

Resona 7/Resona 7CV/Resona 7EXP/Resona 7S/Resona 7OB

Diagnostic Ultrasound System

Service Manual

Revision 14.0

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Revision History

Mindray may revise this publication from time to time without written notice.

Revision	Date	Reason for Change
1.0	2015.10	Initial release
2.0	2015.12	Change FRU order number.
3.0	2016.4	Change the order number of wireless net adapter.
4.0	2016.5	Add the installation of the Gel holder.
5.0	2016.7	Add the installation of Magnetic Generator Trolley.
6.0	2016.8	Change the warning labels.
7.0	2016.12	Change the description of the gel warmer.
8.0	2017.03	Add the installation of probe adapter, change the description of the CW assembly.
9.0	2017.06	Add the installation of protective board.
10.0	2017.09	Change FRU number of PC board.
11.0	2018.5	Add the installation of AC Power Assembly (UR POWER).
12.0	2018.7	Add keyboard shelter in FRU list.
13.0	2018.12	1.Add information about global password for installment 2.Add information about anti-virus software and VPN configuration. 3.Update model of digital scanner
14.0	2019.4	1. Add small keyboard in FRU list 2. Update the order number of PC carrier board

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Applicable for

This service manual is applicable for the service engineers, authorized service personnel and service representatives of this ultrasound system.

Statement

This service manual describes the product according to the most complete configuration; some of the content may not apply to the product you are responsible for. If you have any questions, please contact Mindray Customer Service Department.

Do not attempt to service this equipment unless this service manual has been consulted and is understood. Failure to do so may result in personnel injury or product damage.

Responsibility on the Manufacturer Party

Mindray is responsible for the effects on safety, reliability and performance of this product, only if:

- All installation operations, expansions, changes, modifications and repairs of this product are conducted by Mindray authorized personnel;
- The electrical installation of the relevant room complies with the applicable national and local requirements;
- The product is used in accordance with the instructions for use.

Mindray's obligation or liability under this warranty does not include any transportation or other charges or liability for direct, indirect or consequential damages or delay resulting from the improper use or application of the product or the use of parts or accessories not approved by Mindray or repairs by people other than Mindray authorized personnel.

This warranty shall not extend to:

- Any Mindray product which has been subjected to misuse, negligence or accident;
- Any Mindray product from which Mindray's original serial number tag or product identification markings have been altered or removed;
- Any products of any other manufacturers.



WARNING:

It is important for the hospital or organization that employs this equipment to carry out a reasonable service/maintenance plan. Neglect of this may result in machine breakdown or injury of human health.

Customer Service Department

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1 Safety Precautions

This chapter describes important issues related to safety precautions, as well as the labels and icons on the ultrasound machine.

1.1 Meaning of Signal Words

In this operator's manual, the signal words **⚠DANGER**, **⚠WARNING**, **⚠CAUTION** and **NOTE** are used regarding safety and other important instructions. The signal words and their meanings are defined as follows. Please understand their meanings clearly before reading this manual.

Signal word	Meaning
⚠DANGER	Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.
⚠WARNING	Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.
⚠CAUTION	Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.
NOTE	Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

1.2 Symbols

The following tables provide location and information of the safety symbols and warning labels, please read carefully.

1.2.1 Meaning of Safety Symbols

Symbol	Meaning
	Type-BF applied part The ultrasound transducers connected to this system are type-BF applied parts. The ECG module connected to this system is Type-BF applied part.
	"Attention" indicates the points that you should pay attention to. Before using the system, be sure to carefully read the relevant contents of this operator's manual.

1.2.2 Warning Labels

No.	Warning Labels	Meaning
1.		<p>a. Do not place the device on a sloped surface. Otherwise the device may slide, resulting in personal injury or the device malfunction. Two persons are required to move the device over a sloped surface.</p> <p>b. Do not sit on the device.</p> <p>c. DO NOT push the device. When the casters are locked.</p>
2.	<div style="border: 1px solid black; padding: 5px; width: fit-content;"> N.W:127kg MAX.W(Loaded):140 kg </div>	<p>127kg: Main unit weight (not including the weight of the probe)</p> <p>140kg: The weight in total for main unit weight and maximum load.</p>
3.		Mind your hands.

1.2.3 General Symbols

This system uses the symbols listed in the following table, and their meanings are explained as well.

Symbol	Description
	Type-BF applied part
	Refer to the relevant content in the Operator's Manual, to avoid safety incidents
	AC (Alternating current)
	Functional grounding
	Equipotentiality
	Transducer sockets
	Pencil probe port
	Network port
	USB port
VGA 	Used for VGA output.
S-VIDEO 	Reserved, used for separate video output
AUDIO 	Used for stereo audio output.
HDMI	High definition multimedia interface.
	Microphone input jack

Symbol	Description
	When the lever located at the bottom of the monitor supporting arm points to  , you can move the monitor to the right and left.
	When the lever located at the bottom of the monitor supporting arm points to  , the supporting arm is fixed in the middle position.
	Dangerous voltage
	Product serial number
	Manufacture date
	Authorized representative in the European Community
	<p>This product is provided with a CE marking in accordance with the regulations stated in Council Directive 93/42/EEC concerning Medical Devices. The number adjacent to the CE marking (0123) is the number of the EU-notified body certified for meeting the requirements of the Directive.</p> <p>The radio device used in this product complies with the essential requirements and other relevant provisions of Directive 1999/5/EC (Radio Equipment and Telecommunications Terminal Equipment Directive). The product is in compliance with ETSI EN 300 328 and ETSI EN 301 489.</p>

1.3 Safety Precautions

Please read the following precautions carefully to ensure the safety of the patient and the operator when using the probes.

⚠DANGER Do not operate this system in an atmosphere containing flammable or explosive gases such as anesthetic gases, oxygen, and hydrogen or explosive fluid such as ethanol because an explosion may occur.

1.3.1 Electric safety

⚠WARNING:

1. Connect the power plug of this system and power plugs of the peripherals to wall receptacles that meet the ratings indicated on the rating nameplate. Using a multifunctional receptacle may affect the system grounding performance, and cause the leakage current to exceed safety requirements. Use the power cord accompanied with the system provided by Mindray.
2. Disconnect the AC power before you clean or uninstall the ultrasound machine, otherwise, electric shock may result.

When using peripherals not powered by the auxiliary output of the ultrasound system, or using peripherals other than permitted by Mindray, make sure the overall leakage current of peripherals and the ultrasound system meets the requirement of the local medical device electrical regulation (like enclosure leakage current should be no more than 500uA of IEC 60601-1-1), and the responsibility is held by the user.
3. In maintenance or assembly/disassembly, make sure other cables are connected well before the battery connecting cable is connected, otherwise the system may be damaged due to hot-plug.
4. Do not use this system simultaneously with equipment such as an electrosurgical unit, high-frequency therapy equipment, or a defibrillator, etc.; otherwise electric shock may result.
5. This system is not water-proof. If any water is sprayed on or into the system, electric shock may result.

⚠CAUTION:

1. DO NOT connect or disconnect the system's power cord or its accessories (e.g., a printer or a recorder) without turning OFF the power first. This may damage the system and its accessories or cause electric shock.
2. Avoid electromagnetic radiation when perform performance test on the ultrasound system.
3. In an electrostatic sensitive environment, don't touch the device directly. Please wear electrostatic protecting gloves if necessary.

4. You should use the ECG leads provided with the ECG module. Otherwise it may result in electric shock.

1.3.2 Mechanical safety

- ⚠WARNING:**
1. Before moving the system, please hold the handle. If other parts of the system are held, it may cause damage due to the abnormal force. Do not push the system from the left/right side; otherwise, it may be toppled over.
 2. Do not subject the transducers to knocks or drops. Use of a defective probe may cause electric shock to the patient.

- ⚠CAUTION:**
1. Fasten and fully secure any peripheral device before moving the system, gently and carefully move the system to avoid falling over.
 2. Do not expose the system to excessive vibration (during the transportation) to avoid device dropping, collision, or mechanical damage.
 3. Please install the system on a flat plane with the four casters locked. Otherwise, damage may be resulted by accidental moving.
 4. Pay extra attention when moving the system on a sloping ground, do not move it on a more than 10°-sloped plane to avoid system toppling.
 5. Move the system **ONLY WHEN** the system is shut down or in standby status, otherwise the system hardware disk may be damaged.

1.3.3 Personnel Safety

- NOTE:**
1. The user is not allowed to open the covers and panel of the system, neither device disassemble is allowed.
 2. To ensure the system performance and safety, only Mindray engineers or engineers authorized by Mindray can perform maintenance.
 3. Only technical professionals from Mindray or engineers authorized by Mindray after training can perform maintenance.

1.3.4 Other

- NOTE:** For detailed operation and other information about the ultrasound system, please refer to the operator's manual.

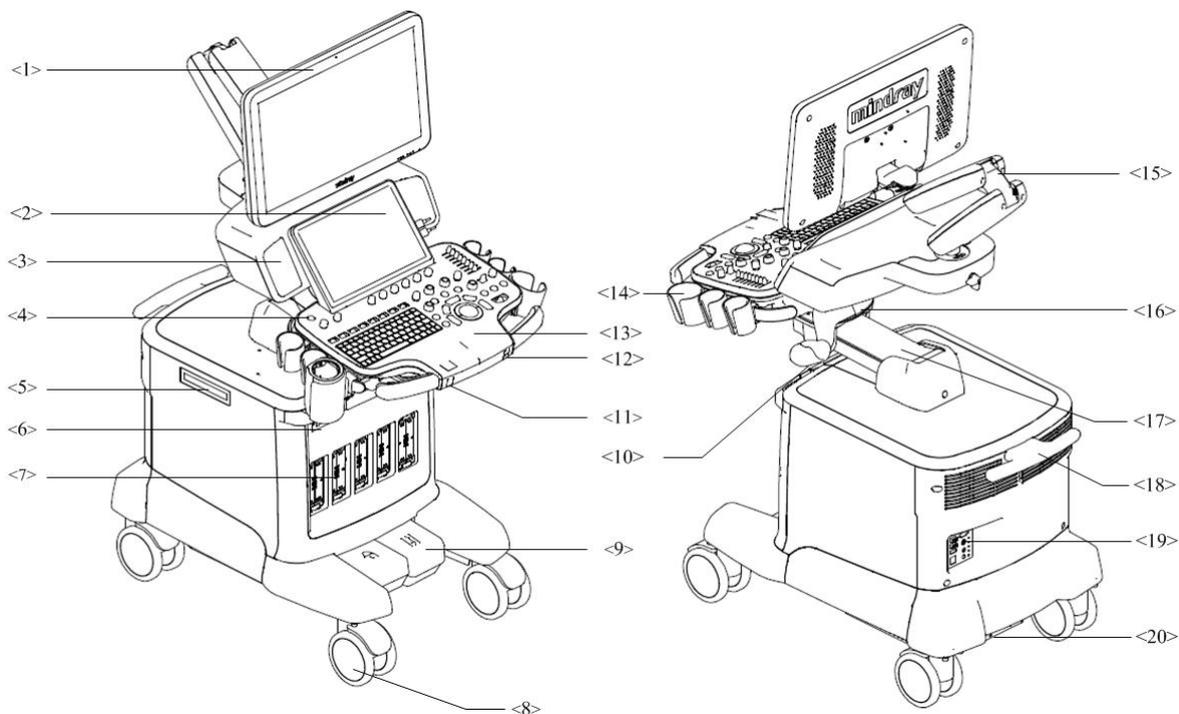
2 Specifications

2.1 Overview

2.1.1 Intended Use

The Resona 7/Resona 7CV/Resona 7EXP/Resona 7S/Resona 7OB series diagnostic ultrasound system is intended for use in clinical ultrasonic diagnosis.

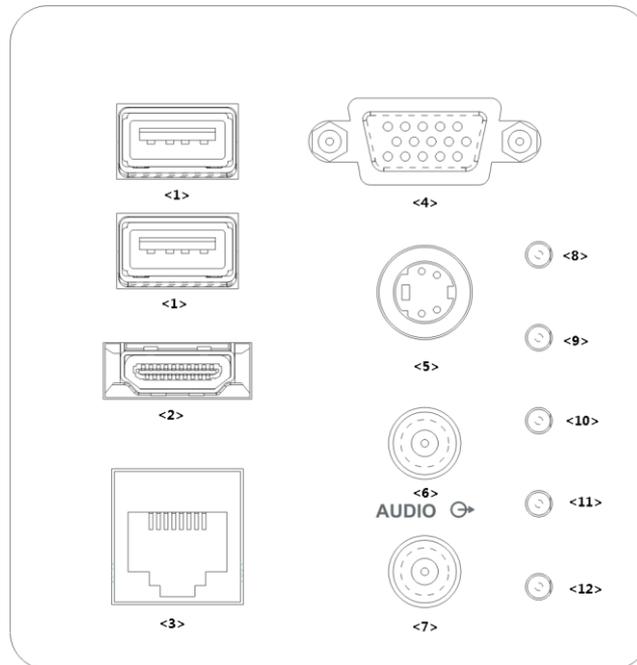
2.1.2 Introduction of Each Unit



No.	Name	Function
<1>	Monitor	Displays the images and parameters during scanning.
<2>	Touch Screen	Screen-touching operator-system interface or accessible to control.
<3>	Speaker	Outputs the audio.
<4>	Power button	Used for powering on/ off the power supply.

No.	Name	Function
<5>	DVD driver	DVD reading and writing
<6>	Front-in panel	Connected to ECG leads and USB drive, etc.
<7>	Probe port	Sockets connecting transducers and the main unit.
<8>	Caster	Used for moving the system.
<9>	Central brake	Used for securing the system or moving the system straight forward. Step on the left brake pedal to lock the device from being moved. Step on the right walking pedal to move the device straight.
<10>	Intracavitary probe holder	Used for placing the probe.
<11>	Rotatable knob on the control panel	Lock or unlock the movement of the control panel
<12>	Ascending/descending button	The button to ascending or descending the system.
<13>	Control panel	Key- pressing operator-system interface or accessible to control
<14>	Transducer (gel) holder	Used for placing transducers and gel temporarily.
<15>	Monitor support arm	Supports the monitor, for adjusting the angle of LCD monitor.
<16>	The control panel stretch mechanism	Used for stretching or rotating the control panel. Note: subject to the <i>Control Panel Moving Mechanism Assembly</i> when the user purchases the product.
<17>	Motor-driven lift mechanical assembly	Used for adjusting the height of the control panel
<18>	The back handle of main unit	Used for winding the cables up and assisting for moving the system.
<19>	I/O Panel	Port panel for input and output signals.
<20>	Power supply assembly for the system	Provides the power to the system.

2.1.2.1 I/O panel

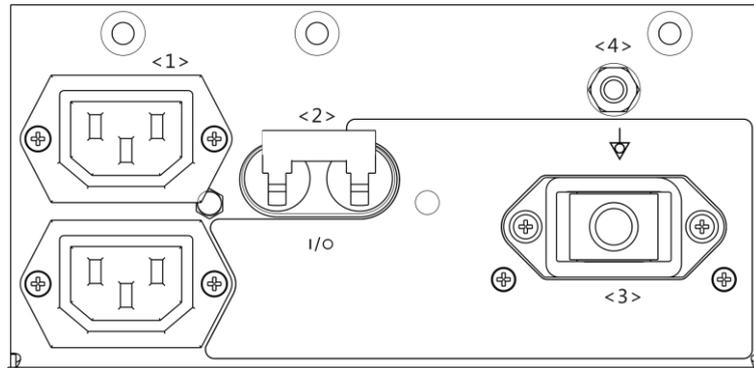


No.	Symbol	Function
<1>		USB ports.
<2>	HDMI	High definition multimedia interface.
<3>		Network port.
<4>	VGA	VGA signal output.
<5>	S-Video	Used for separate video output.
<6>		Audio signal output port, left channel.
<7>		Audio signal output port, right channel.
<8>	/	12V power indicator
<9>	/	5V power indicator
<10>	/	3.3V power indicator
<11>	/	LVDS_OK indicator
<12>	/	PHV protection indicator (reserved)

NOTE:

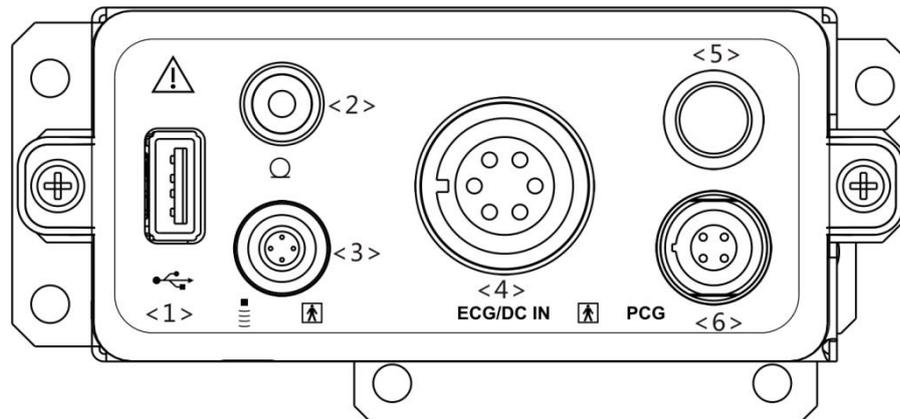
- The S-VIDEO port performs better with analog video printing.
- When connecting an external video device (HDMI/VGA), make sure the display resolution setting is 1920x1080, otherwise the image quality may be degraded.

2.1.2.2 Power Supply Panel



No.	Name	Function
<1>	Alternative current auxiliary output	Supply power for optional peripheral devices.
<2>	Circuit breaker	Used for switching off/ on the power supply.
<3>	Power inlet	AC power inlet
<4>	Equipotential terminal 	Used for equipotential connection, that balances the protective earth potentials between the system and other electrical equipment.

2.1.2.3 Physio Panel



No.	Name	Function
<1>	USB port	Connects USB devices.
<2>	MIC interface	Microphone input
<3>	Pencil probe port	Used for connecting a pencil probe.
<4>	ECG lead signal input port / external ECG signal input port	Connects to ECG leads, to directly obtain the ECG signals of the patient. Connects the signal output port of ECG monitoring device.
<5>	Reserved port	Reserved feature.
<6>	PCG signal input port	Connects to PCG transducer, to directly obtain the PCG signals of the patient.

2.1.2.4 Control Panel



No.	Name	Description
<1>	/	Power button Press the button to turn on the system, the system enters the work status and the indicator becomes green.  AC (Alternating current). It turns on at AC supply.  Standby. It becomes orange in standby status.  Hard disk indicator. It blinks when reading/writing the disk.
<2>	A.power	Adjust the acoustic power.
<3>	Volume	/
<4>	/	Adjust the corresponding functions on the touch screen.
<5>	P1-P4	Undefined Button, set by the user in the Preset. See the operator's manual [Basic Volume] for details.
<6>	Fusion	Enter fusion. Or Undefined Button, set by the user in the Preset. See the operator's manual [Basic Volume] for details.
<7>	Elasto	Enter elastography. Or Undefined Button, set by the user in the Preset. See the operator's manual [Basic Volume] for details.
<8>	Contrast	Enter contrast imaging. Or Undefined Button, set by the user in the Preset. See the operator's manual [Basic Volume] for details.
<9>	iWorks	Enter iWorks. Or Undefined Button, set by the user in the Preset. See the operator's manual [Basic Volume] for details
<10>	/	Press: to set the Baseline Rotate: to set the Scale Slide: to set the Steer
<11>	PW	Press to enter PW mode, and rotate to adjust PW gain (in PW mode) or CW gain (in CW mode); while in 3D/4D mode, rotate the knob to cycle the 3D image through Y axis.
<12>	C	Press to enter Color mode, and rotate to adjust Color gain (in color mode) or Power gain(in Power mode); while in 3D/4D mode, rotate the knob to cycle the 3D image through Z axis.
<13>	/	Press: to enter 3D Slide right: to enter 4D Slide upwards: to enter quad-split display Slide downwards: to enter dual-split display Rotate: to switch the view
<14>	TGC	Slide to adjust the depth gain.
<15>	Cursor	Display/hide the cursor.
<16>	Clear	Remove the comments or measurement caliper.

No.	Name	Description
<17>	M	Enter M mode, and rotate to adjust M mode gain. While in 3D/4D mode, rotate the knob to cycle the 3D image rotate through X-axis.
<18>	CW	Enter CW mode.
<19>	Power	Enter Power mode.
<20>	Dual	Enter Dual mode in Non-Dual mode. Press to switch between the two interfaces in the Dual mode.
<21>	B	Press: to enter B mode; Rotate: to adjust B mode gain.
<22>	Depth	Adjust the depth in real-time imaging.
<23>	Zoom	Rotate to enter the pan-zoom mode, and press to enter the spot-zoom mode.
<24>	Measure	Enter/exit the application measurement mode.
<25>	Update	Switching key: Press to change the currently active window. Start/stop image acquisition in iScape or 3D/4D mode.
<26>	Caliper	Enter/exit the general measurement mode.
<27>	/	Confirm an operation. The function is same with the left-button of the mouse.
<28>	/	Move the trackball to change the cursor position.
<29>	/	Confirm an operation. The function is same with the left-button of the mouse.
<30>	iTouch	Press to optimize the images.
<31>	Save	Save the image; user-defined key.
<32>	Print	Print: user-defined key.
<33>	Freeze	Freeze/defreeze the image.

NOTE: "/" means the key is undefined or has no silk print. For the undefined keys, you can customize them.

Keyboard



■ Common functional keys

No.	Key	Description
1.	Enter	Confirms the input data; or moves the cursor to the head of next row of the text or the input field.
2.	Esc	Cancel or quit the operation.
3.	Tab	Go to the next operation item.
4.	Space or comment	Insert a space or input the comment
5.	Caps Lock	Switch the upper/ lower case.
6.	Home	Activate the Home function: return to the start position of comment.
7.	Delete Text	Delete all comments on the screen.
8.	Direction keys	Move the cursor one letter each time; or, select the ambient one in a selectable area.
9.	Arrow	Press the key to turn to the symbol of arrow.
10.	Body Mark	Press the key to enter the body mark.
11.	Back Space	Delete the character before the cursor
12.	Del	Delete the character after the cursor

■ Functions of the F1 to F12 keys

Key	Function
F1 Help	Open or close the accompanying help documents.
F2 iStation	Enter or exit the Patient Info system.
F3~F6	User-defined keys, the functions of which can be preset.
F7 QSave	Save the current image parameters quickly.
F8 iZoom	Enter/exit full-screen zoom status.
F9 DVR	Enter VCR/DVR mode.
F10 Setup	Enter/exit Setup.

Key	Function
F11 Biopsy	Display/hide the guide line.
F12 Physio	Enter Physio mode.

For user-defined keys, please refer to the operator's manual [Basic Volume].

2.1.3 Peripherals Supported

Type	Model
Graph/text printer	HP Officejet 7000 wide format
Black/white video printer (digital)	MITSUBISHI P95DW-N SONY UP-D898MD
Black/white video printer (analog)	SONY UP-X898MD SONY UP-897MD
Digital color video printer	SONY UP-D25MD CANON SELPHY CP800
Barcode reader	SYMBOL LS2208 (1D), SYMBOL DS4308 (2D)
Footswitch	Wired: 971-SWNOM (2-pedal, 3-pedal), FS-81-SP-2 (1-pedal) Wireless: 1266262 (2-pedal), 1229155 (3-pedal)

Note: the printer driver is preinstalled in the system. Please install other printer drivers for other types of the printers.

2.2 Specifications

2.2.1 Dimensions & Weight

External dimension: depth: 945±10mm; width: 545±10 mm (main unit)/510±10mm (control panel); height: 1360±10 mm (with the display vertical).

Weight: less than 135 Kg (not including the weight of the probe).

2.2.2 Electrical Specifications

2.2.2.1 AC Input

Voltage	220-240~ 100-127V~
Frequency	50/60Hz
Power consumption	1000VA

2.2.3 Environmental Conditions

	Operating conditions	Storage and transportation conditions
Ambient temperature	0°C~40°C	-20°C~55°C
Relative humidity	20%~85% (no condensation)	20%~95% (no condensation)
Atmospheric pressure	700hPa~1060hPa	700hPa~1060hPa

⚠Warning: Do not use this system in the conditions other than those specified

2.2.4 Monitor Specification

2.2.4.1 Main Monitor

Size	21.5 inches
Voltage	12 V
Resolution	1920x1080
Visible angle	≥170°

2.2.4.2 Touch Screen

Size	12.1 inches
Voltage	12 V
Resolution	1280x800
Visible angle	≥140°

3 System Installation

3.1 Preparations for Installation

NOTE: Do not install the machine in the following locations:

Locations near heat generators;

Locations of high humidity;

Locations with flammable gases.

3.1.1 Electrical Requirements

3.1.1.1 Requirement of Regulated Power Supply

Power specification is showing in chapter 2.2.2. Due to the difference of the power supply stability of different districts, please advise the user to adopt a regulator of good quality and performance such as an on-line UPS.

3.1.1.2 Grounding Requirements

The power cable of the system is a three-wire cable, the protective grounding terminal of which is connected with the grounding phase of the power supply. Please ensure that the grounding protection of the power supply works normally.

⚠WARNING: **DO NOT connect this system to outlets with the same fuses that control the current of devices such as life-support systems. If this system malfunctions and generates an over current, or when there is an instantaneous current at power ON, fuses of the building's supply circuit may be tripped.**

3.1.1.3 EMI Limitation

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) by radio frequencies, magnetic fields, and transient in the air wiring. They also generate a weak electromagnetic radiation. Possible EMI sources should be identified before the unit is installed. Electrical and electronic equipment may produce EMI unintentionally as the result of defect.

These sources include: medical lasers, scanners, monitors, cauterizing guns and so on. Besides, other devices that may result in high frequency electromagnetic interference such as mobile phone, radio transceiver and wireless remote control toys are not allowed to be presented or used in the room. Turn off those devices to make sure the ultrasound system can work in a normal way.

3.1.2 Installation Conditions

3.1.2.1 Space Requirements

Place the system with necessary peripherals in a position that is convenient for operation:

1. Place the system in a room with good ventilation or an air conditioner.
2. The door is at least 0.8m wide. The ultrasound machines can move into the room easily.
3. Leave at least 0.2m clearance around the system to ensure effective cooling.
4. An adjustable lighting system in the room (dim/bright) is recommended.
5. Except the receptacle dedicated for the ultrasound system, there should be at least 3-4 more receptacles on the wall for other medical devices and peripherals.
6. The distance between wall outlet and any peripherals should be less than 2m and distance between ultrasound system and peripherals should be less than 1m, to make it easy for cable connections.

3.1.2.2 Networking Pre-installation Requirements

Both wireless and wired LANs are supported by this ultrasound system.

Data transmission is allowed between different departments or areas without network cable. Network can be automatically connected after disconnection in case that the device is required to be moved, wireless transmission task can be recovered after the network resumed to normal condition. Confirm the network devices and network conditions before the installation.

1. General information: default gateway IP address, and the other routers relevant information.
2. DICOM application information: DICOM server name, DICOM port, channels, and IP address.

3.1.3 Confirmation before Installation

Perform the following confirmation before installing the system:

1. The video format used in the region or country where the system is installed.
2. The language used in the region or country where the system is installed.
3. The power voltage used in the region or country where the system is installed.
4. Obstetric formulae and other measurement formulae used in the region or country where the system is installed.
5. Other settings to be used in the region or country where the system is installed but different from the factory settings.
6. The doctor's habits of using the system.

Perform the confirmation above before installing the system. And set up the system to make it according with the usage of the region or country where the system is installed.

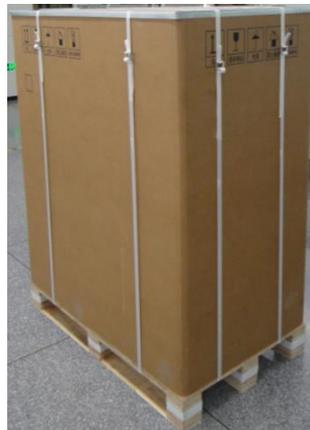
3.2 Unpacking

Unpacking tool: a pair of scissors

Installation duration: 1~2 people, 20 minutes.

3.2.1 Unpacking Process

1. Cut off 4 strips of the external package.



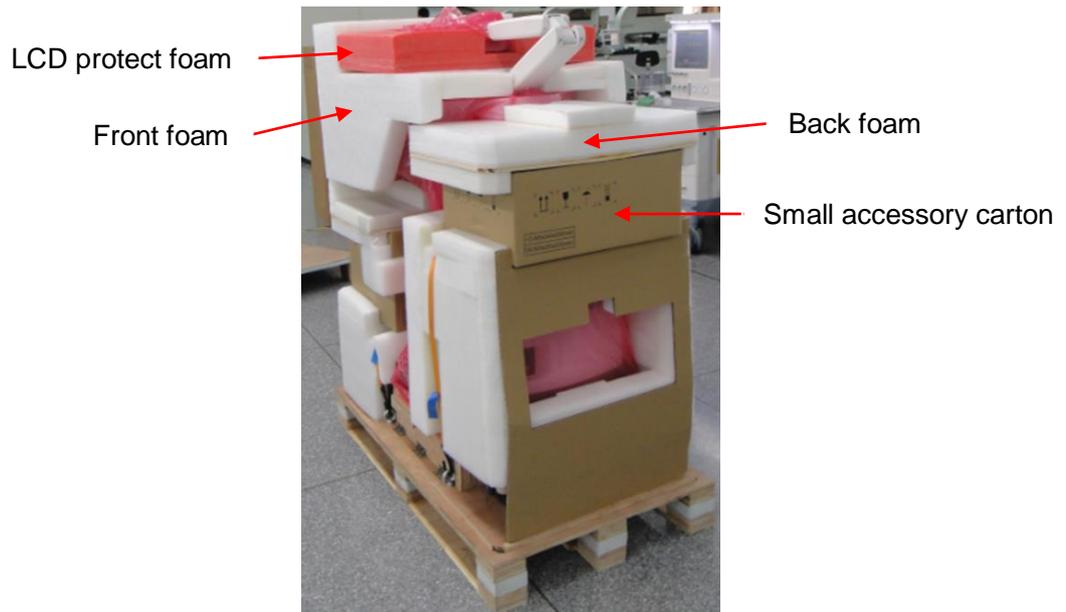
2. Remove the wooden cover and use it as the slope in the front of the device.



3. Remove the crate. Press the clasps down to release them.



4. Remove "front foam", "LCD protect foam", "back foam", "small accessory carton".



5. Remove "support arm foam", "big accessory carton", release the buckle, and remove "front foam", "handle foam".



6. Pull the machine out along the slope.



Note: please follow up the procedures of reverse unpacking when transporting.

3.2.2 Checking

1. After unpacking, check the objects in the container with the package list to see if anything is missing or is wrong.
2. Ensure there is no damage, indentation or cracks occurring to the machine. If any happen, please contact Mindray Customer Service Department.

3.3 Bare Machine Transport

Refer to chapter 3.2.1 for machine transport.

If the machine is not packaged, it is only allowed for short-distance transport. Refer to the following procedures to protect the machine during the transport.

3.3.1 Tool

Tool	Specifications
Vehicle	Vehicle door size: larger than 700 mm (width) X 1280 mm (height) The space for the ultrasound device: larger than 1050mm (length) X 700 mm (width) X 1280 mm (height).
LCD protection foam	LCD protection foam for bare machine transport (1) Note: Do not dispose of red protection foam after completing the unpacking.
Rope	Several

3.3.2 Device Transport

Protect the monitor with the red foam, and use the rope to fasten it around the device. Protect the monitor from moving.



Lower the support arm to the minimum

Fasten the moving mechanism (from moving). Tie the rope around the back handle. Do not press the external cover of the device hard.

Four ends of the ropes should be fastened to four directions of the car. Keep the device from moving in the car

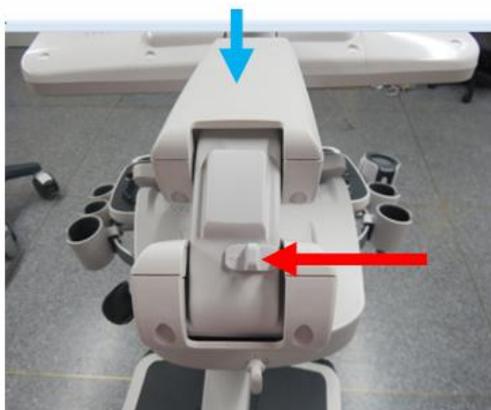
Unlock the brake pedal

3.3.3 Fixing Methods

1. Press the button  to lower the control panel to the minimum position when the ultrasound device is powered on. Press the button  to push the moving mechanism straight forward.



2. Toggle the control switch along the red arrow's direction and press the upper support arm down following the blue arrow's direction. The support arm stays at the lowest position.



3. Protect the monitor with the red foam, and use the rope to fasten it around the device. Protect the monitor from moving.



4. Push the ultrasound device into the car against the slope (other methods also work).
5. Warp the device tight around the front handle and the back handle. Keep the device from moving in the car.



6. Rotate the two switches anticlockwise. Keep the two switches and the brake pedal loosed (marked with the red circle).



3.4 Installing Main Unit

NOTE: To prevent the machine from damage, when you perform the following operations, please lock the casters.

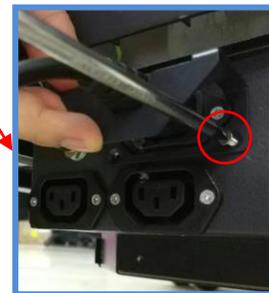
3.4.1 Opening up the Monitor

Adjust the monitor from the horizontal position to the vertical position.

NOTE: Take care of your hands when adjust the monitor up and down.

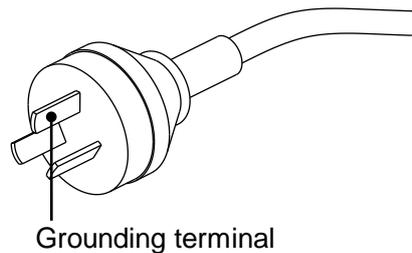
3.4.2 Connecting the Power Cord

1. Push the retaining clamp upward, and insert the power plug into the receptacle. Take off two screws and the fixing board of the power plug from the accessory kits. Fix the power plug board on electronics assembly on the base to press the power cable with 2 M3X8 sunk head screws.



The power plug board

2. Plug the other end of power plug into an appropriate outlet. The grounding terminal should be connected with a power grounding cable to ensure that protective grounding works normally.



NOTE: Make sure to allow sufficient slack in the cable so that the plug won't be pulled out when the system is moved slightly.

3.4.3 Connecting ECG

Connect the ECG cable to the corresponding interface on the physio panel under the control panel. See “2.1.2.3 Physio Panel” for details.

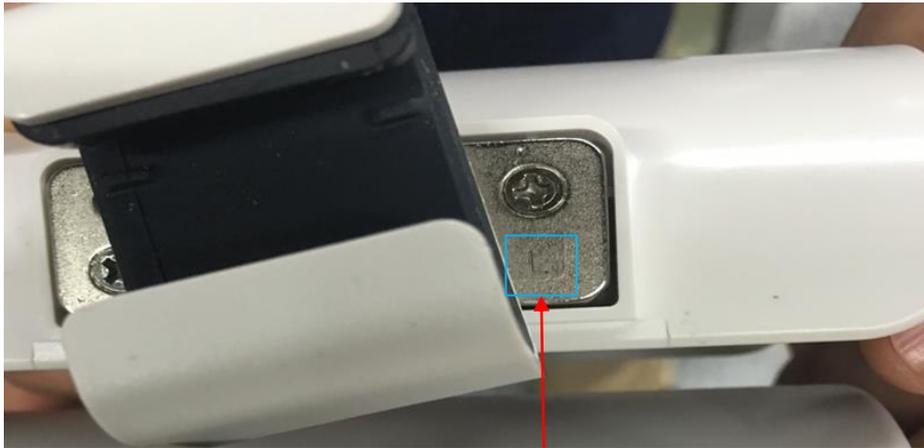
3.4.4 Installing Probe Holder

Insert the coupling gel heating cup, left bracket, 4D probe holder, larger probe holder, small probe holder and plug the coupling gel heating cup to the control panel.



3.4.5 Installing Gel Holder

1. Slide the left/right support beneath the control panel along the gliding track according to the marks (“L” refers to the left bracket and “R” refers to the right support) on the support of the gel warmer.



“L” refers to the left support of the gel warmer



“R” refers to the right support of the gel warmer

**For example:
Slide the left
support
beneath the
control panel
along the left
gliding track**



2. Put the gel warmer into the left/right support, and plug the cable of the gel warmer into the port of the control panel bottom.

