

# 12 Care & Maintenance

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## 12.1 Overview

These procedures in this chapter are recommended.

### 12.1.1 Tools, Measurement Devices and Consumables

**Table 12-1 Tools and Measurement Devices**

Tool/Measurement Devices	Qty.	Remarks
Resin or plastic container	1 pcs	Can accommodate two probes
Soft brush	1 pcs	About a toothbrush size
Small plastic basin	1 pcs	Used to fill the soapy water
Safety test analyzer	1 pcs	Refer to appendix A
Inner hexagon wrench	1pcs	Inner hexagon wrench 6 #
Solid wrench	1pcs	With opening diameters of 36mm
Cross-headed screwdriver	1pcs	105 X100

**Table 12-2 Consumable List**

Consumable	Qty.	Remarks
Aluminum foil	About 1 meter	
Physiological saline	About 1000ml	Filling a half container Immerging the whole probe (referring to appendix A). (concentration 0.85 ~ 0.95%)
Mild soapy water	About 400ml	
Dry soft cloth/cotton cloth	About 5 pcs	

### 12.1.2 Care and Maintenance Items

**Table 12-3 Maintenance Items and Frequency**

NO.	Maintain content	Frequency	Method
1.	Clean dust-proof covers	Once a month	Referring to12.2.1
2.	Clean monitor and touch screen	Once a month	Same as the above
3.	Clean trackball	Once a month	Same as the above
4.	Clean control panel / minor panel	Once a month	Same as the above
5.	Clean probes (the head)	Every time after using	Same as the above
6.	Clean probe cable and the surface of connector	Once a month	Same as the above
7.	Clean holders (including probe holder and gel holder)	Once a month	Same as the above
8.	Clean cover	Once a month	Same as the above
9.	Clean peripherals	Once a month	Referring to12.2.2
10.	Check surface of probes	Once a day	Referring to12.3.1
11.	Check power cable, plug and circuit breaker	Once a month	Same as the above
12.	Check battery	Once a year	Same as the above
13.	Check function of peripherals and options	Once a year	Referring to12.3.3
14.	Mechanical safety inspection	Once a year	Referring to12.3.4
15.	Electrical safety inspection	Once per two years	Referring to appendix A

## 12.2 Cleaning

### 12.2.1 Clean the System

#### 12.2.1.1 Flow of Cleaning

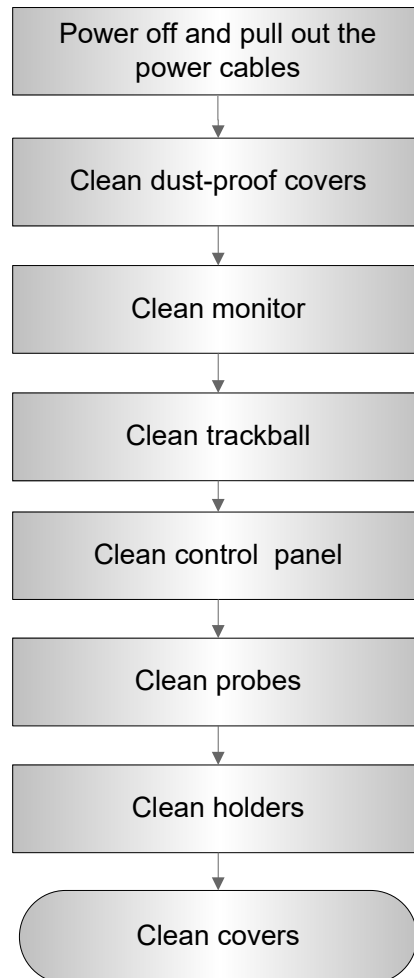


Fig 12-1 Cleaning maintenance flow

**⚠WARNING:** Before cleaning the system, be sure to turn off the power and disconnect the power cord from the outlet. If you clean the system while the power is “On”, it may result in electric shock.

