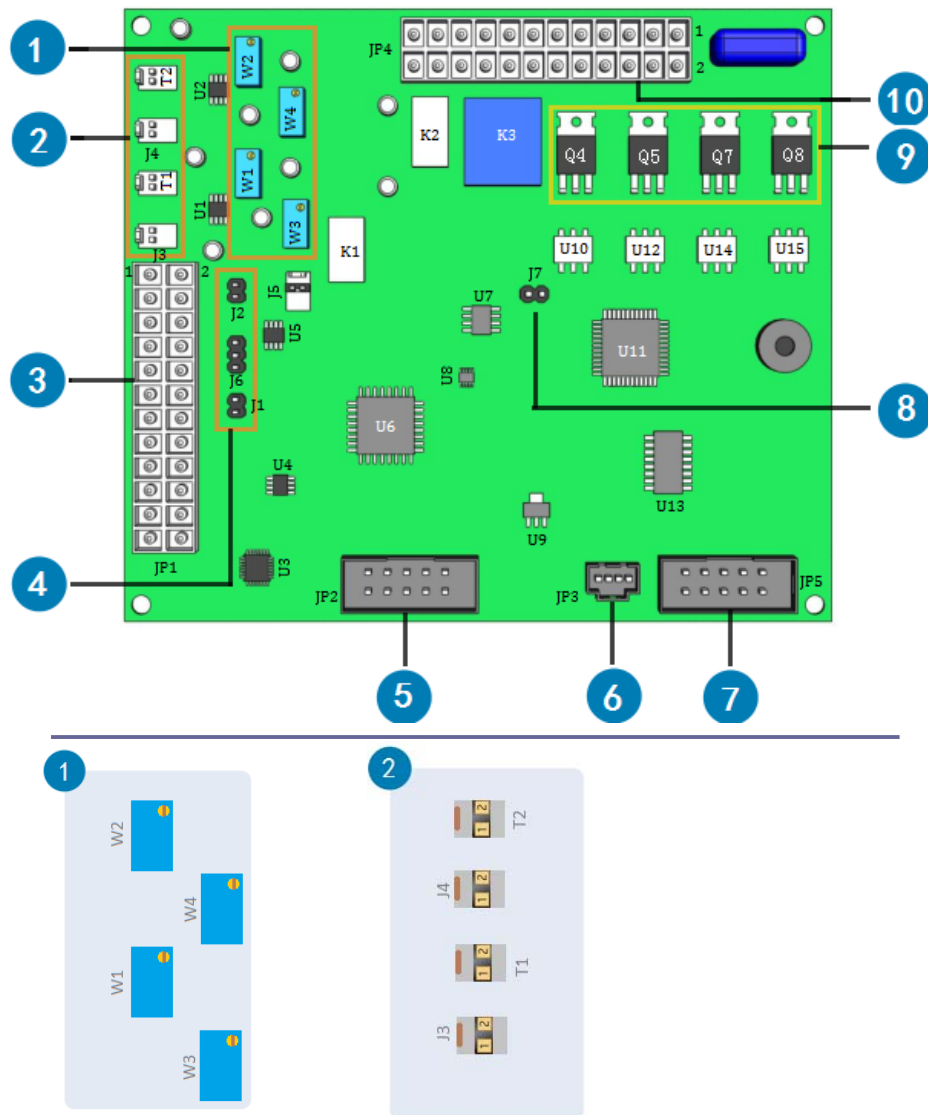


Fig 2.4 motor sub-assembly

No.	Describe	Inventory code
1	Motor components	26tj206
2	Filter	00fb402
3	motor	00fa204
4	grating	23ba004

No.	Describe	Inventory code
5	Photoelectric sensor	26tj205
6	bracket	23aa020
7	bracket	09aa042

2-4 Main control board layout



3 Commonly used spare parts replacement

This section introduce the process of spare parts replacement, please refer to these processes.

3-1 Magnetron replacement

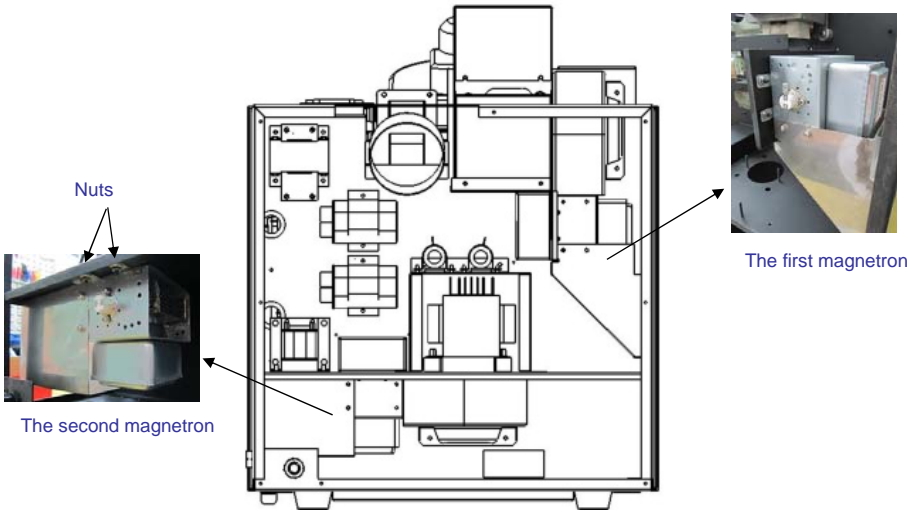


Fig 3-1 Magnetron mounted position

Magnetrons are mounted at the back side of the chamber as fig 3-1 described. We define the above magnetron belongs to the first microwave group, the below one belongs to the second group.

Temperature relay is installed on the surface of the magnetron.

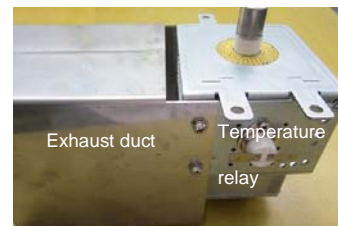


Fig 3-2 magnetron

Note: Exhaust duct is mounted with magnetron, please don't take down when replace the magnetron.

