

SERVICE MANUAL

Hematocrit Centrifuges

DM1424



VERSION20170325

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Chapter 1: General Information

1.1 About This Manual

This manual is version V1. 1.

The manual mainly describes the principle, structure, estimation adjustment of *DM1424 Hematocrit Centrifuge* when failures occur.


When estimating and dealing with failures, please pay attention to safety precautions and comply with the items strictly.

Each main part is attached to drawing with its name and code in this manual. When you need to purchase spare parts, please advise us the ERP No. provided.

Information contained in the manual is subjected to change without notice for product improvement.


1.2 Common safety precautions

Carefully read the following safety precautions for a thorough understanding.

- Follow the instructions and procedures described in this manual to operate this centrifuge safely.
- Carefully read all safety messages in this manual and the safety instructions on the centrifuge.
- Safety messages are labeled as indicated below. They are in combination with signal words of “WARNING” and “CAUTION” with the safety alert symbol  to call your attention to items or operations that could be dangerous to you or other persons using this centrifuge. The definitions of signal words are as follows:

 **WARNING:** Personal Danger

Warning notes indicate any condition or practice, which if not strictly observed, could result in personal injury or possible death.

 **CAUTION:** Possible damage to centrifuge

Caution notes indicate any condition or practice, which if not strictly observed or remedied, could result in damage or destruction of the centrifuge.

NOTE: Notes indicate an area or subject of special merit, emphasizing either the product’s capability or common errors in operation or maintenance.

- Do not operate this centrifuge in any manner not described in the user manual. When in doubt or have any troubles with this centrifuge, ASK FOR HELP.
- The precautions described in the user manual are carefully developed in an attempt to cover all the possible risks. However, it is also important that you are alert for unexpected incidents. Be carefully to operate this centrifuge.



WARNING

- This centrifuge is not explosion-proof. Never use explosive or inflammable samples.
- Do not install the centrifuge in or near places where inflammable gases are generated or chemicals are stored.
- Do not place dangerous materials within 30cm around the centrifuge.
- Make sure to prepare necessary safety measures before using samples that are toxic, radioactive or contaminated with pathogenic micro-organisms at your own responsibility.
- If the centrifuge, rotor and/or accessories that have been contaminated by solutions with toxic, radioactive or pathogenic materials, clean it according to the decontamination procedure that you are specified.
- If you require service at site, please sterilize and decontaminate it in advance, and then notice the service center involved in the details of the particular materials.
- To avoid electrical shocks, no wet hands to handle the power cord or turn on or off the power switch.
- For safety purposes, do not enter within 30cm around this centrifuge when it is in operation.
- While the rotor is rotating, never release the door lock.
- Unauthorized repairs, disassembly, and other services to the centrifuge excepted by our service center are strictly prohibited.



CAUTION

- This centrifuge must be located on a firm and level table.
- Make sure the centrifuge is horizontal before running.
- Make sure the angle between the door and cover is greater than 70 degrees when open the door.
- Be careful not put your fingers or hands between the door and cover while the door off.
- Do not move or relocate the centrifuge when it is running.
- When fluid into the rotor chamber, please promptly dry with a dry cloth to avoid sample contamination.
- Ensure to remove any objects and fragments of the tubes dropped inside the rotor chamber

before running this centrifuge.

- Cautions on rotor

- 1) Always check for corrosion and damages on the rotor surface before using it. Do not use the rotor if such abnormality found.

- 2) Do not set the centrifuge speed beyond the allowable minimum speed of the rotor kits (rotor or adapters). Make sure to run it below the allowable minimum speed.

- 3) Do not exceed the allowable imbalance.

- 4) Use the rotor and tubes within their actual capacities.

- 5) If the rotor is attached with a lid, ensure it is tightened before the operation.

- If any abnormal condition occurs during operation, please stop it immediately and contact our service center. Notify the alarm code if displayed.

- Earthquake is likely to damage the centrifuge, contact our service center if abnormality observed.

1.3 General Safety Guidelines

This manual contains the following caution instructions:



WARNING

Electric shock in contact with dangerous power supply voltage (320V)

In contact with control board and power board DC high pressure (320V), you may receive an electric shock to cause fatal or serious injury.

Before replacing control board or power board, make sure that power supply wire of the instrument has been pulled out and red indicator lamp on power board has been gone out.

Electric Shock in Contact with Dangerous Power Supply Voltage (220V or 110V)

These voltages may cause electric shock. Before connecting power supply cable of the centrifuge, make sure the POWER switch off.



CAUTION

Scald in contact with motor over temperature

Long time heavy load running of motor will lead to motor over temperature, which may cause scald.

