5 Maintenance

5.1 Care and Maintenance

5.1.1 Overview

5.1.1.1 Overview

The ultrasound system does not require regular preventative maintenance such as calibration or adjustments to the hardware and transducers. Periodic cleaning and quality inspection described in this chapter are recommended.

5.1.1.2 Tools, Measurement Devices and Consumables

Table 5–1 Tools and measuring devices

Tool or Measuring Device	Quantity	Remarks
Plastic or resin container	1	Used to store the saline, and can accommodate two ultrasound probes.
Soft brush	1	Its size is similar to that of a toothbrush, and it has a soft head.
Small plastic basin	1	Used to store the soapy water.
Safety tester	1	Used when conducting electrical safety tests. For details, see Part III Appendix. **9.3** Electrical Safety Maintenance

Table 5–2 Tools and measuring devices

Consumables	Quantity	Remarks
Aluminum foil	About 1 m	None
Normal saline solution	About 1000 mL	At least half of the container should be filled with the solution so that the probe can be submerged by the solution (with the concentration of 0.85 to 0.95%).
Mild soapy water	About 400 mL	None
Dry soft cloth or cotton cloth	About 5 pcs	None
Wet wipe	About 5 pcs	None

5.1.1.3 Routine Maintenance Items

Table 5–3 Maintenance items and maintenance frequency

No.	Item	Recommended Frequency	Operator		Method
			End user	Engineer	
1	Clean the filter.	Once per month	•	•	Refer to section "2.1.3 System Cleaning".
2	Clean the display.	Once per month	•	•	
3	Clean the trackball.	Once per month	•	•	
4	Clean the control panel.	Once per month	•	•	
5	Clean the probe (acoustic head part).	After each use	•	•	
6	Clean the probe cable and connector housing.	Once per month	•	•	
7	Clean the holders (including the probe holder and medical ultrasound couplant holder).	Once per month	•	•	
8	Clean the cover, storage tray, and protective cover of the probe.	Once per month	•	•	
9	Clean the peripherals.	Once per month	•	•	
10	Check the probe surface.	1 time/day	•	•	Refer to section "2.2 Check".
11	Check the power cord and plug.	Once per month	•	•	
12	Check the battery.	Once per 3–6 months	•	•	
13	Check the water cooling system.	Once per 3–6 months		•	
14	Check the electric assist function.	Once per month	•	•	
15	Calibrate the electric assist sensor.	Once per year		•	

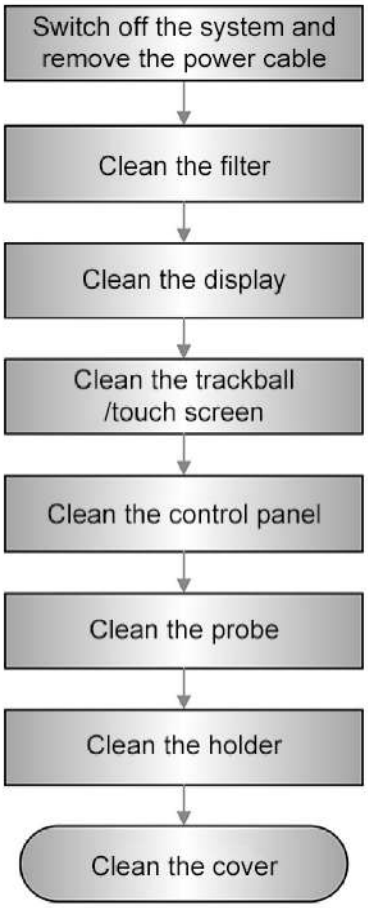
Table 5–3 Maintenance items and maintenance frequency(continued)

No.	Item	Recommend-ed Frequency	Operator		Method
			End user	Engi-neer	
16	Check the electric lifting function.	Once per month	•	•	
17	Check the functions of peripherals and optional accessories.	Once per year	•	•	
18	Check the mechanical safety.	Once per year	•	•	
19	Check the electrical safety.	Once per year		•	

5.1.2 System Cleaning

5.1.2.1 Flow of Cleaning

Figure5–1 Flow of Cleaning



WARNING

Before cleaning the machine, power off the machine and unplug the power cable. Cleaning the device in the power-on state may result in electric shock.