3-2 Magnetron cooling fan replacement

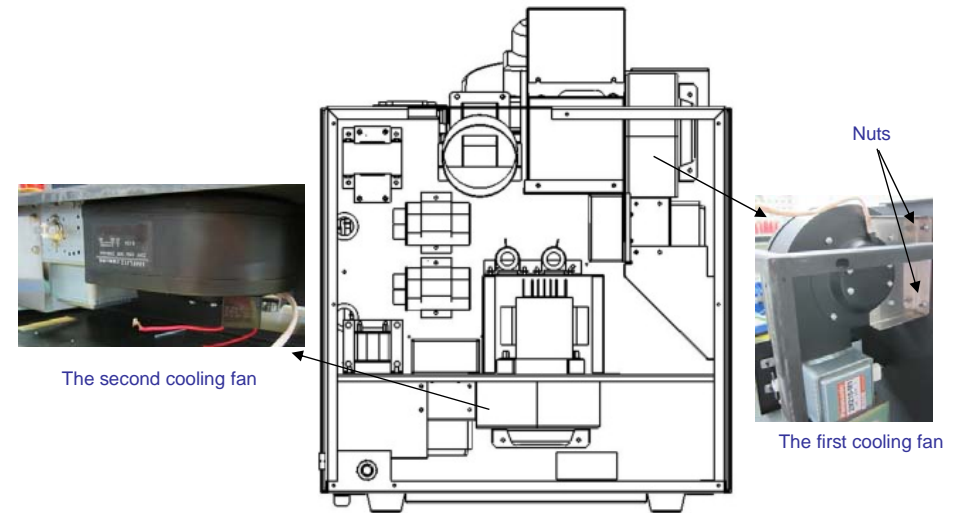


Fig 3-3 Magnetron cooling fan mounting position

Magnetron cooling fan is installed nearby the magnetron, mounted with bracket. Starting capacitance is installed on the surface of the cooling fan.

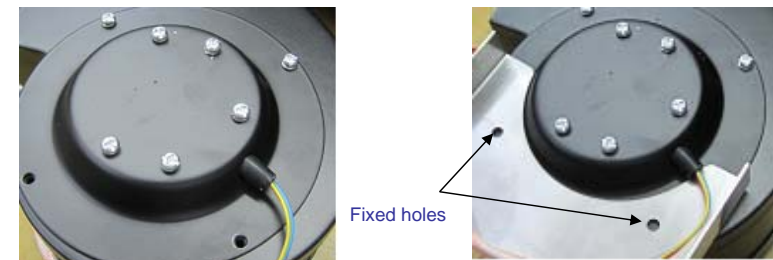


Fig 3-4 Cooling fan and bracket

Fig 3-5 describes the wiring way for magnetron.

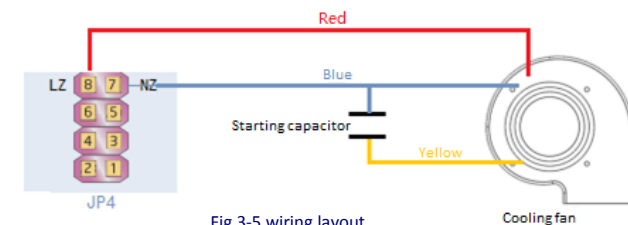


Fig 3-5 wiring layout

3-3 HV transformers replacement

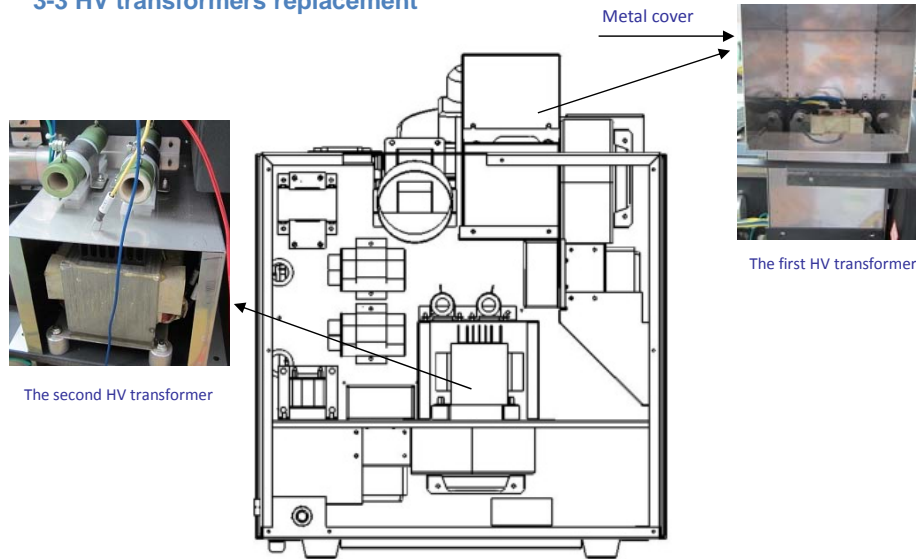


Fig 3-6 HV transformer mounted position

Two magnetrons are covered by metal covers to form a duct reduce the temperature of transformers, refer to fig 3-6. There are two points need to note when maintenance engineer wants to take down the metal covers.

(1) It is no need for take down the fixed nuts, it is OK to unscrew, refer to fig 3-7.

(2) two wiring resistors are installed on the surface of the metal cover, fixed nuts and screws for metal cover need to be taken down, maintenance engineer should pay more attention to the wiring layout and recover the wiring after replacement



Fig 3-7 Fixed nuts

The first transformer is fixed like fig 3-8, take down four fixed nuts and disconnect the cord. We can do replacement process. Two HV transformers are installed as the same way.

Wiring layout

We normally do not stipulate the input wiring way, that is to say live and neutral cord can be connected with HV transformer randomly.

Make sure reliable grounding between HV transformer and chamber..

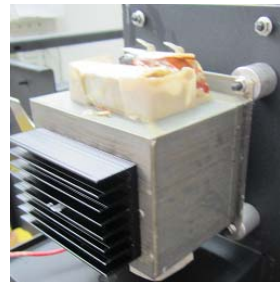


Fig 3-8 HV transformer

3-4 HV capacitor replacement

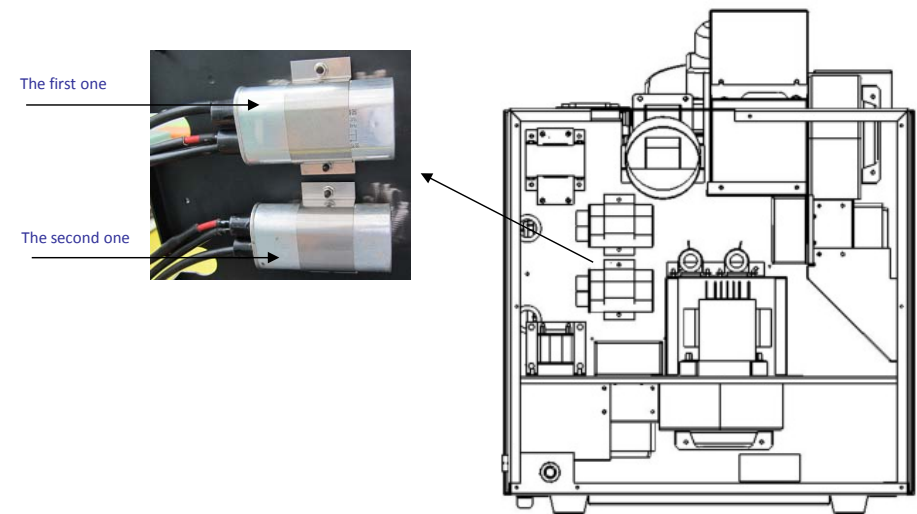


Fig 3-9 HV capacitor mounted position

Two HV capacitor are installed at the back side of the chamber, refer to fig 3-9, both of them are fixed by a metal bracket. It is relatively easy for replacement.