Before replacing motor, please power off the centrifuge first, and pull out the power supply cable. Waiting until motor has been cooling down to avoid scald.

Power supply

Confirm that work power supply of *DM1424 Hematocrit Centrifuge* is AC110V/50Hz(60Hz) or AC 240V/50Hz(60Hz).

When connect power supply wire, grounding wire should be installed at the same time. Ensure that grounding resistance of the grounding wire is below 2 ohm. If the instrument is not connected to ground well, instrument capability of resisting exterior disturbance will be decreased, and floating voltage may occur which increases electric shock danger.

1.4 Warranty

1.4.1 Warranty of Centrifuge

The centrifuge is guaranteed for two years from the date of delivery provided that it has been operated and maintained properly.

The Centrifuge must be operated in accordance with our operating guidelines; serviced and maintained on a regular basis in accordance with the terms specified in the relevant user manual.

Only approved spare parts should be used in *DM1424 Hematocrit Centrifuge* and these should be changed on a regular basis as specified in the relevant user manual. Details of the approved spare parts and accessories are shown in the user manual.

1.4.2 Warranty of Rotor

The rotor is guaranteed for 5 years from the date of delivery upon manufacturer. Please pay attention, do not use the rotor once it has been corrosion or fatigue damage.

1.4.3 Limitations and Exclusions of Warranty

The warranties of centrifuge and the rotor become invalid in the case of the following conditions even if within the guarantee period expires:

- (1) Failures caused by incorrect installation.
- (2) Failures caused by rough or improper handling.
- (3) Failures caused by conveyance or relocation after installation.
- (4) Failures caused by unauthorized disassembly or modification.
- (5) Failures caused by using nonstandard spare parts or accessories and unauthorized

modification of the rotor or centrifuge.

- (6) Failures caused by natural disasters including fire, earthquakes and so on.
- (7) Consumables and parts have a limited guarantee period.

1.5 Installation, Relocation and After-sales Service

Installation should be carried out by or under supervision of qualified service personnel of our company or its authorized service agent.

In order to ensure to operate centrifuge safely and efficiently, it is necessary for regular maintenance. If centrifuge has problems, do not attempt to repair it by yourself. Contact our sales or service center.

If relocation of the centrifuge becomes necessary after delivery, please notify your local sales representative or service office of our company.

Chapter 2: Introduction

2.1 Specifications

Maximum speed	200-14000rpm, increment: 10rpm
Maximum RCF	18260×g, increment: 10×g
Maximum capacity	1.5/2ml×24(14000rpm);
Timer	30seconds -99minutes-HOLD, continuous operation
Driving Motor	Brushless DC motor
Safety devices	Dual door interlock、Over-speed detector、Over-temperature detector、Automatic internal diagnosis
Power requirements	DM1424: Single-phase, 220V-240V, 50Hz/60Hz, 5A. 110V-120V, 50Hz/60Hz, 5A
Dimensions (mm)	DM1424: (L) 280×(W) 364×(H) 266
Weight	DM1424: 10kg
Additional features	Speed/RCF switch、Pulse operation、Processing display、Voice reminder

2.2 Installation Conditions

This section describes the instructions that you should abide when install the centrifuge to ensure your safety and the optimum performance. Before moving the centrifuge, the rotor must be removed.

 **WARNING**

- Improper power supply may damage centrifuge.
- Make sure the power source conforms to the required power supply before connecting.

Location

(1) Place this centrifuge on a firm, flat and level table, ensure the four feet of this centrifuge stand on the table firmly. Avoid installing on the slippery table-board that conveys vibration. The table should be larger than an area of 80cm (L) × 80cm (W).

(2) Ideal ambient temperature is $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$, avoid placing the centrifuge in direct sunlight if temperature exceeds 30°C .

(3) Keep clear of the centrifuge at least 10cm on both sides and at least 30cm behind it to guarantee cooling efficiency.

(4) No heat or water resource nearby, otherwise easily cause sample temperature increase or centrifuge failures.

Connection of the power cord and grounding

 **WARNING**

- To avoid electrical shocks, no wet hands to touch the power cord.
- This centrifuge must be grounded properly.

An over 10A outlet which has a good ground is required, and meet with local safety requirements to ensure its earth terminal is proper.

2.3 Installation Qualification

2.3.1 Routine check

- Check if the centrifuge and accessories are completed.
- Check if there is nick or paint falling on centrifuge outside.
- Check if there is nick, injury and corruption on rotor surface. If yes, contact with service center.

2.3.2 Make sure the centrifuge stands firmly

- The centrifuge must be located on a firm and level table. Make sure it is horizontal before running and

four feet stand firmly on table.