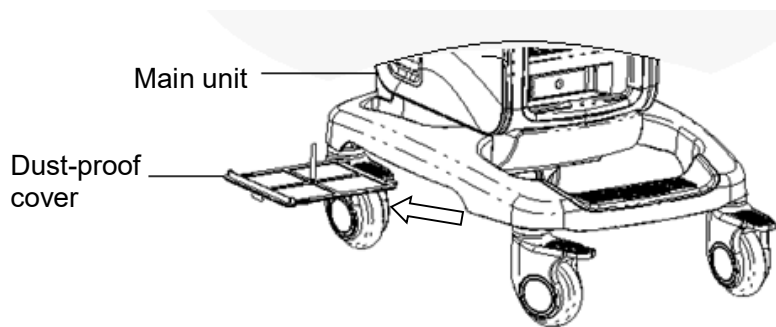
#### 12.2.1.2 Content

##### 1. Clean dust-proof covers

- Tool: Soft brush
- Method:

a) Disassemble dust-proof cover before cleaning.

System dust-proof cover: Grab the lower side of the dust net frame, and then pull out the net.



Probe port dust-proof cover: there is a probe port dust-proof cover at the front of the system, Pull it out.

- b) Cleaning: with soft brush and then wipe off the dust.
- c) Assemble dust-proof covers.

Input the dust-proof clasp into the slot of the main unit, push the dust-proof inward until the dust-proof clasp is blocked in the slot.

**⚠CAUTION:** Please clean all dust-proof covers of the system periodically (1 time per month); otherwise, system damage may result. Cleaning times can be increased when the system is used in the open air or somewhere dust is more.

## 2. Clean Monitor

- Tool: soft dry cloth, clear water or soapy water
- Method:

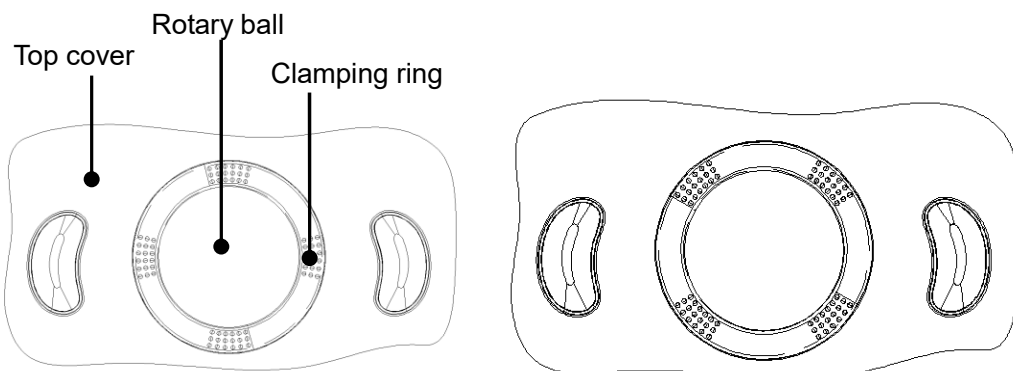
Surface of monitor and touch screen should be cleaned with soft dry cloth directly. Remained stain should be washed out by cloth with a little clear water or soapy water, and then air-dry the surface.

## 3. Cleaning the trackball

- Tools: paper, dry cloth, mild soapy water
- Method:

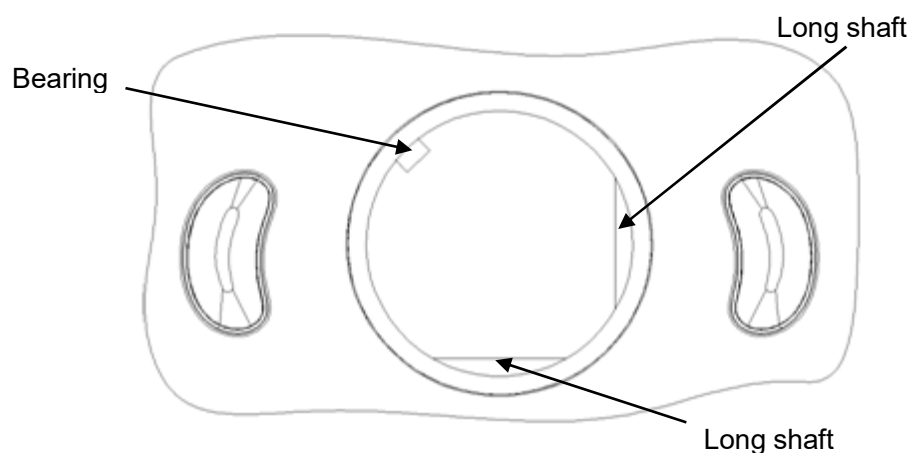
- a) Disassembling the trackball:

Press the bulges on the clamping ring using both hands and turn the ring about 35° clockwise until it lifts. Take out the ring and the rotary ball. Be careful not to drop the ball. See the figure below.



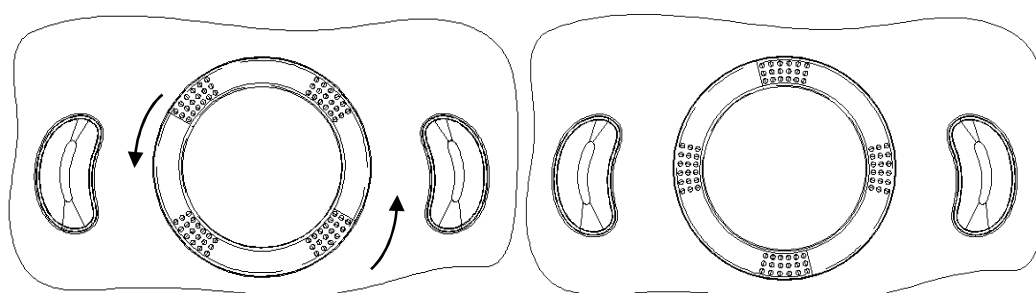
b) Cleaning

Clean the two long shafts, the bearing and the rotary ball with a clean soft dry cloth or paper.



c) Installing the trackball

Put the rotary ball back in the trackball mechanism and put the clamping ring back in. Turn the ring counterclockwise until the bulges are flush with the top cover and the ring clicks and locks, meaning the ring is secured. See the figure below.



#### 4. Clean Control Panel

- Tools: dry soft cloth, soapy water
- Method:

Use dry soft cloth to clean the surface of control panel (including keystrokes, encoders and sliders). If the control panel is dirty, moisten the soft cloth with a little mild soapy water and wipe off any stains. Use another dry soft cloth to remove any moisture and allow all hard surfaces to completely air-dry. If it is difficult to clean the control panel, disassemble the encoder caps first and then use mild soapy water to clean it.

**NOTE:** The control panel should be cleaned periodically; otherwise, keys maybe blocked by dirt and buzzer dings, keys don't work.

#### 5. Clean Probe

- Tools: mild soapy water , dry soft cloth, soft brush
- Method:

- a) Wipe out the dust attached to surface of probe head, connector and cable with dry soft cloth.

- b) Use soft brush to brush the dust inside probe connector gently.
- c) Remained stain or dust attached to surface of cable or surface of connector should be washed out by cloth with a little soapy water, and then air-dry.

**NOTE:** Don't use cloth with water to clean the probe connector.

## 6. Clean Holders

- Tool: dry soft cloth, soapy water, soft brush
- Method:
  - a) Use dry soft cloth to wipe off the dust attached to inside, outside or gap of probe holder or gel holder. As to small intra-cavity probe holder or its gap, use the soft brush to brush the dust or stain.
  - b) Remained stain attached to inside, outside of holder should be washed out by cloth with a little soapy water after it was taken out, and then install the holder after air-dry.