Wiring layout for HV components

Caution: Incorrect wiring may cause faults like fuse blown or no microwave generated.

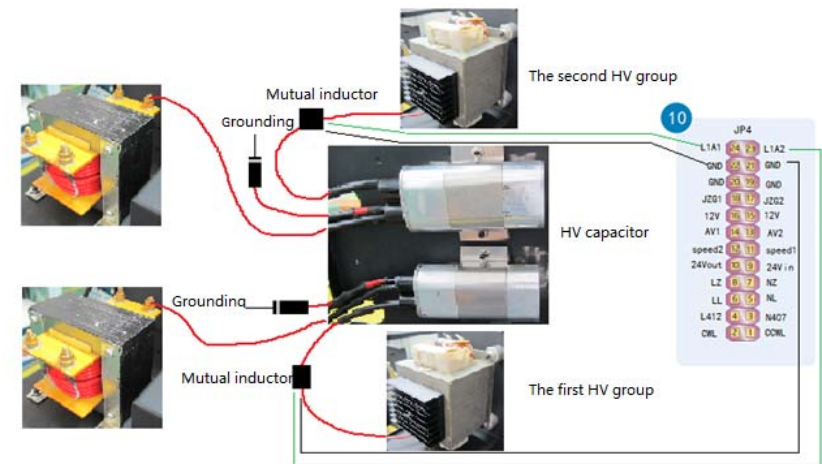


Fig 3-10 Wiring layout

3-5 Thyristor replacement

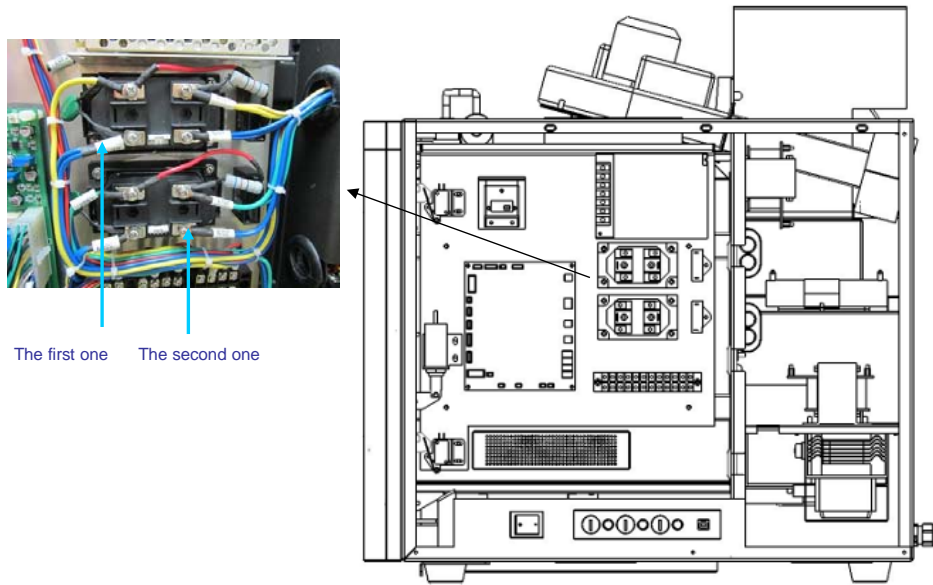


Fig 3-11 thyristor mounted position

Two thyristors are mounted at the right side of the chamber, refer to fig 3-11, take down the right ABS cover, you will see them.

Thyristor is fixed by four M4 screws, the left side is input terminal and the right side is output terminal.

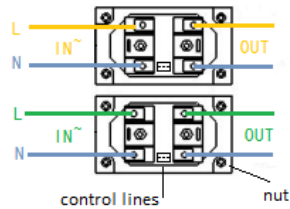


Fig 3-12 Thyristor

Thyristor wiring layout

Refer to fig 3-12, one of the input terminals nearby signal terminal is neutral, and the other is live. Neutral side is always conductive between input and output, but the live is controlled by thyristor, its conductive feature is controlled by signal. Control signal is afforded from JP4-15~20 pins, pin 15, 17 and 19 belong to the first thyristor, pin 16, 18 and 20 belong to the second one, the range of control signal is from 0 to 10 direct current represent various power.

Fig 3-13 is the wiring layout of thyristor.

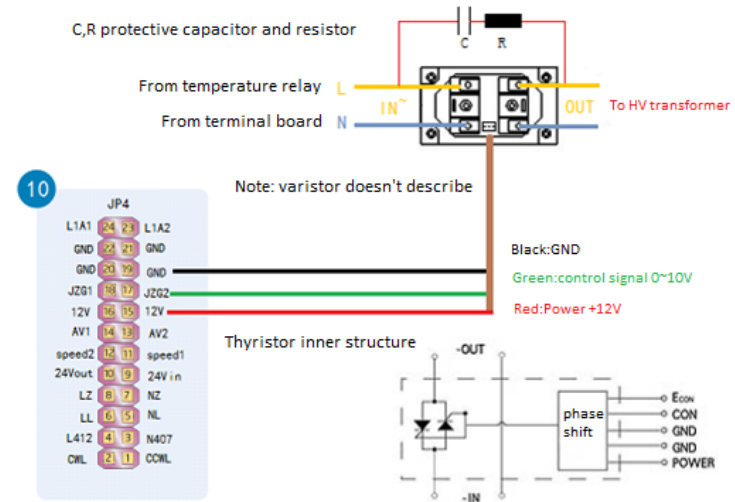


Fig 3-13 Thyristor wiring layout

3-6 Exhaust fan replacement

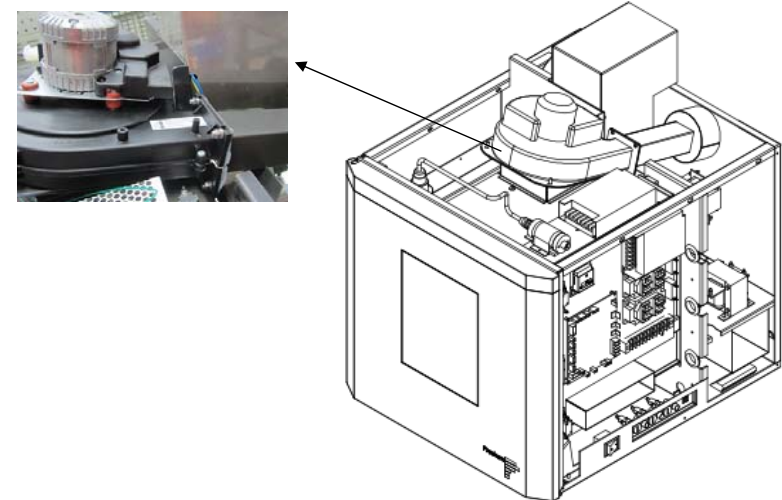


Fig 3-14 Exhaust fan mounted position

Exhaust fan is installed at the top of chamber, refer to fig 3-14. Take down plastic covers, then you can replace the exhaust fan. Exhaust fan is assembled with exhaust duct together, so it is no need for disassembling them when you want to replace exhaust fan, refer to fig 3-15.