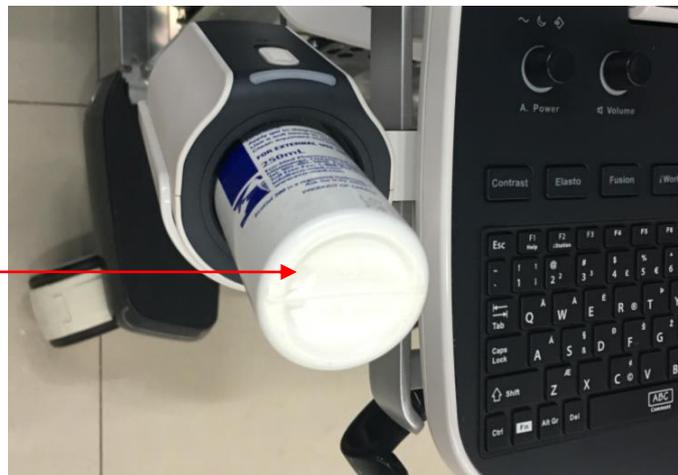
The indicator of the gel warmer facing outside



■ Placing the gel bottle:

Fasten the gel bottle, and then place the bottle in the gel warmer. See the figure below:

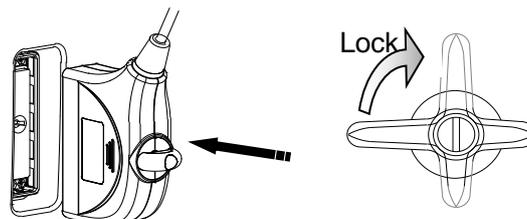
Fasten the gel bottle, and then place the bottle in the gel warmer.



3.4.6 Connecting the Transducer

Four sockets (A, B, C, D) are configured on the system; every socket can be connected with all types of supported transducers.

1. Keep the cable end of the transducer to the up side of the system, and insert the connector into the socket of the system, and then press in fully. (Shown as the left figure)
2. Turn the lock handle 90° clockwise to lock it securely. (Shown as the right figure)



3. Place the probe properly to avoid being treaded or wrapping with other devices (use hanger or hook). DO NOT allow the probe head to hang free.
4. Turn the lock handle 90° anticlockwise to unlock it, and then pull out the connector.

3.5 Installing Peripherals

For the models of the supported peripherals, please refer to “2.1.3 Supported Peripherals”.

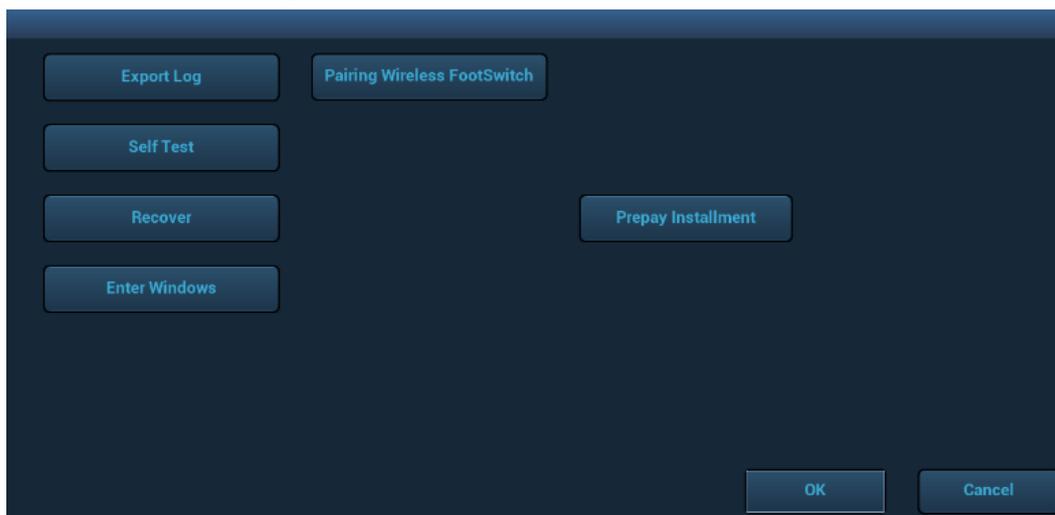
3.5.1 Connecting a Footswitch

⚠WARNING: Do not connect two or more footswitches to the main unit; otherwise, it may lead to the malfunction to the system.

The system supports the wired footswitch (two-pedal, and three-pedal) and wireless footswitch (two-pedal, and three-pedal).

- The setting for the wireless footswitch:

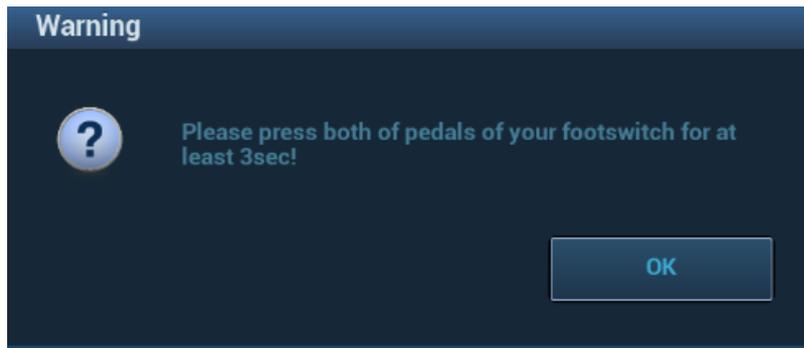
1. Connect the wireless footswitch to the main unit.
2. Press <F10 Setup> to open the page. Select [Maintenance]->[Setup]->[Pairing Wireless Footswitch] to set the footswitch.



3. Click [OK]. The dialog box appears.



4. The warning dialog box appears.



5. Press two footswitches. Click [OK].



6. Select [Key Config]->[Footswitch] to set for the footswitch. After completing the configuration, each of the footswitch can be used according to its function. Step the footswitch to complete the operation.
 - The setting for the wired footswitch:
 1. Connection: directly insert the USB port of the footswitch to the system applicable USB ports.
 2. Function setting: for details, please refer to chapter 3.8.3.

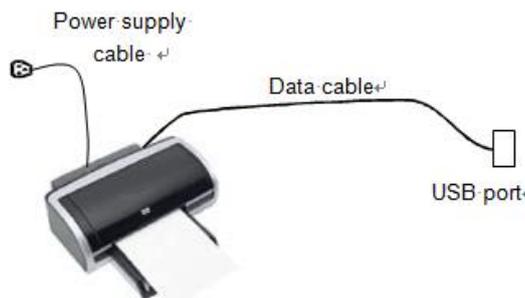
3.5.2 Installing a Graph / Laser Printer

NOTE: Please restart the ultrasound system after printer installation.

- Connecting a local printer

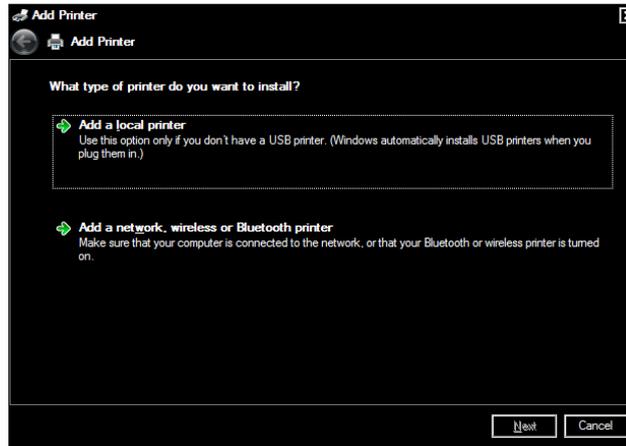
NOTE: Printers listed in “2.1.3 Peripherals Supported” Chapter have drivers installed already.

As shown in the figure below, a graph / text printer has a power cord and data cable. The power cord should be directly plugged into a well-grounded outlet.



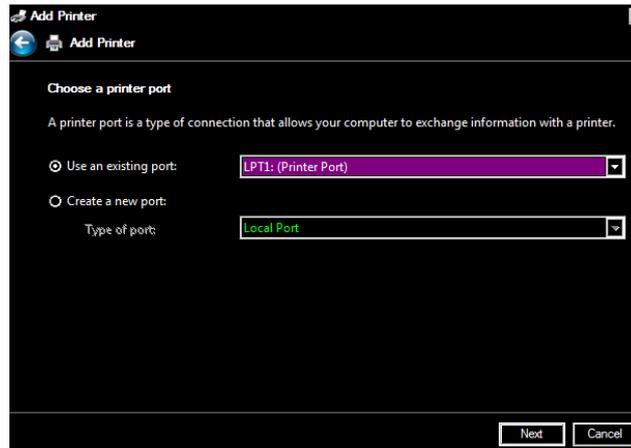
1. Connect the data cable to the USB port on the ultrasound system.

2. Power the system and the printer on.
3. Put the installation optical disk of the printer driver into the DVD R/W drive.
4. Install the printer driver: Select [Setup]→[Print Preset]→[Add Printer].



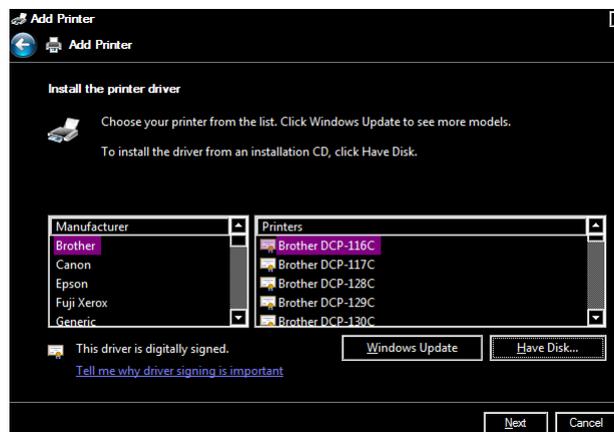
NOTE: all the operations are finished with right <Set> key.

5. Select [Add a local printer] and click [Next] to enter the screen used for browsing driver.



NOTE: see the printer's operation manual to select the port, or try to use the default port of the system.

6. Click [Have Disk...] to find the driver path (the installation type should be WIN7 64), and then click [Next] to install the driver.



7. Complete the operation according to the tips on the screen. Click [Finish] to end the installation.

NOTE:

1. Before adding the local printer, make sure the printer is powered on, and the printer has been well connected with the ultrasound device (a sound feedback will be heard when connecting)
2. In case of installation failure under Doppler, try to install the printer in Windows (click [Enter Windows] on the Maintenance menu). If the installation can't be performed neither in Doppler nor Windows, then the printer can't be supported by the ultrasound machine.
3. Use the original driver disk to perform the driver installation.

■ Add network printer

1. As the system is connected into a LAN, open [Setup]-> [Printer Preset] screen.
2. Click [Add Printer], select [Add a network, wireless or Bluetooth printer].
3. The system starts to search all available printers within the network. Select the target printer and click [Next], the system tries to connect to this printer.
4. When the connection is successful, the system prompts the dialogue box, click [Next] according to the screen tips and then click [Finish].The printer is installed successfully.

Tips: the system has combined many types/brands of printer drivers, if targeted printer drive is not included in the system, you may need to install the driver for the network printer. Please use the optical disk or USB disk with the driver to install according to the system prompts.

NOTE: When you install the printer's driver, you must specify the specific path for installation. A vague path may result in longer searching times.

The network printer functions depending on the configured network environment in the hospital, please consult the network configuration manager in case of failure.

Before connecting a network printer, connect the ultrasound machine into the same network with the printer and make sure the network works normally. Once a network printer is found, an identification dialogue box will appear if the server needs identity confirmation. Enter the user name and pass code; select "Auto Connecting" and then click [OK].

The printer name typed should be valid, \\server\printer for example. Otherwise, a connection failure notice may appear.

■ Print

Both report and image can be printed on a graph / text printer.

To set the default report printer and its attribute:

In "[Setup]→[Print Preset]" screen, select the "Report Print" column in the service list.

You can select printer from the driver list next to "Printer" in the lower screen and set the items in the "Property" box. Click [Save] after you have finished setting.

Please refer to the accompanying manuals of the printers for more details.

3.5.3 Installing Video Printer

The system support both black/white video printers (digital) and color video printers (digital).

**CAUTION:**

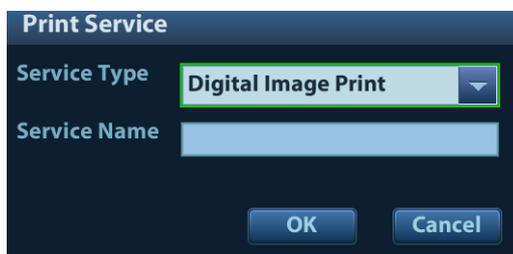
The auxiliary power outlet in the system is used to supply power for approved peripheral devices. Do not connect other/unapproved devices to this outlet; otherwise the rated output power may be exceeded and the system failure may result. Maximum output power of the outlet is 240VA.

■ Local printer installation

1. Position the printer in the proper place.
2. Plug the printer power cord into an appropriate outlet.
3. Use a USB cable to connect between the system's USB port and the printer's USB port.
4. Load a paper roll, and turn on the system and printer.

See section “3.5.2 Installing a Graph / Laser Printer” for the driver installation procedure (printer drivers listed in chapter “2.1.3 Peripherals Supported” are installed already).

5. Add a print service:
 - (1) Open the “[Setup] → [Print Preset]” screen.
 - (2) Click [Add Service] to enter the page.



- (3) Select the service type and enter the service name manually.
- (4) Click [OK] to return to the page.
- (5) Select the target printer from the drop-down list in the “Property” box and set other printing properties.
- (6) Click [Save] to complete.

3.5.4 Installing a Wireless Printer

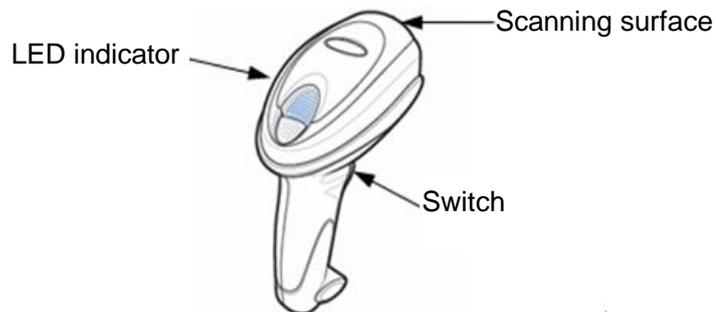
The system supports the Officejet Pro 8100 wireless printer for report printing.

1. Plug the printer power cord into an appropriate outlet.
2. Power the system and the printer on.
3. Make sure the ultrasound machine and the printer are connected to the same LAN, and turn the printer's W-LAN function on.
4. Add a wireless adapter, following the steps described in “Add network printer.” See chapter “3.5.2 Installing a Graph / Laser Printer.”
5. Open the [Setup] → [Printer Preset] page, select “Report Print” from the printer list, select the printer to be Officejet Pro 8100, and set properties.
6. Click [Save] to exit the preset and make the settings effective.

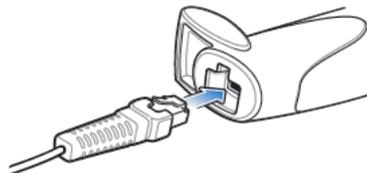
3.5.5 Installing a Barcode Scanner

The system supports barcode reader to read the patient information (ID).

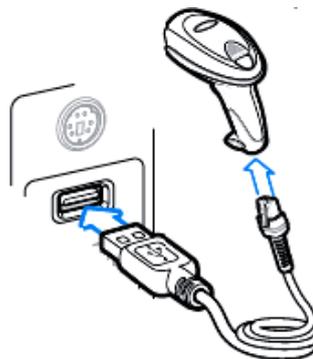
1. For structure of the scanner, see the figure below. The important parts are: LED indicator, scanning surface, and the switch.



2. Connect the cable to the port on the scanner.



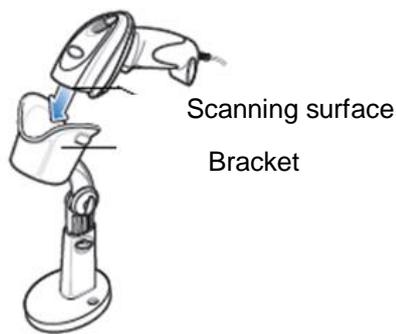
3. Connect the other end of the cable to the USB port on the ultrasound system.



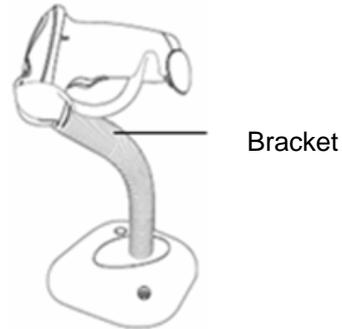
4. When the ultrasound system is working, information scanning can be performed by pressing the switch on the scanner. For detailed operations, please refer to the operator's manual of the scanner.

Note: If the scanner does not work, check if the scanner is configured properly (for example, if the Enter key is configured). For details, refer to operator's manual of the scanner.

5. Fix the scanner on the bracket (see the figure below) to avoid accidental falling.



2D scanner



1D scanner

3.6 Ascending/descending the Main Control Panel Manually

Ascending/descending the main control panel manually after the cut-off:

1. Turn the inner hexagon spanner on the device back left or right, and pull the spanner straight forward.



2. Insert the shorter end of the inner hexagon spanner into the hole as shown in the figure below.

Turn the inner hexagon spanner clockwise. The main control panel becomes lower;



Turn the inner hexagon spanner anti-clockwise. The main control panel becomes higher;



- Note:
- Re-insert the inner hexagon spanner into the hole when the spanner reaches the horizontal level. Turn the spanner again to ascend or descend the main control panel.
 - Do not turn the inner hexagon spanner while the spanner becomes tightened. It indicates the main control panel reaches the height limits (lowest position or highest position).

■ Moving the main control panel horizontally after the cut-off:

1. Toggle the lever of support arm to **Unlock**. See the figure below.



2. Step the brake pedal down to lock the casters. See the figure below.



Brake pedal

3. Stretch the main control panel out towards the arrow's direction. See the figure below.



4. Move the main control panel left or right towards the arrow's direction. See the figure below.



3.7 System Configuration

3.7.1 Running the System

Connect the AC power; make sure the ultrasound system and other optional devices are correctly connected.

When the AC power indicator on the control panel is on (indicator  is in green), press the power button  on the control panel to turn on the system.

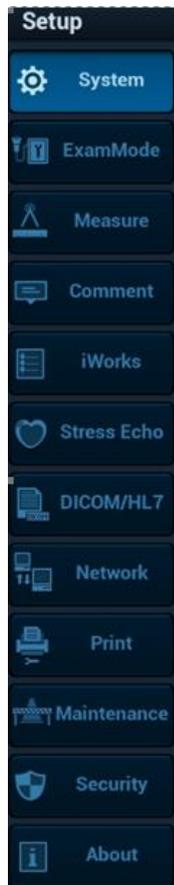
3.7.2 Entering Doppler

After the system is activated and the initialization is completed (about 1 minute), it enters Doppler interface, see the figure below:

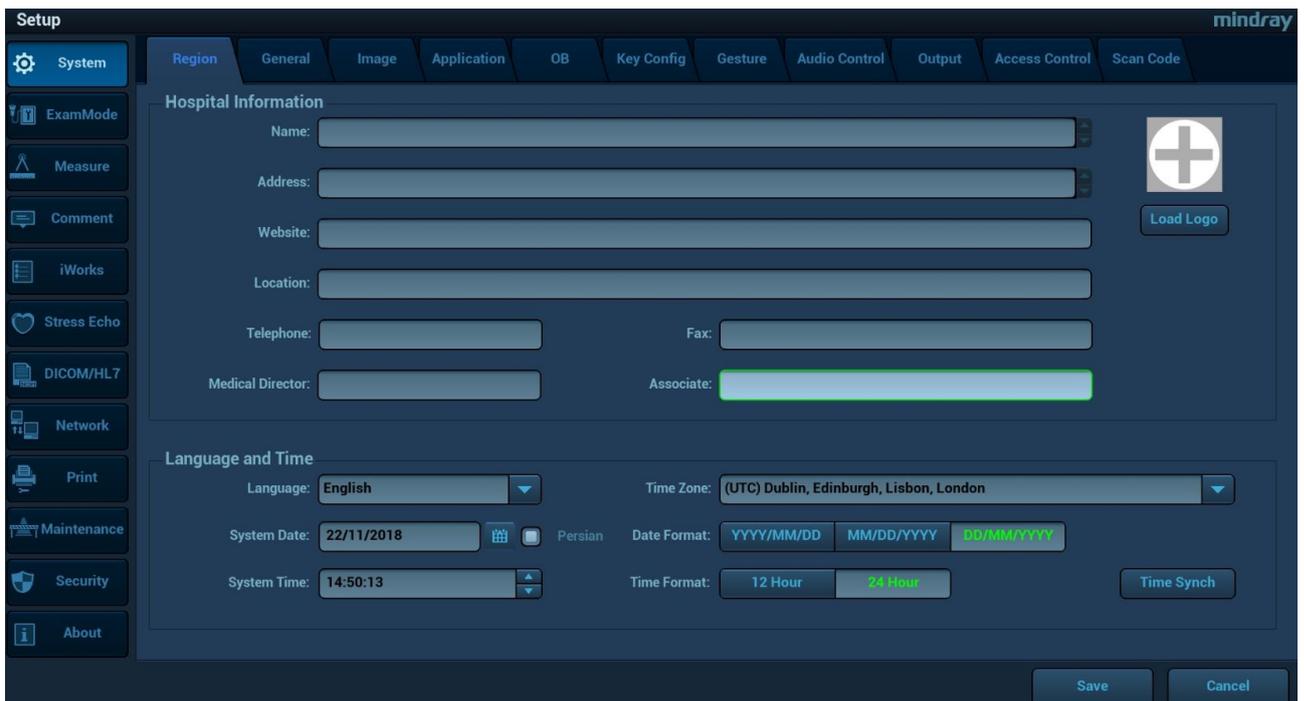


3.7.3 System Preset

1. Press <F10> on the keyboard to open the Setup menu.



2. The system displays the System Preset screen.



The following settings can be performed on the System Preset screen.

Page	Description
Region	To set the hospital name, language, time zone, system time format, system date format and system date/time.
General	To set patient information, exam setup, patient management, storage, system dormancy, operation log and so on.
Image	To set some general parameters in imaging modes.
Application	To set the measure ruler, measure setting, follicle method, comment setting and so on.
OB	To set the relevant information about fetal gestational age, fetal growth formula and fetal weight.
Key Config	To assign functions to footswitch and the user-defined keys.
Gesture	Preset the gesture on the touch screen.
Access Control	Set audio function.
Output	Set the output format, the range and the resolution for the image.
Admin	To set the user account control relevant information.
Barcode	To set relevant information of barcode.

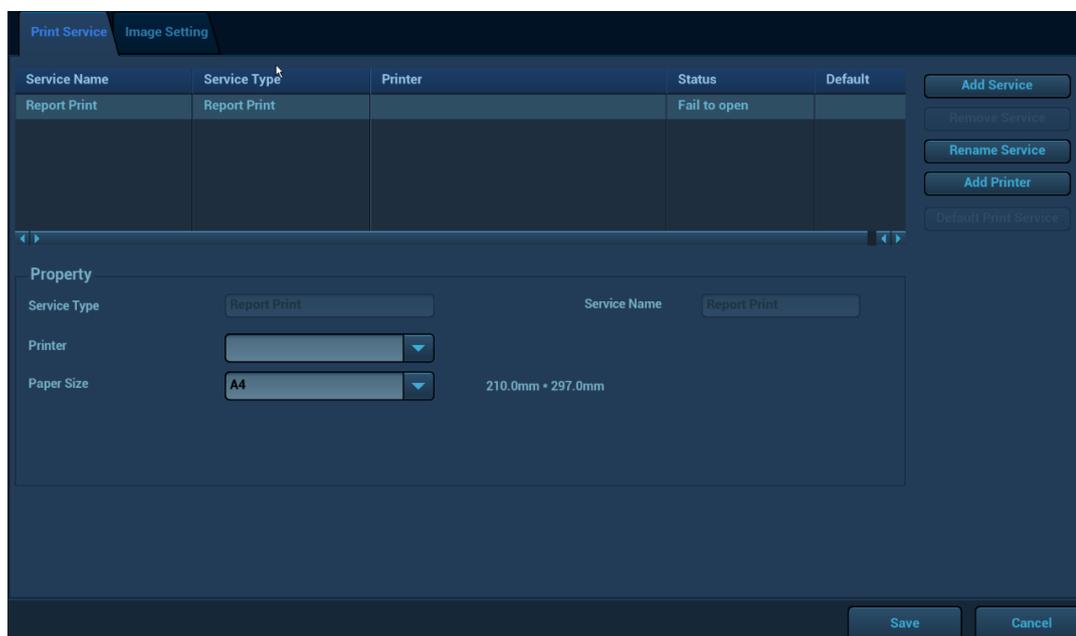
3.7.4 Printer Preset

This screen is used to set up the printer and image printing.

Click [Print] in the preset menu to enter.

■ Printer setting

The printer settings include print service and print driver.



● Print Service Setting

- Add Service: click to begin adding print services.
- Remove Service: click to delete the selected print service.
- Rename Service: click to rename the selected print service.
- Default print service: click to set the selected print service as the default one.
- Property: to preset print service properties.

- Image Settings

Click [Image Setting] to enter the page, you can set the brightness, contrast and saturation of image printing, or you can use the default values.

3.7.5 Network Preset

Select <F10 Setup> → [Network] → [Network Settings] to enter the Network Settings interface.

- Transmission Encryption

After accessing the network, click [VPN Config] to enter the "VPN Config" interface.

Parameter	Description
Status	No driver: click [SetupDriver] to enter the "TAP-Windows 9.21.2 Setup" interface, and do as instructed. Ready: the VPN is ready for use. Advance: VPN Advance Configuration Connected: VPN is successfully connected. Disconnected: VPN is disconnected. Error: error connection.
Server IP	/
Group	
User Name	
Password	
Hide characters	The password is displayed as *.
Connect/ Disconnect	Connect or disconnect VPN.

Parameter	Description
Advance	<p>Enters the "VPN Advance Config" interface.</p>  <p>Reset: if the system does not respond after you click [Config], click [Reset].</p> <p>Config: enters the "OpenConnect-GUI VPN client" interface. For details about the settings, please refer to the TAP manual.</p> <p>Note: after exiting the "VPN Advance Config" interface, you need to reboot the system; otherwise, you cannot connect VPN normally.</p>
Close	Close the "VPN Config" interface.

Note: if the system is installed with McAfee, software like VPN that is provided by the third party will be blocked. If users want to use VPN, select [Preset] → [Maintenance] → [Setup] → [Enter Windows], and input password to enter Windows. Open E:\VPNDrivers\tap-windows.exe to start installation.

■ Turn on hosted network function:

You can set the system as a hotspot. When other devices (with available wireless network function) are connected to the system, DICOM, iStorage and network print function can be implemented this way.

1. Select [Network Settings] page in Network Preset screen.
2. Confirm the Wi-Fi is enabled: you see [Disable Wifi] in the screen.
3. Enter the name and password for this hotspot in the Hosted Network box.
4. Click [Start] to enable the function.
5. Use other devices to search and connect to this network.

NOTE: Please do not switch [Disable Wi-Fi]/[Enable Wi-Fi] frequently. If [Start]/[Stop] button become available after frequent switching or the system can no longer search any other hotspots, please click [Disable Wi-Fi] again and then click [Enable Wi-Fi] to see if it works.

3.7.6 Network Configuration

■ Use the Wireless feature

1. Press <Cursor> to show the cursor, click  in the bottom bar to open the wireless network manager.

- Roll the trackball and press <Set> to select the target network, click [Connect] to connect to the network.

When connecting an encrypted network, enter the password in the box first. You can select to hide password characters or not.

- The system tries to connect and the wireless manager icon turns into . The icon turns into  or  after successful connection.



NOTE: When the system background is processing network task (DICOM sending for example), please do not enter network setting to change the IP or Eap, otherwise the background task may fail. You can check if there are tasks undergoing in the task manager.

■ IP Config

IP config is used for setting local network parameters, which is also applied to DICOM connection.

- In Wireless network manager screen, click [IP Config] to open the page:



- If “DHCP” is selected, the IP address will be automatically obtained from the DNS server.
 - Click [Refresh] to check current IP address.
- If “Static” is selected (using a static IP address), enter the IP address.
 - IP address of the system should be in the same network segment with the server.
 - Subnet Mask: set different network segment.
 - Gateway: set the gateway IP.

NOTE: the name of the device is saved under the service name by default. The system remembers the service name of the ultrasound system when sending the image, the

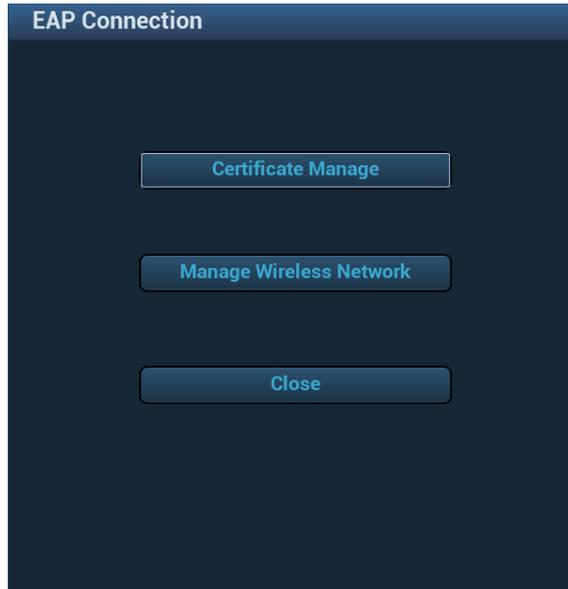
report to DICOM server. Open the file (DCM Editor Tool、eZDicom.exe) to view the service name (iStation Name).

2. Click [Apply] to save current setting. Click [Close] to exit.

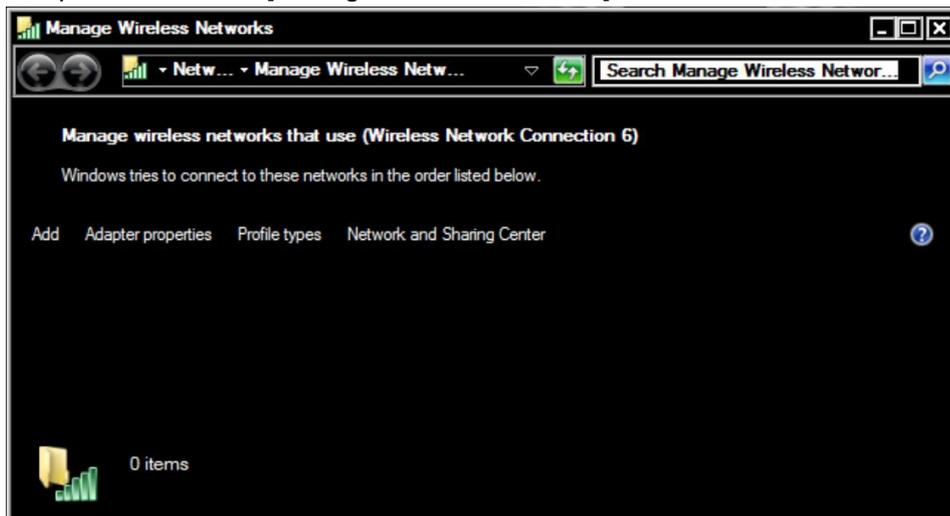
NOTE: If the IP address displays as 0.0.0.0, this means that the network is abnormal. The reason for the failure may be disconnection or the system cannot obtain the IP address.

■ EAP Network

1. In Wireless network manager screen, click [Eap Network] to open the page:



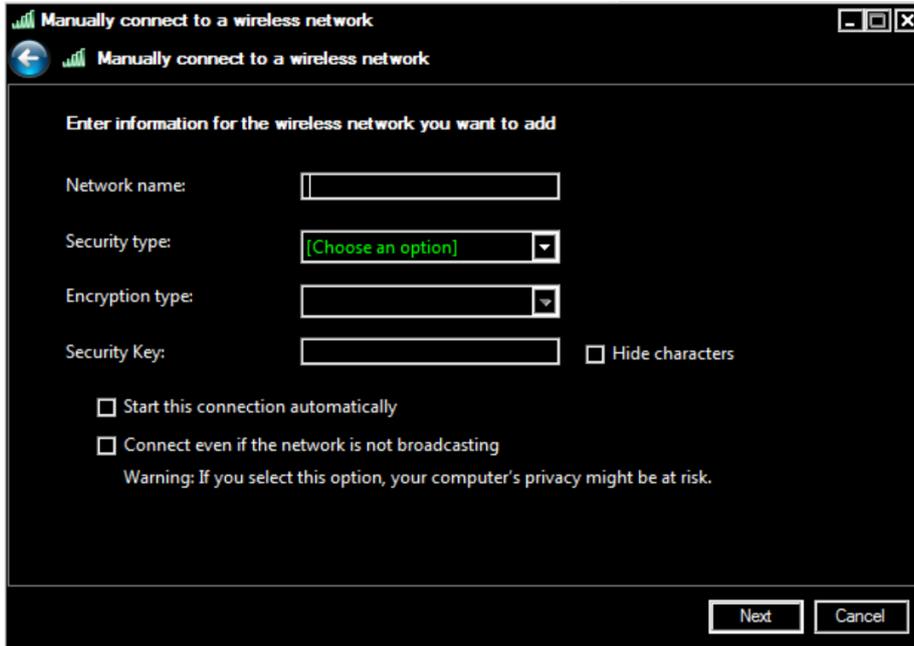
- Import certificate: Click [Certificate Manage] to enter Certificates page, click [Import...] to import root certification in “Trusted Root Certification Authorities” page, then click [Import...] to import personal certification in “Personal” page, and set Eap network password.
- Set Eap network: Click [Manage Wireless Network] to set.



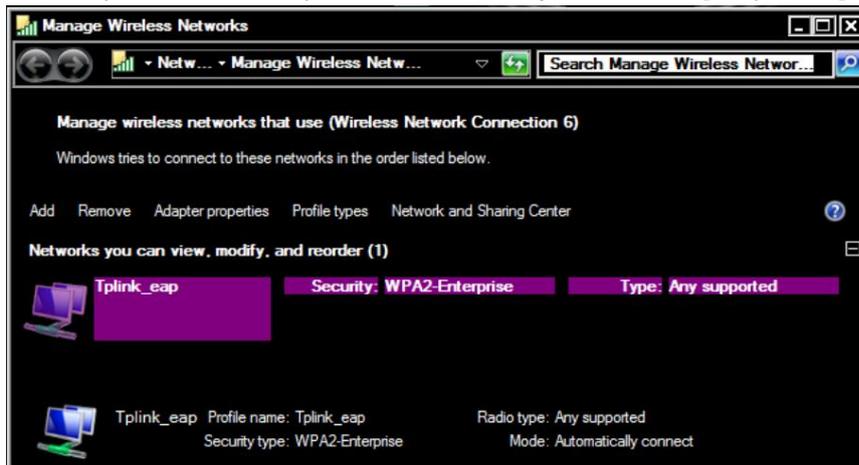
- Click [Add]->[Manually create a network profile] to set, then click [Next].
Network name: input Eap network name;
Security type: WPA2-Enterprise;
Encryption type: AES;

Security key: keep blank;

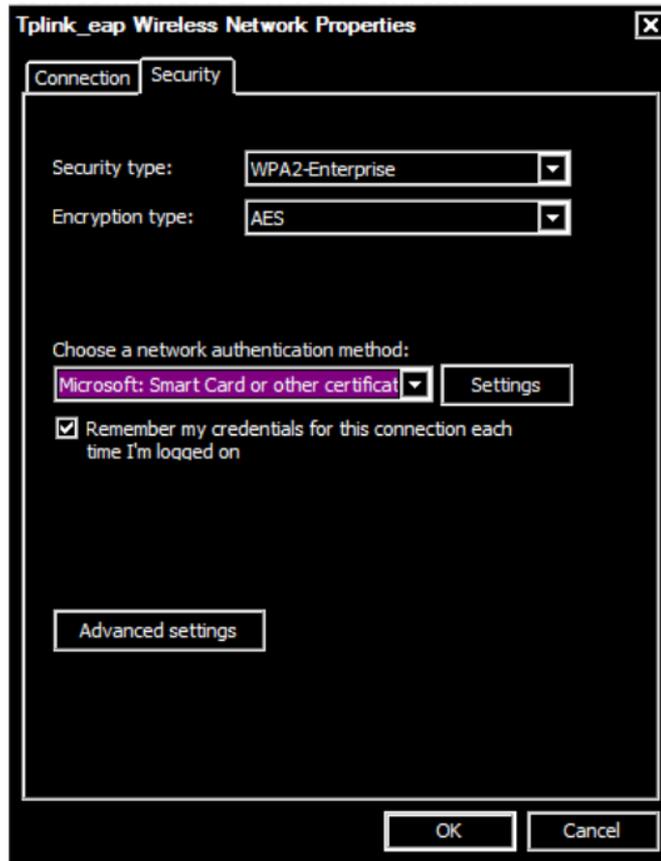
Select “Start this connection automatically” and “Connect even if the network is not broadcasting”.