## 7. Clean Cover

- Tools: dry soft cloth, soapy water
- Method:

Use dry soft cloth to clean the cover of the system. If the system is dirty, moisten the soft cloth with mild soapy water and wipe off any stains, then air-dry.

Note: Be sure to use soft brush to brush the dust attached to all the sockets or interfaces which can be seen (such as probe sockets, sockets or interfaces in IO panel and power supply panel), not the cloth with water.

# 12.2.2 Clean the Peripherals

Do the cleaning maintenance according to your actual peripheral configuration; items which are not configured can be skipped.

**Table 12-4 Peripherals Cleaning List**

No.	Content	Description
1.	Color and B/W video printer	First wipe off dust or stain attached to the cover of printer with soft dry cloth, then clean the inside of printer. Be sure to do the cleaning maintenance according to the operation manual if is necessary.
2.	Graph / text printer	First wipe off dust or stain attached to the cover of printer with soft dry cloth, then clean the inside of printer. Be sure to do the cleaning maintenance according to the operation manual if is necessary.
3.	Foot switch	Use soft dry cloth with a little mild soap water to wipe off the dust or stain attached to the pedals or cable of foot switch.
4.	Bar code scanner	First use soft dry cloth to wipe off dust attached to glass panel of scanner, then the dust or strain attached to cable and bracket. Be sure to do the especial cleaning maintenance according to the operation manual if is necessary.

## 12.3 Checking

### 12.3.1 General check

**Table 12-5 General check list**

No.	Content	Method
1.	Probe	a) Visually check to confirm that there is no crack and expansion to probe head. b) Visually check to confirm that there is no deterioration or desquamation to probe cable. Visually check to confirm that there is no bend, destroyed or falling off pins to the connector
2.	Power supply cable and plug	a) Visually check to confirm that there is no wrinkles, crack or deterioration b) Manually check to confirm that there is no looseness or rupture to cable. The connection of plug is reliable and the retaining clamp of power supply cable is effective.
3.	Battery	Check the battery periodically : a) Check if battery can be charged normally when power-on: That the current capacity is 100% or capacity increases after a short time indicates that the battery can be charged normally. It takes less than 2 minutes to increase 1% capacity when the total capacity is less than 90% and it takes more time when the capacity is more than 90%. b) Disconnect the system from the AC power supply to confirm if the system can maintain normal work status in the battery power supply.

### 12.3.2 System Function Check

The system function checking is not required during Preventive Maintenance. Engineer or Customer may use it as part of their product Quality Assurance Program tests.

**Table 12-6 System function list**

No.	Content	Method
1.	B mode	Verify basic operation of B mode. Check basic software and hardware controls affecting B mode operations.
2.	Color mode	Verify basic operation of Color mode. Check basic software and hardware controls affecting Color mode operations.
3.	Doppler mode (PW/CW)	Verify basic operation of Doppler mode. Check basic software and hardware controls affecting Doppler mode operations.
4.	M mode	Verify basic operation of M mode. Check basic software and hardware controls affecting M mode operations.

No.	Content	Method
5.	Measurement (2D, M, Doppler general measurement, optional applied measurement )	Scanning gray scale imaging on phantom, verify distance and area accuracy with measurement control. Verify measurement accuracy by performance test.
6.	Keyboard test	Operate keyboard test to verify if all control keys can work normally.
7.	LCD	Verify LCD display function and parameters adjustment. Refer to that of LCD checking.
8.	Software menu check	Verify software menu display function: if each operation menu and page can be accessed.
Remark: Please refer to 5.4~5.5 for details.		

### 12.3.3 Peripherals and Options Check

If the system is not configured with any module or peripheral, the corresponding items checking can be skipped.