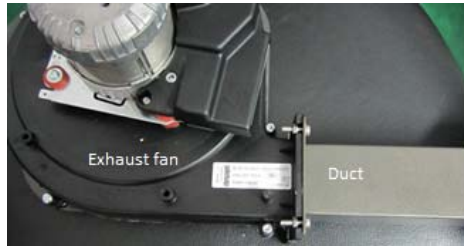


Fig 3-15 Exhaust fan unit

Exhaust fan replacement sequence:

- (1) Take down three M5 nuts, refer to fig 3-16.
- (2) Disassemble the exhaust fan and duct.
- (3) Take down the connection bracket installed with exhaust fan.



Fig 3-16 M5 fixed nuts

Exhaust fan installation

- (1) Clean up the sealing silicone, cover with a layer of silicone again, refer to fig 3-17.
- (2) Use four screws to fix the connection bracket onto the exhaust fan with a layer of sealing silicone, refer to fig 3-18.
- (3) Use four screws and nuts to fix exhaust fan and duct, the gap should be filled with sealing silicone.
- (4) Remount the exhaust fan fixed by three M5 nuts, refer to fig 3-16.
- (5) Restore wiring connection.

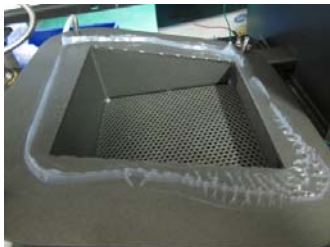


Fig 3-17 Sealing silicone

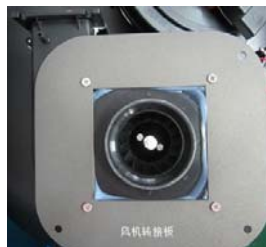


Fig 3-18 Connection bracket

Exhaust fan wiring diagram

Exhaust fan wiring is divided into power cord and speed regulating signal lines, these wires are controlled by main control board JP4. JP4-6 controls live and JP4-5 controls neutral, speed regulating signal is controlled by JP4-11, 12, refer to fig 3-19.

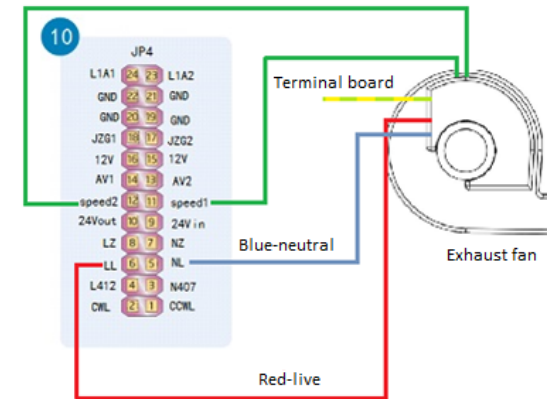


Fig 3-19 Exhaust fan wiring layout

3-7 Pressure sensor replacement

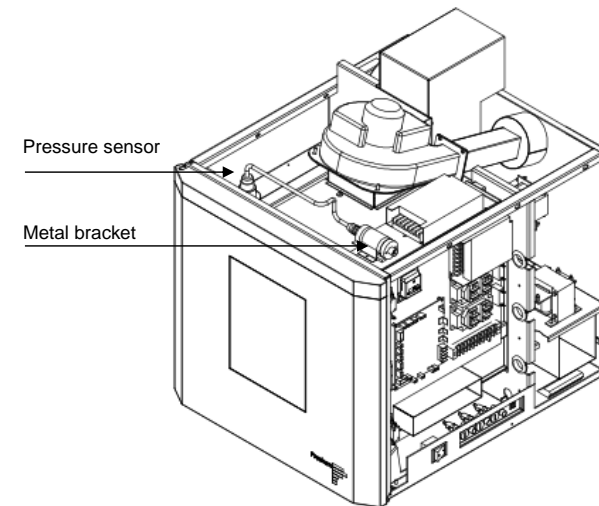


Fig 3-20 Pressure sensor mounted position

Pressure sensor is mounted on the top of chamber, refer to fig 3-20. One side is inductive terminal and the other side is data cable.

Installation matters

- (1) Residual air between PTFE gap and pressure sensor should be drained entirely, or may cause insensitive response and pressure lingering, refer to fig 3-21.
- (2) Screw thread of the pressure sensor should be covered with teflon seal tape about 3 layers.
- (3) Side Z should be adjusted towards operator, refer to fig 3-22.

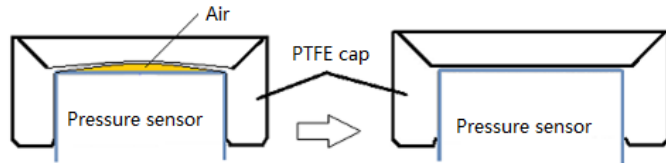


Fig 3-21 Residual air



Fig 3-22 Side Z

Pressure sensor wiring layout

Pressure sensor data lines are connected with main control board JP1 pin7 to pin10, refer to fig 3-23.

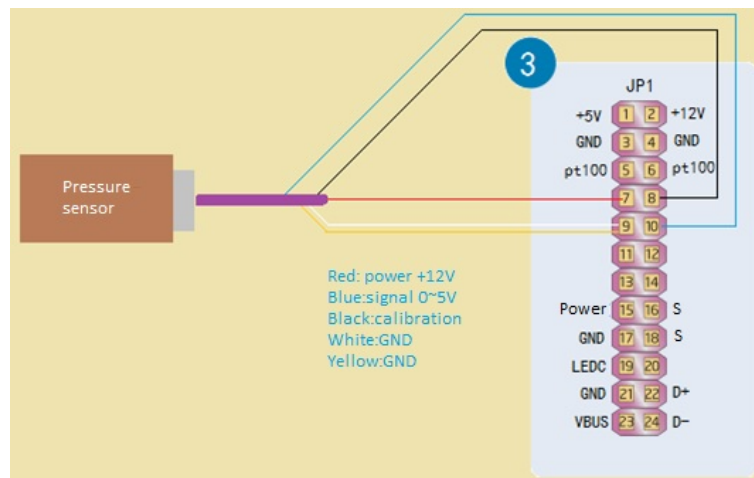


Fig 3-23 Pressure sensor wiring diagram

3-8 Turntable motor replacement

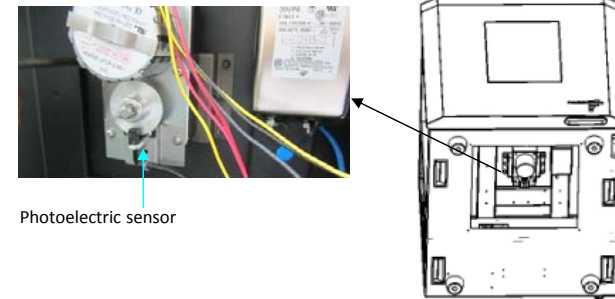


Fig 3-24 Turntable motor mounting position

Turntable motor is mounted at the bottom of the chamber by four M4 nuts. Turntable motor is a subassembly gathered with metal bracket, photoelectric sensor and grating.