2.3.4 Power on

- Insert power plug into power socket directly.
- After power on, self-checking interface will display and enter main interface if pass self- checking. Otherwise related error information will be displayed and please solve the problem according to the prompt.
- Open the door, and rotate the drive shaft slightly. Make sure no obvious shaking occurs while drive shaft is spinning.
- Put the rotor on drive shaft and put the lid on the rotor. Set the maximum speed and start running. It should be stable and no abnormal noise during running.

Attention: Some rotors may have “whistle” noise when it runs without rotor cover, or is not full with tubes, or the speed is more than 12000rpm.

Introduction of Structure

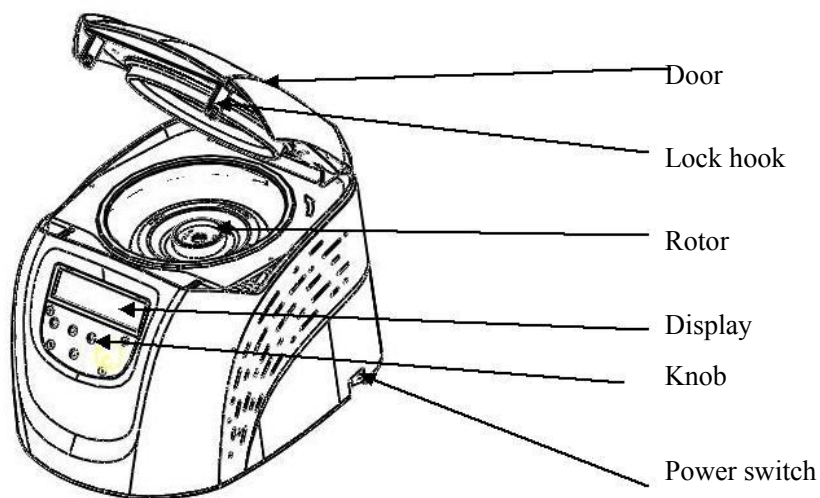
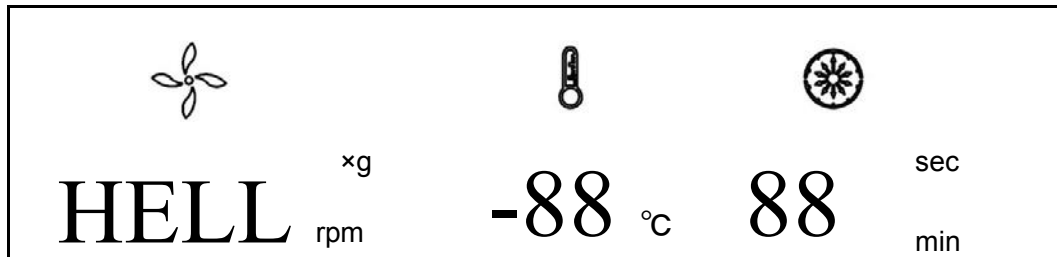


Fig. 2-1 DM1424 Centrifuge

Chapter 3: Introduction of Initial Interface

3.1 Welcome interface



3-1 Welcome interface

3.2 Accumulated running time

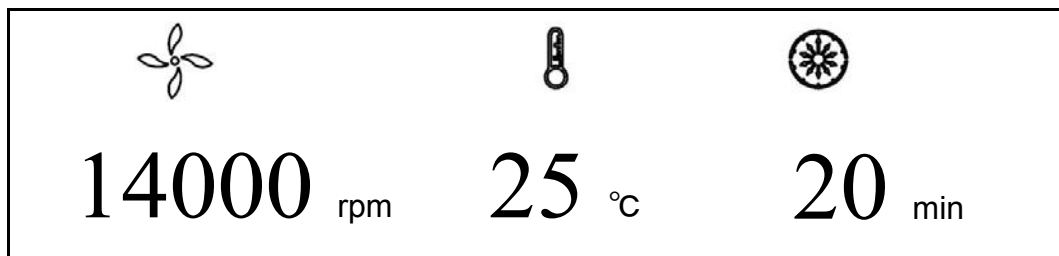
Second interface is to display the accumulated running time.



3-2 Accumulated running time (360 hours 55min 20sec)

3.3 The third interface is to display the operation parameters last time

You can run directly or reset the parameters what you want.



3-4 Preparation interface

Chapter 4: Trouble shooting

This centrifuge is designed with self-checking function. When something is wrong and it is not available to operate, the alarm code will be displayed on the screen, and the operator can know the malfunction caused by the alarm code.