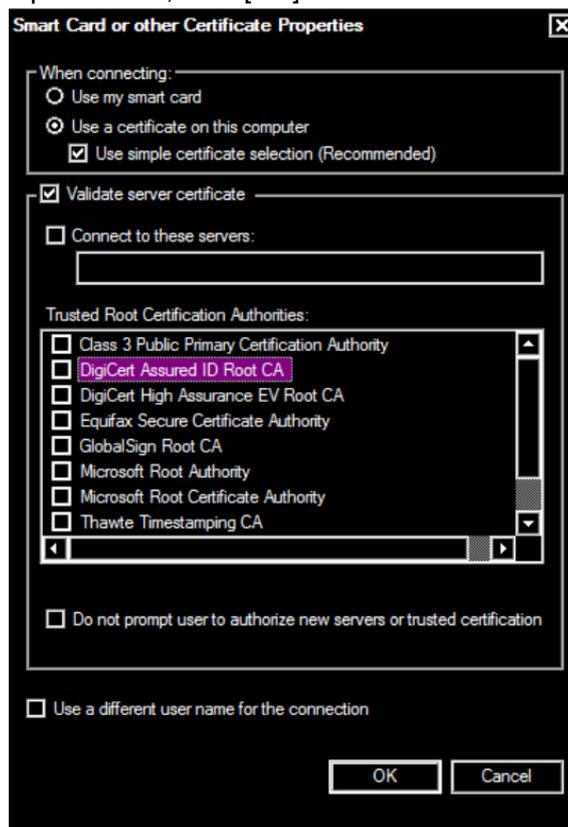
- Select Eap network, then press left <Set> key, and select [Properties] manu.



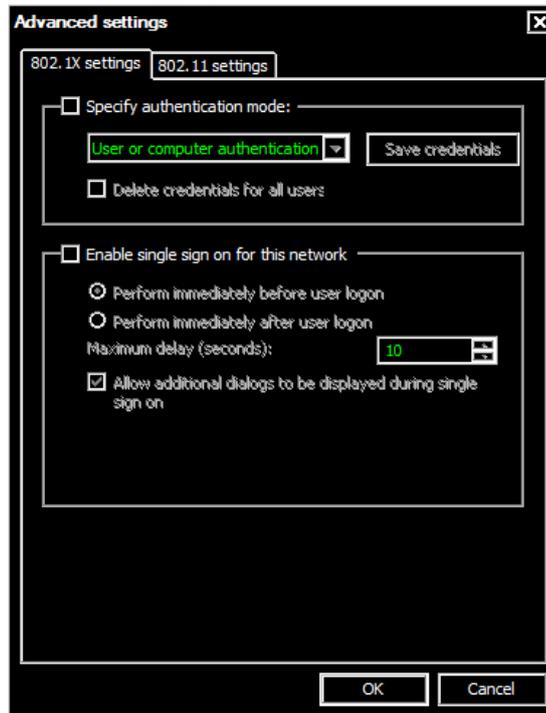
- Enter “Security” page, select [Microsoft: Smart Card or other certificate] from “Choose a network authentication method” drop-down list.



- Click [Settings], select trusted root certification from “Trusted Root Certification Authorities” drop-down list, click [OK].



- Click [Advanced Settings] to set in “Security” page. Select “Specify authentication mode”, and select “user or computer authentication” from the drop-down list. Then click [OK], close the setting page.



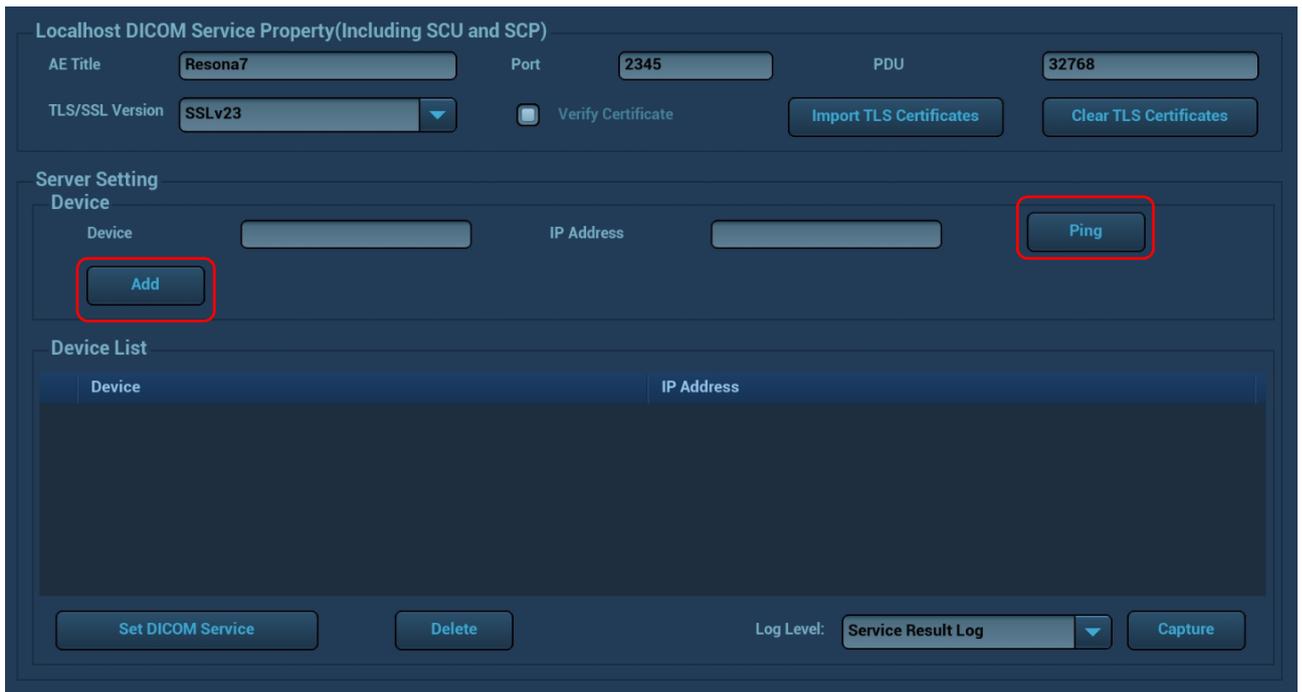
2. Select Eap network in the wireless network manager, click [Connect] to connect to the network.

3.7.7 DICOM/HL7 Preset

NOTE: Only if DICOM basic option is configured, [DICOM Preset] is available.

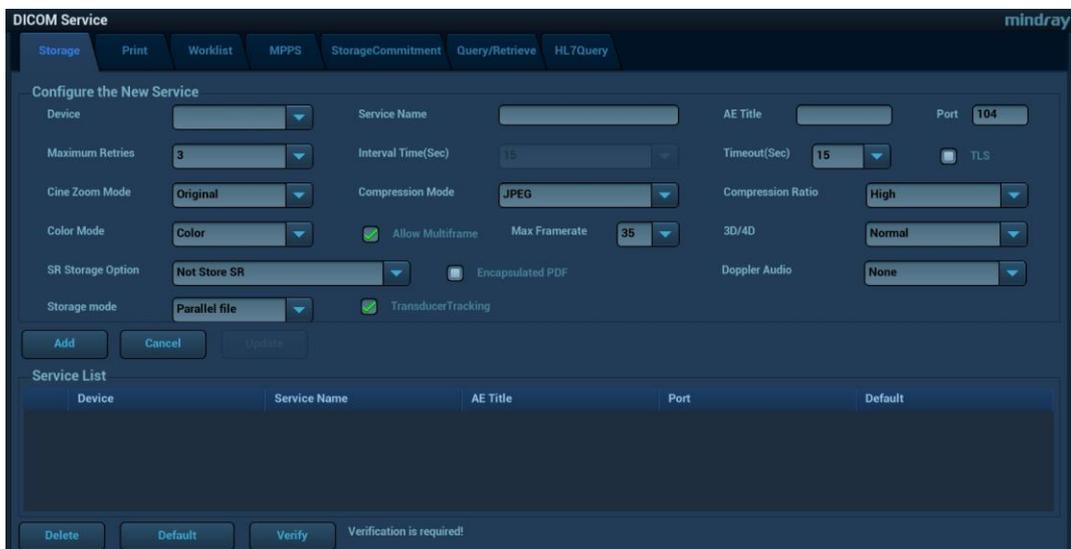
1. Click [DICOM/HL7] to open the DICOM Preset screen. Enter the AE Title of the ultrasound system, port and PDU according to the actual situation.
2. DICOM Server Setting
 - 1) Enter the device name and the IP address.
 - 2) You can ping other machines to verify connection after entering the correct IP address by clicking [Ping].
 - 3) Click [Add] to add the server to the list if the connection works normally.

The following is an example:



- NOTE:**
1. AE Title should be the same with the SCU AE Title preset in the server (PACS/RIS/HIS).
 2. DICOM communication port should be the same with the one in the server.
 3. If the currently entered name has already existed, the system will pop up: "The server name exists!" Click [OK] to enter another name.

3. Click [Set DICOM Service].



When the system is configured with DICOM basic function module, and installed DICOM Worklist, MPPS, DICOM Structured Reporting and Query/ Retrieve modules, the corresponding preset settings can be found in DICOM Service screen.

The DICOM Service Setting is used to set properties of DICOM services as Storage, Print, Worklist, MPPS, Storage Commitment and Query/ Retrieve. The detailed information please refer to DICOM chapter in the operator's manual [Basic Volume].

NOTE: Only if DICOM basic option is configured, Worklist page and other pages are available.

3.7.8 Check System Information

In System Information screen, it displays the product configuration, the optional hardware installation status, software version, hardware & boards, and driver related information. You can check the product information here.

1. Press <F10 Setup>, and then click [About] to open the following screen.

Title	Status
Product	NEUTRAL
Manufacturer	MINDRAY
Configuration Type	SFDA
ECN/TCN	
Internal Version	1.0
MAC Address	00 00 50 d0 50 91
Serial Number	
Contact Detail	400-700-5652

2. On About Detail page, system hardware & board related information can be seen.

Title	Status
System Software Version	00.01.00(Rev48973) 2015/08/24 10:33:51
Operating System Version	2.7 2015-6-12
LiftControl Board	
LiftControl Board PCB Version	0x02
LiftControl Board PCBA Version	0x02
LiftControl Firmware Version	0x06
ECG Board ID	2.1.1
ECG Firmware Version	0.2
PC Carrier Board	
PC Carrier Board PCB Version	Not Install
PC Carrier Board PCBA Version	Not Install
MultiFunc FPGA Version	0x15081701
UsMultiFunction Driver Version	0.0.0.6
EC Firmware Version	0x05
Pri. Display	
Main Monitor Hardware Version	0x66
Main Monitor Software Version	0x69

NOTE:

1. Be sure to confirm the system information before and after the software maintenance.
2. If necessary, please remind the user of saving the current system information.

4 Product Principle

4.1 General Structure of Hardware System

◆ Symbol Illustration

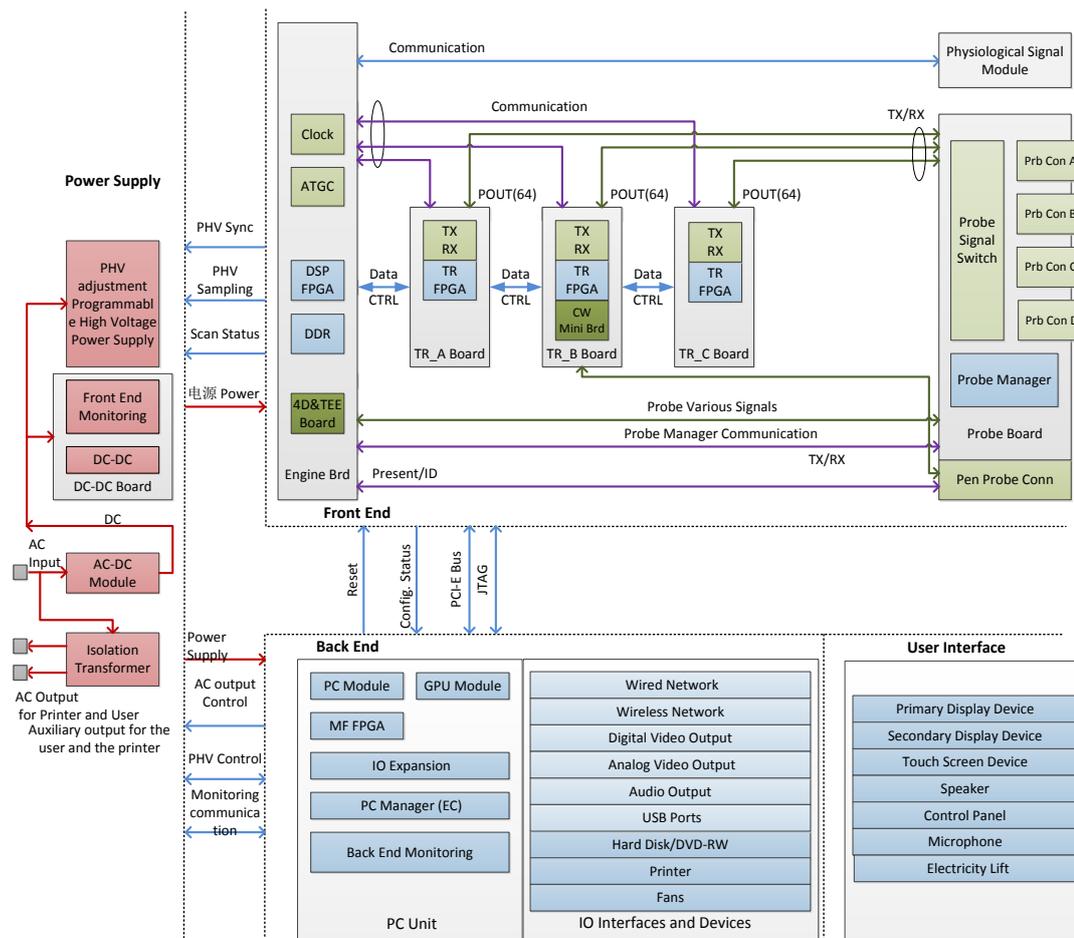


Figure 1 Schematic Diagram of System Hardware

The structure of Resona 7 series hardware system is shown in the figure above, the main unit consists of:

- Front unit (probe board, TR board, engine board, CW sub-board, 4D-TEE board, ECG module);
- Back-end unit (PC carrier board, IO interface board);
- Power supply unit (AC input unit, AC-DC module (including 5V_STB, 12V, 24V module), isolation transformer, DC-DC board, PHV board);
- User interaction unit (main monitor, touch screen (sub-monitor), speaker, control panel, microphone, electronic ascending/descending, moving mechanism of the control panel);

4.2 Ultrasound Front Unit

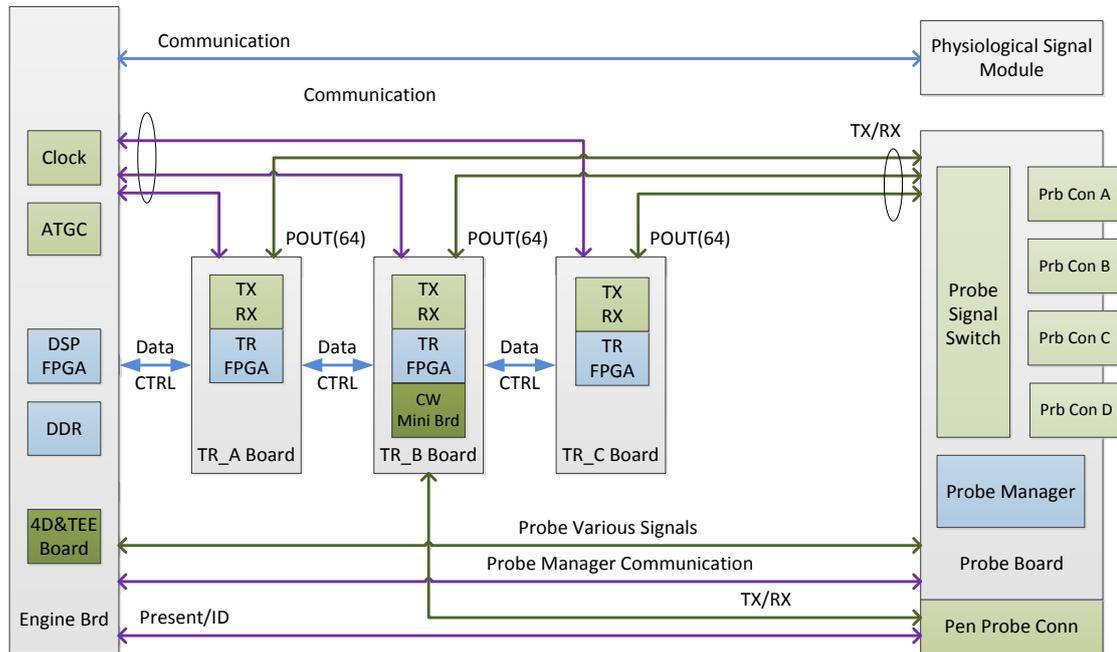


Fig 2 Schematic Diagram of Ultrasound System Front-end

Front-end unit mainly consists of:

- Probe board
- TR_A board, TR_B board, TR_C board
- Engine board
- CW sub-board (option configuration on the TR_A and TR_C board, standard configuration on the TR_B board)
- 4D-TEE board
- ECG module
- Pencil probe board (optional)

Ultrasound front-end unit carries out the transmitting and receiving, the ultrasound image signal will be sent to the CPU module on the digital board for post processing after amplification, A/D conversion, beam forming and signal processing.

For details of the each board, see the following chapters:

4.2.1 Probe Board

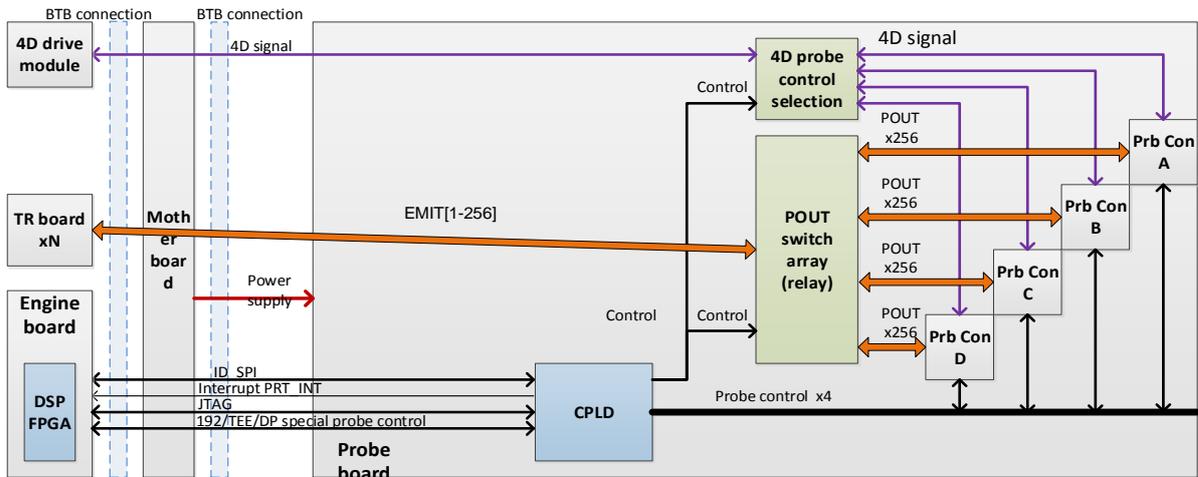


Figure 3 Schematic Diagram of the Probe Board

The hardware structure of the probe board is shown in the figure above: The introduction of probe board is described as follows:

- The probe board supports probe switching of four 408pin probe plug, every plug has 192-array connecting with the main unit physical channels.
- 408-pin probe plug supports general probe (192-array at most), mechanical 4D, 1.25D/1.5D probe, bi-plane, TEE (compatible with the interface) probe and probe containing high-voltage switch.
- Probe board FPGA supports on-line upgrade.
- Support the detection of the probe's hot swapping.
- Support activating the indicator of the probe.
- The probe board can be used for the burn-in without disassembling the JTAG of FPGA.

4.2.2TR Board

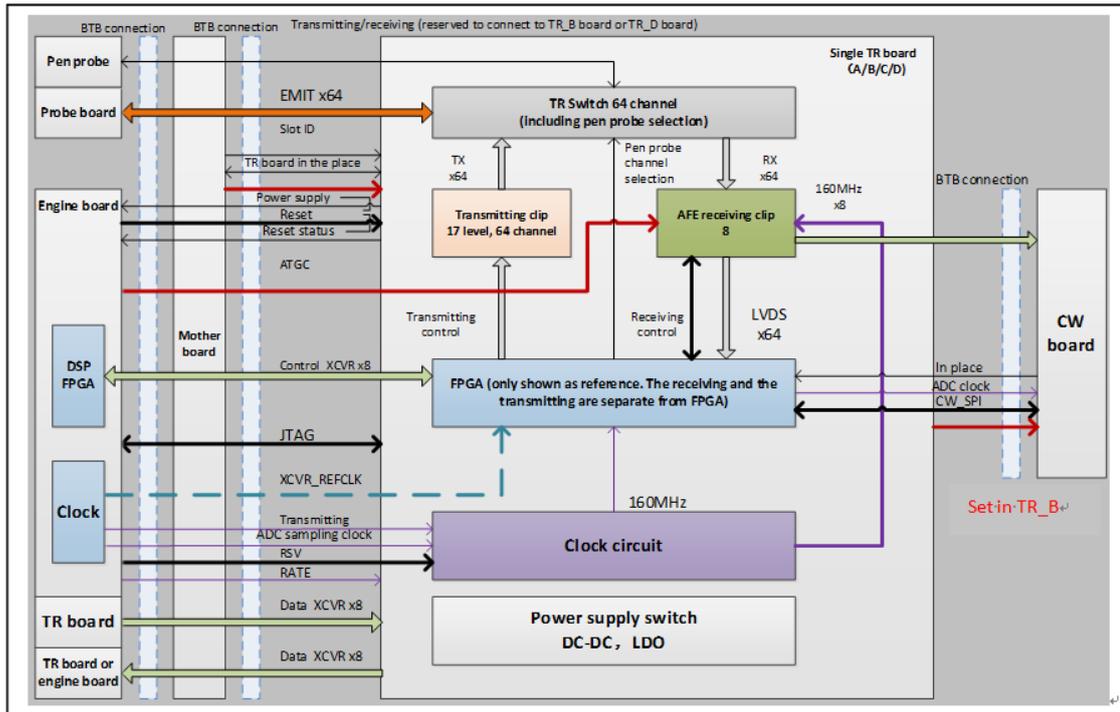


Figure 4 Principle Diagram of TR Board

The principle diagram of TR board is shown above, the main functions include:

- **Transmitting:** in accomplishing the transmitting focus of the entire unit, TR_FPGA controls 64 channels on a single board to send high-voltage ultrasound signal to the probe.
- **Receiving:** in accomplishing the receiving focus, TR_FPGA controls 64 channels on a single board to receive ultrasound echo signal of the probe.
- **Assemble CW function.**
- It refers to the CW mini board on TRB board; it fulfills the filtering and sampling of adjustment of CW, and accomplishes the reception of CW signal.
- **Pencil probe supports:** the switch between the receiving channel and general receiving channel of pencil probe on TRB board

4.2.3 Engine Board

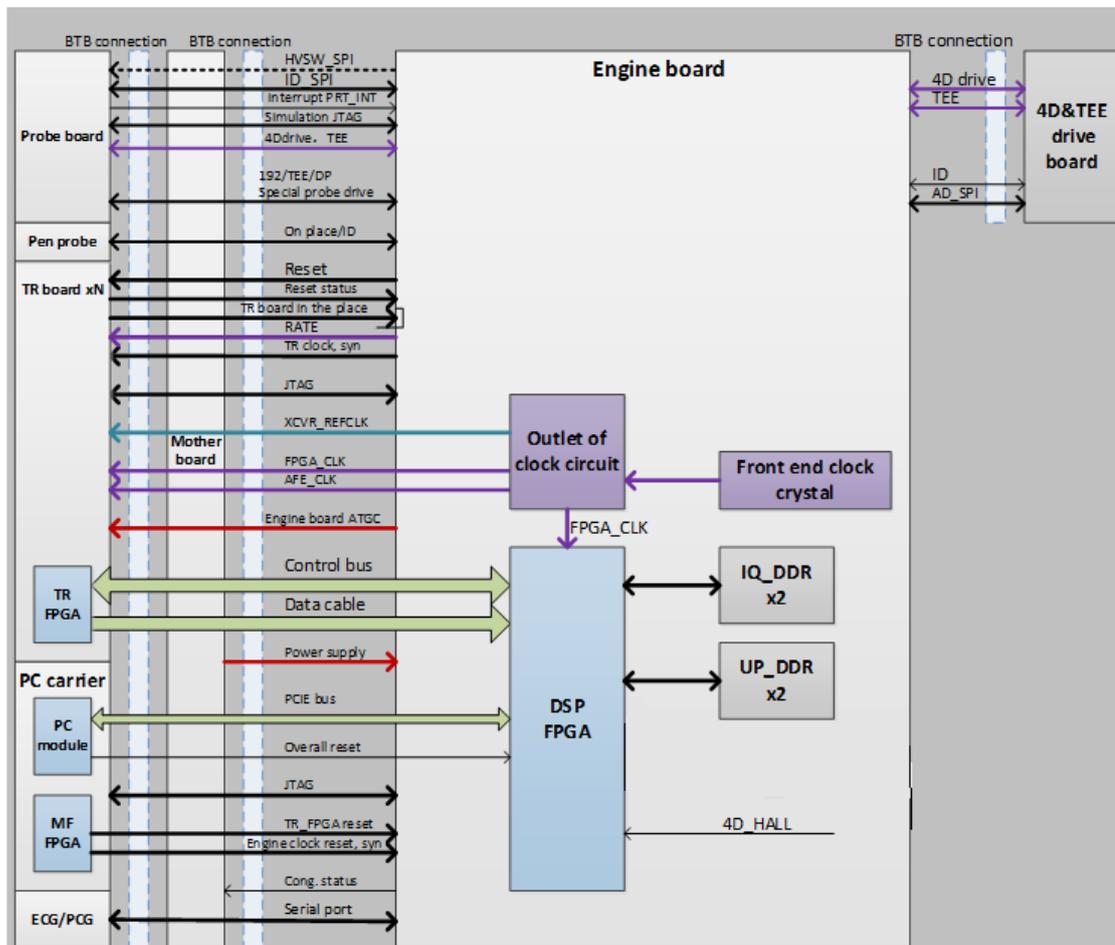


Figure 5 Principle Diagram of Engine Board

The hardware circuit of engine board is shown in the figure above.

Function:

- Distribute the clock.
- Provides the control and management function of probe related.
 - a) Probe online, IDs, hot-plug.
 - b) Control of interior circuit of the probe, such as high-voltage switch, parallel turning, Cable Driver, etc.
- Corresponding control signal of the probe board:
 - a) Control of the high-voltage (only applicable for the physical channel less than 128, Plato is not equipped with the function).
 - b) Configuration of the CPLD on the probe.
 - c) SPI communicate with probe
- Responsible for the module resetting, online upgrade, the management of module information.
- Communication and control of the accessories related with image scan, the accessories include:
 - a) 4D driving function module; it is an optional independent module, which belongs to the engine board.
 - b) Physiological signals function module.

4.2.4 ECG Module

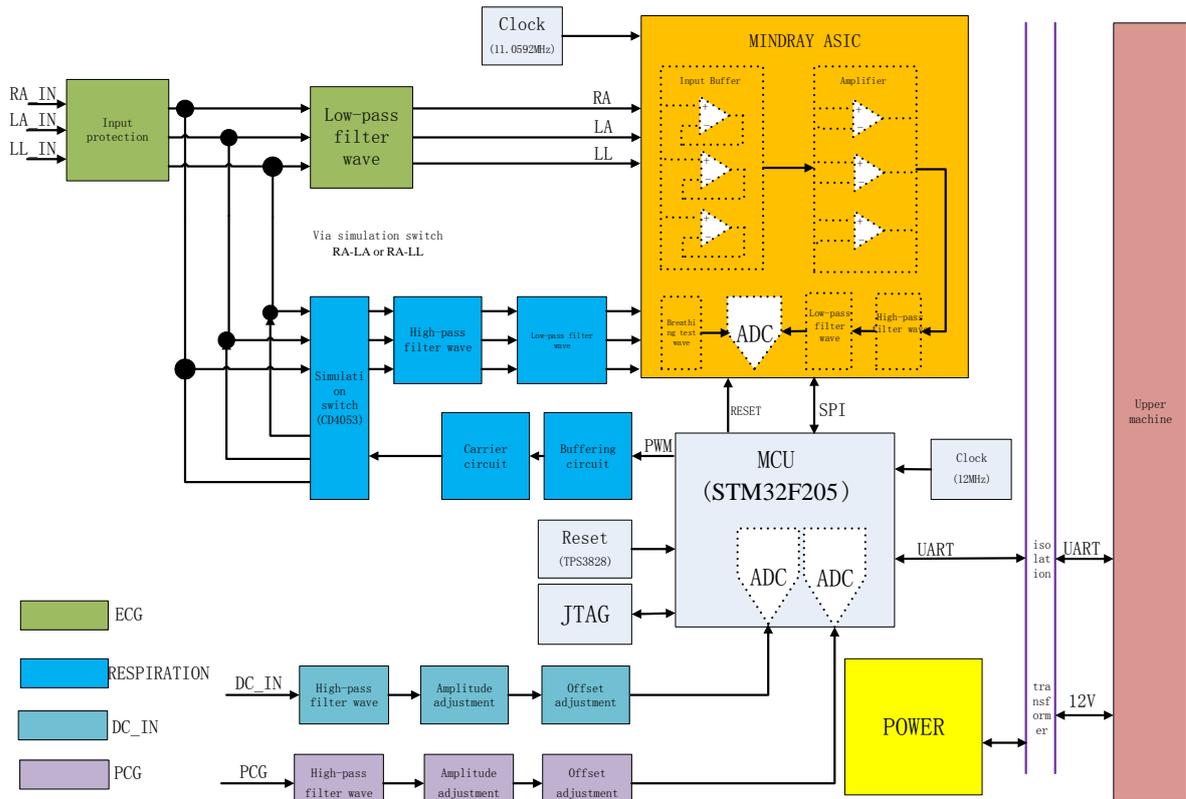


Figure 6 Principle Diagram of ECG module

The ECG module is designed for monitoring of ECG signals and display of ECG waveforms, which serve as the reference of ultrasound images. This module can synchronously trigger display of 2-D images and color flow images. After the ECG signal is amplified, filtered and sampled, the signal is sent to the DSC module through the serial port; at the same time the R-wave is detected, and the detected ECG-triggering signal is sent to the system controllers through interrupt, to start the scan transmission.

The detail specifications are:

- Support 3 lead: RA, LA and LL available.
- Do not support lead reorganization.
- Only support one channel.
- AC overloading protection, 50Hz/60Hz, 1Vp-p, duration 10s, module return to be normal after overload signal disappear
- 3 lead provides drop check of all limbs lead and RL lead.
- QRS: 0.2mV.
- Input impedance is more than 5 MΩ (10Hz).
- The input range of ECG is ± 8 mV.

➤ WIFI Module

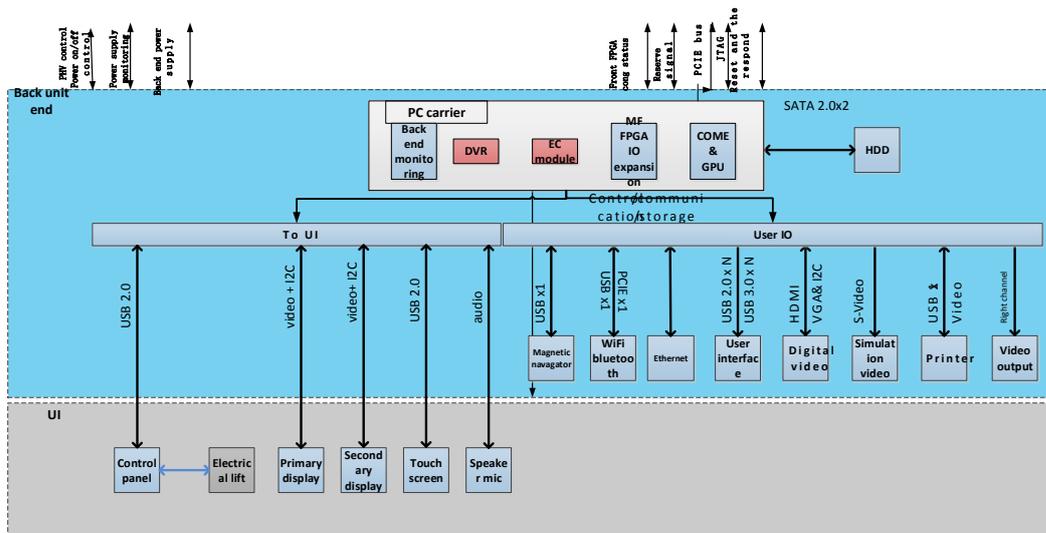


Figure 8 Diagram of Back-end Unit

4.3.1 COME (CPU) module

COME (CPU) module is integrated CPU (with integrated graphics), host bridge (IO extension), memory bank, together with PC carrier board, hard disk and independent GPU, as the calculation and control center of the entire unit, CPU module fulfills the comprehensive functions on the computer system.

Key specification of Resona 7 COME (CPU) module is shown below:

- Select the industrial CPU module which meets the COME 2.0 Type 6.
- CPU: i7
- Memory: 8G

4.3.2 Independent GPU (GPU)

The independent GPU is used as the coprocessor of COME (CPU) module, it has stronger calculation capacity. The key specification below:

- Module type under standard MAX 3.0 Type B. mechanical size: 82mm*105mm. Plug height: 5mm.
- Support CUDA, the processing ability is not less than GTX770M.

4.3.3 Memory device (SSD&SATA hard disk)

It is used for saving image data, user data and operating system. Together with COME (CPU) module, PC carrier board and independent GPU, it fulfills the comprehensive functions on the computer system.

Taking account of compatibility and capacity of , Resona 7 chooses a SSD with mSata interface 120G as the operating system disk and a 2.5 inches hard disk with 1T to save user data.

4.3.4 PC carrier board

Function

- Provide PC environment for ultrasound system

- Provide interface of GPU processor.
- Responsible for interface output of the main screen and touch screen.
- Provide the interface of memory function, such as system hard disk, user memory hard disk, drive, etc.
- Extend user IO interface, such as display interface, USB interface, and network interface.
- Provide the communication interface of engine board and PC system to fulfill data uploading and control sending of front-end system.
- Fulfill power management function of ultrasound system.
- Provide interface of wireless module and Bluetooth.
- Provide ascending/descending management, high-voltage power management, system monitoring, power monitoring.
- Provide printing control, JTAG interface of hardware system debug, ID management of hardware board.