Note:

- (1) Instrument should be overturned, take down the black cover.
- (2) Take the turntable and vessels out of chamber to avoid damage the sensors. It is no need to take down the pressure sensor and gas pipe.

Photoelectric sensor replacement

Photoelectric sensor is installed on the surface of grating, used for turntable direction control. There are two points need to know when operate the photoelectric sensor replacement.

- (1) Cut the signal lines nearby the photoelectric sensor, peel off a short of insulating layer, then put insulating heat shrink tube about D2 on signal lines separately.
- (2) Weld the signal lines and photoelectric sensor together, refer to fig 3-2, use heat shrink tube cover the welding part finally to avoid short circuit.

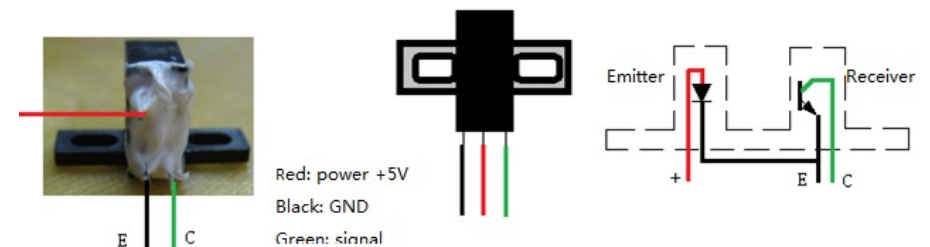


Fig 3-24 Photoelectric sensor feature

Wiring diagram for turntable motor subassembly

Turntable motor power cord is connected with main control board JP4 pin1 and pin 2, decide clock wise or anti clock wise according to the signal from photoelectric sensor. Photoelectric sensor provides signal to main control board through pin 15, pin 16 and pin 17, refer to fig 3-25.

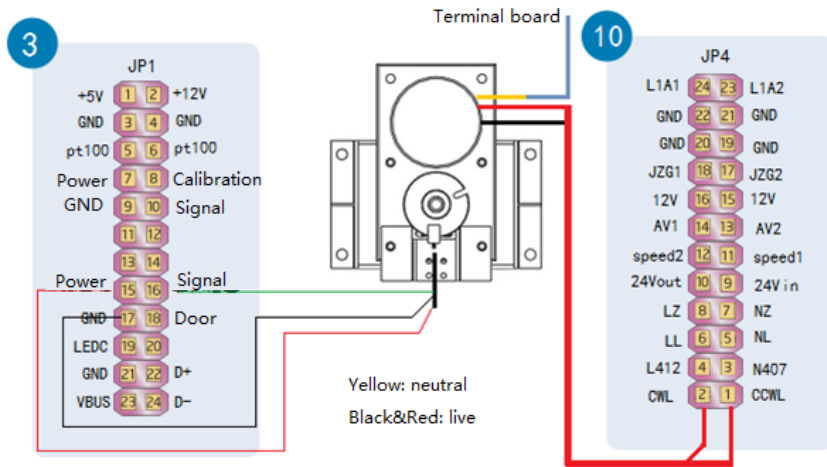


Fig 3-25 Turntable motor subassembly wiring layout

3-9 LCD replacement

Touch screen is mounted in top ABS cover, refer to fig 3-26.



Fig 3-26 LCD subassembly

LCD is fixed by four M3*6 screws, data communication type is serial communication via a LCD connector connected with main control board, refer to wiring diagram. There are four points need to pay more attention when maintenance engineer disconnect the FPC flat cable.

- (1) Clean up the locking silica gel, refer to fig 3-27.
- (2) Open the FPC fixed cover upward.
- (3) Takedown FPC flat cable.
- (4) Restore the FPC flat cable installation, use silica gel to lock the fixed cover at the same time.

Note: Blue side towards fixed cover and the other side face to PCB.



Fig 3-27 FPC connector

Stop button wiring layout

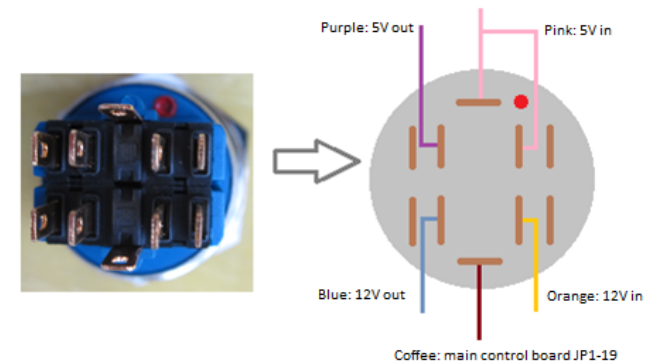


Fig 3-28 Stop button define

Stop button is mounted at the upper right of TOPEX, is used to stop the microwave in emergency, refer to fig 3-28.

3-10 Built-in camera and monitor replacement

Monitor screen is mounted inside door shell, and the pin hole camera is located on the right side of the chamber, there are two points need to pay more attention when disassemble the subassembly.

- (1) Take down black cover fixed by eight M3*10 screws, then you will see six screws to fix the door shell, refer to fig 3-29.
- (2) Take down door shell, replace relevant components.



Fig 3-29 Safety door subassembly

Monitor subassembly relationship is described like fig 3-30.

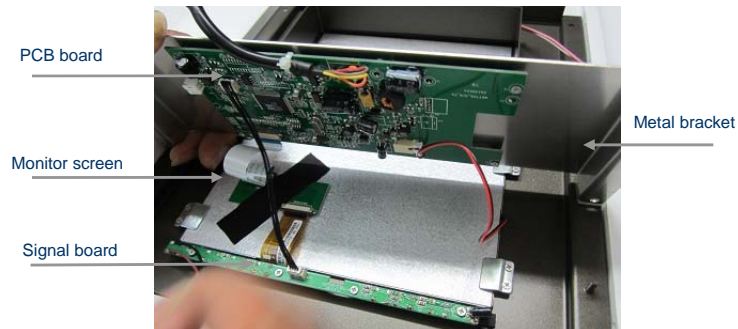


Fig 3-30 Monitor screen subassembly

Note: Monitor and its PCB connection style is push-pull way strange form LCD, refer to fig 3-31.

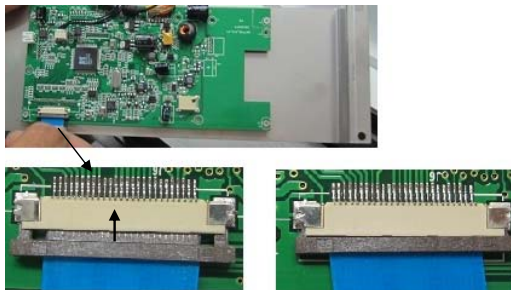


Fig 3-31 Push-pull style

Monitor system wiring diagram

Monitor system power supply is control by stop button,yellow line is video signal, refer to fig 3-22.