4.1 Alarm Codes

Code	Possible Causes	Diagnoses	Measure
E01-- Turn on the power, LCD is not lit on.	<ol style="list-style-type: none"> 1. No power supply 2. Fuse is broken 3. Connection between control board and power board or between display board and control board is failure. 	Check if the fuse is broken	<ol style="list-style-type: none"> 1. Check and connect the power supply, then power on again 2. Replace fuse 3. Reconnect.
E02—door open	<ol style="list-style-type: none"> 1. the door is open during operation 2. door lock assembly is improper installed; 3. door lock assembly goes failure. 		<ol style="list-style-type: none"> 1. close the door at once; 2. adjust the lock assembly; 3. check or replace the lock assembly.
E03- Abnormal vibration	<ol style="list-style-type: none"> 1. rotor do not match with shaft; 2. samples are imbalance; 3. rotor lid loosed. 	Check if there is defects on the surface matching with shaft.	<ol style="list-style-type: none"> 1. Install the rotor again or replace the rotor; 2. Weighting scales and install symmetrically; 3. Tighten the rotor lid firmly
E04- Abnormal temperature sensor	<ol style="list-style-type: none"> 1. Temperature sensor goes failure; 2. Temperature sensor communication cable j4* is improper connected. 	Power on again, if code E04 is display during self-examination, mostly the problem is caused by 1 or 2, otherwise check control board	<ol style="list-style-type: none"> 1. Replace temperature sensor assemble; 2. Reconnect J4
E06- Set wrong parameters	The setting parameters exceed the allowable range		Modify the parameters value
E08- Abnormal temperature	<ol style="list-style-type: none"> 1. Temperature sensor goes failure; 2. Chamber temperature is over 48℃ 	Power on again, if code E08 is display during self-examination, mostly the problem is caused by 1 or 2, otherwise check control board.	<ol style="list-style-type: none"> 1. Replace temperature sensor assemble. 2. Lower the ambient temperature, or check if the fan works well.
E10-Unable to drive	<ol style="list-style-type: none"> 1. Connection between the motor and control board is improper; 2. Control board is failure; 3. Long time no running. 		<ol style="list-style-type: none"> 1. Reconnect motor and control board; 2. Replace the control board; 3. Rotate rotor by hand and run again.
E11- Speed signal losing	<ol style="list-style-type: none"> 1. Speed communication cable J5* is improper connected; 2. Speed sensor goes failure; 	Power on the unit and rotate the shaft slightly; Check LD3-8* on	<ol style="list-style-type: none"> 1. Reconnect J5*; 2. Replace speed sensor(motor) assembly;

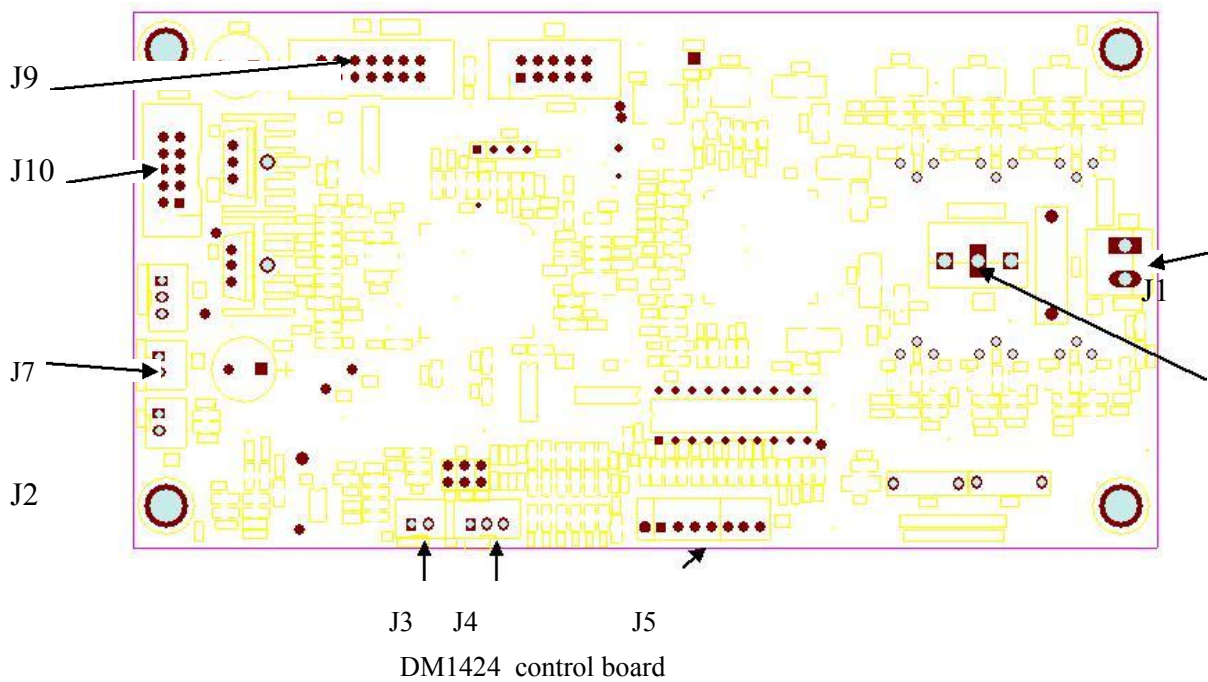
	3. Control board goes failure	control board which should blink 1 time every rotor round.	3. Check or replace control board.
E12-Motor over heated	1. Motor temperature is too high; 2. Motor over temperature cable j3* is improper connected.	If Motor temperature is too high(>105 °C), check whether motor bearing has noise.	1. Replace motor; 2. Reconnect J3* on control board;
E15- Over voltage(DC voltage is too high)	Power board DC voltage is more than 420V	1. Check whether connection of brake resistance P2* is well; 2. Whether the brake resistance has been broken; 3. If brake resistance is disconnected, DC voltage will be high during stop.	1. Reconnect and ensure brake resistance is proper connected; 2. Replace brake resistant if necessary
E20-Over speed(Real speed exceeds 1000 rpm than maximum speed)	Speed signal is unstable	Check if speed signal is normal during low speed and high speed	Replace speed sensor assemble or control board.