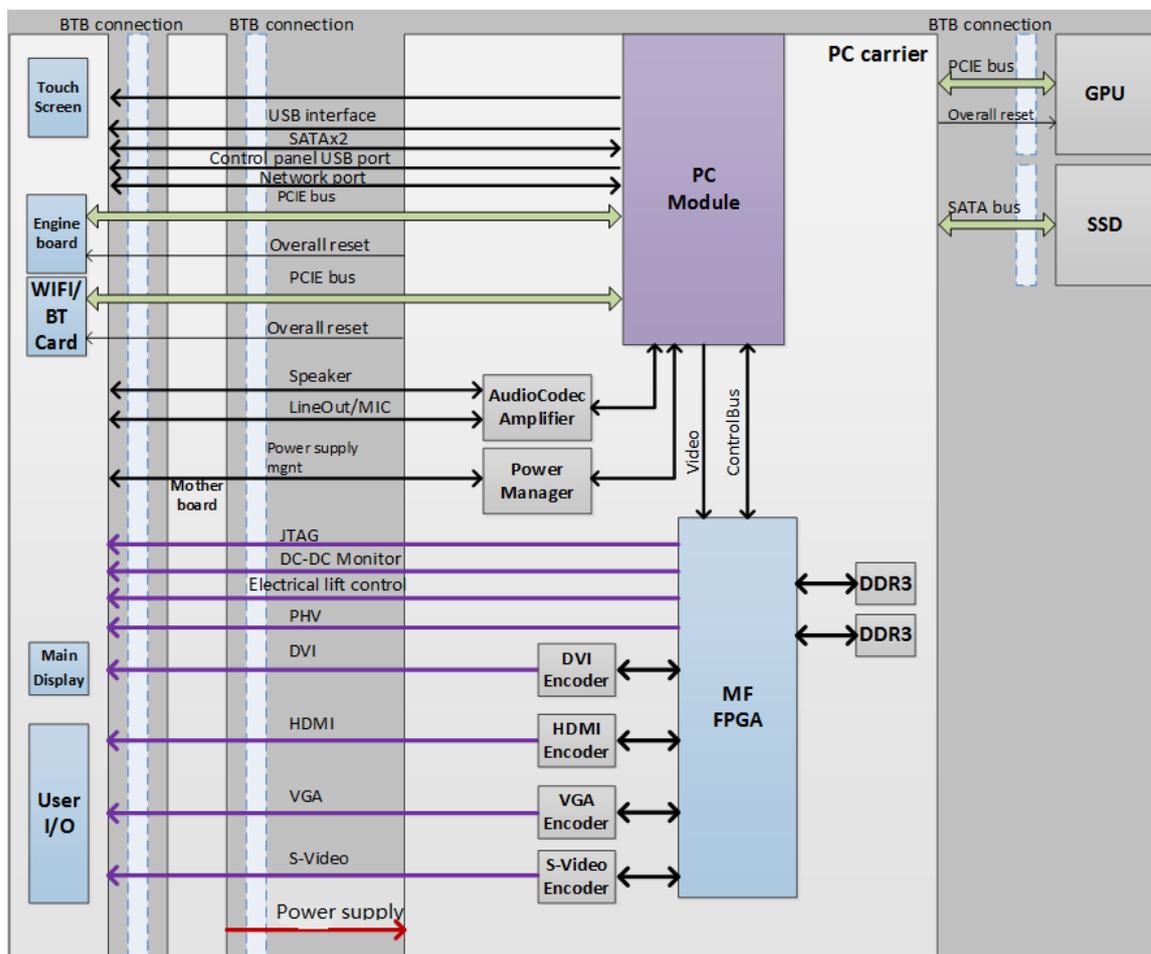


Figure 9 Schematic Diagram of PC carrier board

PC carrier board is used as the carrier of COME (CPU) module. The main functions include:

- as PC main board to support the following modules :
 - a) Support COME (CPU) module, provide the power, power management, on/off management for COME (CPU) module.
 - b) Support GPU, provide power and power management for GPU, and provide the channel (PEGx16) between GPU and COME (CPU) module.

- c) In order to decrease the distance between COME (CPU) module and SSD, the MSata is on the carrier, and the carrier provides the power for SSD.
- Extend the interface of COME (CPU) module; it can be applied for user interface or communicating with other module. The extend interface module include:
 - a) Video extension. Through mother board, PC carrier board provides Video extension to the main monitor, touch screen, IO board.
 - b) Audio distribution. Through mother board, PC carrier board provides Audio distribution to speaker and IO interface board.
 - c) USB extend module. Through mother board, PC carrier board provides USB extension to other modules and IO interface board.
 - d) SATA extend module.
 - e) PCIE distribution. COME distribute PCIE interface to other modules by PC carrier board and mother board, such as WIFI module, engine board, GPU, Ethernet port.
 - f) Network interface;
 - g) I2C distribution
- System monitoring function.
- System resetting function.
- System upgrade function.

Most of modules are coupled with user interaction unit, detail description is shown below.

4.3.4.1 Video Extension Function Specifications and Plans

Resona 7 product has following instantiated items on platform:

- Primary display interface Mini HDMI, resolution 1920*1080.
- Secondary display interface HDMI, resolution 1280*800.

The distribution image of Resona 7 is shown in figure 10, and the description is as follows:

- The primary display and secondary display use DVI signal, communicate with PC carrier board through DDC, and adjust the display parameter.
- PC carrier board offers DDC channel. It communicates with VGA peripheral, HDMI peripheral. Obtain peripheral resolution information, etc.
- The signal between primary display and secondary display is transmitted through the cables (lifting column).
 - The primary display uses Mini HDMI.
 - The secondary display use HDMI cable to transport DVI signal
- The video signal of the peripheral is connected through board-to-board.
- The changes of the video signal and the resolution can be realized by the multifunctional logic of PC carrier board.

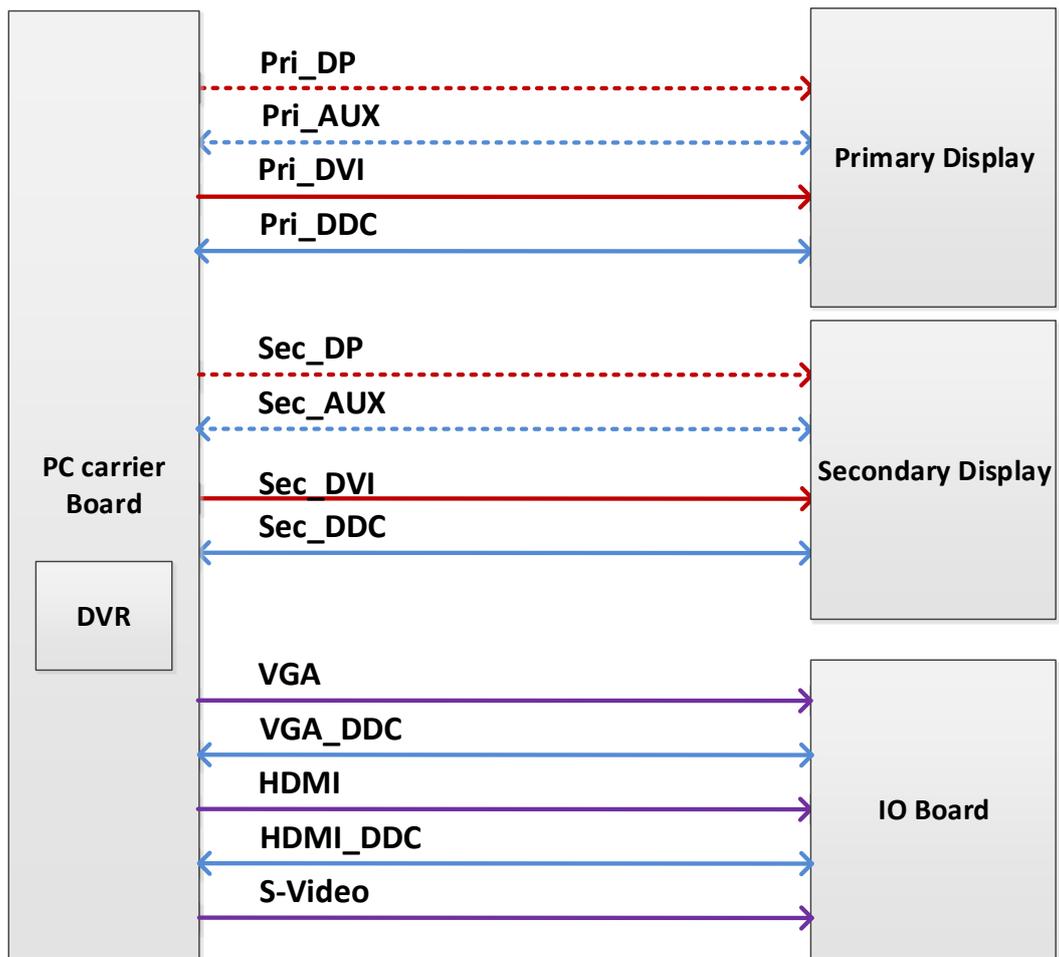


Fig 10 Plato Video Distribution

4.3.4.2 USB Distribution Plan (including USB power distribution plan)

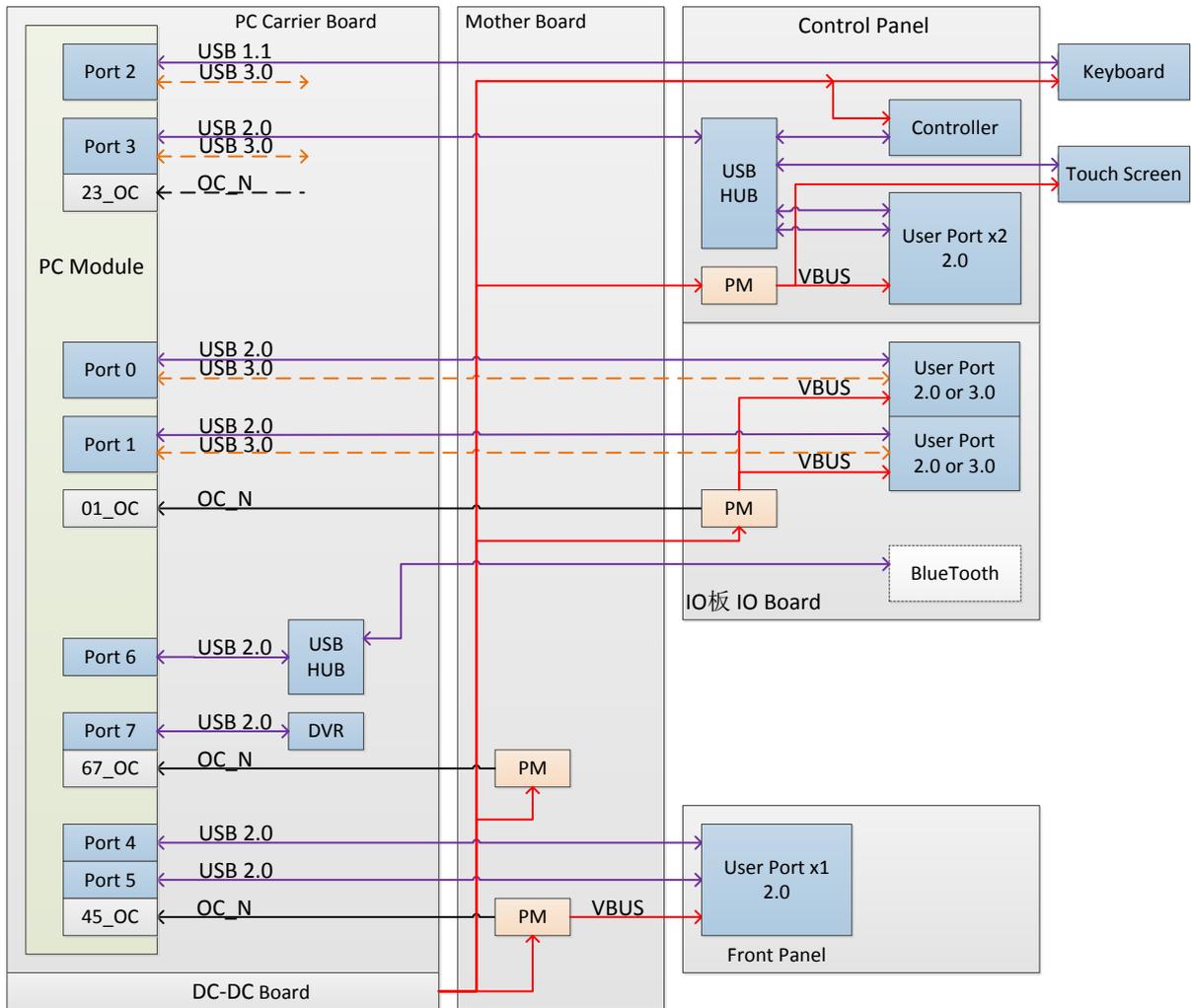


Figure 11 USB Distribution Plan

USB distribution plan is shown in figure 11, descriptions is as follows:

- The VBUS of USB comes from the DC-DC board; it is not distributed by PC carrier board. PC carrier board only receives overcurrent indicating signal.

4.3.4.3 Network Port Requirements and Plan

Connect the network to ultrasound device to accomplish DICOM, remote control, remote print, etc. The requirement of the system to network capability:

- Supports wired network: ten trillion Ethernet, hundred trillion Ethernet and gigabit Ethernet.
- Supports wireless network: Wi-Fi (802.11b/g/n). Bluetooth reserved.

Realization of network capability:

- Wired network: is realized based on CPU module (MAC+PHY) and isolation transformer of IO board. The network capability is decided by CPU module. Isolation transformer and RJ45 network circuit have to meet the security requirements of creepage distance.
- Wireless network: uses built-in wireless module. The network capability is decided by wireless module and cables.

4.3.4.4 PCIE Interface Distribution plans

The data and controls of ultrasound devices are based on PCIE interface.

The structure of PCIE interface distribution of the system is shown in table 1

Table 1 PCIE distribution

PCIE interface on CPU module	Device	Transport speed
LANE [3:0]	Engine board on front-end	PCIE Gen 2, 5Gbps, Form x4
LANE [4]	Wireless module on back-end	PCIE Gen 1, 2.5Gbps
LANE [6:5]	Reserved	/

4.3.4.5 SATA Interface Function Requirements and Plan

SATA interface is applied for connecting memory device; detail distribution is shown in table 2:

Table 2 SATA interface distribution

SATA interface on CPU module	Device	Description
Port 0	SSD for PC carrier board	BTB connect, SATA 3.0
Port 3	Hard Disk	WTB connect, SATA 2.0
Port 2	DVD driver	WTB connect, SATA 1.0

4.3.4.6 Audio Interface Function Requirements and Plan

The audio interface is applied for connecting speaker, microphone, earphone and other devices, so back-end must support speaker output, microphone input, general audio output (speaker and earphone).

The load index of speaker: the speakers on the device support dual tracks of 10W/8Ω for earphone and speaker, it supports dual output only.

4.3.4.7 The Frame of System Monitor Function

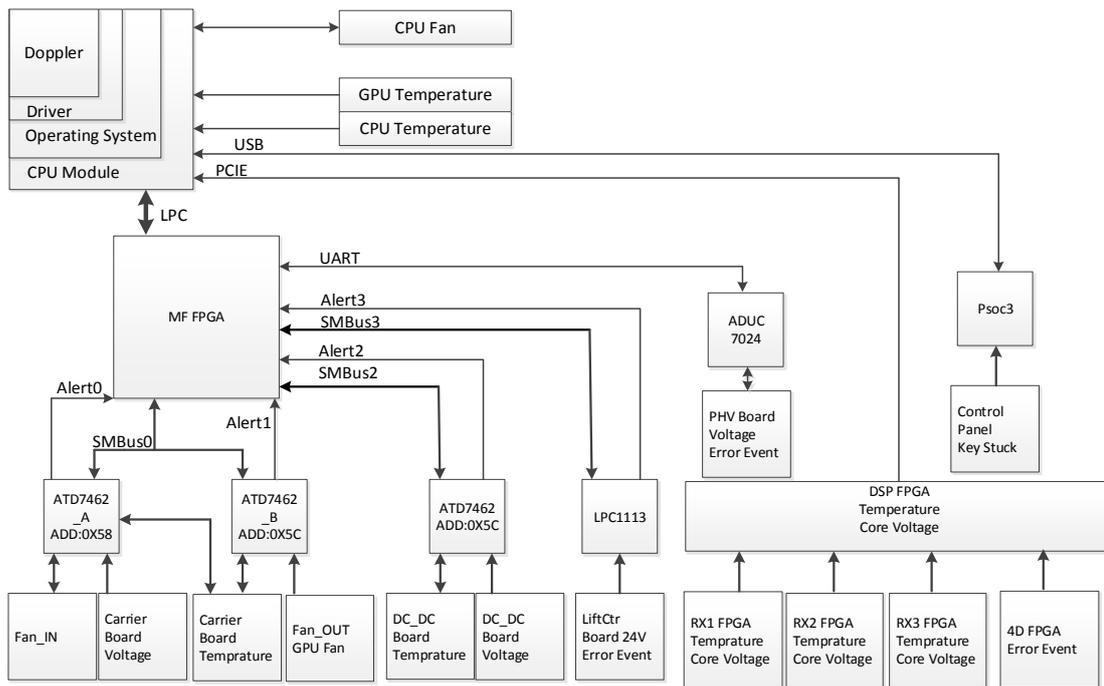


Fig 12 Principle Diagram of System Monitor Function

Main monitoring content:

- CPU/GPU temperature
- GPU/GPU fan
- The voltage and temperature of PC carrier board, voltage and temperature of DCDC board which are captured by 7462.
- The cooling fan captured by 7462
- PHV related voltage
- Electrical ascending/descending voltage, communication and key block monitor
- The key block of control panel
- DSP/RX1/RX2/RX3/4D FPGA voltage, temperature monitoring

Related monitor description:

Monitoring items	Function description	Interface Description
CPU Fan	Monitor the rotation speed of CPU fan and control the rotation speed of CPU speed	Doppler software read the speed via the port, and controls the speed
GPU/CPU Temperature	Monitor the temperature of CPU/GPU	Doppler reads it directly by interface.
Psoc3	Control panel, key block of control panel	USB connects with main unit, Doppler communicates with Psoc by USB interface

ADUC 7024	PHV voltage monitoring	Communicate with multifunctional FPGA by serial port
FPGA	DSP/RX1/RX2/RX3/4D FPGA voltage, temperature monitoring	Communicate with PCIE and host computer by DSP FPGA
ADT7462A/B/C	Monitor fan of machine, GPU fan and PC carrier board, DCDC related voltage, temperature.	Communicate with multifunctional FPGA by Smbus
LPC1113	Electrical ascending/descending voltage and warning monitor	Communicate with multifunctional FPGA by Smbus

4.3.4.8 Extend Function of Other Interface

Except for the interfaces described above, the system uses modules to communicate with PC; the main modules include:

1. System monitoring (power supply, temperature, fan): I2C interface.
2. VGA video I2C, HDMI video I2C.
3. The primary display/touch screen I2C (reserved for the display which is compatible but has non-DP interface).
4. Battery management (serial port, platform reserved)
5. PHV module (serial port)

CPU module does not have any I2C interfaces, so the serial port and I2C interface must be extended by MF_FPGA to connect with different devices. MF_FPGA communicates with CPU module by LPC.

4.3.5 User I/O Interface Board

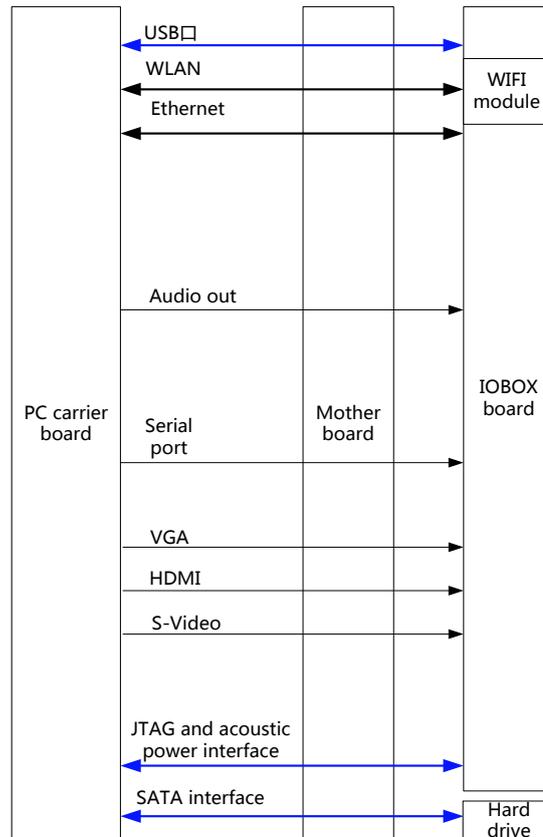


Fig 13 Principle Diagram of I/O Box Board

Function:

IO interface board includes functions as follows:

- Provide user IO interface. IO interfaces are all from COME (CPU) module which is extended by PC carrier board and connects to the IO interface. IO interface types include:
 - a) Video input and output interface
 - i. HDMI output
 - ii. VGA output
 - iii. SVIDEO output
 - b) Audio output port
 - i. Audio OUT
 - c) USB interface: 2, version 2.0 or above.
 - d) Ethernet port
- Debug interface
 - a) Test signal of output acoustic power.
 - b) JTAG port of machine debugging
- Standby status indicator
 - a) FPGA configuration status;
 - b) Power indicator.
- Wi-Fi module is on the IO interface board. Connect with COME (CPU) module through mother board and PC carrier board by PCIE and USB interface.

4.3.6 WiFi Module

The WiFi module, as shown above, is on the IO interface board. Resona 7 uses wireless network module and supports Bluetooth function. The functions are shown below:

- Built-in Wi-Fi module
- Mini PCIE interface
- Half-size card
- Meet 802.11 b/g/n

4.4 Power Supply Unit

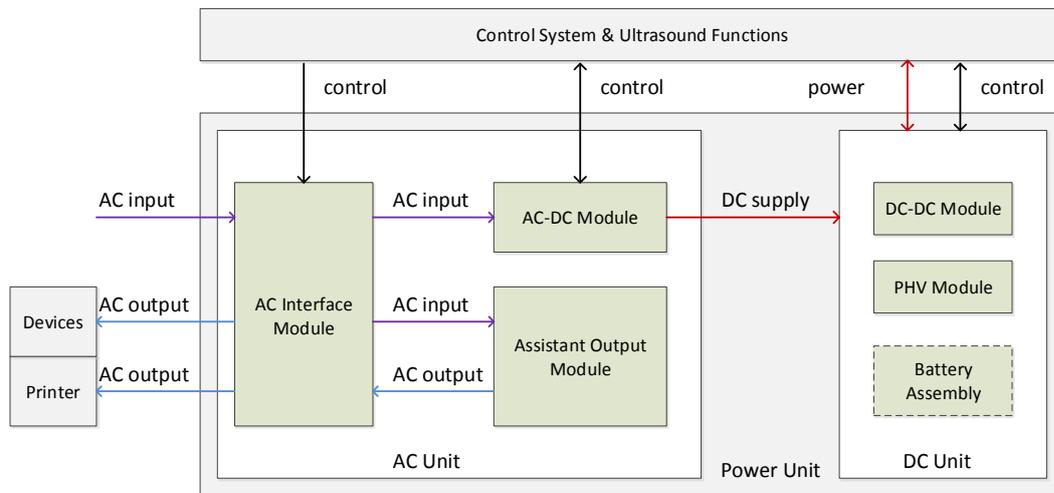


Figure 14 Schematic Diagram of Power Supply Unit

The function of power supply unit is to provide power for each unit of machine, including: front-end unit, back-end unit, user interaction unit, user peripherals (auxiliary output). Power supply is mainly from net power, the system is compatible with the standby status when powering off; corresponding battery and battery management do not have the function as the product does not define the function. The power unit main include following modules:

- AC Interface Module
- Auxiliary Out Module
- AC-DC Module
- DC-DC Module
- PHV Module

4.4.1 AC Interface Module

The function of this module has the function of connection and net power processing. Main function is to output the processed net power to AC-DC module and auxiliary output module, as follows:

- The function of connection board: support AC input connector, transport the processed AC input power to user as auxiliary output and AC-DC as the input.
- The overcurrent protection of machine. When the current is overloaded, it can cut off the input power.
- Provide the user with grounding equipotential terminal.

- Select isolation transformer when switching between 220V and 110V. It is not necessary to switch for AC-DC input. It supports 110V or 220V generally.
- Auxiliary output switch control function; the default auxiliary output is off when the machine is powered off.

4.4.2 Auxiliary Output Power Isolation Transformer

Auxiliary output provides AC power for the user peripherals. It needs to isolate the leakage current of auxiliary output in order to meet the regulation. The platform uses the isolation transformer.

The key indices of the auxiliary output of Resona 7: 2 auxiliary output port, one for B/W printer, another for color printer and other peripherals, Power consumption is totally 300VA (100~127 Vac or 220~240Vac@50/60Hz in total). The two interfaces of Resona 7 are on the AC interface module.

4.4.3 AC-DC module

AC-DC module changes the AC power to DC power to provide power for other assemblies by DC-DC module. The module needs the indicating signal when AC power is off to control the circuit of battery.

The specification of Resona 7 is as follows:

- AC-DC outputs 3 voltage, there are:
 - a) 12V: not less than 692W (DC-DC module 572W, PHV module 120W);
 - b) 24V: not less than 150W (electrical ascending/descending 50W, two electromagnets each is 50W).
 - c) 5V_STB (Output from 5V board assembly): the peak current is 2A when powering on, duration in 4ms; the average value is in 500mA when working normally.
- Resona 7 does not define the function of standby status when battery in, so it is not necessary to have AC power off indicator. Take the reservation into consideration by platforms.
- The indicator when AC is in the place: reminds of the validity of AC input; it is used for service personnel to decide the failure on the scene, available.
- I2C interface: main control system obtains the work status of module. Available.

4.4.4 DC-DC board

DC-DC board provides DC power for different functional boards and peripherals to fulfill the requirement of current and voltage, special requirement as follows:

- Support PC system standby.
- Support ATX sequence.

The switch of DC-DC can interfere with the analog circuit of front-end easily. It should keep away from the front-end board. Provide grounding shield when necessary.

Power-up and power-down sequence of functional board is realized in board.

4.4.5 PHV module

The PHV module provides the DC current for the following modules:

- Programmable voltage power of the general transmission circuit.
- Programmable power for CW transmission circuit.
- Power for high voltage switch.
- Programmable bias voltage for special probe.

The PHV board functional block diagram is shown in the figure below:

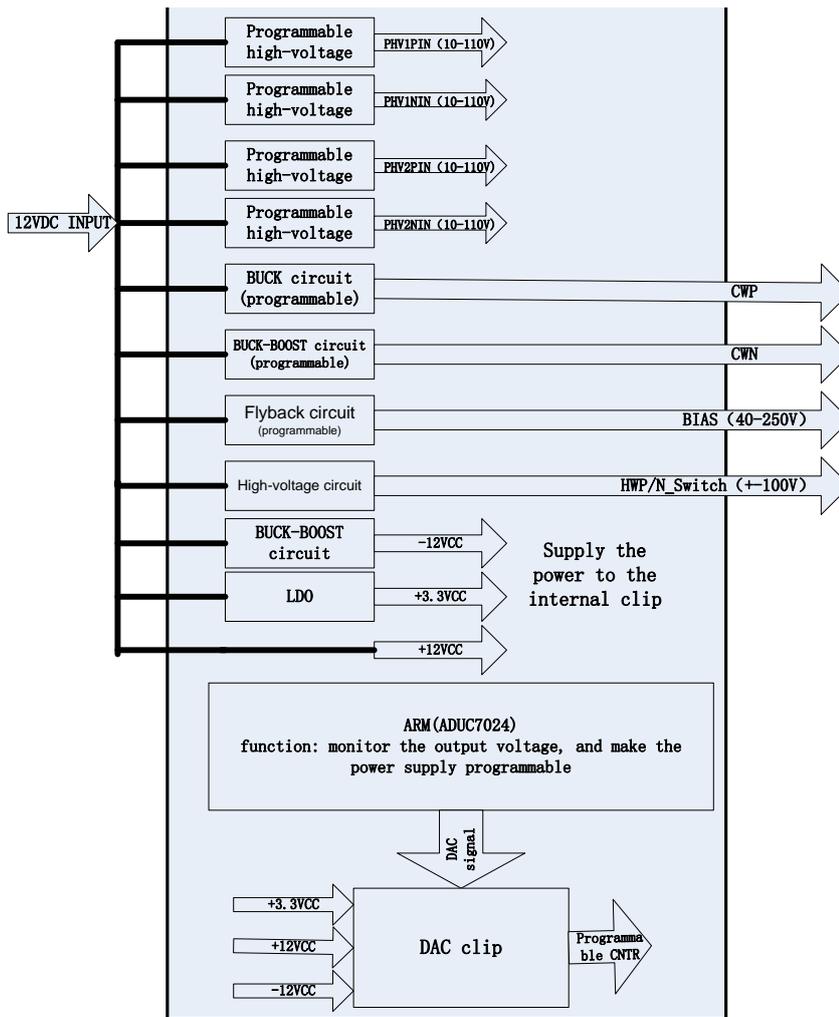


Figure 15 Schematic Diagram of PHV Board

4.5 New Power Supply Unit

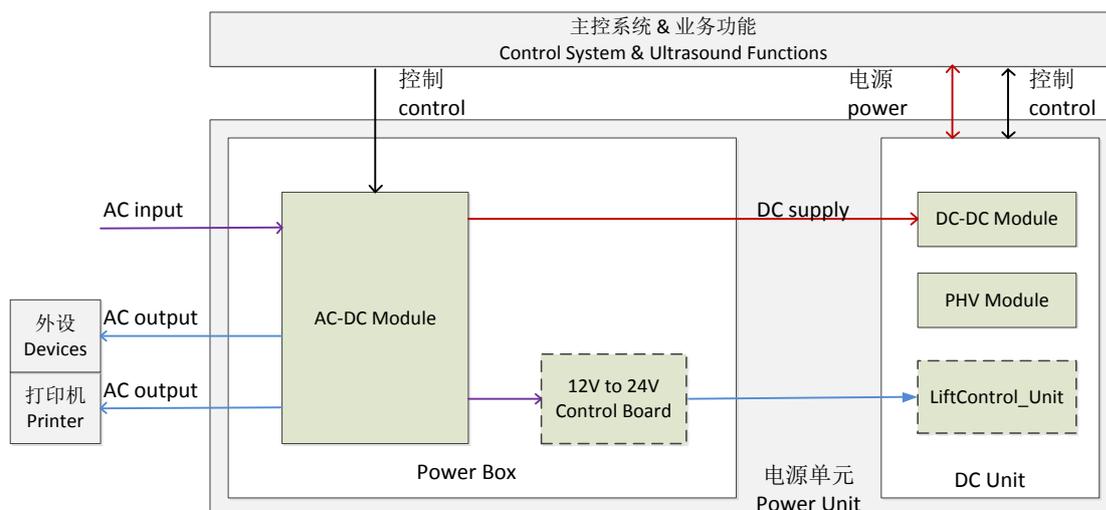


Figure 16 Schematic Diagram of New Power Supply Unit

The function of new power supply unit is to provide power for each unit of machine, including: front-end unit, back-end unit, user interaction unit, user peripherals (auxiliary output). Power supply

is mainly from net power, the system is compatible with the standby status when powering off; corresponding battery and battery management do not have the function as the product does not define the function. The power unit main include following modules:

- 12V to 24V Control Board
- AC-DC Module
- DC-DC Module
- PHV Module

4.5.1 AC-DC module

AC-DC module changes the AC power to DC power to provide power for other assemblies by DC-DC module. The module needs the indicating signal when AC power is off to control the circuit of battery.

The specification of Resona 7/8 is as follows:

- AC-DC outputs 3 voltage, there are:
 - a) 12V: not less than 692W (DC-DC module 572W, PHV module 120W);
 - b) 5V_STB: the peak current is 2A when powering on, duration in 4ms; the average valve is in 500mA when working normally.
 - c) Auxiliary Output :
- Resona 7/8 does not define the function of standby status when battery in, so it is not necessary to have AC power off indicator. Take the reservation into consideration by platforms.
- The indicator when AC is in the place: reminds of the validity of AC input; it is used for service personnel to decide the failure on the scene, available.
- I2C interface: main control system obtains the work status of module. Available.

4.5.2 12V to 24V Control Board

The control board (12V to 24V) is only used to the electric lift and down product, which indicates 12V to 24V control board in figure 16 (12v to Control Board、LiftControl_Unit).

The voltage which is separated from 12V voltage is converted to 24V voltage to provide the power for the motor control system. The out power of the 24V voltage is no less than 150W (the electric lift and down module is 50W, each of two electrical magnets is 50W).

4.5.3 DC-DC board

Please refer to chapter 4.4.4.

4.5.4 PHV module

Please refer to chapter 4.4.5.

4.6 User Interaction Unit

4.6.1 Control Panel

Control panel is the key assembly for user input; the basic functions are as follows:

- Key scan: scan the input action of user.
- Key backlights: according ID design requirement, lay the LED beneath the button; user knows different key status and optimized function. Four adjustable levels for backlight's brightness. Four adjustable levels for sound volume.
- Signal processing about USB trackball input (including left/right key)
- USB extended function: extend 2 USB interface for user.
- USB communicates with main unit.
- Power on button
- Status indicators: including working status, AC in-place, standby status, hard disk reading status.
- Support outsourceuser-defined key, and support backlight function; the backlight's brightness can be adjusted.
- 8-segment TGC sliders.
- Provide the power supply to one gel heater: 12V@3A.

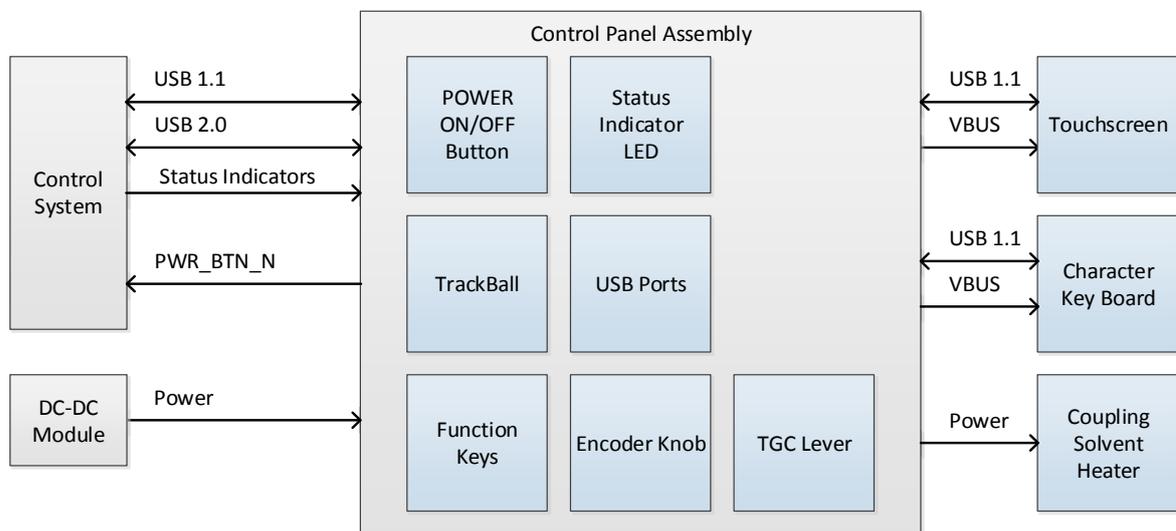


Figure 16 Schematic Diagram of Control Panel Assembly

4.6.2 Primary Display Assembly

Primary display shows the interface of ultrasound application program, including imaging area.

The specifications of Plato's primary display are:

- 21.5 inches, resolution: 1920*1080 @ 60±1Hz.
- Visual angle: left/right angle is equal to or larger than 85°, up/down is equal to or larger than 85°.
- Adjustable brightness and contrast can be adjusted via communication software.
- Display status indicator.
- Powering: 12V±5%.
- The signal is DVI; the connector is MiniHDMI.

4.6.3 Secondary Display Assembly

The secondary monitor shows auxiliary control interface of ultrasound application program and completes touch control with touch screen.

The specifications of Plato's primary display are:

- 12.1 inches, resolution: 1280*1080 @ 60±1Hz.
- Visual angle: left/right angle is equal to or larger than 85°, up/down is equal to or larger than 85°.
- Adjustable brightness and contrast: can be adjusted via communication software.
- Powering: 12V±5%。
- The signal is DVI; the connector is HDMI.
- Power supply and the signal uses USB 1.1 standard. Used-definition of the connector.

4.6.4 Electrical Ascending/Descending and Electromagnet

The diagram of electrical ascending/descending and moving system is shown below:

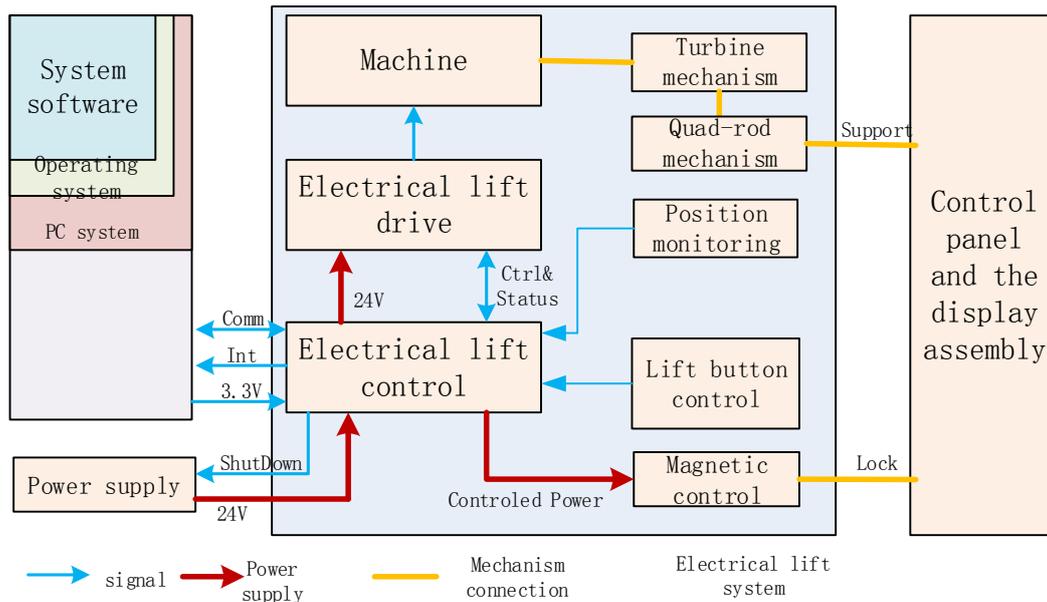


Figure 17 Schematic Diagram of Electrical Ascending/Descending and Moving System

There is only communication interface (defined as IIC), interruption interface, power interface between electrical ascending/descending and main unit system. It supports the control panel, locks the control panel.