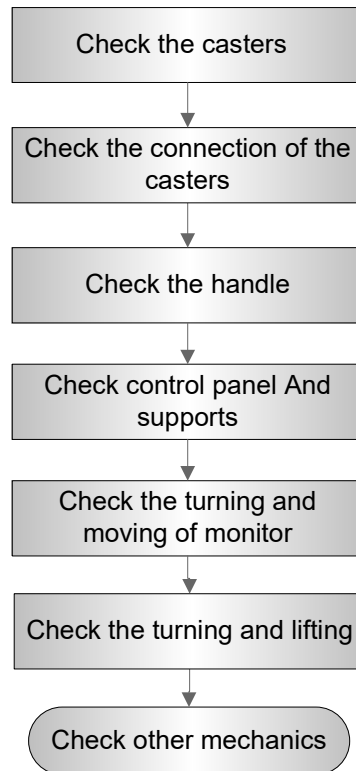
**Table 12-7 Options, Peripherals and Accessories Check list**

No.	Content	Method
1.	Color and B/W video printer	Check if the output of video printer is normal.
2.	Graph / text printer	Check if the output of graph / text printer is normal.
3.	Foot switch	Check if the foot switch can implement the set functions according to the program.
4.	DVD-R/W	Check if DVD can work normally (write, read and pop).
5.	Bar code scanner	Check if the scanner can work normally and the output content is right.
6.	DICOM	Check if DICOM can work normally and send pictures and other data to DICOM server.
7.	ECG module	Check basic operations and verify the implementation of ECG functions.
Remark: Please refer to 5.3 for details.		

### 12.3.4 Mechanical Safety Inspection

Mechanical safety inspection is mainly used to check mechanical strength and mechanical function of the key assembly of ultrasonic system. The mode of test evaluation mainly is: Perform the evaluation by means of visual check and operating check, if the check result cannot pass, the system is in abnormal status now. Stop using the system and adopt proper measures. The test flow is as following:





**Fig 12-4 Mechanical Safety Inspection Flow**

**Table 12-8 Mechanical Safety Check**

NO.	Item	Method	Tool
1.	Caster	1. Visually check to confirm there is no any crack. 2. Operate the casters to confirm the locking and releasing functions are normal.	none
2.	Connection of the caster	a) Visually check to confirm that there is no skewness and the connecting studs are free of breakage or falling off. b) Check with the wrench to make sure that there is no looseness between the caster and the base connection stud.	Solid wrench
3.	Handle	1. Visually check to confirm there is no any crack. 2. Hold the handle to push the ultrasound machine, and then pull it gently to confirm that the handle is free of looseness.	none
4.	Control panel and support assembly	Check by hand to confirm that the support assembly is normal and the control panel is free of skewness and looseness.	none
5.	Fixing and rotating	a) Visually check to confirm if any inclination happened to the monitor.	none

NO.	Item	Method	Tool
	mechanism of the monitor	b) Manually operate the monitor to make sure the monitor can be rotated around its central pivot point or tilted for the optimum viewing angle normally, no abnormal sound exists.	none
		c) Remove the rear cover of the control panel and neck cover of the monitor, check by a wrench to confirm that the fixing screw are free of looseness; Visually check to confirm that the cables are not scratched or clipped out that the core can be seen.	Cross-headed screwdriver, inner hexagonal wrench 6#
6.	Turning and lifting mechanism	<ol style="list-style-type: none"> <li>1. Hold the height adjusting handle under the control panel to move it to the end of the adjustable height , make sure that control panel can go up and down normally without abnormal sounds or phenomena</li> <li>2. Hold the height adjusting handle to move it to the middle of the adjustable height, make sure that the control panel can turn smoothly without abnormal sounds or phenomena.</li> </ol>	none
7.	Other mechanics	Check to confirm that there is no looseness to other mechanical parts, no crack to cover and no conductive parts show in sight.	none

### 12.3.5 Electrical Safety Inspection

Only technical professionals or engineers after training can perform electric safety inspection.  
Please refer to appendix A: Electrical Safety Inspection for details.