*** Please refer to Chapter 5 electrical components.**

Chapter 5: Electrical Components

5.1 Control board of DM1424

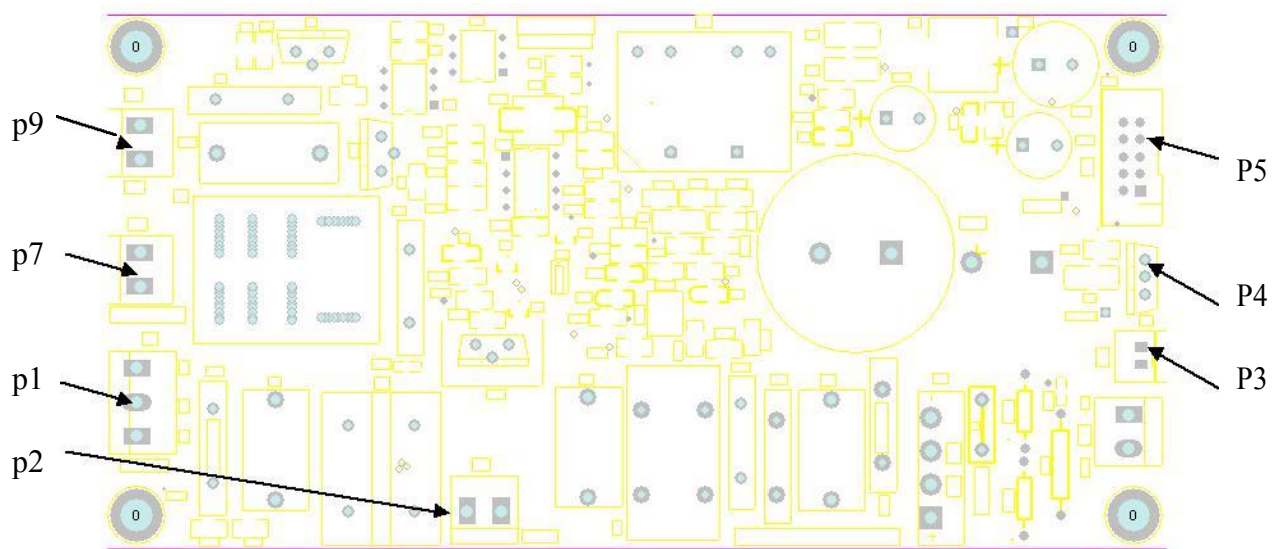
Control board PCB:



Position	Description	Normal	Failure	Remark
J1	DC power supply	DC300V~340V		
J2	Motor UVW			
J3	Motor over hot			
J4	Temperature			
J5	Speed signal		Off or blink unevenly	LD4-9 blink one time evenly every motor round.
J7	Lock signal	Off	On	
J9	Display-key connection	On	Off	
J10	Power connection			