Signal name	Description	Signal constraint
Comm	Communication interface (defined as IIC) of electrical ascending/descending and main unit system	3.3V level
Int	Interruption interface of electrical ascending/descending and main unit system	Direction: electrical ascending/descending to main unit
3.3V	Control logical power of electrical ascending/descending and moving system	/
24V	Power supply	/
ShutDown	Switch control signal of 24V power	Reserved design
Support	Four rods mechanism support the control panel	/
Lock	Electromagnet locks/unlocks control panel to move.	/

5 Function and Performance

Checking Method

5.1 NOTE

The chapter offers the detailed method for checking product main function and performance. It is only for reference not a required task.

5.2 Device Status Checking

5.2.1 Running Status

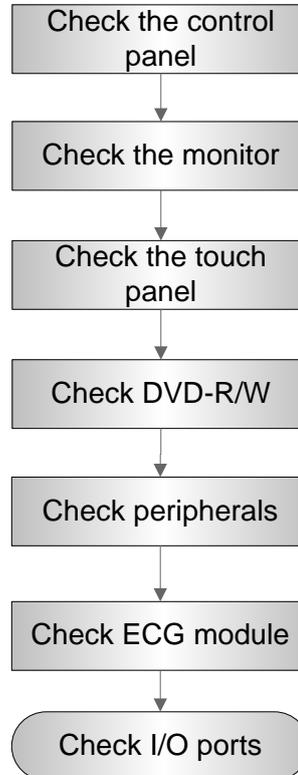
1. Normal power on/off operation (duration time is normal), no abnormal sounds or phenomena occur during normal operation.
2. After ultrasound system is turned on, the fan starts working and no abnormal sound when the fan is working.
3. Check if configuration, software version are normal through the [About] in preset menu.
4. Check if contrast and brightness of the monitor are normal.
5. Check if time and date are valid and correct.
6. Check if all status indicators are normal.
7. Check all log records with user, to confirm if there is any abnormality.

5.2.2 Working Condition

Check the ambient temperature and humidity to see whether it meets the requirement. The measurements related to safety features are particularly sensitive to humidity. If the insulation feature of the system deteriorates due to the increase of system service time or system malfunctions; the fluctuation range of measurement results are likely to increase with the increase of humidity.

5.3 General Exam

5.3.1 Check Flow



5.3.2 Checking Content

5.3.2.1 Check Control Panel

Procedure	Checking Standard
Check all buttons, keys and knobs Follow the direction: left to right, and up to down.	All keys and knobs are effective.
Function checking of the trackball: <ul style="list-style-type: none">■ Press the <Freeze> key to enter the Freeze status.■ Press <Measure> to enter into measure status, do vertical and horizontal measurement, or do other trackball operations.	The trackball can be rotated easily; the cursor responds sensitively, the rotation direction is the same as the direction of the cursor.

5.3.2.2 Check the Monitor

Procedure	Standard
<ul style="list-style-type: none"> ● Monitor Brightness/Contrast Adjustment Press <F10>. Select [System]→[General]. Click [LCD] to adjust the brightness and the contrast. ● Restore the factory default settings Press <F10>. Click [System]→[General]. Click [LCD] to adjust. ● Monitor maintenance Log on as Service, click [Maintenance]->[Test Main Monitor] to check the monitor functions 	<ul style="list-style-type: none"> ■ Press on the monitor to adjust the values, real-time values will be displayed on the adjusting bar. ■ Brightness/Contrast load factory values ■ Click each functional button, the LCD responds correctly, the standard is as follows: <ol style="list-style-type: none"> 1. Light-spot: 0; flash point: 0. 2. The adjoining dark spots are no more than 3 pairs, and there is no adjoining dark spot in image area. 3. There is no adjoining dark spot of 3 or more than 3. 4. The dark spots are no more than 7 and those in the image area are no more than 2 5. The distance between bad spots is no less than 5mm. <p>NOTE: image area refers to rectangle when the background is black/right.</p>

5.3.2.3 Check Touch Panel

Procedure	Standard
<ul style="list-style-type: none"> ● Check if keys on the touch screen of each exam mode can respond normally. ● [Preset]→[System]→[General]. Click [TouchPanel] to adjust the brightness and the contrast. ● Press <F10>. Click [System]→[General]. Click [TouchPanel]→[Default] to adjust. ● Touch screen maintenance Log on as Service, click [Maintenance]->[Setup]->[Test Touch Screen] to check the monitor functions 	<ul style="list-style-type: none"> ● All keys functions are effective. ● Press on the touch screen to adjust the values, real-time values will be displayed on the adjusting bar. ● Brightness/Contrast load factory values ● Click each functional button, the LCD responds correctly, the standard is as follows: <ol style="list-style-type: none"> 1. Light-spot: 0; flash point: 0. 2. The adjoining dark spots are no more than 3 pairs, and there is no adjoining dark spot in image area. 3. There is no adjoining dark spot of 3 or more than 3. 4. The dark spots are no more than 7 and those in the image area are no more than 2 5. The distance between bad spots is no less than 5mm. <p>NOTE: image area refers to rectangle when the background is black/right.</p>

5.3.2.4 Check DVD-R/W

Procedure	Standard
<ul style="list-style-type: none"> ■ Press [Eject] ■ Use the optical disk drive to read and burning. 	<ul style="list-style-type: none"> ■ Disk can be normally ejected. ■ Normal, no abnormal sounds.

5.3.2.5 Check Peripherals

Procedure	Standard
<p>Footswitch:</p> <p>Connect the footswitch; check the functions of footswitch according to the functions listed in Key Config. (e.g. right key- image frozen, middle key- Prospectivet, left key- Retrospective)</p>	<ul style="list-style-type: none"> ■ Press the freeze key (the right key), image is frozen, the freeze menu is displayed; press the key again, image is unfrozen. ■ Press the print key (middle key), color printing starts. ■ Press the print key (left key), B/W printing starts.
<p>Video printer:</p> <p>Check if the video printer and ultrasound system are correctly connected. Then check the function of each key.</p>	<p>Press <Print> key, the printer begins to work, no image print deficiency or degradation.</p> <p>Switch video output port or USB port; repeat the step.</p>
<p>Text/graph printer:</p> <p>Check if the printer and ultrasound system are correctly connected.</p> <p>Then check the function of each key.</p>	<p>Press <Print> key, the printer begins to work, no print deficiency or degradation.</p>
<p>Barcode reader:</p> <p>Perform code bar scanning when the ultrasound system is running normally.</p>	<p>The bar code is correctly displayed on the screen.</p>

5.3.2.6 Check ECG Module

Procedure	Standard
<p>Confirm if the ECG module is configured, then:</p> <p>Set [ECG] as "On".</p>	<ul style="list-style-type: none"> ■ ECG trace is displayed; the heart icon is displayed at the upper right corner of the screen. ■ The parameters [Speed], [ECG Gain], [ECG Pos], [Rotate] can be adjusted. ■ ECG signal can be reviewed correctly.

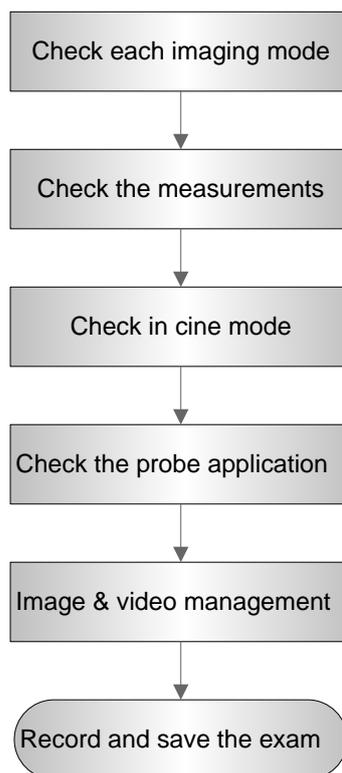
5.3.2.7 Check I/O Ports

Procedure	Standard
<p>Checking the main I/O ports:</p> <p>Besides the video/audio ports, USB ports, the other ports required to be checked including:</p> <p>VGA port;</p> <p>Connect external VGA/LCD monitor (with resolution supporting 1280*1024)</p> <p>Other USB ports.</p>	<ul style="list-style-type: none"> ■ The contents displayed on the display are the same as those displayed on the ultrasound system displayer, no character and image loss, no color difference, no fluttering and flicking. ■ Smooth communication. ■ USB port data storage/accessing are normal.

5.4 Function Checking

NOTE: A complete function inspection is described here, do the checking according to the actual system configuration.

5.4.1 Check Flow



5.4.2 Content

5.4.2.1 Imaging Modes

➤ B mode

- In B Mode scanning, the image parameter area in the upper left corner of the screen will display the real-time parameter values as follows:

Parameter	F	D	G	FR	DR	iClear	iBeam	iTouch	Zoom
Meaning	Frequency	Depth	Gain	Frame Rate	Dynamic Range	Display when the function is turned on.			

- Parameters that can be adjusted to optimize the B Mode image are indicated in the following.

Adjustment	Parameter
Control panel	Gain, depth, TGC, iTouch, Zoom, Focus Position, Steer
Touch screen / menu	Tint map, line density, flip, persistence, image quality, focus, FOV, iClear, dynamic range, TSI, iBeam, H Scale, dual live, LGC, echo boost, gray map

Procedure	Checking criteria
Press button.	Enter B mode image. B mode interface appears.
Gain adjustment G Rotate button	Gain increases with rotating the knob clockwise; Gain decreases with rotating the knob anticlockwise;
Depth adjustment D Poke <Depth> rod.	The depth of the image changes accordingly. Depth range varies depending upon the probe types.
TGC adjustment Adjust 8 sliders on the control panel	Push the slider right to increase the gain. The brightness of the area becomes brighter. Push the slider right to decrease the gain. The brightness of the area becomes darker. About 1.5s after the adjustment is finished, the TGC curve disappears.
iTouch Press <iTouch> button	Press <iTouch> on the control panel to enter the iTouch status, the symbol of which will be displayed in the image parameter area of the screen. Click [iTouch] on the image menu to adjust the gain in iTouch status among -12 through 12dB. Long press <iTouch> to exit iTouch mode.
Zoom Rotate <Zoom> button	Rotate clockwise to zoom in the image and vice versa. Roll the trackball to change the image position. Press <Zoom> to exit magnification status.
Acoustic power adjustment B image touch screen-[Acoustic power].	The system offers 34 values to adjust the acoustic power. Acoustic power (AP) is displayed in real time in the upper part of the screen.
Focus B image touch screen-[Focus number] Use <Focus> deflector rod to adjust focus position.	Focus position/number adjustment The focus position icon ◀ is displayed on the right side of the image.
Scan range and FOV position B image touch screen-[FOV].	Image display adjustment [FOV] is on and move the trackball to adjust the scan range.
Frequency adjustment B image touch screen-[Image quality]	The real-time value of frequency is displayed in the image parameter area in the upper screen (fundamental wave-F, Harmonic frequency-H). Values of frequency vary depending upon the probe types.
Steer Use <Steer> deflector rod.	To steer the beam the probe transmits.
ExFov B image touch screen-[ExFov]	Click [ExFov] on the touch screen to enable/disable the function.
Line Density B image touch screen-[Line Density].	The function determines the quality and information of the image. Levels of line density: UH/ H/ M/ L.

Dynamic Range B image touch screen-[Dynamic Range].	The adjusting range of parameter is 30-180 dB in increments of 5 dB.
iClear B image touch screen-[iClear].	The system provides 7 levels of iClear effects adjustment, <i>Off</i> represents iClear is disabled, and the bigger the value is the stronger the effect becomes.
Persistence B image touch screen-[Persistence].	The system provides 7 level of persistence. The bigger the value is the stronger the effect becomes.
Rotation/Invert B image touch screen-[L/R Flip]/[U/D Flip].	To invert the image horizontally or vertically. Image can be rotated by the angle of 0°, 90°, 180° and 270°. When the image is rotated in the angle of 90° or 270°, the depth scale is displayed on the upper part of the screen. The “M” mark indicates the direction of the image; the M mark is located on the top of the imaging area by default.
iBeam B image touch screen-[iBeam].	The system provides 4 values of iBeam in B mode. iBeam is disabled when it is off.
Auto Merge B image touch screen-[Auto Merge].	In the Dual-split mode, when the images of the two windows have the same probe type, depth, invert status, rotation status and magnification factor, the system will merge the two images so as to extend the field of vision. Turn on or off the function through the [Auto Merge] item in the touch screen;
Gray Map B image touch screen-[Gray Map]	Adjust the gray from [Gray Map] on the touch screen; There are 8 different maps available.
Tint Map B image touch screen-[Tint Map]	Select the tint map from [Tint Map] on the touch screen. Turn on or off the tint map from [Tint Map] on the touch screen.
TSI B image touch screen-[TSI].	Select TSI from [TSI] on the touch screen. The system provided 4 ways of optimization for specific tissues: general, muscle, fluid and fat.
HScale B image touch screen-[HScale]	Click [HScale] on the menu to display or hide the scale (HScale).
Dual live B image touch screen-[Dual live].	Enable [Dual Live] on touch screen, and dual-split window of images are displayed on the screen. Two pages of adjustable parameters are displayed on the touch screen as well; where, shared parameters and left window parameters are displayed on the B(L) page, while right window parameters are displayed on the B(R) page.
LGC B image touch screen-[LGC].	Images corresponding to four groups of parameters are displayed on the touch screen (from left to right). Click [LGC1-5] to adjust the parameters.

Echo Boost B image touch screen-[Echo Boost].	[Echo Boost] is enabled when it is on in B mode. (Highlighted) the system is in "Echo Boost" status.
--	--

➤ M mode

- In M mode scanning, the image parameter area in the upper left corner of the screen displays the real-time parameter values as follows:

Parameter	F	D	G	V	DR
Meaning	Frequency	Depth	M Gain	M speed	M Dynamic Range

- Parameters that can be adjusted to optimize the M Mode image are indicated in the following.

Control Panel	Gain, Depth, TGC, Focus position
Touch Screen	Speed, Display Format, Gray Map, Dynamic Range, Tint Map, M Soften, Edge Enhance

➤ Color mode

- In Color mode scanning, the image parameter area in the upper left corner of the screen displays the real-time parameter values as follows:

Parameter	F	G	PRF	WF
Meaning	Frequency	Color Gain	Pulse Repetition Frequency (PRF)	Color Wall Filter

- Parameters that can be adjusted to optimize the Color Mode image are indicated in the following.

Control Panel	Gain, Depth, iTouch, Scale
Touch Screen	Invert, Baseline, B/C Wide, Dual Live, Image quality, Flow State, Priority, Packet Size, Map, Wall Filter, Line Density, Smooth, Persistence, Velocity Tag, steer

➤ Power mode

- In Power mode scanning, the image parameter area in the upper left corner of the screen displays the real-time parameter values as follows:

Display	F	G	WF	PRF
Parameter	Frequency	Power Gain	Power Wall Filter	Pulse Repetition Frequency

➤ PW/CW mode

- The parameters will be displayed in the image parameter area on the left part of the screen as follows:

Display	F	G	PRF	WF	SVD	SV	Angle
Parameters	Frequency	Gain	Pulse Repetition Frequency	WF (Wall Filter)	SV Position	SV Size (only CW)	Angle

- Parameters that can be adjusted to optimize the PW/CW Mode image are indicated in the following.

Control Panel	Gain, iTouch, Baseline, PW Steer, Scale, Angle
Menu	Display Format, Invert, Duplex/ Triplex, Quick Angle, Wall Filter, Image Quality, Tint Map, Dynamic Range, Trace Area, Speed, SV, Gray Map, T/F Res, Auto Calc, Auto Calc Para, HPRF, Auto Calc cycle, Volume, A. power

5.4.2.2 Basic Measurements

Procedure	Standard
In B image mode: Press <Measure>: Press <Caliper> key	The system enters application measurements The system enters general measurement mode. Perform any 1-2 measurements (e.g., length, area), the results will display at the lower part of the image.
Press the same key again or press <Esc>.	Exits measurement.
Do the same operation in other image modes.	Application measurements are classified into different application packages, do the application measurements selectively.

5.4.2.3 Cine Review

Procedure	Standard
Press [Freeze] key to freeze an image, and the [Cine] key indicator lights on. The system automatically enters the manual cine status.(It has been set that when system enters into freeze mode, the default status is cine review.) Press <iStation> key, then click [Review]; or press <Review> key to open a cine file.	The system enters into cine review status The system enters into auto cine review status.
Roll the trackball	Manual cine review
Click [Auto Play] on the menu or soft menu.	Auto play function is turned on, adjust the soft menu button. The greater the value is, the quicker the speed is. When the value is 0, the system exits auto play mode.
Move the cursor onto the desired start point of the cine loop, click [Set First Frame] in the menu or soft menu to set the start point.	Set the start point of cine loop.
Move the cursor onto the desired end point of the cine loop, click [Set Last Frame] in the menu or soft menu to set the start point.	Set the end point of cine loop.
Click [Auto Play] again	Review region is confined to the set start point and end point.

Then press the [Cine] key again.	Cine review stops.
Press the <Freeze> key to unfreeze the image. Press <Cine> or <Esc> key.	Freeze indicator light is off; the system will return to image scanning and exit cine review. The images are still frozen but the system exits cine review.
<p>The diagram illustrates the 'Auto Review Region' as a horizontal bar. A bracket above the bar is labeled 'Auto Review Region'. On the right side, a label 'Total frames' points to the end of the bar. Inside the bar, there are three vertical markers: 'Start mark' on the left, 'Playback mark' in the middle, and 'End mark' on the right. A vertical line with a triangle at the top points to a specific position on the bar, labeled 'Current frame', which is accompanied by the text '205/266'.</p>	

5.4.2.4 Probe Recongizing/Switching

Procedure	Standard
Press <Freeze> key→ connect the probe to the system→ press <Freeze> key→ press <Probe> key to select the probe.	Connect a convex probe to probe socket A, and then connect a linear probe to probe socket B, the operator can select probe A or probe B as the active probe.
Press <Freeze> key→ disconnect the probe→ connect another probe to the port	The system can recognize the newly connected probe in no time.

5.4.2.5 Patient Information Management

Procedure	Standard
Press <Save> (the function already set) during image scanning	Image will be saved to the patient database, and a thumbnail will be displayed at the right part of the screen.
Open [Setup] →[System Preset]→"General", then check "Send/Print Image after End Exam" in the Patient Management area. Click [End] during image scanning	The system automatically sends the images of the exam to the default DICOM storage server or print server.
<ul style="list-style-type: none"> ● Click [Review]. ● Click [Exit] on the Review screen; or, Click [Review] again, or, press <Esc> key 	<ul style="list-style-type: none"> ● The system enters into image review mode. ● The system exits image review mode.
<ul style="list-style-type: none"> ● Select the contents to be demonstrated, and select the demo mode in the iVision screen. Then select an item already added to the list and click [Start] ● When the demonstration is finished, click [Exit] or press <Esc>. 	<ul style="list-style-type: none"> ● Demonstration begins. ● Image files are played according to file names one by one (including the image of system-relevant and PC-compatible format). ● The system exits the demonstration.

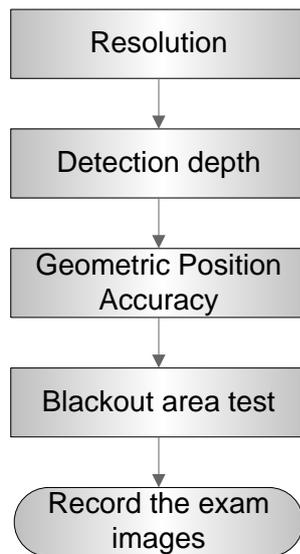
Press <iStation> key to enter patient information management (iStation page)

The saved patient information (images) can be found, and the patient information can be:

- Backed up/ Restored
- Sent (To DICOM or USB disk etc.)

5.5 Performance Test

5.5.1 Test Process



5.5.2 Test Content

NOTE: The image used here is only for reference, stick to the image effect in the real situation.

Requirements:

1. Display: set the contrast and brightness at the clinical application value (or the default status)
2. Operation environment: dark room, simulating the clinical application environment.
3. Scanning techniques: contact the probe with the acoustic window of the phantom, no spacing nor pressing.

Tips:

For the testing phantoms, please refer to Appendix B.

KS107BD is low frequency phantom and used when Probe focus frequency is less than 4MHZ;
KS107BG is high frequency phantom and used when Probe focus frequency is more than 5MHZ;

5.5.2.1 Resolution

■ transverse resolution

Test Step:

1. Cover the scan surface of the phantom with water or couple gel, gently contact the probe with the scan surface, making the transverse resolution testing targets to be displayed around the midline of the image.
2. Scan the position where the transverse resolution testing targets are displayed.
3. Adjust parameters like gain, dynamic range, TGC, making the background tissue unseen, just displaying the target image clearly.
4. In condition that the transverse resolution testing targets are horizontally displayed, record the minimal distance of two targets that can be clearly recognized.
5. Repeat the operation above for the transverse resolution testing targets at other depths.

As shown in figure below.

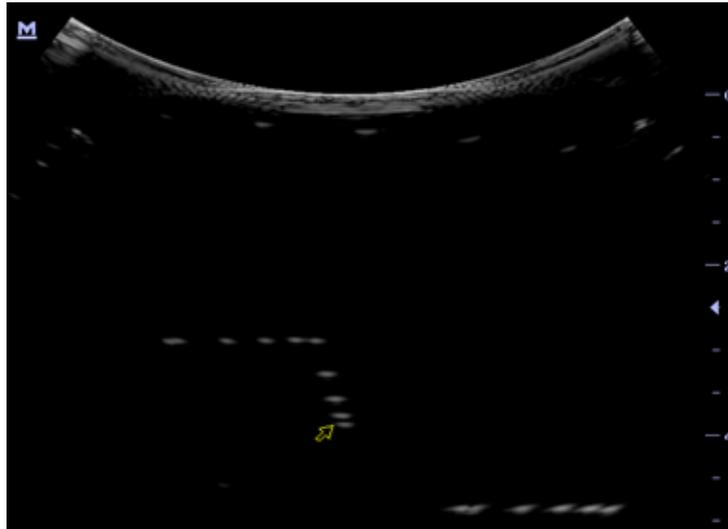


■ Axial resolution

Test Step:

1. Cover the scan surface of the phantom with water or couple gel, gently contact the probe with the scan surface, making the longitudinal resolution testing targets to be displayed around the midline of the image.
2. Adjust the focus point focuses at the position where the longitudinal resolution testing targets are displayed.
3. Adjust parameters like gain, dynamic range, TGC, making the background tissue unseen, just displaying the target image clearly.
4. Record the minimal distance of two longitudinal resolution testing targets that can be clearly recognized.

5. Repeat the operation above for the longitudinal resolution testing targets at other depths.



NOTE:

1. When using the convex probe, keep the transverse resolution testing targets displaying near the midline.
2. When using a linear probe with steer function, do not turn on the steer function when performing the transverse resolution test.
3. Zoom in the region where the targets located if necessary.
4. The diameter of the target point at a certain depth is equal to the transverse resolution at the depth.

5.5.2.2 Maximum Depth

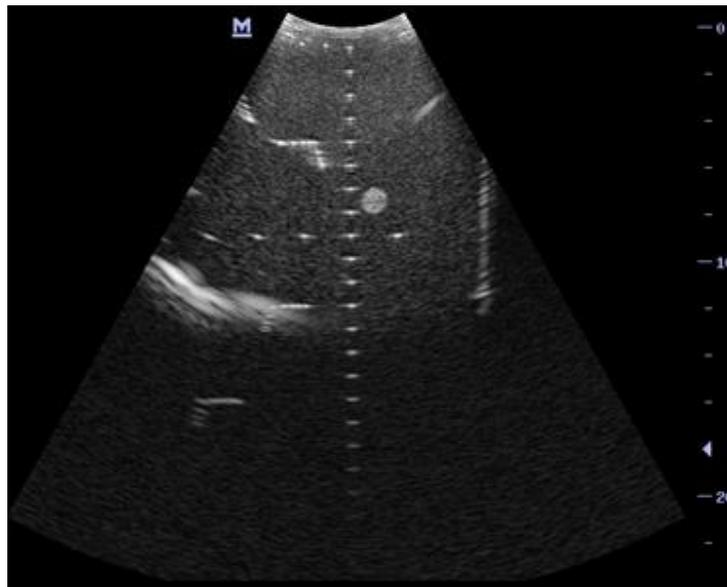
Test Step:

1. Cover the scan surface of the phantom with water or couple gel, gently contact the probe with the scan surface
2. Set the system display depth according to the expected maximum available depth of the probe in use.
3. Adjust the focus point to the deepest, and AP at the maximum value.
4. Set gain, contrast, TGC at a greater value, but no halation nor defocus is allowed.
5. Record the depth of the furthest target (the target can be seen clearly).

NOTE:

1. Increasing the gain will also increase the noise, and echo may be covered.
2. When using a linear probe, please completely contact the probe with the scan surface, no side clearance is allowed.
3. When using a convex or phased-array probe, make the axis targets to be displayed at the middle of the scanning image.
4. When system is not frozen, the fast field target information may be similar to that of the noise, do not use this target.

As shown in figure below.



5.5.2.3 Geometric positioning accuracy

■ Longitudinal geometric positioning accuracy

Test Step:

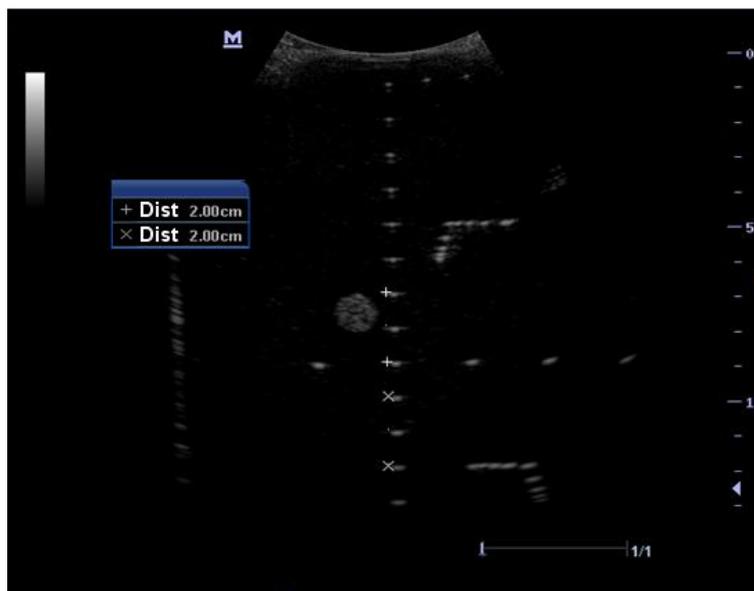
1. Do adjustments as the way in testing the maximum depth.
2. Record the distance by 20mm each segment on the longitudinal targets line using the measurement caliper;
3. Select the value with the greatest error (to 20mm), calculate the accuracy using the formula below

$$\text{Geometric Position Accuracy (\%)} = \left| \frac{\text{Measured value} - \text{Actual distance}}{\text{Actual distance}} \right| \times 100$$

NOTE:

1. The measurement caliper should be positioned at the upper edge of the target, not the middle nor the lower edge.
2. The scanning plane should be vertical to the target line, that means the scanning plane is parallel with the cross-section of the phantom

As shown in figure below.



■ Transverse geometric positioning accuracy

Test Step:

1. Cover the scan surface of the phantom with water or couple gel, gently contact the probe with the scan surface
2. Adjust the depth, making the transverse targets to be displayed in the image.
3. Adjust the focus point to be positioned beside the transverse targets (the standard is not clear)
4. Adjust parameters like gain, TGC, making each transverse targets to be clearly displayed.

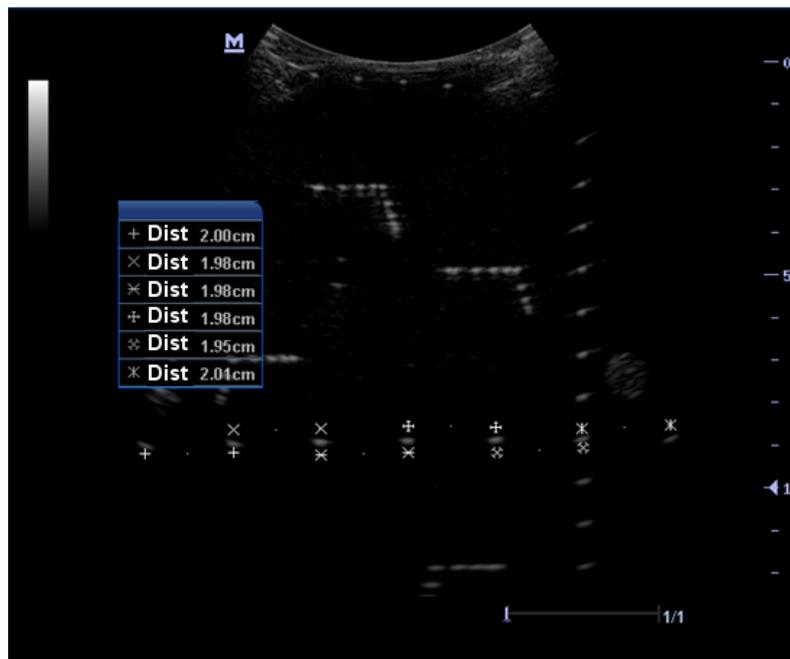
5. Record the distance by 20mm each segment on the transverse targets line by using the measurement caliper
6. Select the value with the greatest error (to 20mm), calculate the accuracy by using the formula below

$$\text{Geometric Position Accuracy (\%)} = \left| \frac{\text{Measured value} - \text{Actual distance}}{\text{Actual distance}} \right| \times 100$$

NOTE:

1. When using a linear probe, record the transverse distance by segment.
2. When using a convex probe, all transverse targets should be displayed integrally in an image.
3. The measure caliper should be posited at the upper side or lower side of the target center.

As shown in figure below.



5.5.2.4 Blackout Area

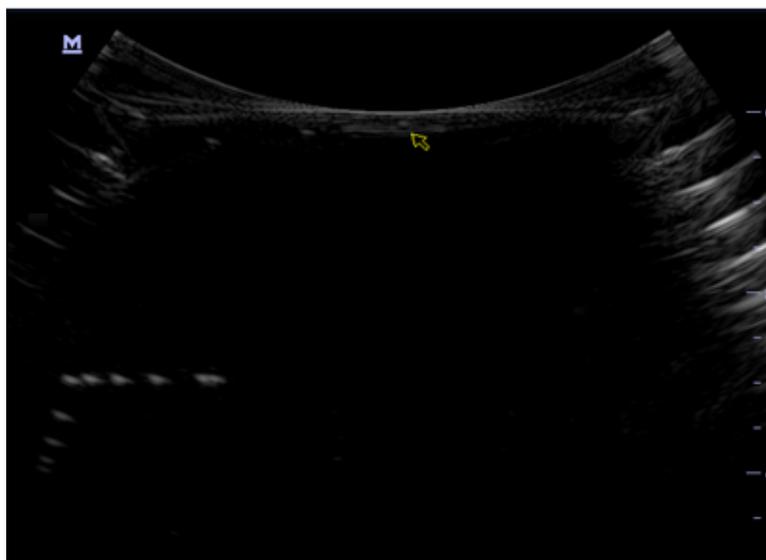
Test Step:

1. Cover the scan surface of the phantom with water or couple gel, gently contact the probe with the scan surface
2. Adjust the depth at a lower value, and set the focus at the nearest place to the scan surface.
3. Decrease the value of parameters like AP, Gain until the background noise just can be seen.
4. Record the smallest depth of the target that can be seen clearly, that value is the blackout area value.

NOTE:

1. When using a linear probe, please completely contact the probe with the scan surface, no side clearance is allowed.
2. For convex probe, the targets in the blackout area should be positioned on the midline of the scanning plane.

As shown in figure below.



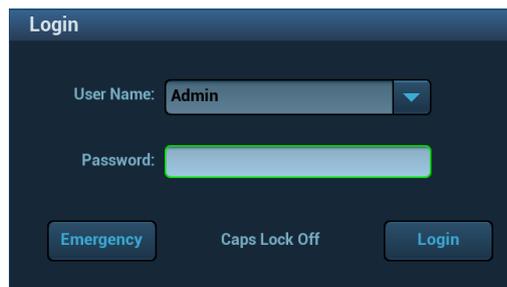
6 Software Installation & Maintenance

6.1 Entering Maintenance

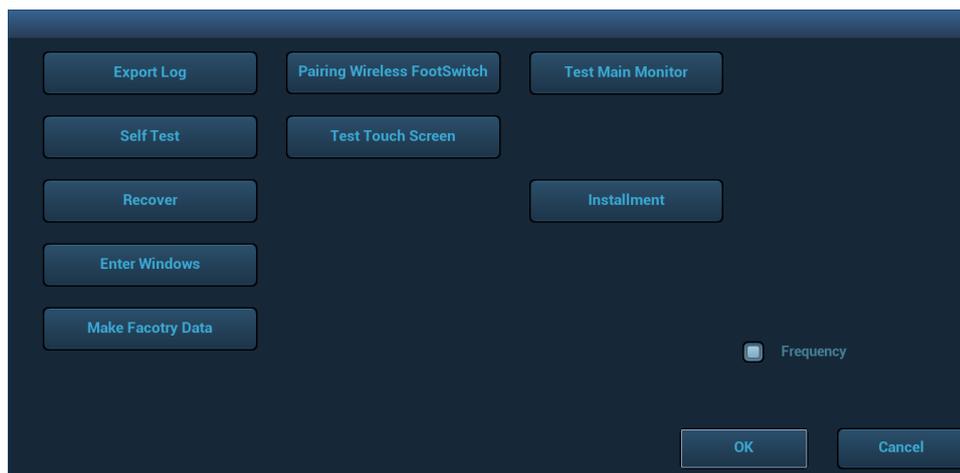
NOTE: Before the maintenance operation, the engineer should login the system with the account of Service.

Login:

1. When Access Control is disabled: press [ctrl]+[/] to open the login dialogue box and select Service as the user name. If Access Control is enabled, log in as the admin first and then press [ctrl]+[/] to see the Service in User Name.



2. Log in the system with the account of Service. Press [F10 Setup] to select [Maintenance] → [Setup] to enter the related maintenance menu.



6.2 Set Installment

If the customer purchases the product with the installment, the service can set installment and the installment password will be generated by the system automatically.

NOTE: Log on the system with the identity of Service before perform system maintenance.

1. Press [Setup]. Select [Maintenance] → [Setup] → [Installment]. Click [Set Installment], and set the times of the installment in “Periods” list. Set the time interval of each installment in “Days” list, as shown below.

The screenshot shows the 'Set Installment' dialog box. It has three main sections: 'Periods', 'Days', and 'Password List'. The 'Periods' field is empty, and the 'Days' field is empty. Below these fields are three buttons: 'Generate', 'Reset', and 'Save As'. The 'Password List' section is empty and has a 'Display Password' checkbox which is unchecked. At the bottom are 'OK' and 'Cancel' buttons.

2. Click [Generate], and tick off “Display Password”. The password generated by the system will be displayed in “Password List”, as shown below.

The screenshot shows the 'Set Installment' dialog box after clicking 'Generate'. The 'Periods' field is set to 4, and the 'Days' field is set to 30. The 'Password List' section now contains three entries: 3 (72681202), 4 (67419482), and Global (59090825). The 'Display Password' checkbox is checked. The 'Generate' button is disabled, and the 'Reset' and 'Save As' buttons are visible. At the bottom are 'OK' and 'Cancel' buttons.