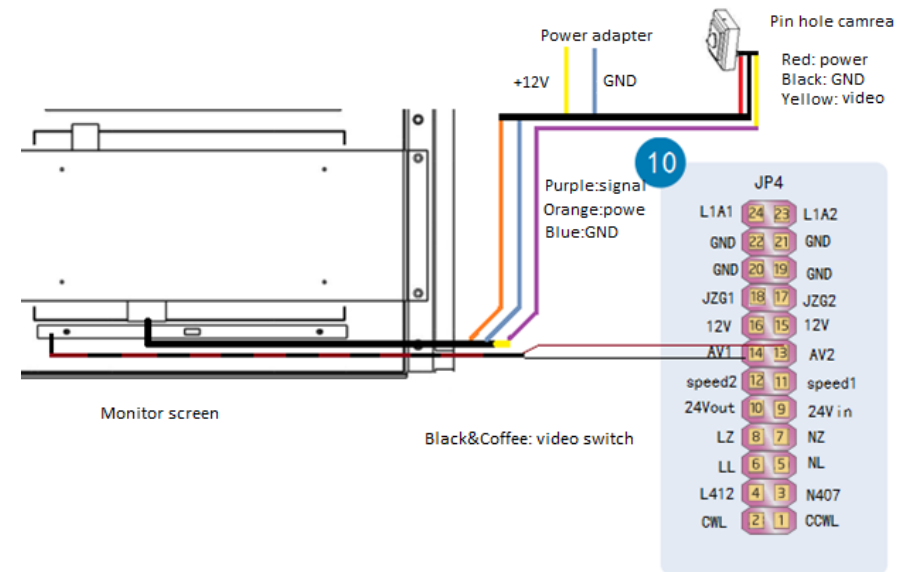


Fig 3-32 Monitor system wiring diagram

3-11 LED backlight replacement

LED backlight replacement needs to pay attention to plus-n-minus, refer to fig 3-33.



Fig 3-33 LED backlight

3-12 Push style electromagnet replacement

Push electromagnet is use to open the door automatically, located right side of chamber, its work voltage is 24V controlled by main control board, refer to fig 3-34.

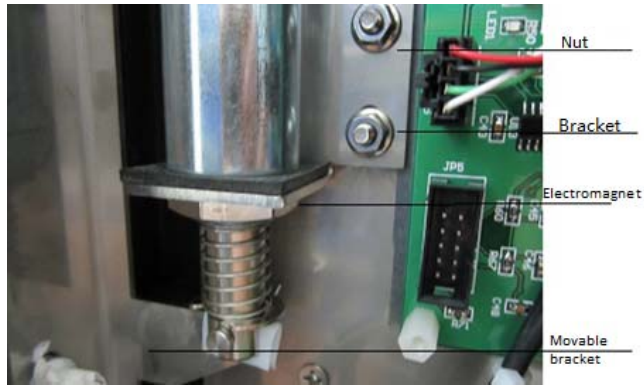


Fig 3-34 Push style mounting location

Wiring diagram

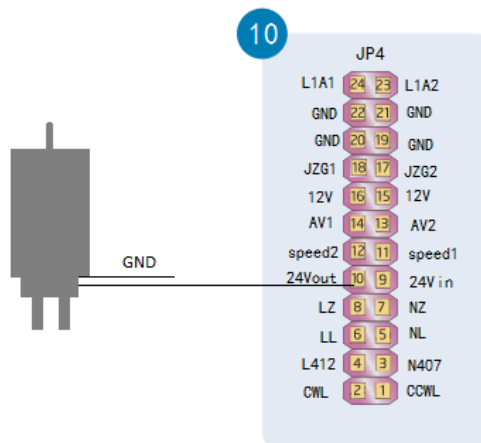


Fig 3-35 Electromagnet wiring layout

4 Trouble shooting

For safety considering, maintenance engineer who can do some service work should be trained and approved by PreeKem, and get the qualification.

Fault	Probable cause	Solution
No power	Fuse is blown Socket is loosen	Replace related fuse Insert socket again
No microwave	Fuse is blown HV components error Main control board error	Replace related fuse Check HV components Replace PCB
Microwave can not be regulated	Thyristor fault Main control board error Mutual inductor broken	Replace related thyristor Replace PCB Replace mutual inductor
Discontinuous microwave	Temperature error	Replace cooling fan (fan does not work) Replace related temperature
Temperature value unstable	Microwave interference Temperature socket loosen Temperature sensor Main control board error	Check door gap Re-mount the temperature Replace temperature Replace PCB
Temperature reading value error	No temperature signal Main control board error No calibration	Replace temperature sensor Replace PCB Calibrate temperature valve
Pressure value is not zero when the actual pressure is zero	No calibration Main control board error Pressure fault	Calibrate pressure error Replace PCB Replace pressure sensor
Pressure value unstable	Microwave disturb Pressure sensor fault Main control board error	Check door gap Replace pressure sensor Replace main control board
Spark in chamber	Improper microwave power	Set right microwave power
Crackle		Check HV transformers Check HV diodes appearance Check HV ca Check filament transformer terminals Check magnetrons appearance

Fault	Probable cause	Solution
Turntable does not work	Photoelectric sensor fault	Replace photoelectric sensor
	Motor fault	Replace motor
	Main control board error	Replace main control board
Touch screen fault	Resistance broken	Replace touch screen
	No calibration	Calibrate touch function
	Main control board error	Replace main control board
Garble code on screen	Bad data lines connection	Re-installation the data lines
	LCD fault	Replace LCD
	Main control board error	Replace main control board
No video show	No video signal	Replace pin hole camera
	No working voltage	Check 12V power and its wiring
	Monitor screen fault	Replace monitor screen
No response for 'auto open door' function	Exhaust fan is open	Stop exhaust fan
	Main control board error	Replace main control board
	No 24V work voltage	Replace power adapter (24V)
	Electromagnet fault	Replace electromagnet
	Axis of electromagnet decentration	Re-mount the door mechanism
Warning : "Time-out"	No microwave	Check microwave generated components
	Wrong microwave power setting	Set right microwave power
	Poor microwave absorb ability	Increase microwave power
	Heating time is short	Prolong heating time and set multi-step
Warning: "Temperature error"	Air leakage	Check the air impermeability
	Pressure sensor fault	Replace pressure sensor
	Main control board error	Replace main control board
Warning: 'Pressure limited'	Power is setted too large	Set related microwave power
	Pressure setting value is lower	Reduce microwave power
	Samples have good microwave absorbing ability	Increase setting value
	Pressure sensor fault	Reduce microwave power
Warning: 'Pressure control'	Pressure sensor fault	Replace pressure sensor
	Lower pressure setting value	Increase setting value
Warning: 'Turntable fault'	Main control board error	Replace main control board
	Turntable motor fault	Replace motor
	Photoelectric sensor fault	Replace Photoelectric sensor

4-1 HV components measuring method

Measuring the HV components input or output terminals with the power on is forbidden. These HV components can be estimated by measuring its resistance. Test behavior can only be operated 5 minutes latter after power off.