5.1.2.2 Cleaning the Filter

Filter of the main unit

Tool: soft brush

Method:

1. Before cleaning, remove the filter. Remove the front cover assembly and the filter as shown below.

1) Pull out the rear grille outward from the groove, remove it directly, and flip it over on the workstation.

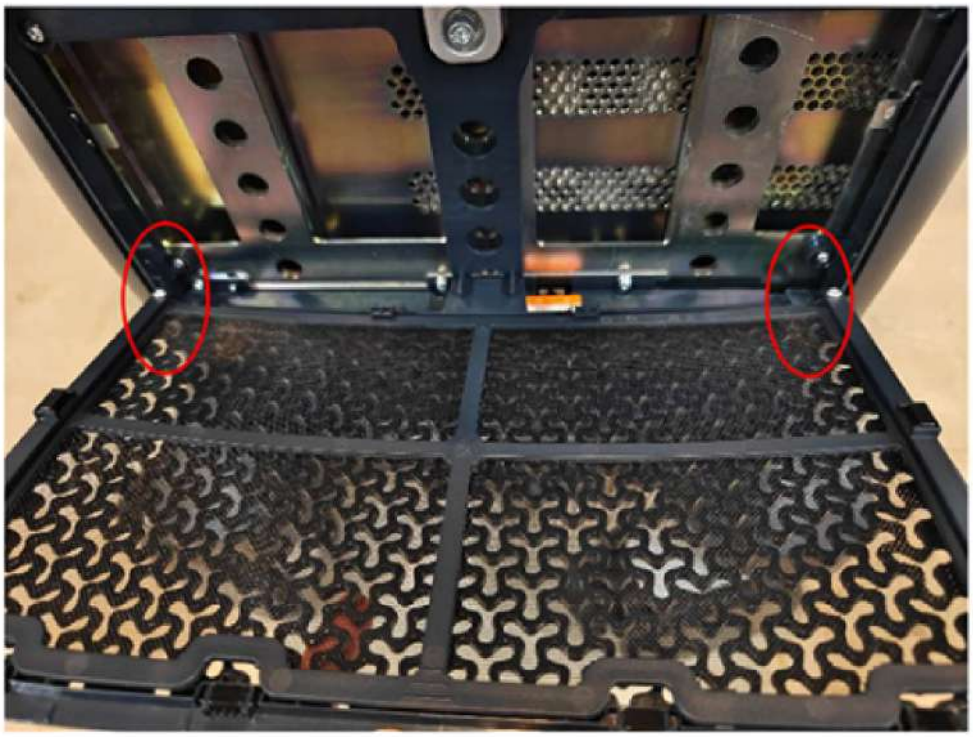
2) Pull out the filter installed on the back of the grille.

3) Find the filter handle on the upper part of the chassis and pull the filter outwards.

Figure5–2

2. Clean the filter: Gently brush off the dust from filter with a soft brush.
3. Install the filter: Follow the steps for removing the filter. First slot the rear grille onto the back shell, and then close the grille. If you hear a click, it means the grille has been successfully installed.

Figure5–3



CAUTION

Clean all the filters of the machine regularly (once a month). Otherwise, it is easy to cause overheating to the machine, make excessive noise, lead to shutdown, and even cause damage to the machine. When the machine is used in dusty places, increase the cleaning frequency.

5.1.2.3 Cleaning the Display

Tools: dry soft cloth, water or mild soapsuds
Method: Directly use a dry soft cloth to clean the surface of the display and touch screen. If there is still a stain, dip a dry soft cloth with a little water or mild soapsuds to wipe and then air dry the display.