Take the Figure above as an example.

Note: the first time installment is the down payment.

- a) The system creates each 4 installment password for 4 times installment.
- b) First installment password:

After the user paying off the down payment, the installment dialog box appears after turning on the device. Enter this password in “Period Password”, and click “Start” to log in the system.

Note: after the user pays off the down payment and enters the first installment password, the system starts to calculate next installment time.

c) Second installment password:

- The user prepays the amount of this period installment.

Press [Setup]. Select [Maintenance] → [Setup] → [Prepay Installment], Choose [2] in “Periods” list, and then enter the password. Then, click [OK] to log in the system. The system reminds the user of the current available days.

- Installment due. The user pays off the amount of this period installment.

The installment dialog box appears after turning on the device when installment is due. Enter this password in “Period Password” list, and click [Start] to log in the system.

The using of the third and the fourth installment password is identical with that of the second one. After the user paying off the fourth payment, the system is no longer limited to the installment.

d) Payoff password: it is the password with which the user pays off the rest amount of the installment.

- The user prepays the rest amount of the installment.

Press [Setup]. Select [Maintenance] → [Setup] → [Prepay Installment]. Choose [Pay Off] in “Periods” list, and then enter the password. Click [OK] to log in the system. The system is no longer limited to the installment.

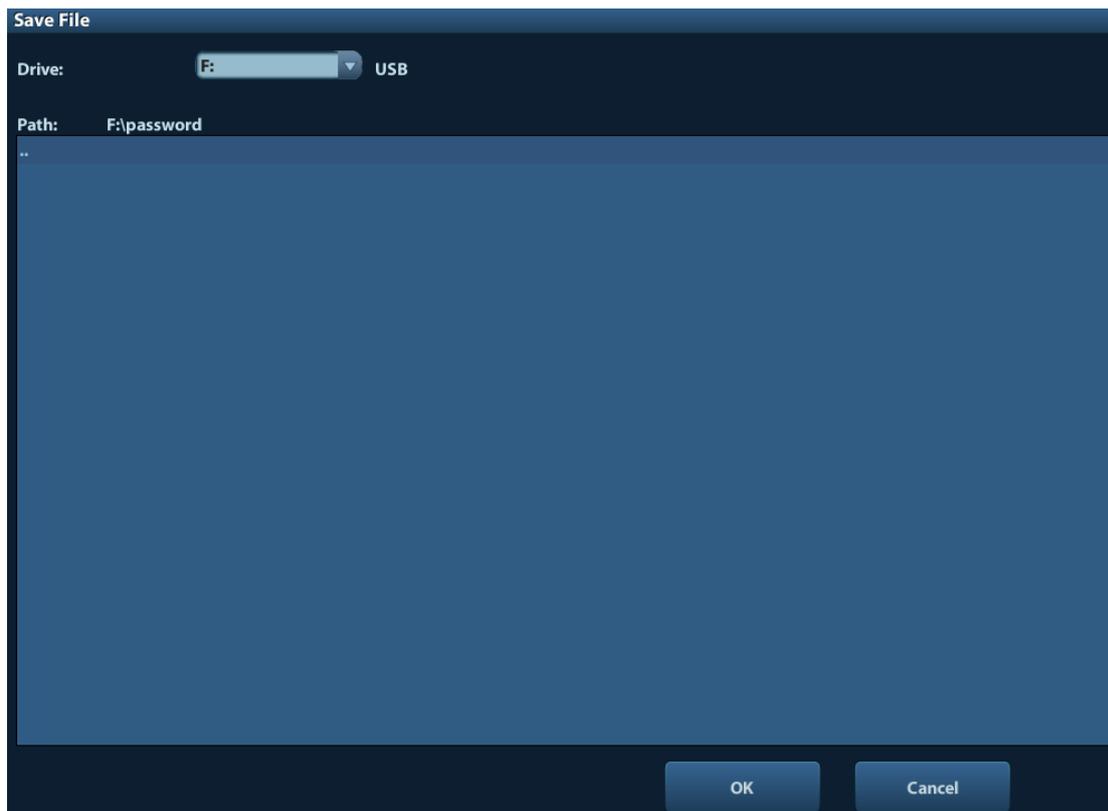
- Installment due. The user pays off the rest amount of the installment.

The installment dialog box appears after turning on the device when installment is due. Enter this password in “Pay Off Password” list, and click [Start] to log in the system. The system is no longer limited to the installment.

e) Global password: used to protect the installment from being changed.

Caution: The global password is displayed only once, please remember the global password carefully. If you forget the global password, you cannot log on the system with the identity of service and reset the installment after setting the installment and restarting the system.

3. Click [Reset] to reset the installment. Set the times of the installment in “Periods” list and the time interval of each installment in “Days” list. Then, click [Generate], and tick off [Display Password]. The new installment password generated by the system is displayed.
4. Insert USB device. Click [Save As] to select the directory, and then click [OK] to save the installment password, as shown below.



5. Restart the system. Click [Service entry], input the Global Password, click [Login], and the Service account login dialog is displayed. Input the service account password, click [Login], and the system enters the Doppler interface.
6. Press [Setup]. Select [Maintenance] -> [Setup] -> [Installment]. Click [Set Installment], a login dialog is displayed. Input the global password to enter the **Set Installment** interface.
 - View the installment password
 - Press [Setup]. Select [Maintenance] → [Setup] → [Installment], and tick off [Display Password] to view the installment password. Or
 - Open txt. file which contains the password, and view the installment password.

6.3 Software Installation/Restoration

See *System Recovery Guide* for system operations and Doppler system restoration.

- ⚠ WARNING:**
1. In case of data loss, back up user's preset data and patient data before system restoring.
 2. Do Not cut off, shut down or restart the system in the process of restoration.

6.4 Enter Windows

1. Open [Enter Windows] to enter the interface to set the password (website: <http://ukmo.mindray.com/>). The following dialog box appears after clicking **Make Pwd** icon.

MAC Address :	<input type="text"/>	-	<input type="text"/>								
Serial NO. :	<input type="text"/>										
<input type="button" value="Make Pwd."/>											

2. Type device's Mac address and serial number (see *System Information*). The password of Mac address to Windows system is created after clicking **Make Pwd**.
3. Enter maintenance menu. Click [Enter Windows]. Type the password to enter Windows system.

6.5 Software Maintenance

6.5.1 Export Log

1. Plug the USB disk to the device;
2. Click [Setup] interface; click [Export Log] to open the log interface.
3. Select the path on the browsing interface to save the log, and then click [OK].
4. When the log is exported, the system shows **Export succeed!**. Then, click [OK] to return.

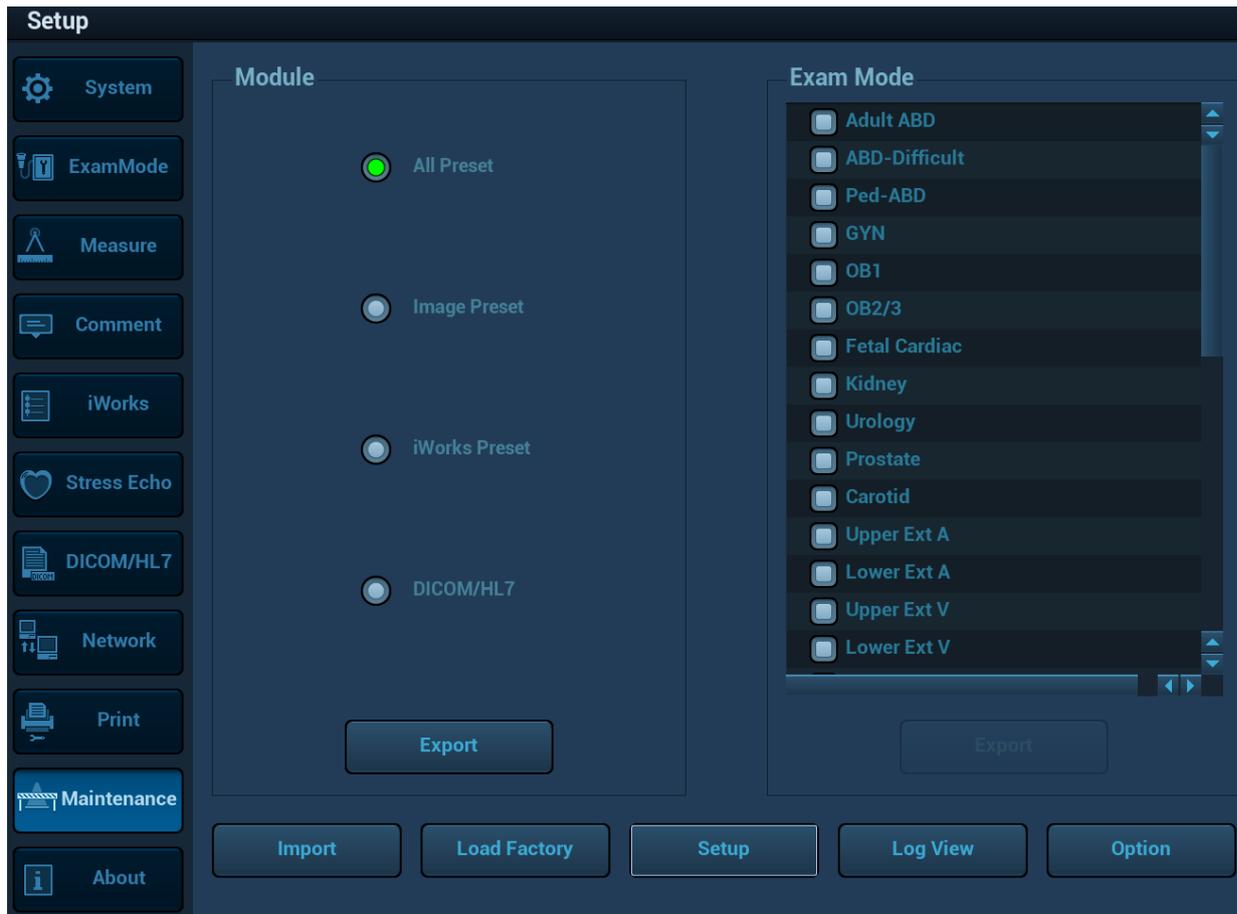
NOTE:	The log can be exported to the external USB storage device only. Make sure there is enough space for the storage and USB flash disk is plugged in properly before exporting.
--------------	--

Note: if there is an image error condition happens, such as abnormal frozen, interruption, dark strips, abnormal noises and abnormal spectrum, press <Fn>+<F5> to save internal parameters first, and then export the log with those parameters. Return the data to service engineers in the headquarters to analyze.

6.6 Data Backup and Storage

6.6.1 Preset Data Management

Select [Setup]→[Maintenance]. Export/import system preset data or load factory as needed.



6.6.1.1 Back up the Setup Data

1. Click [Export] to open the **Export Data** dialogue box.
2. Select the path to save data.
3. Click [OK]. A progress bar appears and the setup data of the selected item is exported to the specified path.

6.6.1.2 Restore the Setup Data

1. Click [Import] to open the **Load Data** dialogue box.
2. Select the path to import the data. Select the path to import all data or some of the data;
3. Click [OK]; a progress bar appears and the setup data is imported to the specified module.

NOTE: If selecting [Load Factory], the settings are restored to the factory defaults, except for region preset, admin, DICOM setting and network setting (including iStorage).

6.6.2 Patient Data Backup and Restoration

6.6.2.1 Patient Data Backup

1. Press [iStation] on the keyboard to open the iStation dialogue box;
2. Click [Select All Exams] to select all data or select the desired data one by one;
3. Select the information. Click [Backup Exam] to open **Backup Patient Record** dialogue box. Select the desired storage device (recorder or USB disk). Click [Backup]. Back up the selected data automatically.

4. Select whether to encrypt backup exams for USB only: input the password and confirm password in the field box, and then click [Backup]. A "Patient.7z" compressed package is backed up to the USB device, and you need to input the password to open the package.

Note: If the password is forgotten, you cannot open the backup package.

6.6.2.2 Restore Backup Patient Data

1. Press [iStation] on the keyboard to open the iStation dialogue box;
2. Select the drive which contains the patient data. Click [Select All Exams] to select all data or select the patient data to be restored one by one. Click [Restore] to restore the patient data from the current drive to the patient database.

6.7 Introduction on Hard Disk's Partitions

- The entire capacity of the system hard disk is 1052 GB. The details are shown as follows:

VOLUME	CAPACITY	FORMAT
C:	50G	NTFS
D:	930G	NTFS
E:	5G	NTFS
F:	62G	NTFS

- Data distribution on each drive is shown as follows:

1. D drive

Data directory of drive D		Description
D:\DC9	\DVR	DVR data
	\Log	Log file
	\PATIENTDATA	Patient database path – private library
	\PhoneAnnotation	Voice Comment
	\ScreenSaver	Screensaver
	\StressEcho	buffer the data
	\temporary	Temporary file directory

2. E drive

Directory structure of the data saved in E drive		Description
E:\DC9	\PatientBack	Patient data backup
	\Demo	Demo file

3. F drive

Directory structure of the data saved in F drive		Description
F:\DC9	\DICOMRevFiles	Dicom temporary file directory
	\gui	English word library index file
	\Log	Log file
	\PATIENTDATA	Patient database path – the main library
	\Preset	User preset data
	\PhoneAnnotation	Voice Comment

	\StressEcho	buffer the data
	\temporary	Temporary file directory

7 Adjustments

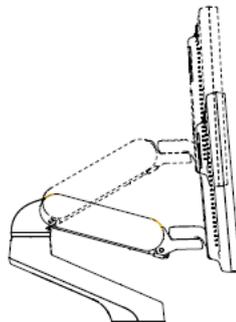
7.1 Adjusting Monitor

7.1.1 Adjusting Position

Gently hold the bottom edge of the monitor when adjusting its position.

- Height adjustment

Move the monitor support arm up or down to adjust the height.

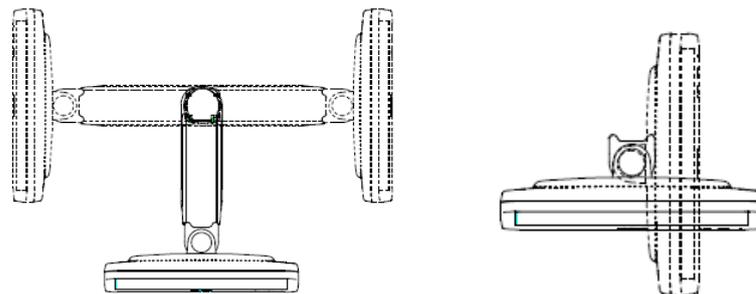


NOTE: Take care not to trap your hands when adjusting the monitor up and down.

- Rotating the monitor

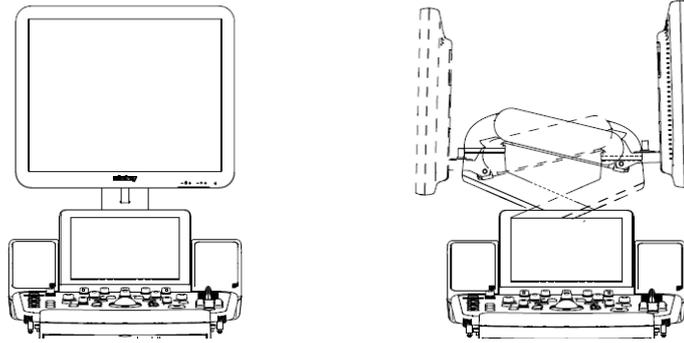
- Upper arm rotation

The monitor can be rotated $\pm 90^\circ$ along with the supporting arm, or the supporting arm can be fixed and the monitor can be rotated $\pm 90^\circ$ alone.



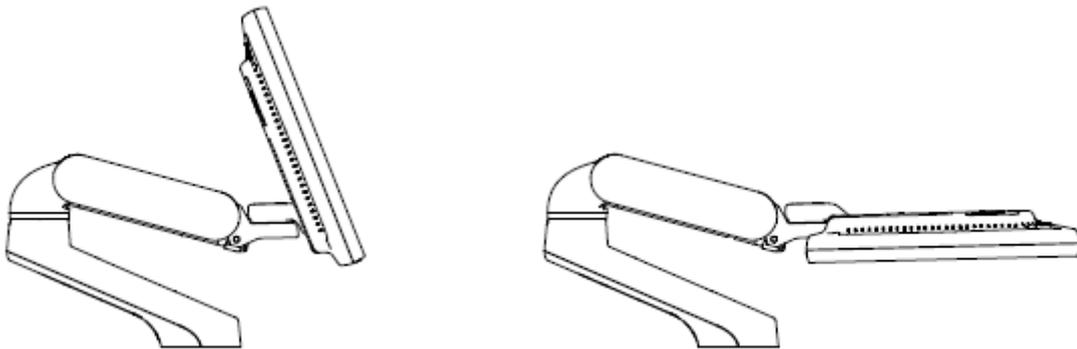
- Lowering arm rotation

Rotate the lock to , and move the monitor arm from left to right.



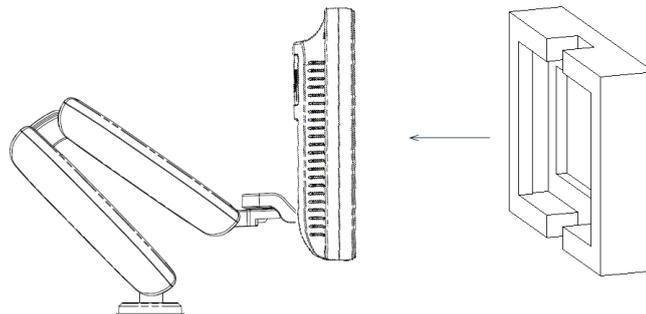
■ Tilting the monitor

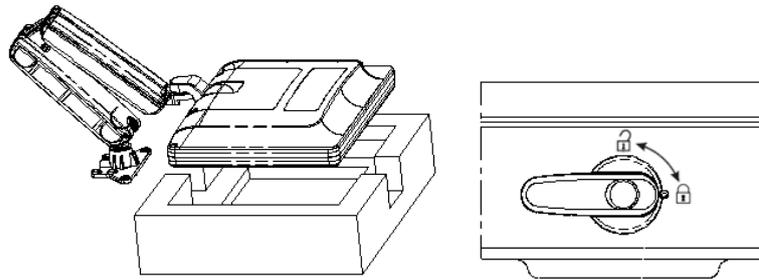
When positioned vertically, the monitor can be tilted 20° backward and can be tilted forward to a horizontal position. When transporting or moving the system, keep the monitor in the horizontal position, as shown below:



■ Locking the monitor

To move the machine for a short distance, install the protective foam (provided in the packaging) onto the monitor, adjust the monitor and supporting arm to the middle position, and then lock the locking lever to  state to avoid movement.





7.1.2 Adjusting Brightness and Contrast

To avoid adjusting the gain, TGC, dynamic range and the acoustic output repeatedly, it is necessary to set the proper brightness and contrast. The adjusting buttons are shown as follows:

■ Brightness adjustment:

Press <F10 Setup>. Click [System]→[General]→[LCD] to adjust the brightness.

■ Contrast adjustment:

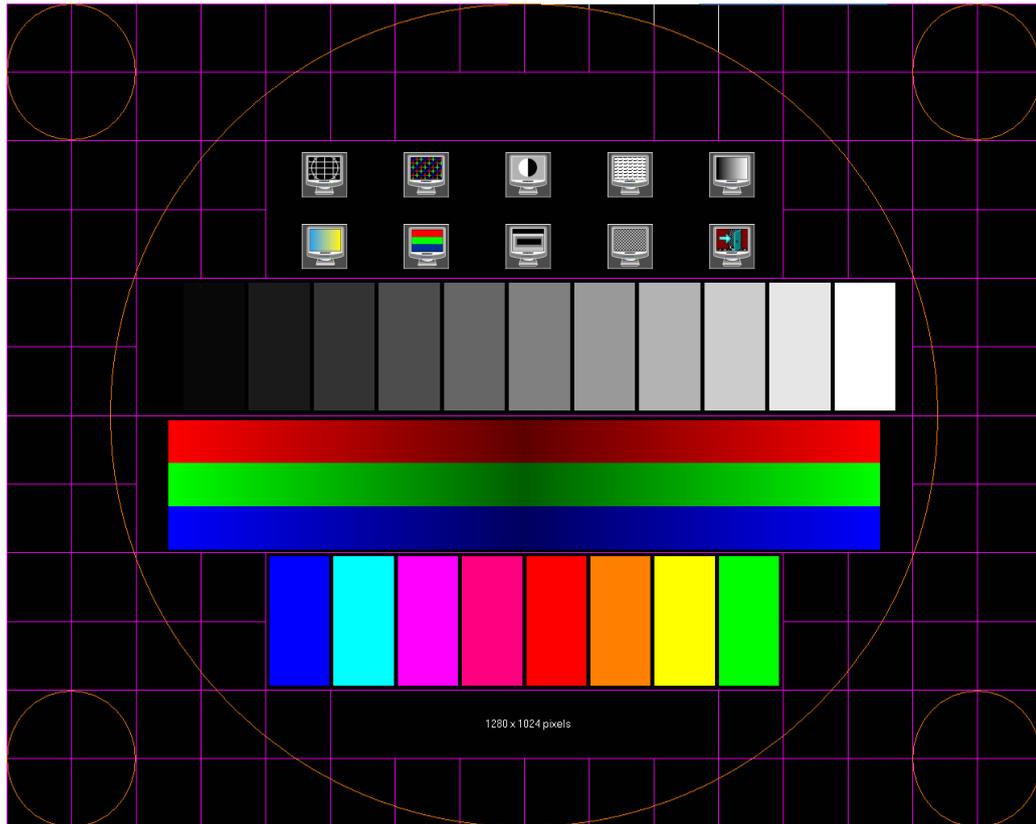
Press <F10 Setup>. Click [System]→[General]→[LCD] to adjust the contrast.

Click "Brightness auto adjustment". The brightness/contrast can be adjusted according to the situation.

NOTE: On the monitor, the brightness adjustment comes before contrast. After readjusting the monitor's brightness and contrast, adjust all preset and peripheral settings.

7.1.3 Monitor Test

1. Log on as the "Service"; refer to chapter 6.1 for details.
2. Press the [F10] key on the keyboard to enter setup menu, and click [Maintenance] to enter the screen.
3. Click [Setup] and select [Test Main Monitor] to enter the screen:



No.	Item	Description
1.	Contrast	The screen displays a white strip in the middle while the above and below are black, if the boundary of black and white is clear, the test is passed;
2.	Resolution	Press [Set] to switch between the 2 interfaces, and it's required that the black and white strips in the middle or around are clear, while the adjacent strips can be distinguished to pass the test;
3.	AshRank	Images of different gray rank levels can be distinguished easily with a smooth transition, and the brightness transition can also be obtained from the images. Gray rank of low level is not obviously lean to red or green, and then the test is passed.
4.	ColorRank	Images of different color rank levels can be distinguished easily with a smooth transition, and the brightness transition can also be obtained from the images.
5.	Colorful	If different kinds of color graphics appear on the screen where the color and the word of each graphics are consistent, test is passed.
6.	focus	Press [Set] to switch among the 3 interfaces, if the images are clear with letters and characters easy to be recognized and there is no ambiguous display or variance among them, the test is passed;
7.	BadPoint	Press [Set] to enter pure color interfaces of green, blue, red, black and white. Observe the LCD screen. Check bright point and dark point in the black and white interfaces. Criterion for pass: bright point number is 0; number of continuous dark point pair is ≤ 3 , and no continuous dark point appears in the

7-4 Adjustments

	image area; there are no three or more than three continuous dark point; dark point defects number is ≤ 7 , and number of dark points in the image area is ≤ 2 ; point flash defects is 0; space between fail points is $\geq 5\text{mm}$.
--	---

4. Click [OK] on the touch screen or press [ESC] on the keyboard to return to the main screen interface.

7.2 Touch Screen Adjustment

7.2.1 Touch Screen Brightness and Contrast Adjustment

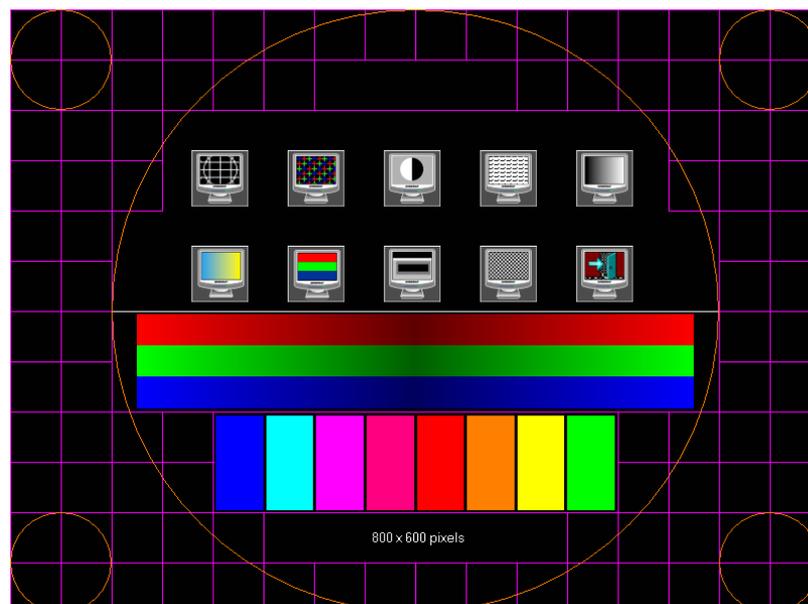
Note: Avoid operating under direct sunlight, or the touch screen could be blocked. Do not place anything on the touch screen, or the screen view will be blocked.
--

- Brightness adjustment:
Press <F10 Setup>. Click [System]→[General]→[TouchPanel] to adjust the brightness.
- Contrast adjustment:
Press <F10 Setup>. Click [System]→[General]→[TouchPanel] to adjust the contrast.
Click "Brightness auto adjustment". The brightness/contrast can be adjusted according to the situation.

Note: On the monitor, the brightness adjustment should be performed before contrast adjustment.
--

7.2.2 Touch Screen Test

1. Log on as the "Service"; refer to chapter 6.1 for details.
2. Press the [F10] key on the keyboard to enter setup menu, and click [Maintenance] to enter the screen.
3. Click [Setup] and select [Test Touch Screen] to enter the screen, test methods are the same as in main screen test.



The difference is that in the touch screen test, you should click the touch screen rather than press [Set] in the main screen test; and click the corresponding icon on the touch screen rather than the main screen.

NOTE: After changing the LCD screen, parameter setting must be performed before using.

7.3 Control Panel Adjustment

■ Control Panel Position Adjustment

Press the ascending/descending button  on the right handle, to adjust the height of the control panel.

Press the unlock button  on the left handle to rotate the control panel and move the control panel.

■ Key backlit brightness and volume adjustment

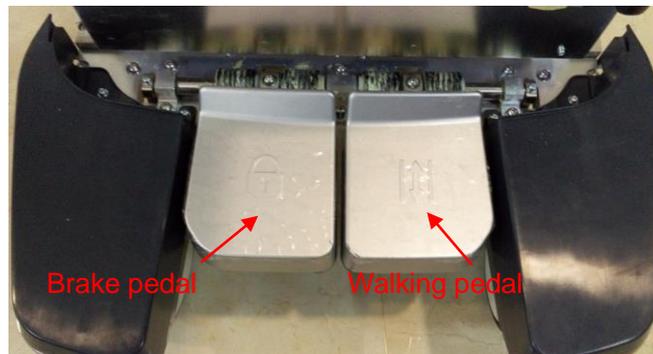
In the [System Preset]→[Key Config] page, you can adjust key backlit brightness and volume.

■ Functional keys setting

In the [System Preset]→[Key Config] page, you can preset functions for keys of <Print>, <Save>, <k1~k8>, <F3>, <F4>, <F5>, <F6>, gesture, for example, you can preset F3 as “save image”.

7.4 Adjusting Caster

Step the pedal to lock the caster; step the walking pedal to let the device move.



8 Field Replaceable Unit

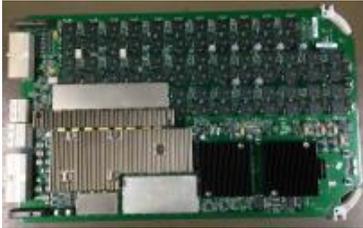
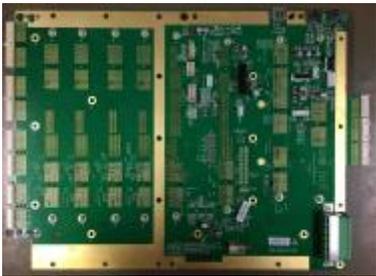
The detailed information of Field Replaceable Unit is as follows:

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
1.	Main unit related	PC carrier board (FRU)	115-033595-02		Including button battery CR2450	Referring to 9.3.25.6
2.		Button cell Lithium 3V620mAh CR2450	022-000152-00		Button battery CR2450	Referring to 9.3.25.1

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
3.		CPU module (FRU)	115-033596-00		Including fan, radiator	Referring to 9.3.25.4
4.		FAN 12V 7.5CFM 34dB 70*67*12mm	024-000518-00		Part number of GPU fan	Referring 9.3.25.2 (GPU fan); Referring 9.3.25.5 (CPU fan);
5.		GPU module	115-033594-00		/	Referring to 9.3.25.3
6.		SSD card (Resona 7/CE/FRU)	115-033597-00		Remark model, software version, regulation type, serial number of unit	Referring 9.3.25.6
		SSD card (Resona 7EXP/CE/FRU)	115-033598-00			
		SSD card (Resona	115-033599-00			

8-2 Field Replaceable Unit

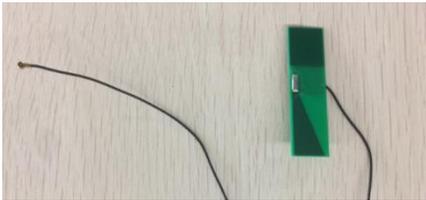
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
		7CV/CE/FRU)				
		SSD card (Resona 7S/ CE/FRU)	115-033600-00			
		SSD card (Resona 7OB/ CE/FRU)	115-033601-00			
7.		SSD card (Resona 7/FDA/FRU)	115-037070-00			
8.		SSD card (Resona 7EXP/FDA/FRU)	115-037071-00			
9.		SSD card (Resona 7CV/FDA/FRU)	115-037072-00			
10.		SSD card (Resona 7S/FDA/FRU)	115-037073-00			
11.		SSD card (Resona 7OB/FDA/FRU)	115-037074-00			

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
12.		TR64 board PCBA (FRU)	115-033616-00		Three TR board are the same	Referring to 9.3.24.1
13.		Engine Board PCBA (Re6V2.0/FRU)	115-037314-01		/	Referring to 9.3.24.3
14.		Probe board assembly (FRU)	115-033612-00		/	Referring to 9.3.29
15.		Mother board assembly (FRU)	115-033591-00		/	Referring to 9.3.36

8-4 Field Replaceable Unit

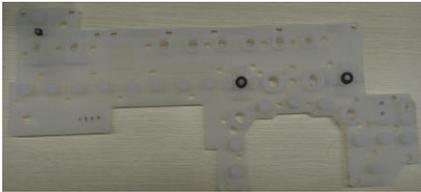
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
16.		HDD assembly (FRU)	115-033602-00		Including wires and assembly board	Referring to 9.3.31
17.		IO Interface Module (include WIFI/FRU)	115-052933-00		Including m. 2 port Wifi module, Compatible with the IO interface module(Mini PCIE port Wifi module)	Referring to 9.3.28
18.		IO assembly (international/FRU)	115-025764-00		With bracket, the port of Wireless network card is Mini PCIE	Referring to 9.3.28
19.		IO Board Assembly(FRU)	115-051521-00		With bracket, the port of Wireless network card is M.2	Referring to 9.3.28

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
20.		4D/TEE Assembly Kit	115-046245-00		Support maintenance and upgrade	Referring to 9.3.24.4
21.		CW Module Kit	115-032775-00		Optional. Support maintenance and upgrade	Referring to 9.3.24.2
22.		WIFI Module Kit	115-051210-00		Optional. Support maintenance and upgrade, including assembly board and antenna, M.2 port Wireless network card	Referring to 9.3.26
23.		WIFI Module Kit	115-039264-00		Optional. Support maintenance and upgrade, including assembly board and antenna, Mini PCIE port Wireless network card	Referring to 9.3.26

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
24.		Antenna and cable assembly	0012-00-1730-01		Support maintenance, use for Mini PCIE port Wireless network card	Referring to 9.3.27
25.		M.2 port wifi antenna	024-000965-00		Support maintenance, Use for M.2 port Wireless network card	Referring to 9.3.27
26.		ECG Module Kit (AHA)	115-032776-00		Optional. Including DC-IN wire and lead wire	Referring to 9.3.34
27.		ECG Module Kit (IEC)	115-032777-00		Optional. Including DC-IN wire and lead wire	
28.		Inlet fan assembly (FRU)	115-033607-00		/	Referring to 9.3.24.5

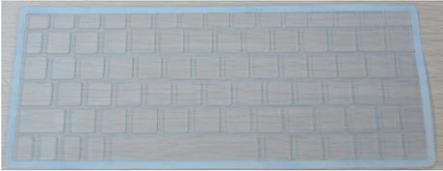
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
29.		Front-in assembly	115-029779-00			Referring to 9.3.33
30.		DVD assembly (FRU)	115-033613-00		Including wires and assembly board	Referring to 9.3.32
31.	Monitor related	Support arm assembly (FRU))	115-033584-00		No covers	Referring to 9.3.12

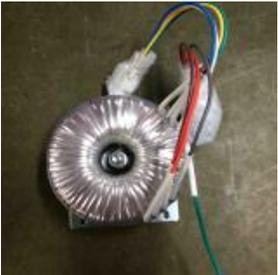
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
32.	Monitor related	21.5" HDMI Display Kit (Resona 7/FRU)	115-036971-01		Including cable cover	Referring to 9.3.5
		21.5" HDMI Display Kit (Resona 7EXP/FRU)	115-036970-01		Including cable cover	
		21.5" HDMI Display Kit (Resona 7OB/FRU)	115-036969-01		Including cable cover	
		21.5" HDMI Display Kit (Resona 7S/FRU)	115-036968-01		Including cable cover	

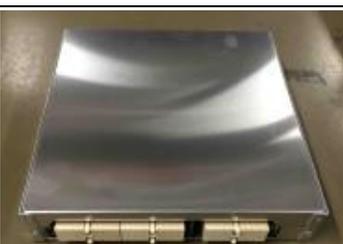
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
		21.5" HDMI Display Kit (Resona 7CV/FRU)	115-036967-01		Including cable cover	
33.		LCD Signal Connector PCBA assembly	115-030256-00		With power line and fixed metal; Mini HDMI input port HDMI output port	Referring to 9.3.13
			115-030256-01		With power line and fixed metal; HDMI I/O ports	
34.	Control panel related	Keyboard top cover assembly (FRU)	115-033585-00		Not including functional encoder board, single-encoder board, TGC board, trackball, trackball button board, keypad, etc.	Referring to 9.3.6.11
35.		Silicon key on the control panel.	049-000785-00		/	Referring to 9.3.6.13

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
36.		Multifunctional encoder board PCBA	051-002188-00			Referring to 9.3.6.7
37.		General encoder board (FRU)	115-033588-00		Including overlay of encoder board	Referring to 9.3.6.8
38.		Single-encoder board PCBA	051-001828-00		/	Referring to 9.3.6.6
39.		Trackball	023-001033-00		No cables	Referring to 9.3.6.4

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
40.		Trackball key board PCBA	051-002195-00		Not including the cables and the silicon button	Referring to 9.3.6.5
41.		Silicon key of the trackball key board	049-000786-00		/	Referring to 9.3.6.5
42.		TGC board PCBA	051-002185-00		Not including the cables and the silicon button	Referring to 9.3.6.10

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
43.		Keyboard shelter	049-001352-00			
44.		Small keyboard	115-033709-00		/	Referring to 9.3.6.9
45.		Small keyboard assembly(FRU/R U)	115-061605-00		/	Referring to 9.3.6.9
46.		Touch screen assembly (FRU)	115-033590-00		/	Referring to 9.3.8

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
47.	Power supply related	Transformer (FRU)	115-025762-00		/	Referring to 9.3.30.5
48.		Power input assembly (FRU) (220V)	115-036196-00		/	Referring to 9.3.30.1
49.		Power input assembly (FRU) (110V)	115-036197-00		/	
50.		AC Connection Board PCBA (220V/FRU)	115-033604-00		/	Referring to 9.3.30.2

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
51.		AC Connection Board PCBA (110V/FRU)	115-033605-00		/	
52.		5V board assembly (FRU)	115-033606-00		Including press pad for power supply	Referring to 9.3.30.3
53.		AC power assembly (FRU)	115-033611-00		/	Referring to 9.3.30.4
54.		DC box assembly (FRU)	115-033592-00		/	Referring to 9.3.24.6