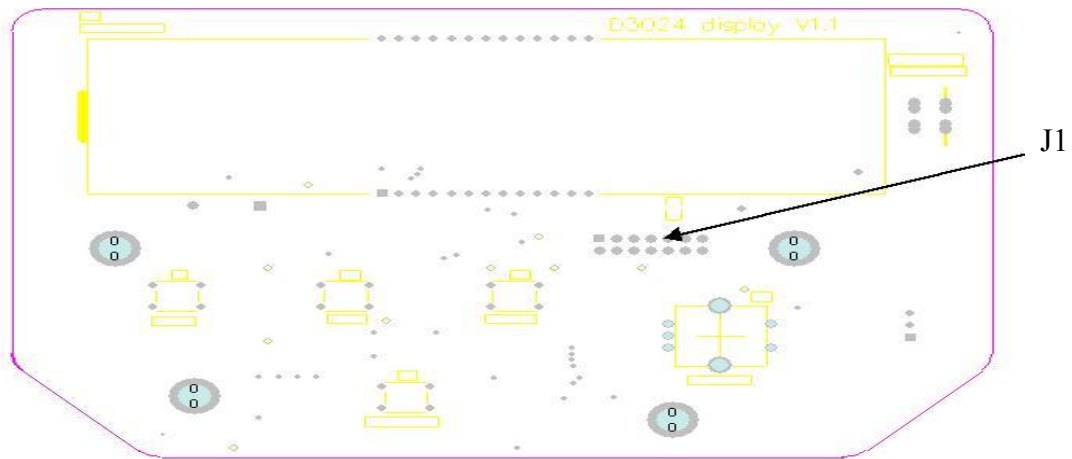
5.2 Power Board

Power Board PCB:



Position	Description	Normal	Failure	Remark
P1	Power supply	AC 110V or AC 220V		
P2	Brake resistance			
P3	DC high voltage	DC300V~340V		
P4	Lock power	DC24V		
P5	Control board connection			
P6	Cooling fan	AC 110V or AC 220V		
P7	Compressor	AC 110V or AC 220V		