4-1-1 Filament transformer

Disconnect the primary and secondary wiring terminals, the resistance of primary is about 20 Ω and the secondary is 1 Ω normally. If resistance is right, we can eliminate the doubt of filament transformer fault

4-1-2 HV transformer

Disconnect the primary and secondary wiring terminals, the resistance of primary is about 1.5 Ω and the secondary is nearly 100 Ω normally (between secondary and grounding).

Fault type: open circuit

4-1-3 HV capacitor

- The resistance between two terminals is about 10M Ω .
- Lower or higher resistance indicate the capacitor has been break down.
- Resistance should escalate while the measuring process, if the resistance is directly fixed at 10M Ω , no escalation process, that indicates the HV capacitor has been break down.

Fault type: Break down

4-1-4 HV diode

Take down HV diode

- If no microwave generated and the surface temperature is too high that indicates HV diode has been break down.
- The resistance between anode and cathode is about 30 to 70M Ω .
- The resistance between cathode and anode is infinite.
- If the forward direction resistance is too high or reverse is too low beyond the standard indicates break down.

The anode must be connected with HV capacitor and reliable grounding for cathode.

4-1-5 Magnetron

- Resistance of filament cathode is nearly 1 Ω .
- Resistance between filament cathode and grounding is infinite.
- Magnet flaws on magnetron is not allowed.

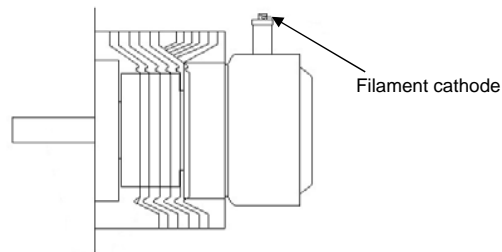


Fig 4-1 Magnetron appearance

Fault type: filament cathode open circuit, antenna spark, magnet flaws.

Caused faults: no microwave, lower microwave efficiency, blown fuse and HV diode.

4-2 Infrared sensor

Type: OPTCSMLT15

Temperature range: 0~350℃

Output: 0~3.5V

Ratio: 15:1

Scale: 1℃\10mV

Wiring define:

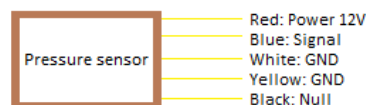


4-3 Pressure sensor

Range: 0~5Mpa

Output: 0~5V

Scale: 1atm / 50mV



5. Fault cause analysis

5-1 No microwave generated

- Maintenance engineer should confirm the fuses are not blown. If the fuse blown continually when start microwave, the problem must be caused by short circuit hidden in HV components, such as thyristor, HV capacitor, HV transformers and so on. Measuring method refer to chapter 4.
- If HV components have good quality, the possible reasons are terminals spark.
- Confirm related thyristor has input or output voltage. If no input voltage, the problem may caused by the former components described on wiring diagram, and if no output voltage, the problem maybe caused by thyristor error.
- If the problem is still encounter, change the magnetron and have a try.

5-2 Garble microwave power match

Thyristor can not control its output voltage may cause this fault, there are three cause reasons.

- (1) Power control signal afford by main control board is error.
- (2) Thyristor is broken.
- (3) Mutual inductor is broken.

5-3 Infrared display value error

- Infrared temperature is compensated, so the real temperature is lower than reading value displayed on screen, but they are both have a certain proportion relation.
- Measuring the output signal, if the signal is too large or stable, this problem must be caused by fault main control board.
- If the signal does not up while the temperature go up, the IR sensor may be broken.

5-4 Pressure display value error

- Observe the pressure value displayed on screen whether change or not to affirm fault through press the sensitive terminal by thumb.
- Measuring the output signal between blue and white, if the signal can match the displayed value, the problem maybe caused by pressure sensor.
- If there is no output signal or weak signal change, that's probably the pressure sensor error.
- Replace the pressure sensor after the fault confirmed to avoid difficult installation.

5-5 Other components faults

Other components work mechanism are relatively simple, right work voltage and good quality, these problems can be easily deal with according to the wiring diagram.

6 Parameter calibration

6-1 Temperature calibration (PT100)

Disconnect the temperature sensor in chamber, use standard resistance box to calibrate the temperature parameter, refer to fig 6-1.

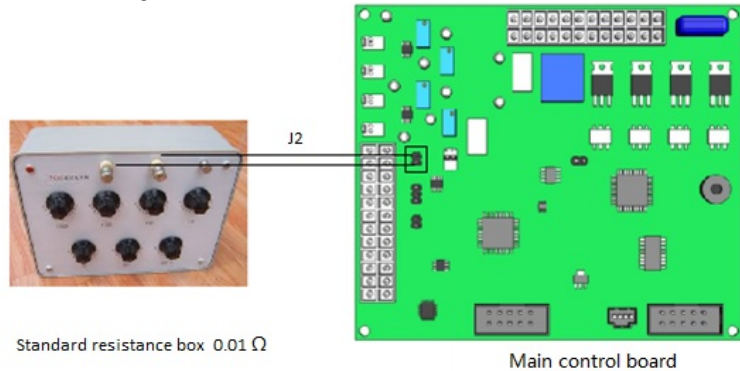


Fig 6-1 Wiring layout for temperature calibration

(1) Use super password entering calibration interface, refer to fig 6-4. There are one thing need to notice, that is gray status represents lowercase and highlight represents uppercase, refer to fig 6-2 and 6-3.