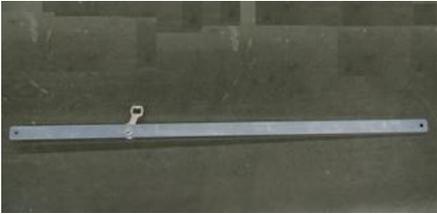
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
55.		PHV box assembly (FRU)	115-033593-00		/	Referring to 9.3.24.6
56.	Motor-driven lift related	Motor-driven lift mechanical assembly (FRU)	115-033583-00		Not including motor and Lift control PCBA assembly	Referring to 9.3.37.6
57.		Motor-driven lift mechanical assembly (W/O shift/FRU)	115-035514-00	/	Not including motor and Lift control PCBA assembly	/

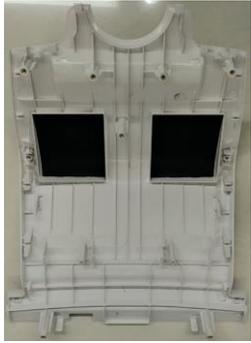
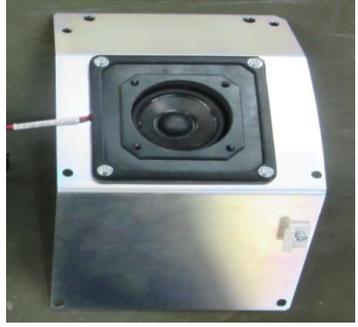
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
58.		MOTOR DC brushless 24V 50W Deceleration ratio 30	024-000664-00		Motor of electric lifting mechanism	Referring to 9.3.37.7
59.		Lift control PCBA assembly (FRU)	115-033587-00		Including power cord for motor drive and control cable	Referring to 9.3.37.7
60.		Turbine protective shell assembly (FRU)	115-033626-00		/	Referring to 9.3.21

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
61.		Turbine protective bracket	043-005039-00		/	Referring to 9.3.21
62.		Turbine protective shell	043-005036-00		/	Referring to 9.3.20
63.	Shifting and rotation of control panel related	Double sided mechanism lock assembly	115-030222-00		/	Referring to 9.3.15.1

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
64.		Control panel moving mechanism assembly (FRU)	115-033586-00		/	Referring to 9.3.15
65.		Handle panel assembly	115-029942-00		/	Referring to 9.3.7
66.		Base Assembly	115-034033-00			Referring to 9.3.14
67.	Central brake related	Straight line caster	034-000416-00		/	Referring to 9.3.37.5

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
68.		Full lock caster	034-000415-00		/	Referring to 9.3.37.5
69.		Left/right brake pedal assembly	115-033603-00		/	Referring to 9.3.37.3
70.		Central brake pedal assembly	115-033610-00		Apply for the sheet bracket	Referring to 9.3.37.4

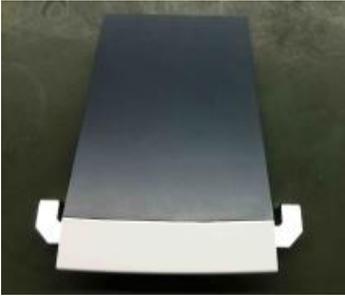
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
		Central Brake Assembly(V2.0/F RU)	115-033610-02		Apply for the metal bracket	
71.		Left brake rod assembly	115-030158-00		/	Referring to 9.3.37.3
72.		Right brake rod assembly	115-030157-00		/	Referring to 9.3.37.3

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
73.		Speaker cover assembly (small speaker)	115-034854-00		/	Referring to 9.3.9
74.		Left speaker assembly (small speaker/FRU)	115-035512-00		/	Referring to 9.3.10
75.		Right speaker assembly (small speaker/FRU)	115-035513-00		/	Referring to 9.3.10

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
76.		The back handle of the main unit	044-000597-00			Referring to 9.3.37.1
77.		Wire pothook assembly	045-001749-00			Referring to 9.3.3
78.		Cup rack	044-000600-00			Referring to 9.3.2

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
79.		Coupling gel heating cup 12V 12W	024-000693-00		Support maintenance and upgrade	Referring to 9.3.1
80.		Left bracket package of the coupling gel heating cup	115-032780-00		Support maintenance and upgrade	Referring to 9.3.1
81.		Right bracket package of the coupling gel heating cup	115-032781-00		Support maintenance and upgrade	Referring to 9.3.1

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
82.		Left Probe Holder Kit	115-032778-00		/	Referring to 9.3.1
83.		Right Probe Holder Kit	115-032779-00		/	Referring to 9.3.1
84.		Main unit top cover	115-025235-00		/	Referring to 9.3.22

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
85.		Main unit front-top cover assembly (FRU)	115-033608-00		/	Referring to 9.3.19
86.		Main unit front cover assembly	115-025237-00		/	Referring to 9.3.19
87.		Left pedal cover	043-005034-00		/	Referring to 9.3.23

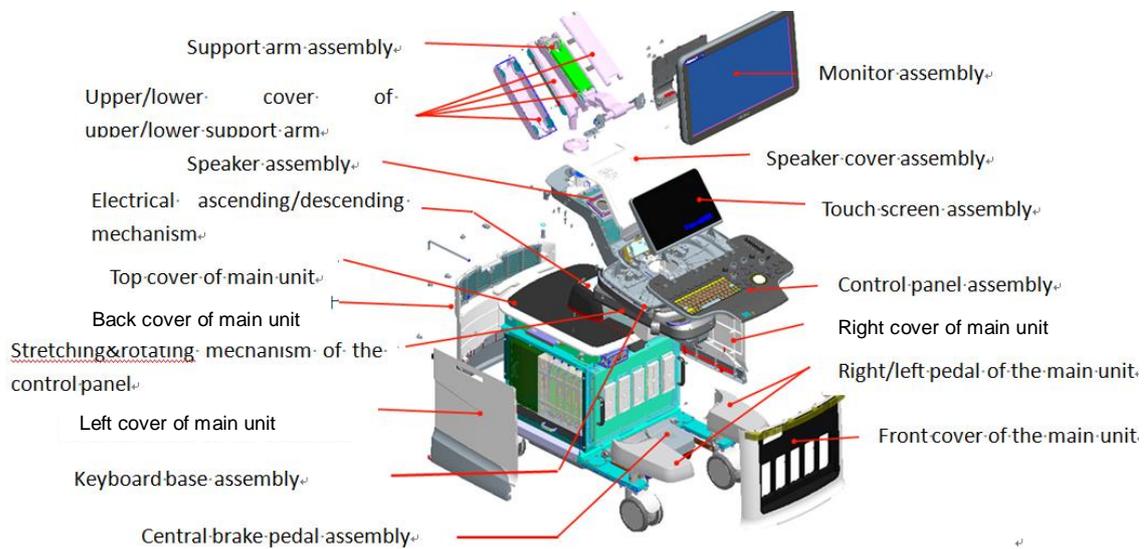
No.	Classification	Description	Order Number	Figure	Comments	Disassembly
88.		Right pedal cover	043-005035-00		/	Referring to 9.3.23
89.		Back Cover	043-005236-00		/	Referring to 9.3.16
90.		Main unit left cover assembly	115-025238-00		/	Referring to 9.3.17

No.	Classification	Description	Order Number	Figure	Comments	Disassembly
91.		Main unit right cover assembly	115-033609-00			Referring to 9.3.18

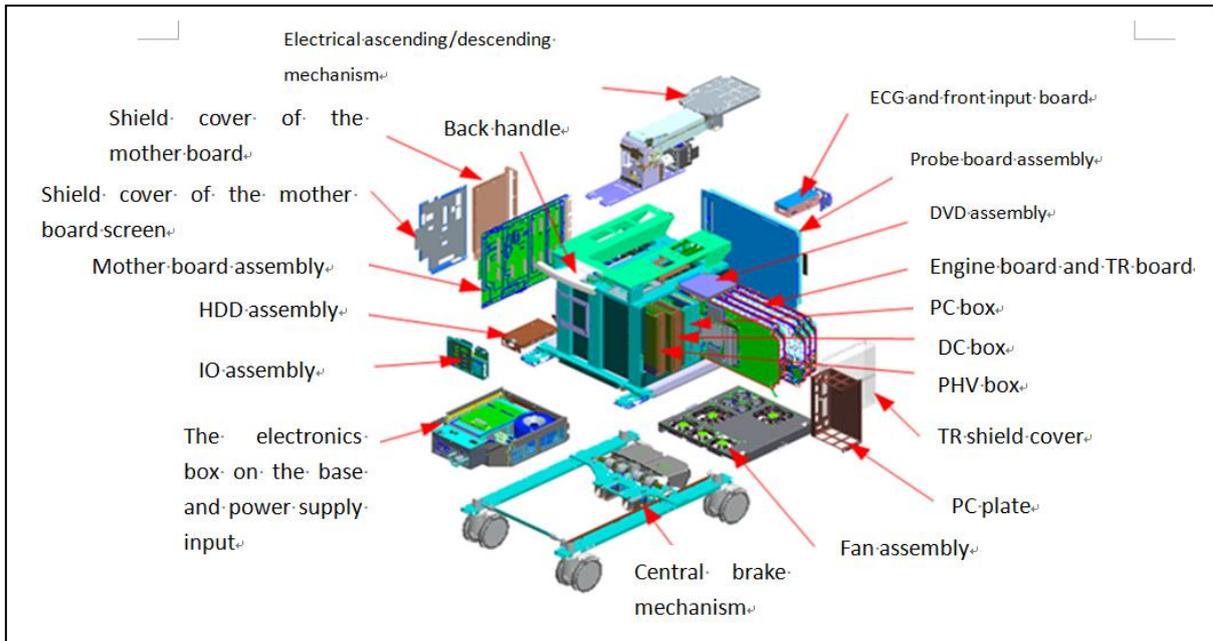
9 Structure and Assembly/Disassembly

9.1 Structure of the Complete System

Explosion View of the Complete System



Explosion View of Assembly:



9.2 Preparation

9.2.1 Tools Required

Name	Type	Remarks
Inner hexagon spanner	/	M3、M4、M5、M6、M8
Cross-headed screwdriver	107*75	M2、M3、M4
Flat-headed screwdriver	/	/
Spanner	1PK-H024	4"
Diagonal cutting pliers	N-206S	/
Anti-static glove	/	/

9.2.2 Engineers Required

Only technical professionals from Mindray or engineers authorized by Mindray after training can perform maintenance and check.

9.2.3 Requirements

You should perform the following preparations before the disassembling of ultrasound device.

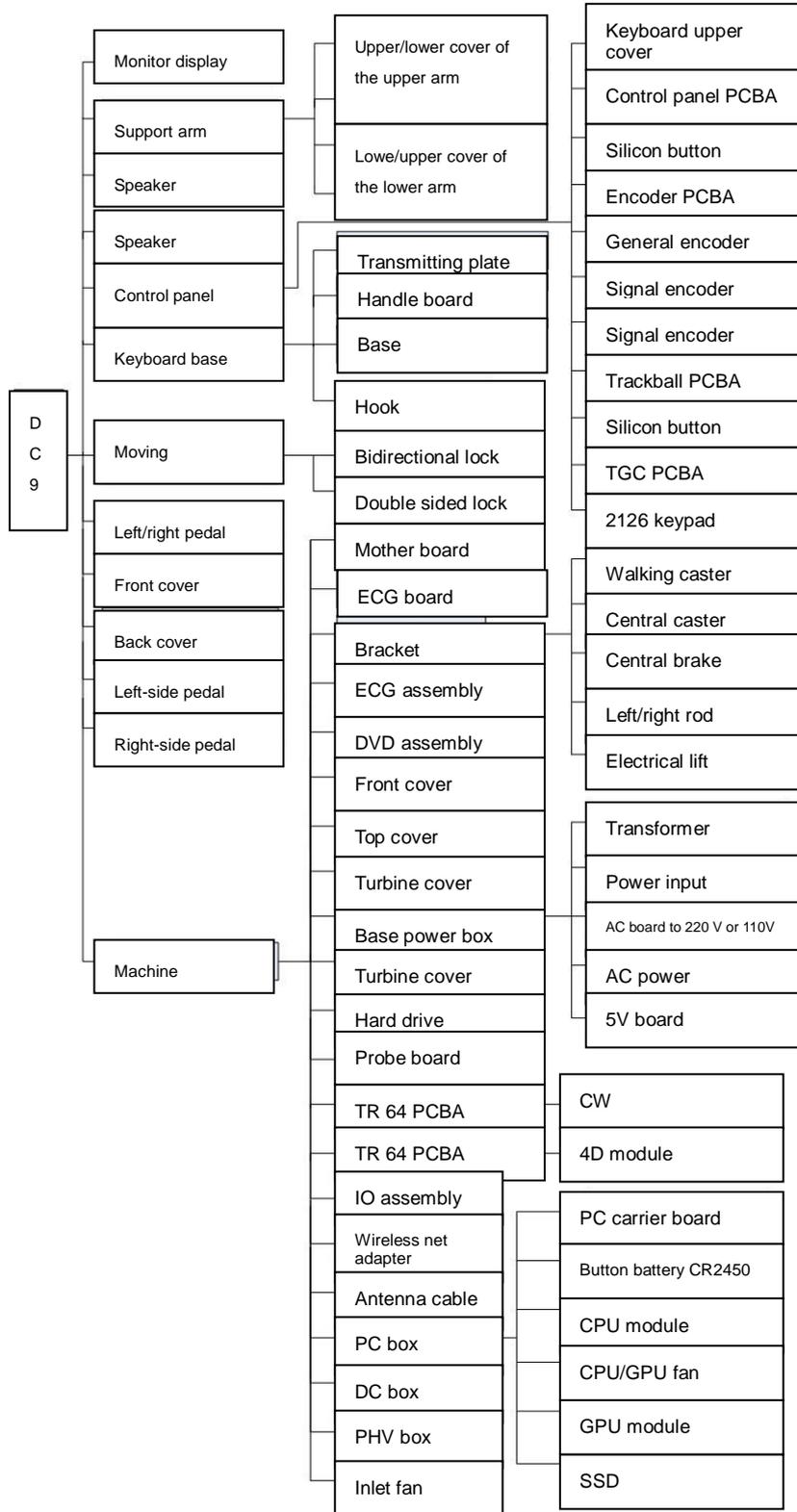
1. Stop the scanning and the image capture, power off the system and disconnect the system from the AC power supply, then pull out AC power cables.
2. Prepare a soft platform and keep the platform clear. Prevent the device being scraped.
3. Lock the casters to prevent the device from moving when disassembling.

4. Prepare the tools required.

9.3 Assembly/Disassembly

This section describes the disassembling and the assembling of the main modules and hardware boards. The assembling is the inverse process of the disassembling if not mentioned in particular.

■ Sketch



Note: The illustration of disassembly is provided for reference only, and the concrete picture depends on the actual model.

9.3.1 Large/Small Probe Holders, Left Bracket of Coupling Gel Heating cup, Intracavitary Probe Holder

1. Remove the probe holder in the order of 4D probe, large probe holder, coupling gel heating cup and small probe holder along the arrow's direction.



Coupling gel heating cup 12V 12W



Left bracket of the coupling gel heating cup



Right bracket of the coupling gel heating cup

2. Unscrew 2 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove intracavitary probe bracket.



Left intracavitary probe bracket



Right intracavitary probe bracket

9.3.2 Cup Rack Assembly

The disassembly tool: M5 Inner hexagon spanner

Unscrew 8 M5 X 12 round inner head screws (with the pad), and remove the right and the left cup rack assembly.



Cup rack assembly

9.3.3 Wire Pothook Assembly

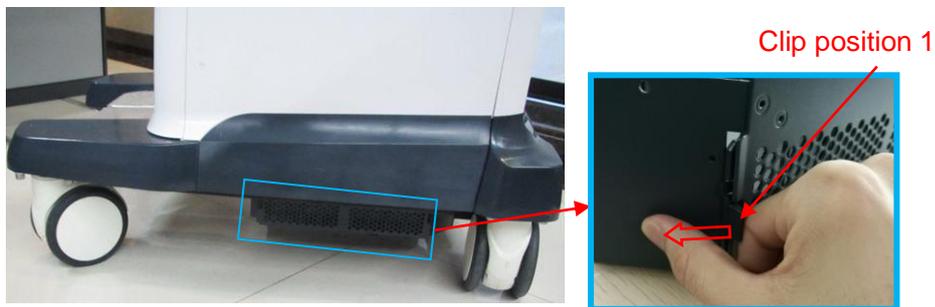
The disassembly tool: cross-headed screwdriver (M3, M4).

Unscrew 6 M4 X 12 cross panhead screws from the base of the hook management with cross-headed screwdriver (M3, M4) to remove 3 pothooks.

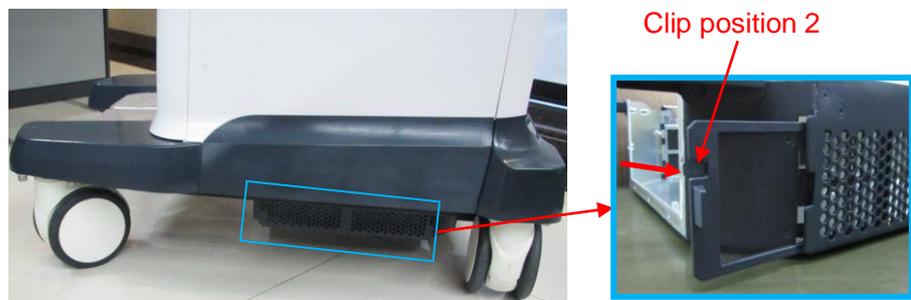


9.3.4 Mesh of the Base

Hold electronics assembly on the base and push the clip by the index figure, pull out the dust-proof cover.



NOTE: If you can not pull out the dust-proof cover after the above operations being taken, please pull the other clip and pull out the dust-proof cover at the same time.



9.3.5 Display (monitor) Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), diagonal cutting pliers.

1. Remove 2 pads from the cable holes.



2. Unscrew 2 M4 X 12 screws with cross-headed screwdriver (M3, M4).

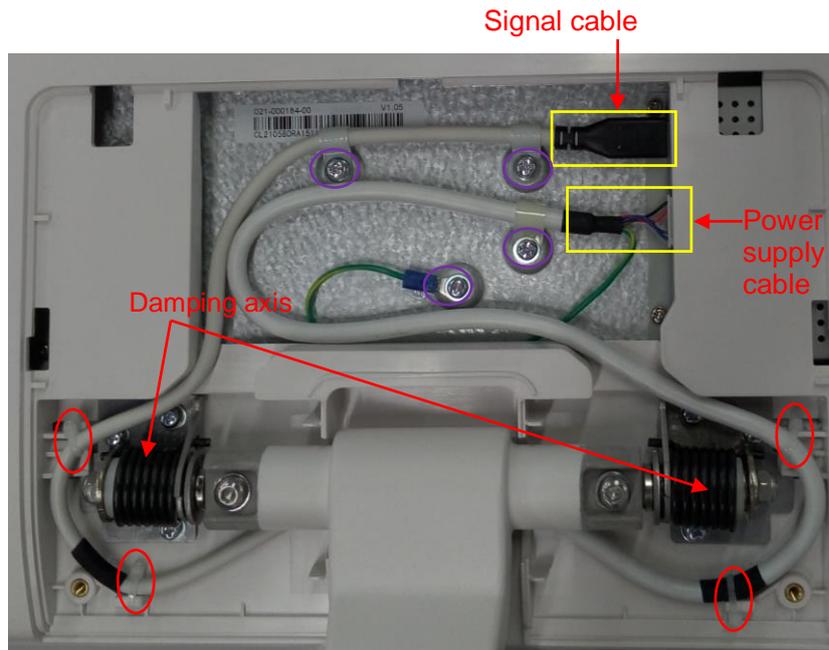


3. Remove the cable cover towards arrow's direction.



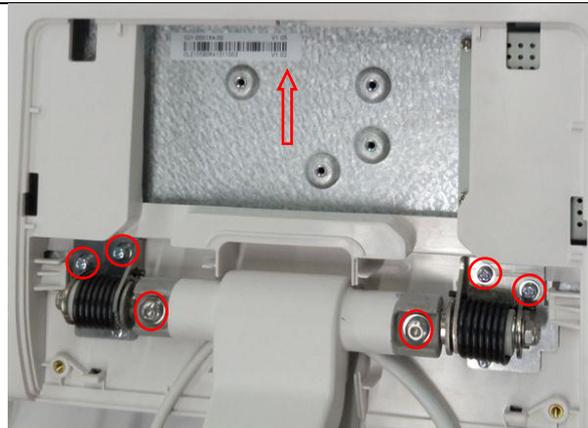
4. Cut off the 4 cable ties with diagonal cutting pliers. Unscrew 4 M4 X12 cross panhead screws to pull the signal cable and the power supply cable out with cross-headed screwdriver (M3, M4).

Note: See the figure below for installing the cable anticlockwise. The cable should keep distance with the damping axis.



5. Unscrew 6 M4 X12 cross panhead screws from the assembly board with the screwdriver (M3, M4) to remove the display assembly towards the arrow's direction.

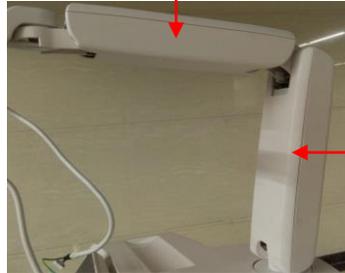
Note: When conducting the operation, please hold the support arm with one person in case of the falling of the support arm assembly.



Monitor (FRU)

Note: Set the upper support arm level and the lower support arm vertical, and then remove them. In case of the damage to the personnel, be careful when disassembling

Set the upper support arm level



Set the lower support arm vertical

9.3.6 Control Panel Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), anti-electrostatic glove, paper clip.

1. Unscrew 12 M4 X 12 screws from the base of the control panel with cross-headed screwdriver (M3, M4).



Bottom-left



Bottom-right



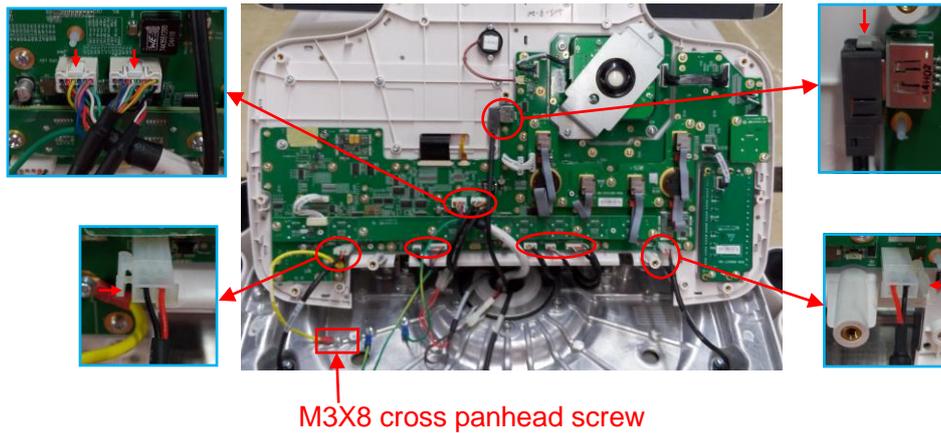
Bottom



Bottom (with the base rotating 90°)

2. Remove the cover of the control panel. Pull 10 plugs out from the PCBA board. Unscrew 1 M3 X 8 cross panhead screw from the grounding wire of the control panel to remove the control panel assembly.

Note: Press the clip to remove the cables shown in 4 small pictures.



9.3.6.1 Rectangle Caps

Note: it is unnecessary to disassemble the control panel to remove the rectangle caps.

The ultrasound system is equipped with five rectangle caps (iScale, RIMT, TDI, V Flow, S-Planes) by factory default. It is designed for replacing the rectangle caps by the user.

Insert the paper clip or pen into the slot around the rectangle buttons (P1, P2, P3, P4, Fusion, Elasto, Contrast, iworks) to remove them.



9.3.6.2 General Encoder Cap/Multi-functional Encoder Cap/Mode Encoder Knob/Mode Encoder Button

See Chapter 9.3.6 *Control Panel Assembly* for details.

Place the control panel assembly on the anti-electrostatic foam. Pull 9 general encoder caps (red circle) out, 2 functional encoder caps (purple circle), 4 mode encoder knobs (yellow circle) and 4 mode encoder buttons out (yellow circle).



9.3.6.3 TGC Cap

1. Refer to 9.3.6 *Control Panel Assembly* for details.
2. Pull the TGC caps upwards.

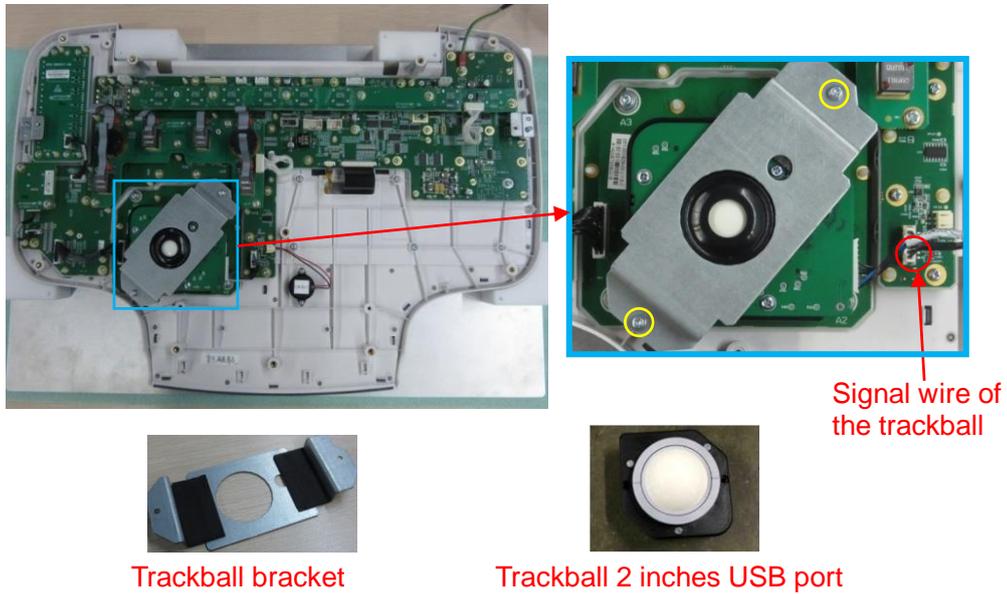


9.3.6.4 Trackball

1. Refer to 9.3.6 *Control Panel Assembly* for details.
2. Wear the anti-electrostatic glove. Place the control panel assembly on the tool. Pull the signal wire (009-004569-00) of the trackball out of the trackball assembly and the control panel board.

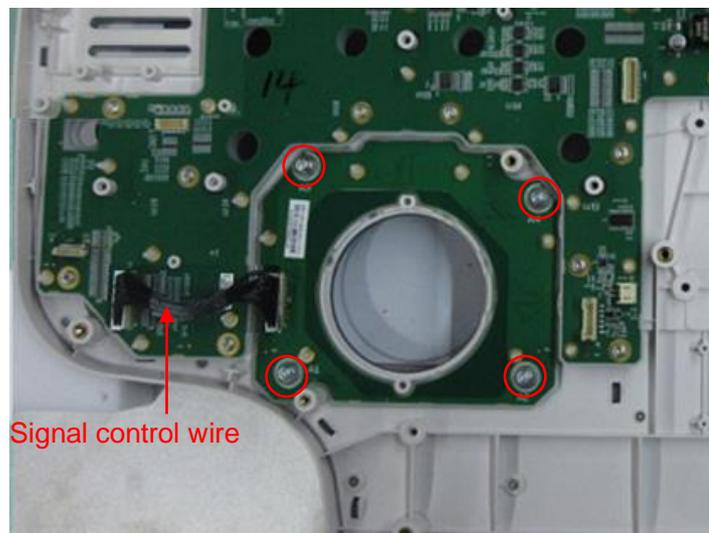
Unscrew 2 M3 X 8 panhead screws from the trackball bracket with cross screwdriver (M3, M4). Remove the trackball bracket, and take the trackball out (2 inches USB port).

Note: If there is no tool available, place the book besides the control panel assembly.

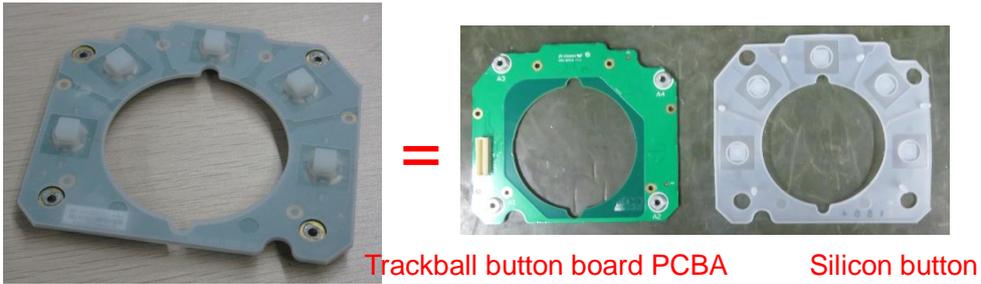


9.3.6.5 Trackball Key Board PCBA/Large, Small Fan-shaped Buttons

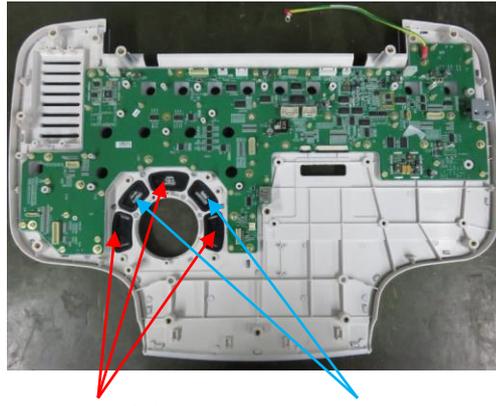
1. Refer to 9.3.6 Control Panel Assembly and 9.3.6.4 Trackball for details.
2. Wear the anti-electrostatic glove. Unplug one signal control wire (009-004568-00) from the trackball board. Unscrew 4 M3 X 8 small panhead screws with screwdriver (M3, M4) to remove the trackball button board PCBA (with silicon button).



3. Pull the silicon buttons out to remove the trackball button PCBA.



4. Remove large fan-shaped button (3), and small fan-shaped button (2).



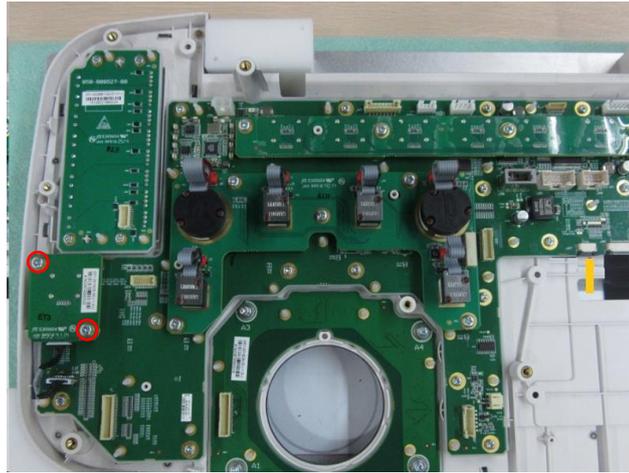
Large fan-shaped button (3) Small fan-shaped button (2)

9.3.6.6 Single-encoder Board

1. See 9.3.6 Control Panel and 9.3.6.2 for details.



2. Wear the anti-electrostatic glove. Unscrew 2 PT4X10 panhead tapping screws with the screwdriver (M3, M4) to remove the single-encoder board.

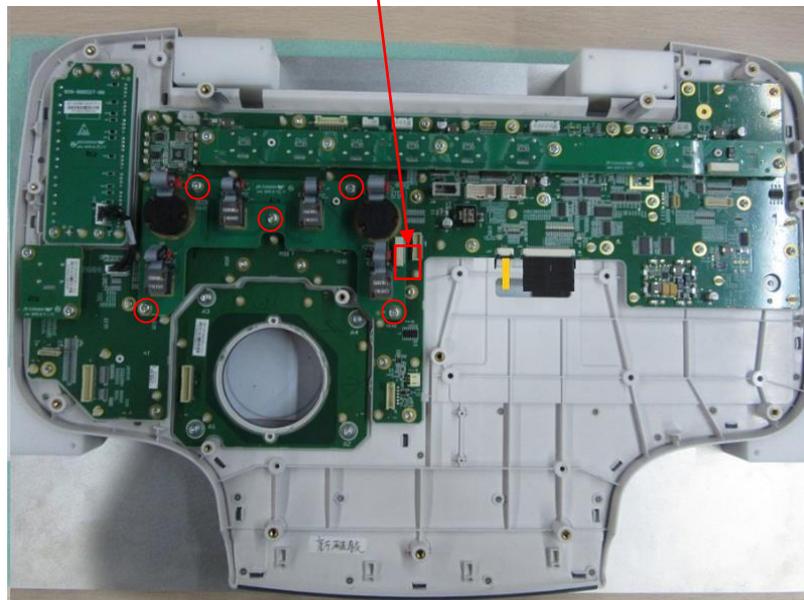


Single encoder board PCBA

9.3.6.7 Multi-functional Encoder Board

1. See 9.3.6 Control Panel and 9.3.6.2 for details.
2. Wear the anti-electrostatic glove. Unplug the signal control wire from the multi-functional encoder board and the control panel assembly. Unscrew 5 PT4X10 cross panhead tapping screws with the screwdriver (M3, M4) to remove the multi-functional encoder board PCBA.

Signal control wire of multi-functional encoder board



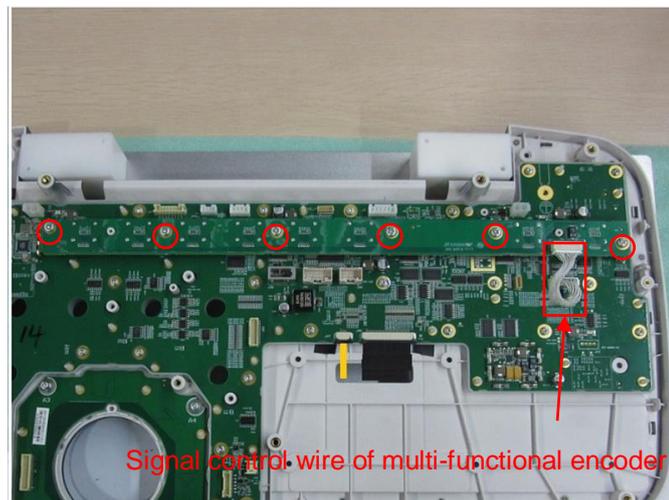
Multi-functional encoder board PCBA

9.3.6.8 General Encoder Board

1. See 9.3.6 Control Panel and 9.3.6.2 for details.



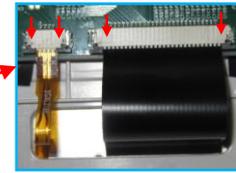
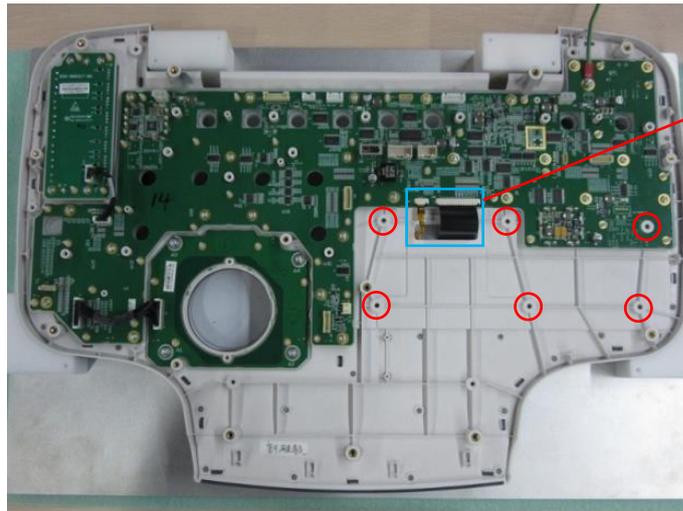
2. Wear the anti-electrostatic glove. Unplug one signal control wire from the general encoder board and the control panel board.
3. Wear the anti-electrostatic glove. Unscrew 6 PT4X10 panhead tapping screws with the screwdriver (M3, M4) to remove the single-encoder board (FRU).