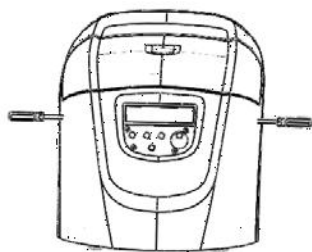
5.3 Display board



Position	Description	Normal	Failure	Remark
J1	Control board connection			

Chapter 6: Replacement of spare parts

6.1 Open the door and remove door cover

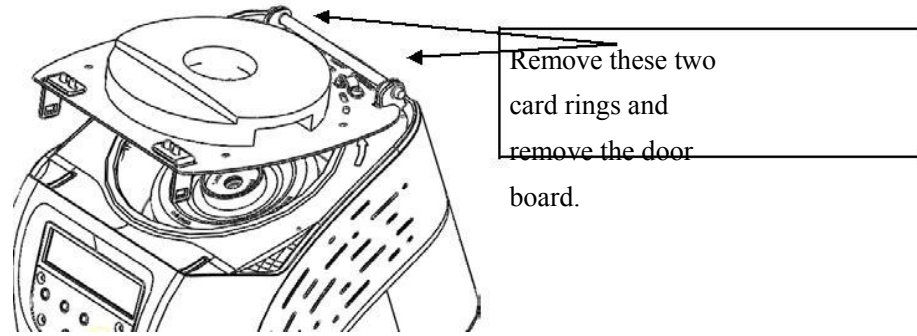


Open the door



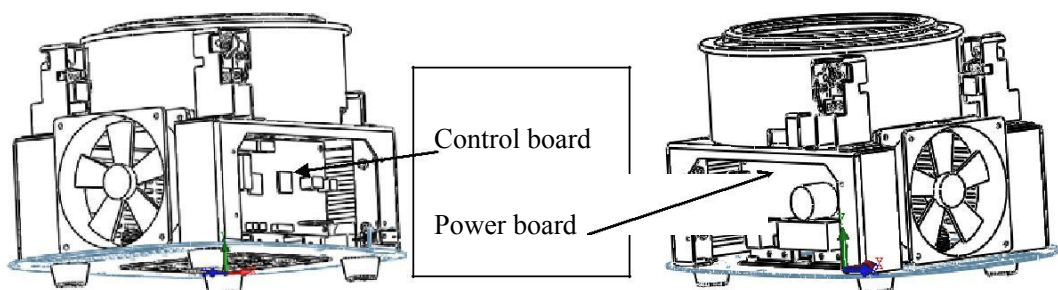
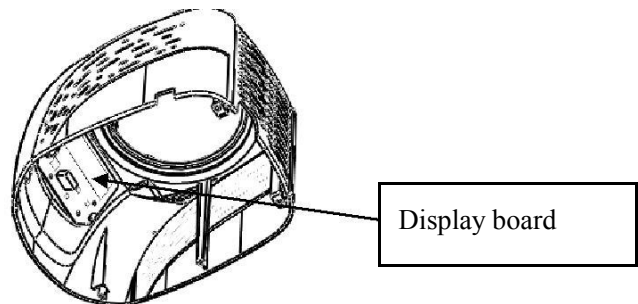
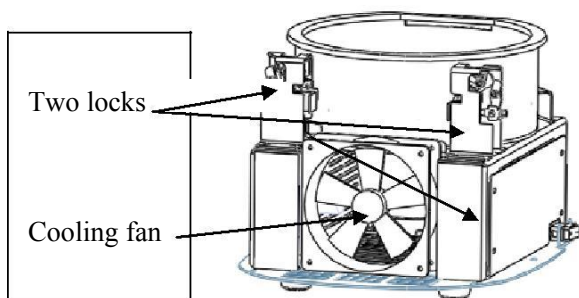
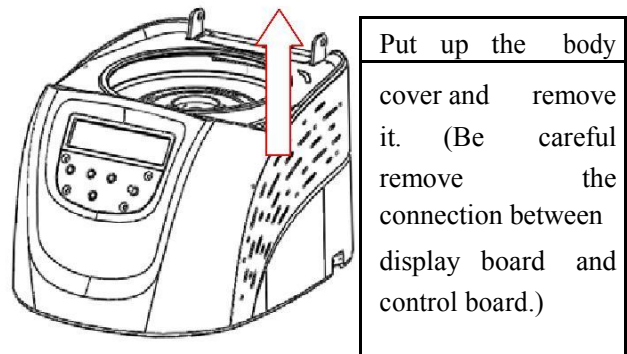
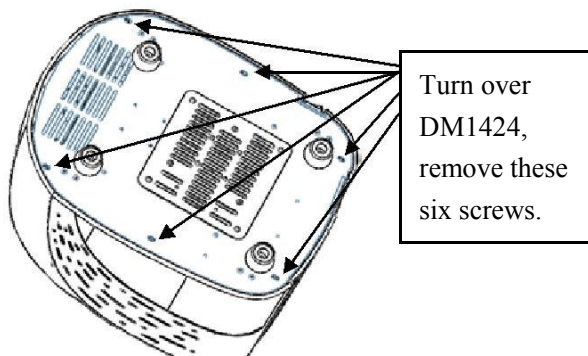
Remove door cover

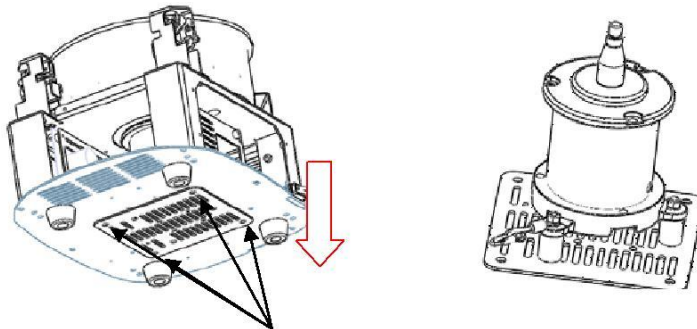
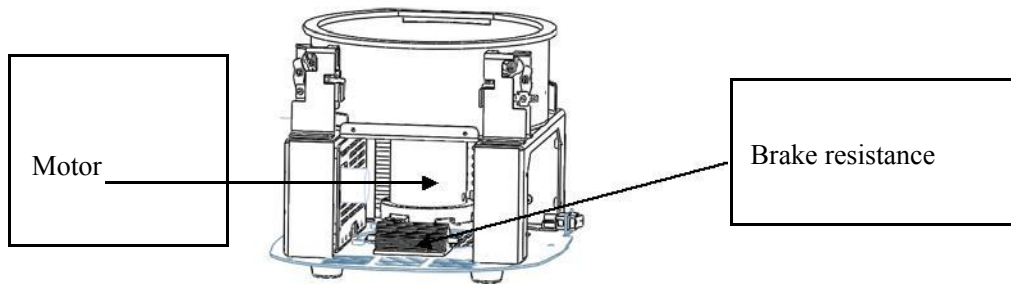
Remove these
four screws