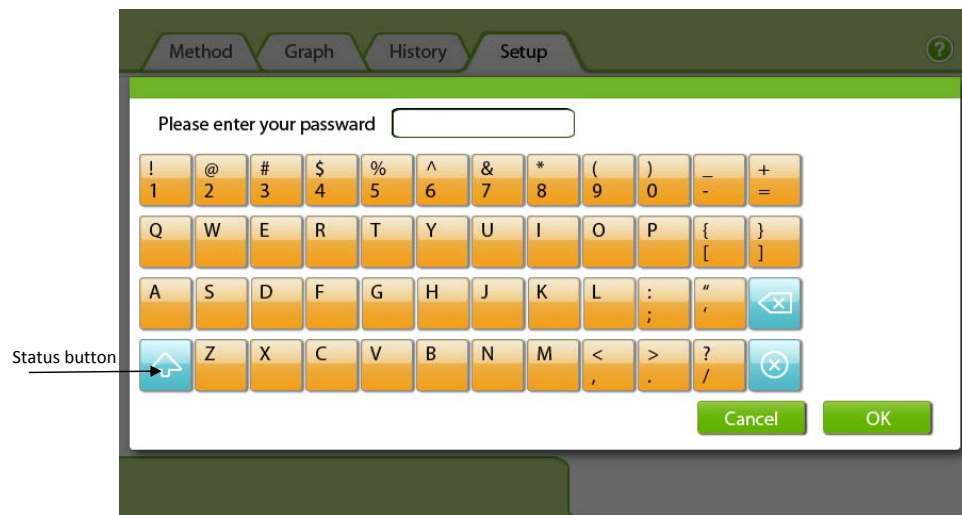


Fig 6-2 Lowercase status

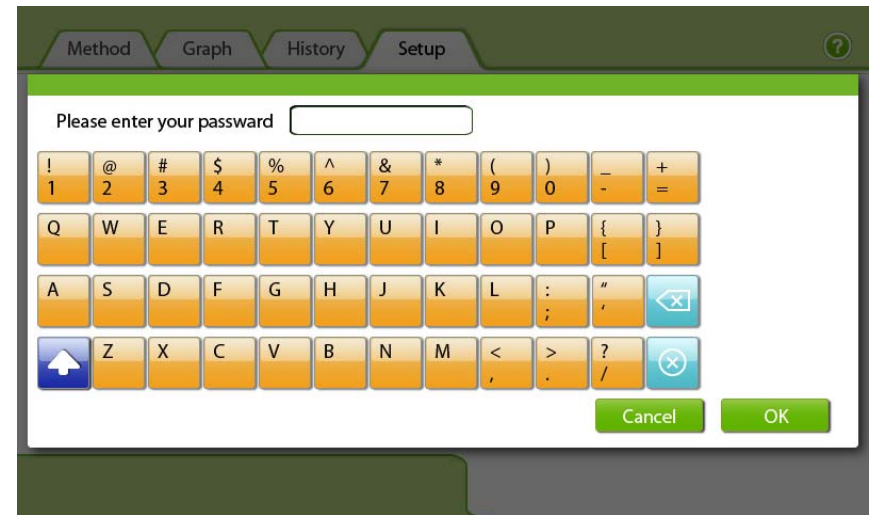


Fig 6-3 Uppercase status

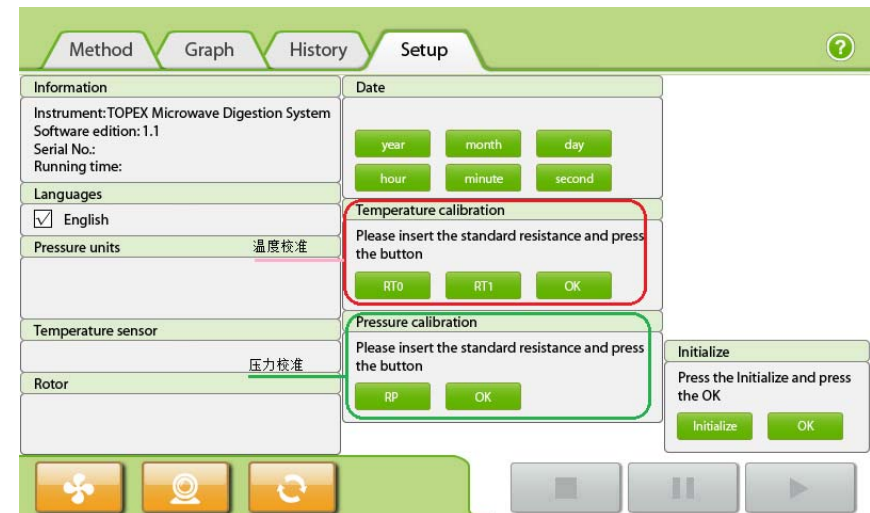


Fig 6-4 Temperature and pressure calibration interface

- (1) Set 100.00Ω, click button RT0, refer to fig 6-4, it's no need to click OK button.
- (2) Set 199.50Ω, click button RT1, finally click OK button to save.
- (3) Disconnect resistance box, reinstall the temperature sensor, if the temperature value displayed on screen is not right, the temperature should be calibrated again.

6-2 Pressure parameter calibration

Pressure parameter calibration should calibrate zero first then span, this sequence can not be reversed.

- (1) Multimeter connects with J6 pin S and G on main control board, refer to fig 6-5, adjust side Z until the output voltage is 10 mV . This operation process is zero calibration

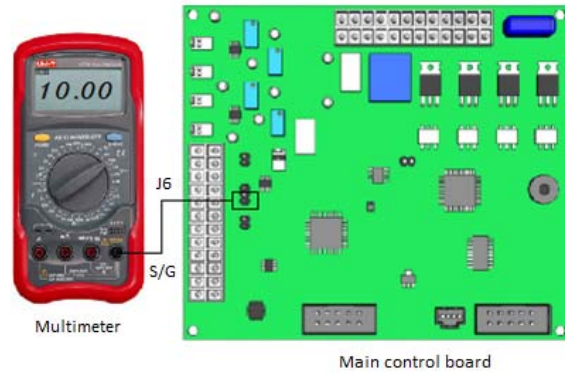
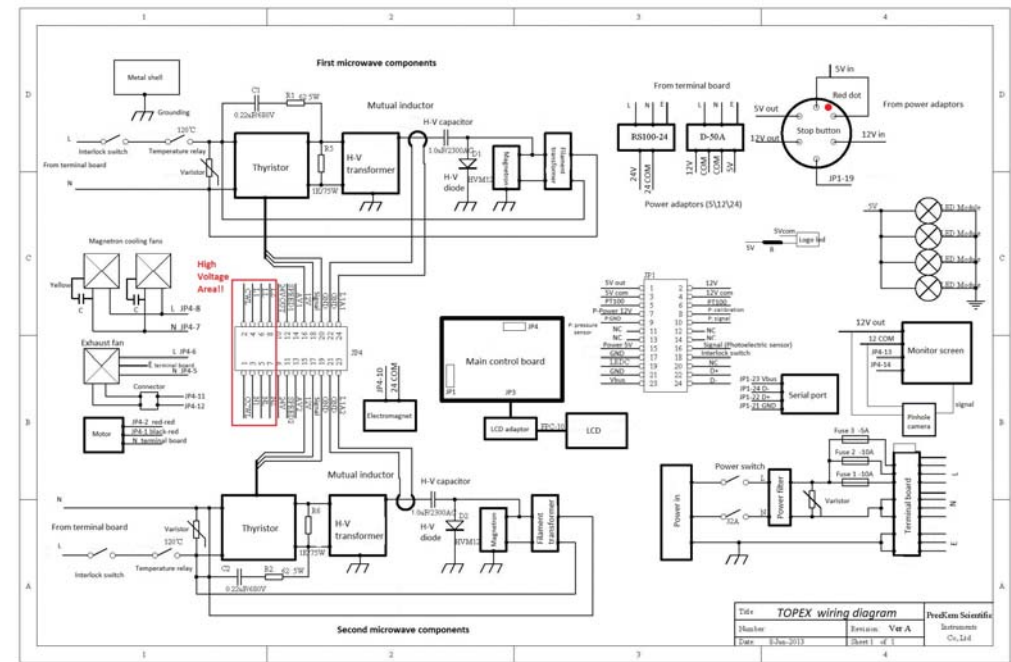


Fig 6-5 Wiring layout for pressure calibration

- (2) Connect J6 pin G and J with a mini jumper, adjust side S until the output voltage is 4.00 V then entering setting interface and press button RP, refer to fig 6-4, finally click button OK to save calibration value. If the value displayed on screen is not right, pressure parameter should be calibrated again.



7 Wiring diagram



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Service manual

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