NOTICE

- **Remove the protective film from the touch screen before use.**
- **The residual gel left on the screen may cause the touch screen to malfunction or become ineffective. Wipe and clean it in a timely manner.**

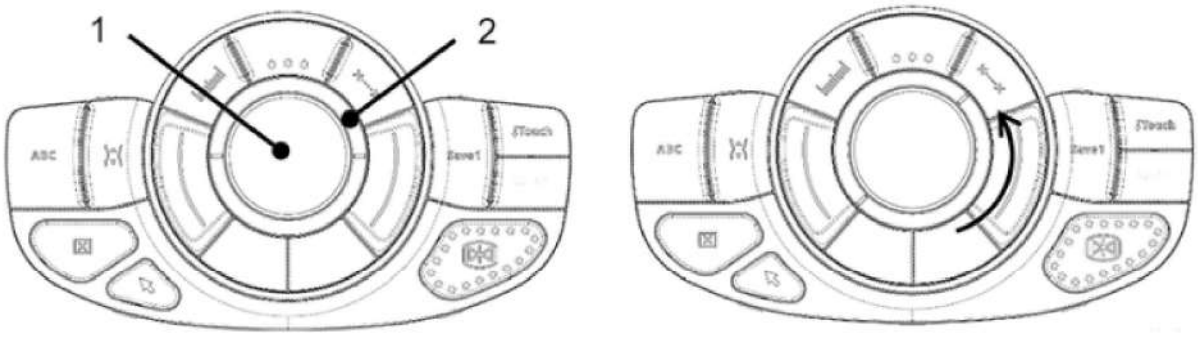
5.1.2.4 Cleaning the Trackball

The trackball is a human-computer interaction component. It is easy for the trackball to bring dust or the silicone oil of the sterile cover to the ball surface or into the module during use. Therefore, regular maintenance is needed to ensure the system performance. When the cursor control is not flexible, it may be caused by dust pollution inside the trackball of silicone oil on the ball surface. In this case, remove the trackball and clean the dust inside.

- Tools: paper tissue, dry soft cloth, wet wipe, and mild soapsuds
- Method:

1. Remove the trackball:
   Press the bulges on the clamping ring by both hands and turn the ring about 45° counterclockwise until it lifts. Take out the clamping ring and the trackball. Be careful not to drop the ball. See the figure below:

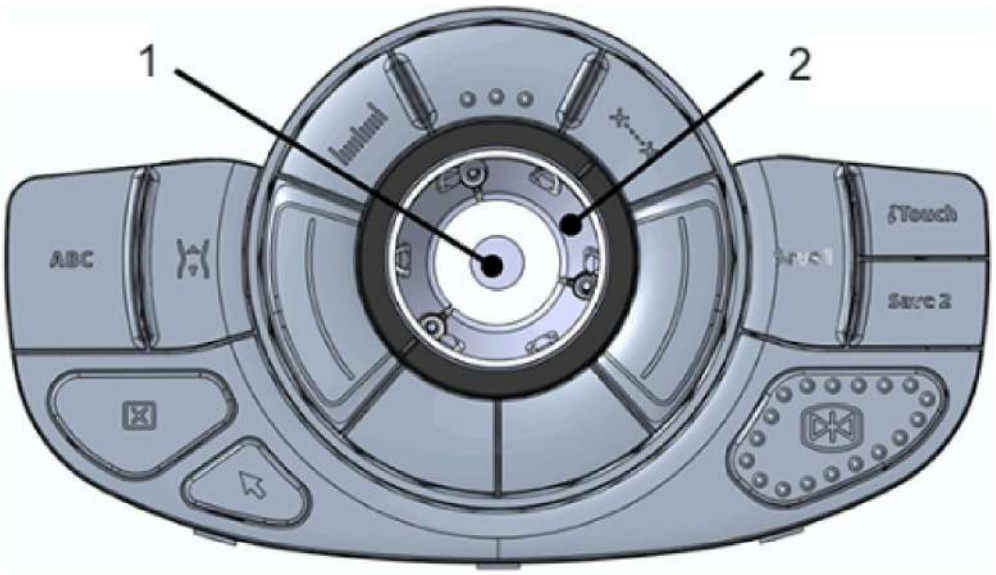
Figure5–4



1	Trackball
2	Clamping ring

2. Cleaning:
   In case of much dust, use a clean soft cloth or dry paper tissue to clean the sensor, ball bearings, plastic housing, and inner part of the clamping ring inside the trackball, as shown below. Meanwhile, clean the ball.
   In case of silicone oil, use wet wipes to clear the housing inside the trackball, ball bearing, ball surface, and inner part of the pressure ring. The sensor should be cleaned by dry soft cloth.

Figure5–5



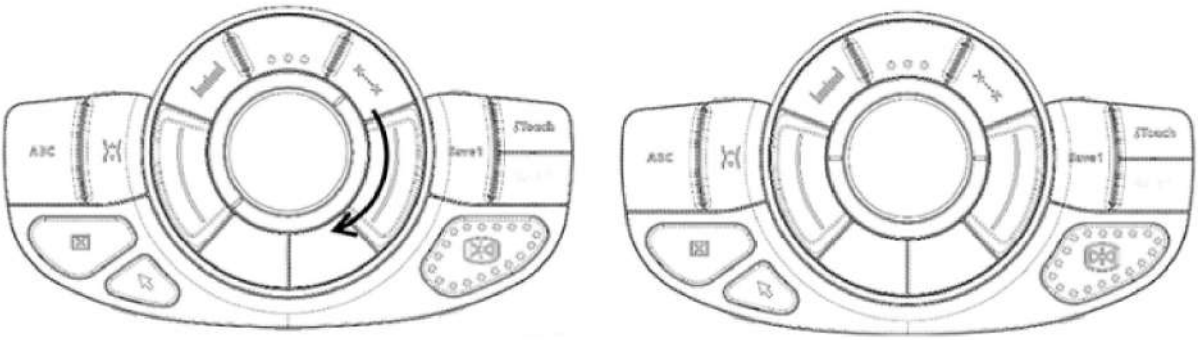
1 Clear the sensor

2 Clean the housing

3. Re-installing:

Put the ball in. Then, put the pressure ring in (the convex strip on the pressure ring is about 15 degrees from the horizontal), and rotate clockwise until the convex strip on the pressure ring is horizontal. Then, the buckle is locked. At this time, the pressure ring can no longer be rotated, indicating that the pressure ring has been installed in place. See the figure below.

Figure5–6



5.1.2.5 Cleaning the Control Panel

Tools: mild soapsuds, and dry soft cloth

Method: Use a dry soft cloth to wipe the dust from the surface of the control panel (including keys and encoder). Or, dip a soft cloth with a small amount of mild soapsuds to scrub away stubborn stains, and then use another soft cloth to dry or air dry the control panel. If it is difficult to clean the control panel, remove the encoder cap and clean the control panel with mild soapsuds.

NOTICE

- **Clean the control panel and keyboard regularly. Otherwise, the dirt in the gaps between keys will jam the keys, causing malfunction of keys.**
- **The residual gel in the smart scene panel will affect the function of the screen. Wipe and clean it in time.**

5.1.2.6 Cleaning the Probe

- Tools: mild soapsuds, and dry soft cloth
- Method:

1. Use a dry soft cloth to wipe off the dust on the head of the probe, connector housing, and cable.
2. Use a soft brash to generally remove the dust on the probe connector terminal.
3. If there are still stubborn stains, dip a dry soft cloth with a little mild soapsuds to wipe off dust or stains on the surface of the probe cable or connector housing, and then air dry them.

NOTICE

Do not wipe the probe connector using a wet cloth.