6.2 Remove relevant parts

6.2-1 For DM1424



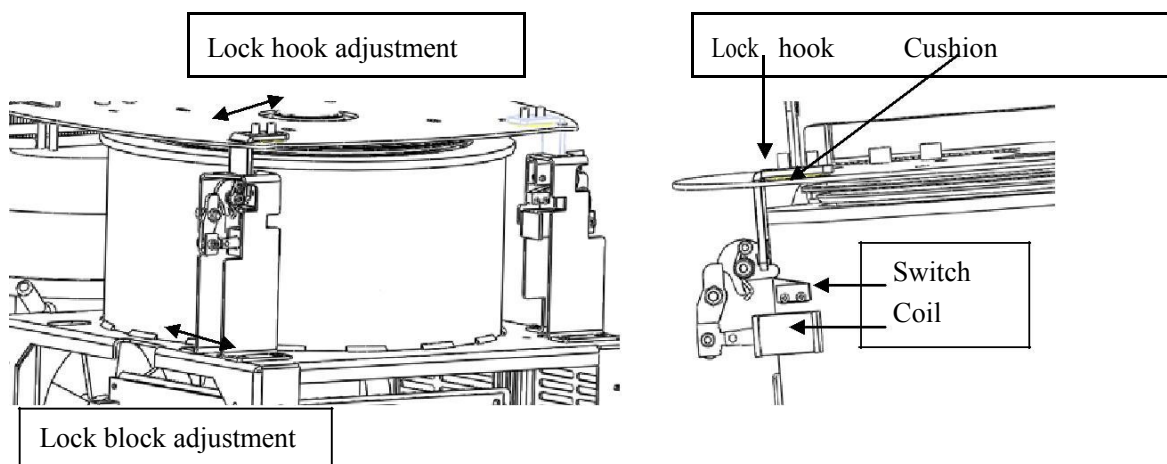


Remove the connections between the motor and others, then remove these four screws and pull down the motor unit.

Chapter 7: Frequency Problem

7.1 The lock failure

7.1.1 Introduce of the lock



There are two locks, but only one switch. The two coils are applied by DC 24 V.
The resistance of coil is around $100\Omega \pm 10\Omega$.

7.1.2 If can not open the door

- ① Open the door by key.
- ② Remove the door cover, adjust the lock hook from left to right, and make sure the lock work well.
- ③ If the lock does not work.
 - Remove the body cover.
 - Make sure the connection between the lock and power is ok.
 - Make sure the lock power (DC 24V) is ok. You can verify the coil connector, if the 24V appears at the moment the lock works.
 - You can adjust the lock block, move it forward or back forward.

7.1.3 Alarm code E02 displays

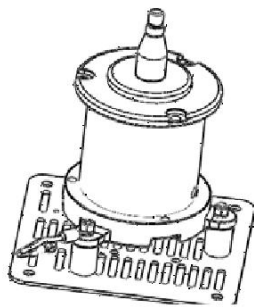
LCD will display the E02 error when run the centrifuge but the door is open.

You can adjust the tongue of the switch and make sure the switch is on when the door closed.

7.2 Big vibration during operation

- 1) Check if the rotor is in its position.
Rotate the rotor slightly, check if the rotor vibrates, if so attach the rotor again.
- 2) Check if there is some thing between the rotor and shaft.
- 3) Check if there is a defect on the rotor surface with the shaft.
- 4) Check if there is loosing for the three absorbers.

7.3 Motor installation



- 1) Install the absorbers on the motor first.
- 2) Put the motor on the pad, one hand hold the absorber, another hand tightens screws, make sure connection is firmly but the absorbers with little distortion.
- 3) Finally, verify there is no defect and big distortion on the absorbers.

Chapter 8: Spare Parts List

8.1 DM1424 spare parts list

Item	ERP No	Spare parts	Item	ERP No	Spare parts
1	19200131	View of door (sidelong)	23	19800063	Parts of power board (110V)
				19800064	Parts of power board (220V)
2	19200089	Door housing	24	19100005	Electric outlet
3	19200085	Soundproof material	25	19200102	D1424 Left baffle of stand
4	19200025	Lock hook of door	26	19200100	Back baffle of stand
5	19200088	Internal plate of door	27	19200104	Welded parts of protective cylinder
6	19200041	Waterproof cover of shaft	28	19200215	Chamber
7	19200042	Waterproof base of shaft	29	19100111	Parts of temperature sensor
8	19200446	seal ring of shaft	30	19200030	Wind guiding disc
9	19900012	Parts of electronic lock	31	19200029	Seal ring of door
10	19800021	Parts of radiator fan	32	19200087	Pressure spring board of door
11	19200101	Right baffle of stand	33	19200094	Baffle of hinge stand
12	19800058	Parts of control panel(1424)	34	19200086	Shaft of door
13	19100004	Mains switch	35	19200090	Sponge of protective cylinder
14	19200098	Fixing plate of control panel	36	19200583	Right tensional spring of door
15	19200156	120 Fan housing	37	19200584	Left tensional spring of door
16	19100020	Brake resistance	38	19200021	Shaft housing of door
17	19200049	Motor base	39	19200096	Hinge stand
18	19800047	Motor	40	19200095	Buckle of hinge stand
19	19200476	Shock absorber	41	19200093	Housing (blank)
20	19200103	Motherboard	42	19800001	Parts of display board
21	19200040	Foot	43	19200081	Button
22	19200099	Fixing plate of power board	44	19200341	Dynamic balance switch

DM1424 spare parts drawing