5.1.2.7 Cleaning the Probe Holster

- Tools: mild soapsuds, dry soft cloth, and soft brush
- Method:

1. Use a dry soft cloth to wipe the dust inside and outside the probe/medical ultrasonic gel holder and the gap of the holder. For the small intracavitary probe holster or gap, use a soft brush to gently brush off the dust and stains from the inner layer.
2. If there are still stubborn stains, you can remove the holder, dip a dry soft cloth with a small amount of mild soapsuds to wipe off the stains attached to the external or internal layer of the holder, air dry the holder, and the install the holder.
3. Medical ultrasonic couplant heating cup: Disconnect the power cord of medical ultrasonic couplant heating cup, remove the heating cup, dip a dry soft cloth with a small amount of soapy water to clean the inside and outside of the heating cup, use a soft brush to clean the dust in the holes at the bottom, dip a dry soft cloth with a small amount of soapy water to remove the residual stains, air dry the heating cup, and then install it.

5.1.2.8 Cleaning the Ultrasonic Gel Warmer

- Tools: mild soapsuds, dry soft cloth, and soft brush

- Method:

1. Disconnect the power cord of the coupler heater and remove the heater from its bracket.
2. Press the snap-fits of the bottom arm in the directions indicated by the arrows to remove the bottom cover.

Figure5–7

3. Use a soft cloth dipped in soapy water or water to gently wipe the heater surface and the connection cable.
4. Remove the bottom cover for cleaning.

NOTICE

Avoid liquid flowing into the gap of the heater. Do not use organic solvent to scrub the heater. Turn on and use the heater only after its surface is fully dried. Do not use strong solvent such as acetone. It is prohibited to use rough materials (such as steel velvet) to clean the surface of the heater.
Clean the bottom cover of the heater regularly. Remove the bottom cover during cleaning. After cleaning, re-install the bottom cover at the bottom of the heater after its surface is dried.

5.1.2.9 Cleaning the Machine Shell

Tools: mild soapsuds, and dry soft cloth
Method: Use a dry soft cloth to wipe the dirt off the machine shell (the exposed part). Or, use with a dry soft cloth dipped in a small amount of mild soapsuds to remove stains, and air dry the shell.

NOTICE

Use a soft brush to gently remove the dust from naked interfaces or sockets (such as probe sockets, IO panels, and power panels). Do not use a wet cloth.

5.1.3 Peripherals Cleaning

5.1.3.1 Cleaning Peripherals

Clean peripherals according to the actual conditions of the optional peripherals, and omit items that are not configured.

Table 5–4 Peripherals to Be Cleaned

Item	Description	Method
1	Color or black and white video printer	Use a dry soft cloth to wipe off the dust or stains on the outer shell of the printer, and then open the outer shell to clean the inside of the printer. Make sure to follow instructions of the printer for cleaning and maintenance.
2	Graph/text printer	Use a dry soft cloth to wipe off the dust or stains on the shell of the printer, and then open the shell to clean the inside of the printer. Make sure to follow instructions of the printer for cleaning and maintenance.
3	Footswitch	Use a dry soft cloth dipped with an appropriate amount of mild soapsuds to wipe off the dust and stains on the keys and cables of the footswitch.
4	Barcode scanner	Use a dry soft cloth to wipe the glass plate of the scanning window, and then wipe of the dust or stains on the cable and bracket. For special cleaning, make sure to follow the instructions of the scanner.
5	Workstation graph fetcher	Use a dry soft cloth dipped with an appropriate amount of mild soapsuds to remove dirt and stains from the cable.
6	Ultrasonic peripheral expansion module	Wipe the casing with a dry soft cloth, then use a brush to remove dust from the ventilation holes, and finally use a dry soft cloth dipped with an appropriate amount of mild soapsuds to remove dirt and stains from the cable.

NOTICE

Use a soft brush to gently remove the dust from naked ports or sockets (such as expansion module IO sockets). Do not use a wet cloth.