General encoder board (FRU)

9.3.6.9 Keypad

1. Refer to 9.3.6 Control Panel Assembly for details.
2. Wear the anti-electrostatic glove. Push the clip of the keypad out towards the arrow's direction, and pull the wire out. Unscrew 6 M3 X 8 cross panhead screws from the control panel assembly with screwdriver (M3, M4) to remove the keypad.



Small keyboard (FRU)

9.3.6.10 TGC Board

1. Refer to 9.3.6 Control Panel Assembly for details.
2. Wear the anti-electrostatic glove. Place the control panel assembly on the tool. Unscrew 2 M3 X8 cross panhead screws (red circle) on the keyboard connection plate with cross screwdriver (M3, M4), and then remove 2 connection plates of the keyboard cover.

Note:

- If there is no tool available, place the book besides the control panel assembly.
- Align the keyboard connection plate with the positioning holes when installing anticlockwise (yellow circle).



3. Wear the anti-electrostatic glove. Unplug one TGC signal control wire (009-004567-00) from the TGC board and the control panel. Unscrew 4 PT3X10 cross panhead tapping screws from TGC board with screwdriver (M3, M4) to remove the TGC board (with the silicon).



TGC signal control wire



TGC board PCBA

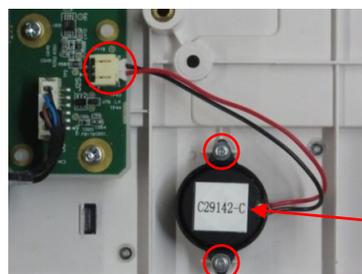
9.3.6.11 Keyboard Top Cover Assembly

See *Chapter 9.3.6, 9.3.6.2, and 9.3.6.10* for details.



9.3.6.12 Buzzer

1. Refer to *9.3.6 Control Panel Assembly* for details.
2. Unplug the connection wire of the buzzer. Unscrew 2 PT2.0X6 panhead tapping screws with the screwdriver (M3, M4) to remove the buzzer.

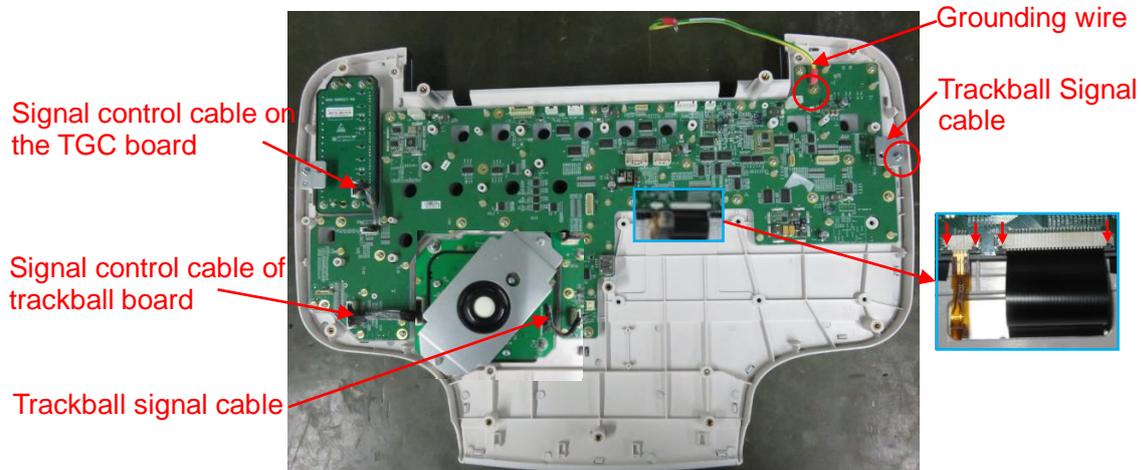


Buzzer

9.3.6.13 The Control Panel PCBA

1. See *Chapter 9.3.6, 9.3.6.6, 9.3.6.7 and 9.3.6.5* for details.

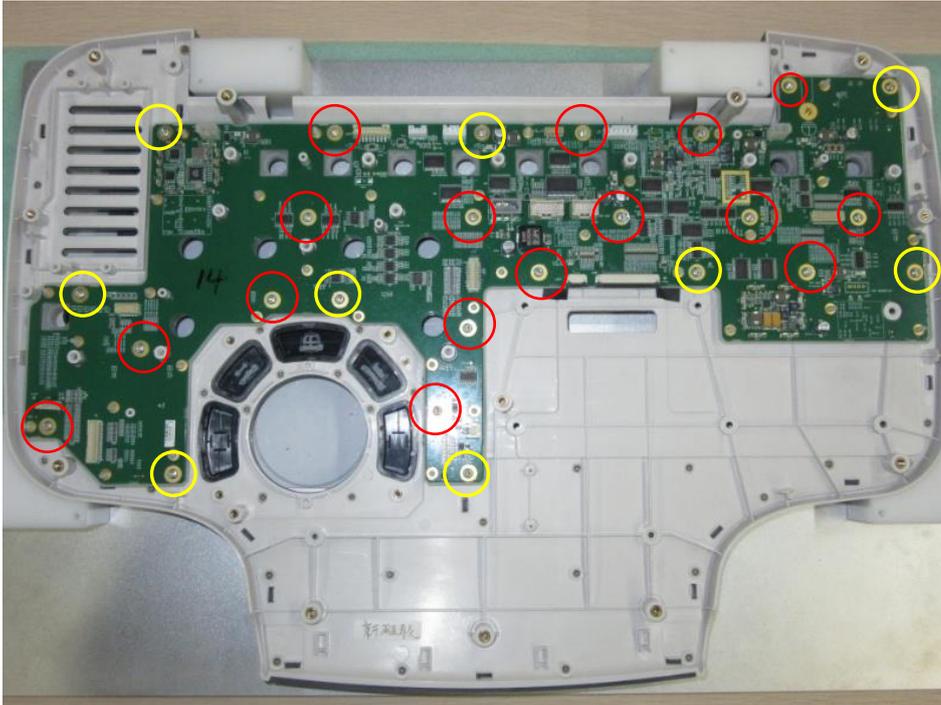
2. Wear the anti-electrostatic glove. Unplug the control wire (009-004567-00) of TGC board, signal wire of the trackball (009-004569-00), signal control wire (009-004568-00). Push the clip out towards the arrow's direction to pull the cable. Unscrew 1 M3 X 8 cross panhead screw and 1 M3 X 8 cross panhead screw with screwdriver from the grounding wire (009-004561-00) to remove the grounding wire and the cap connection plate.



3. Unscrew 25 M3 X 8 cross panhead screws from the control panel PCBA with cross-headed screwdriver (M3, M4) to remove the control panel PCBA (FRU).

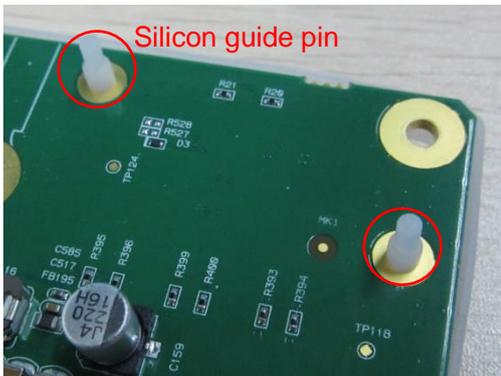
Note: Fasten the screws according to the following procedures when installing anticlockwise.

- a) Fasten 9 PT3X10 cross panhead tapping screws.
- b) Fasten the trackball button board.
- c) Check whether the buttons on the control panel are settled appropriately. The gaps among the buttons should be well-distributed. The toggle buttons should be upright. The buttons can be reset after being pressed.
- d) Fasten 16 PT3X10 cross panhead tapping screws.



Control panel PCBA (FRU)

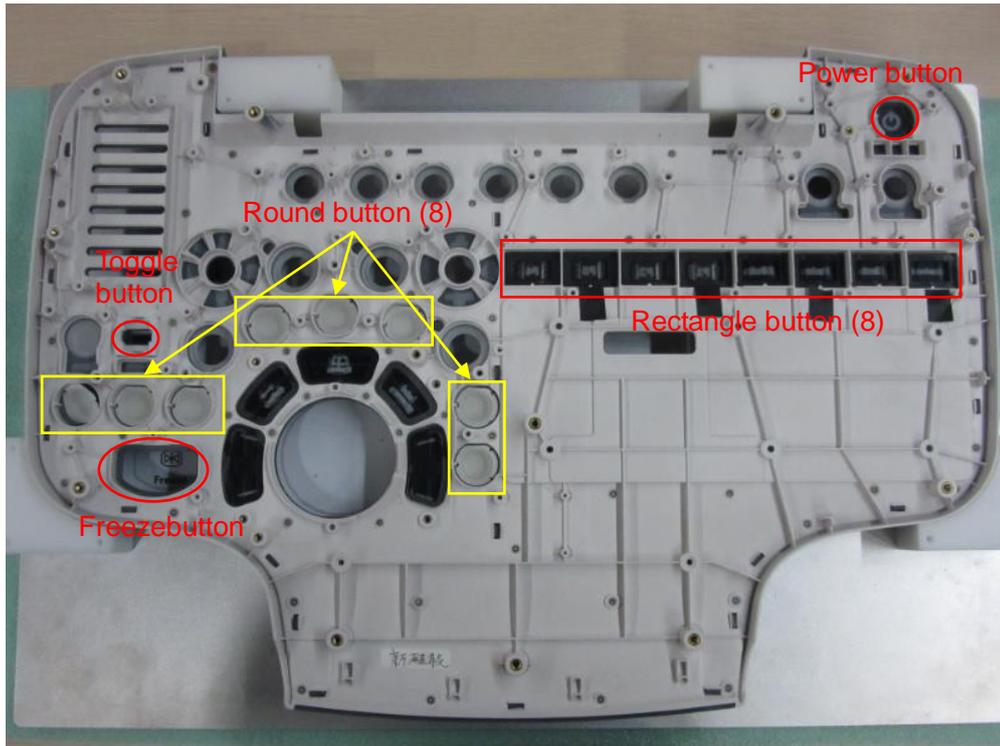
4. Pull the silicon button out from the control panel PCBA. Pull 35 silicon guide pin out of the location hole, and remove the silicon button of the control panel.



The silicon button of the control panel

9.3.6.14 Round Button/Toggling Button/Power Supply Button/Freeze Button/Rectangle Buttons

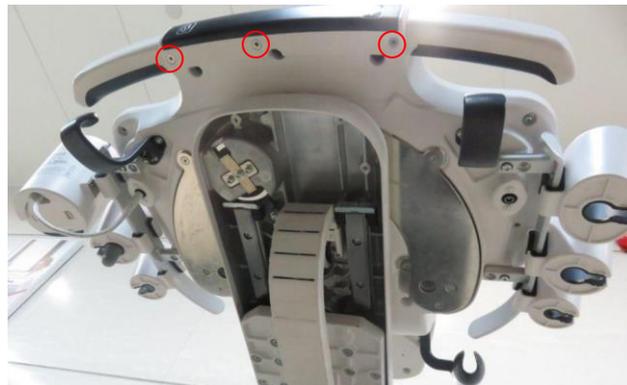
1. Refer to 9.3.6.13 *The Control Panel PCBA* for details.
2. Remove the round buttons (8), toggling button (1), power supply button (1), freeze button (1), and rectangle buttons (8).



9.3.7 Handle Panel Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), diagonal cutting pliers.

1. Refer to 9.3.6 *Control Panel Assembly* for details.
2. Unscrew 3 M4 X 12 stainless steel sunk head screws from the base of the control panel with cross-headed screwdriver (M3, M4) to remove the handle panel assembly.



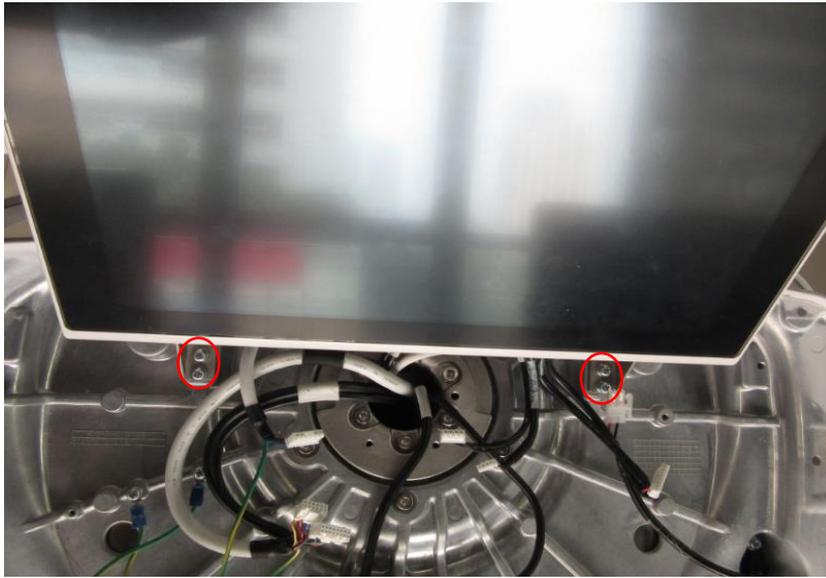
Handle panel assembly

9.3.8 Touch Screen Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. Refer to 9.3.6 *Control Panel Assembly* for details.

2. Unscrew 4 M4 X 12 screws from the touch screen assembly with cross-headed screwdriver (M3, M4).



3. Place the keyboard on a foam or cardboard (larger than the touch screen). Unscrew 2 M4 X 12 cross panhead screws to remove the signal wire of the touch screen.

Note: Do not scratch the touch screen when disassembling.



Touch screen assembly (FRU)

4. Unscrew M4 X 12 cross panhead screw on UC-0.5 lock knob with screwdriver (M3, M4) to remove the power supply cable and USB signal cable.



9.3.9 Speaker Cover Assembly

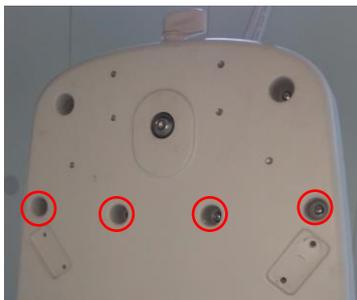
The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.6 Control Panel Assembly and 9.3.8 Touch Screen Assembly for details.



Speaker cover assembly

2. Unscrew 6 M4 X 12 cross panhead screws from the base of the control panel with cross-headed screwdriver (M3, M4) to remove speaker cover assembly.



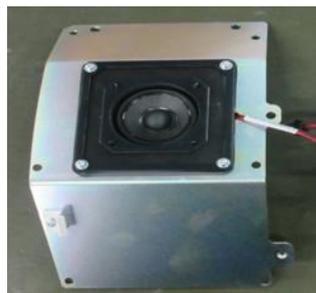
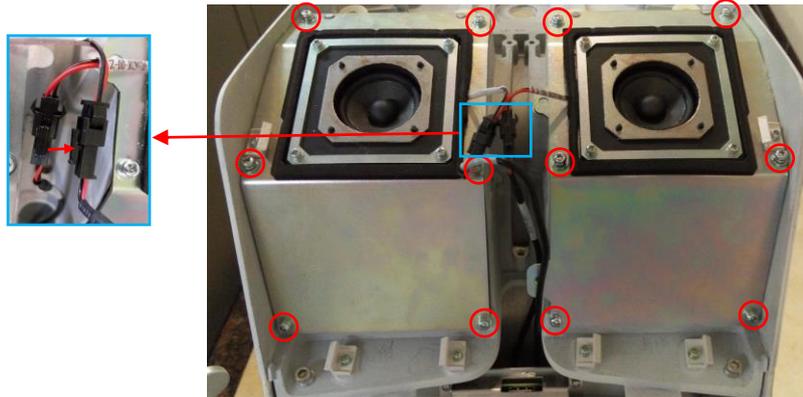
Speaker cover assembly

9.3.10 Left/Right Speaker Assembly

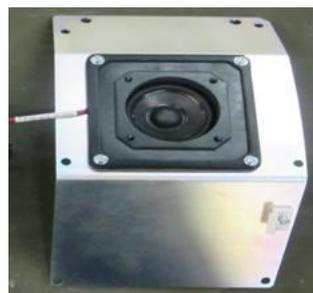
The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.6 Control Panel Assembly, 9.3.8 Touch Screen Assembly, and 9.3.9 Speaker Cover Assembly for details.
2. Press the clip towards the arrow's direction. Pull the power supply cables of the left/right speaker out. Unscrew 12 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove the left/right speaker assembly (FRU).

Note: Install the absorbing cotton insulation appropriately.



Left speaker assembly (FRU)

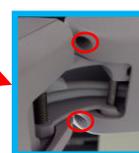


Right speaker assembly (FRU)

9.3.11 Upper/Lower Support Arm Cover

The disassembly tool: cross-headed screwdriver (M3, M4).

1. Unscrew 4 M3 X 8 cross panhead screws from the support arm cover with the screwdriver (M3, M4) to remove the upper and lower support arm cover (2116).



2. Unscrew 4 M3 X 8 cross panhead screws from the support arm cover with the screwdriver (M3, M4) to remove the upper and lower support arm cover (2116).

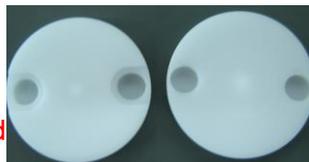
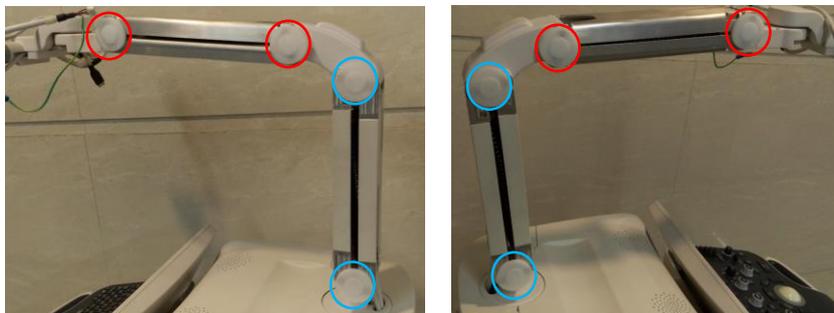


9.3.12 Support Arm Assembly

Disassembly Tools Required: Inner hexagon spanner

1. See *Chapter 9.3.11, 9.3.5, 9.3.6, 9.3.8, 9.3.9 and 9.3.10* for details.
2. Remove 4 pads for upper support arm cover (red circle) and 4 pads for lower support arm cover (blue circle).

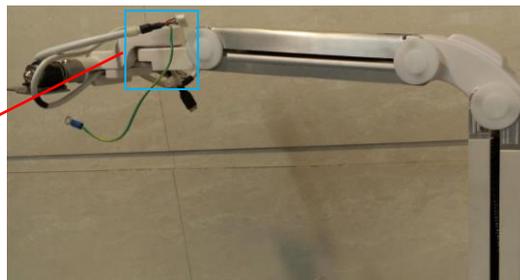
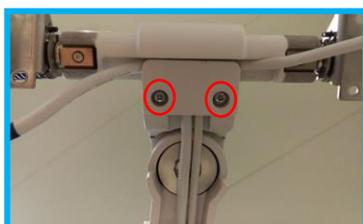
Note: The fixing pad for upper support cover is different from these on the lower support arm. Do not mix them up when installing anticlockwise.



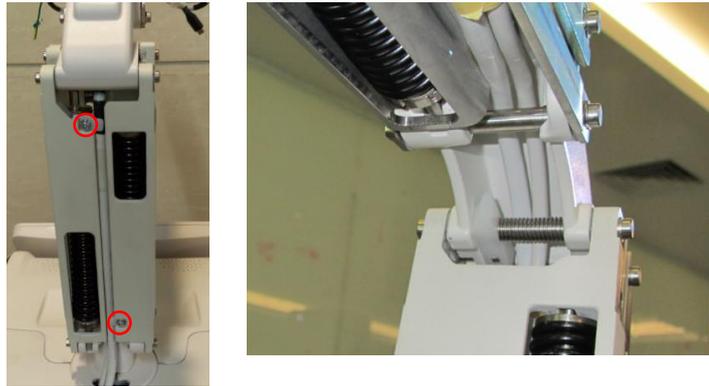
Upper support cover pad

Lower support cover pad

3. Unscrew 2 M4 X 12 panhead screws from fixing block with the screwdriver (M3, M4) to remove the wire fixing block.



4. Unscrew 2 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove the 2 fixing metals, and then remove the wire.



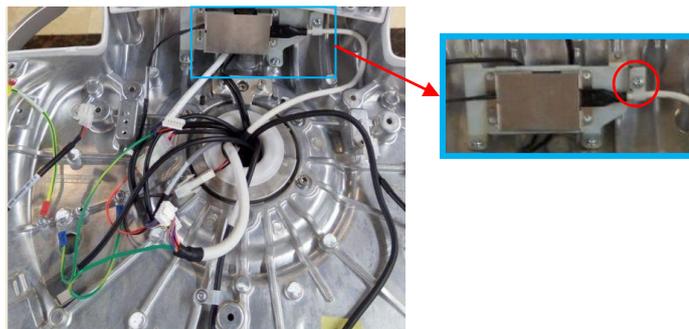
5. Unscrew 1 M10 X 25 round inner head from the base of the control panel with M8 inner hexagon spanner (with external teeth lock washer 10). Pull the support arm assembly upwards when removing the support arm spanner (FRU).



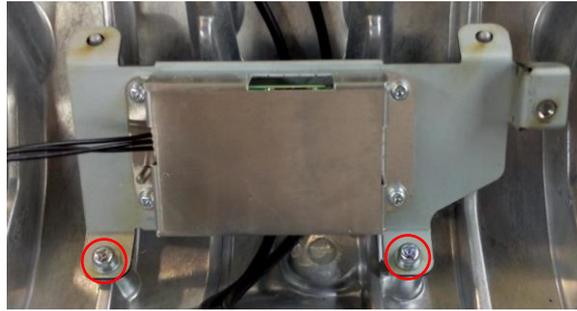
Support arm assembly (FRU)

9.3.13 LCD Signal Connector PCBA assembly

1. Refer to 9.3.6 Control Panel Assembly for details.
2. Unscrew M4 X 12 cross panhead screw on UC-0.5 lock knob with screwdriver (M3, M4) to remove the signal cable of the monitor.



3. Unscrew 2 M4 X12 cross panhead screws with screwdriver (M3, M4) to remove the LCD signal connector PCBA assembly.



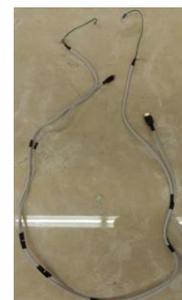
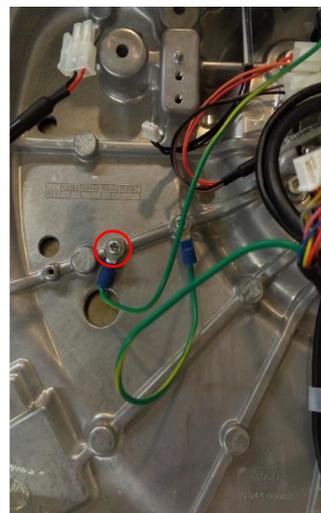
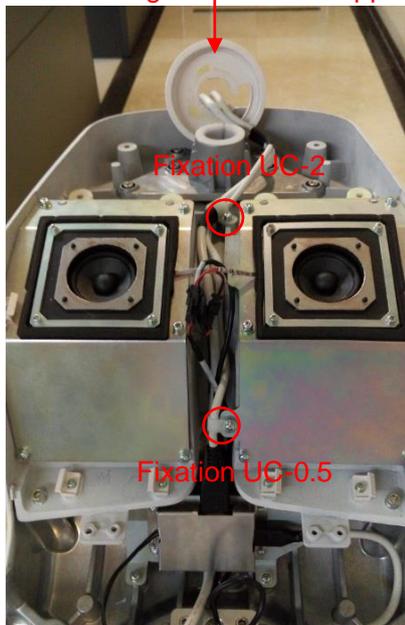
LCD signal connector PCBA assembly

9.3.14 Support Arm Spanner/Bale of Wire for the Monitor/Side Control Panel Base/Base Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M3, M5).

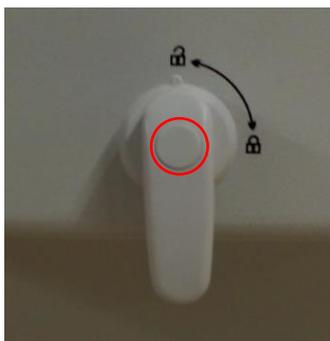
1. See *Chapter 9.3.6, 9.3.8, 9.3.9, 9.3.10 and 9.3.12* for details.
2. Unscrew M4 X 12 cross panhead screw on UC-0.5 lock knob and UC-2 lock knob with screwdriver (M3, M4), and unscrew one M4 X 12 cross panhead screw from the grounding terminal of the monitor to remove the monitor cable and the rotating cap of the support arm.

Rotating cover of the support arm



Bale of wire for the monitor

3. Rotate the support arm spanner clockwise to remove the pad of the support arm spanner.



4. Unscrew M3 inner hexagon screws with M3 spanner to remove the support arm spanner.



5. Unscrew 2 M4 X 12 cross panhead screws from the base of the control panel with cross-headed screwdriver (M3, M4) to remove the cover of the side board.



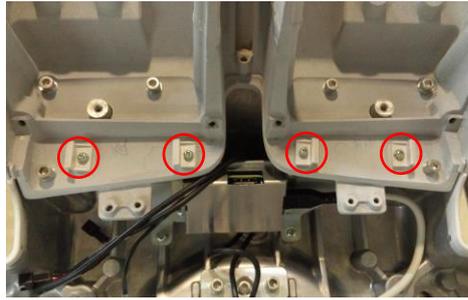
6. Remove the absorbing cotton insulation.

Note: Do not tilt or block the screw holes when installing the absorbing cotton insulation anticlockwise.

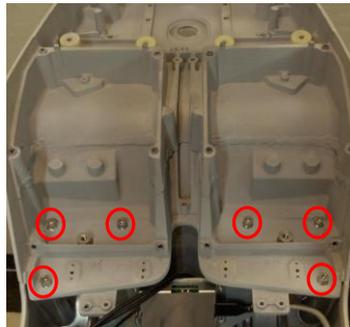


7. Unscrew 4 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove 4 clips.

Note: Be aware of the orientation of the clip. Align the locating pin of the clip with the locating hole of the control panel base when performing the installation.

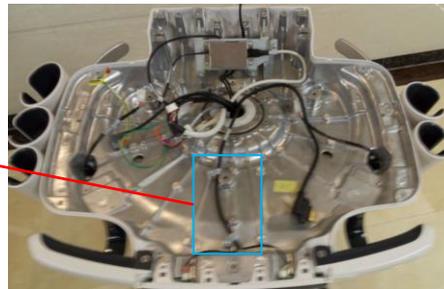
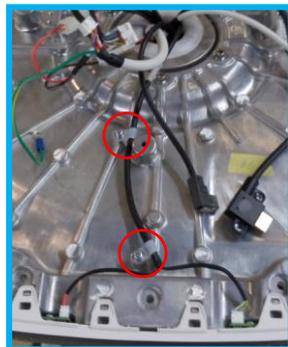


8. Unscrew 6 M5 X 16 round inner head screw (with the pad) by M5 spanner to remove the base of the side control panel upwards.



9. Unscrew 2 M4 X 12 cross panhead screws on UC-0.5 lock knob with screwdriver (M3, M4) to remove the wires.

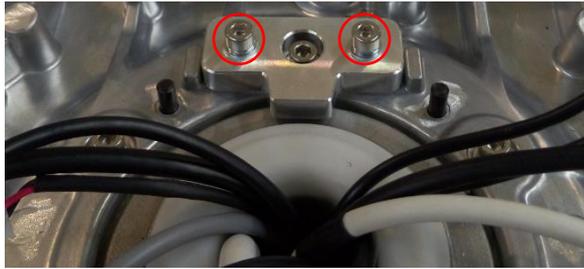
Note: The orientation and the position of the fixing clip should keep same with these in the following figure.



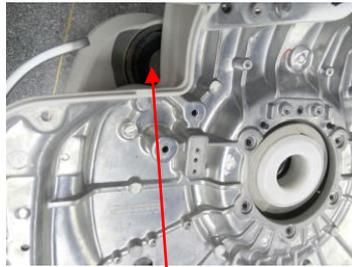
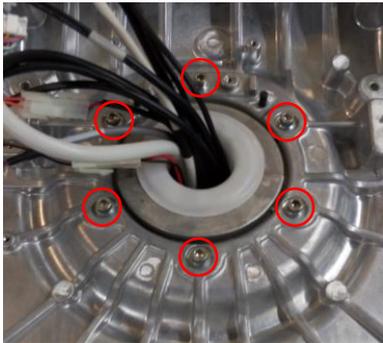
10. Unscrew 4 M4 X12 cross panhead screws with screwdriver (M3, M4) to remove the connection wires of the coupling gel heating cup.



11. Unscrew 2 M5 X 16 round inner head screw (with the pad) from the stop block by M5 spanner.



12. Unscrew six M5 X 16 round inner head screws from the keyboard base with the M6 inner hexagon spanner. Rotate the base assembly anticlockwise until exposing the electrical magnet (electromagnet 120 kgf) (separating the electromagnet), and the lift base assembly straight (FRU).



Electrical magnet



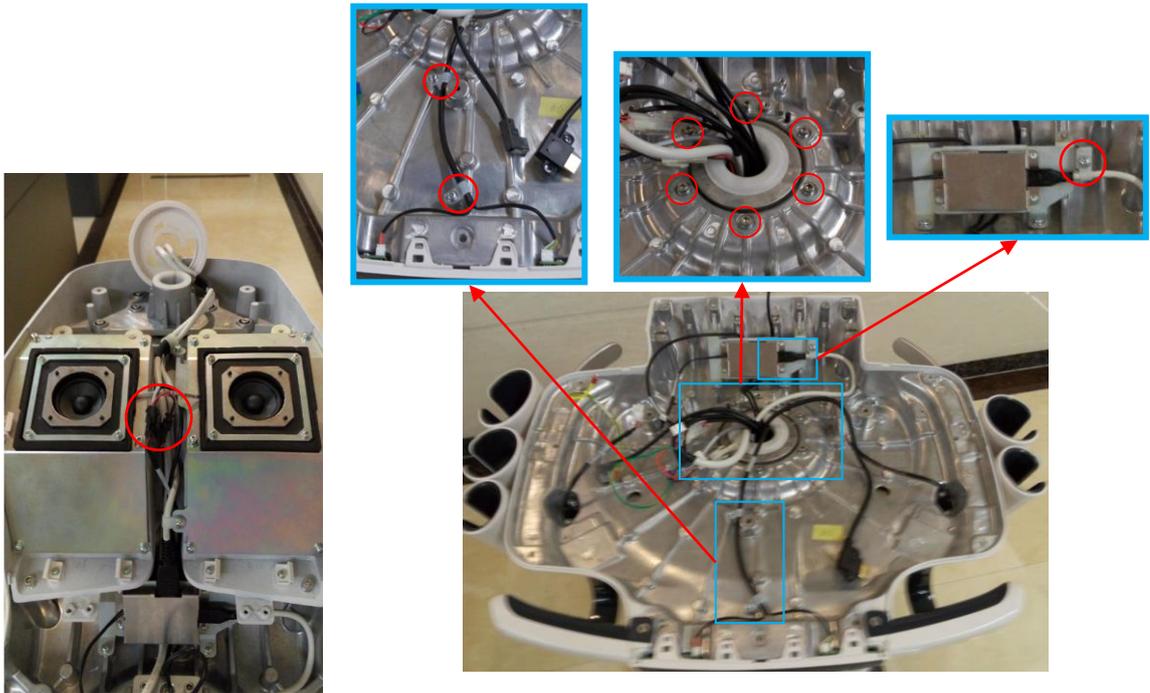
Base assembly (FRU)

9.3.15 Control Panel Moving Mechanism Assembly

Note: the ultrasound system can be disassembled only for the system equipped with the moving mechanism.

The disassembly tool: cross-headed screwdriver (M3, M4), flat-headed screwdriver, inner hex spanner (M3, M5).

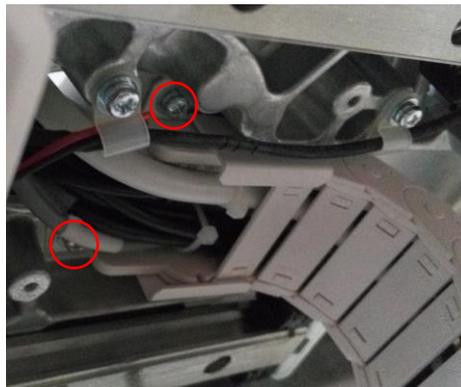
1. See *Chapter 9.3.6, 9.3.8 and 9.3.9* for details.
2. Unscrew the screws in the following figures, and unplug the cables. See *Chapter 9.3.13* for details.



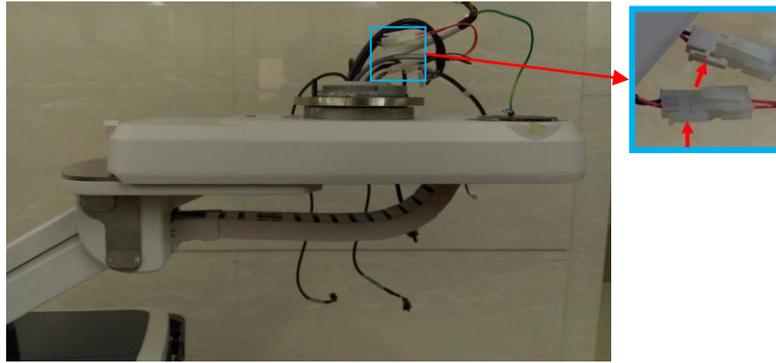
3. Unscrew 4 M4 X 12 cross panhead screws on both left and right side with screwdriver (M3, M4) to remove the cover of the support arm.



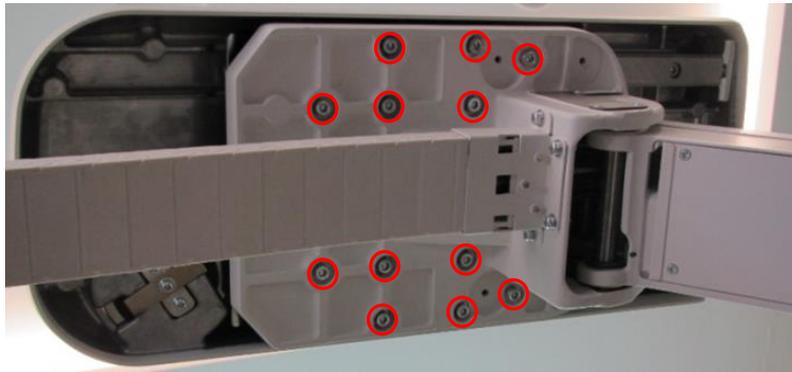
4. Unscrew 2 M4 X 12 cross panhead screws on drag chain holder-1 with screwdriver (M3, M4) to pull the wires out.



5. Press the clip towards the arrow's direction to disconnect the connectors of the electromagnets.



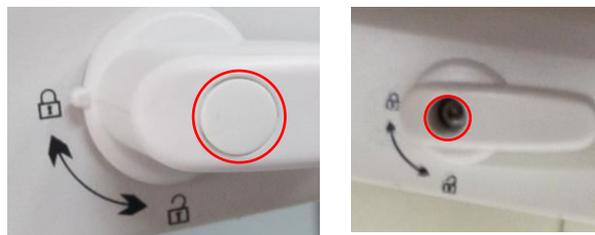
6. Unscrew 12 M5 X 12 round inner head screw (with the pad) from the support arm's cover with M5 inner hexagon spanner to remove the moving assembly of the control panel.



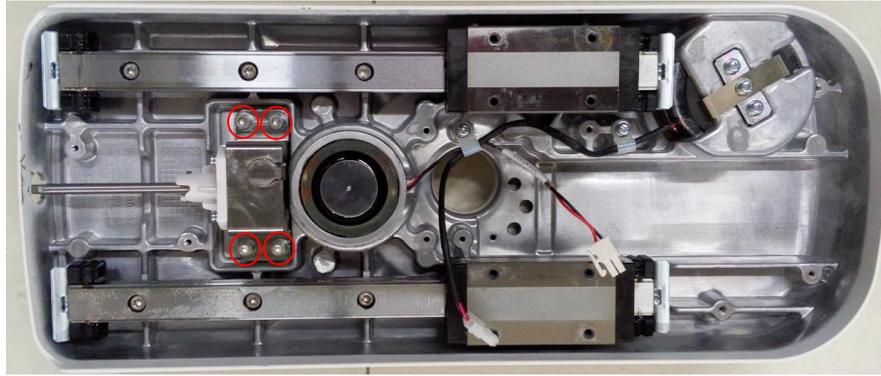
Control panel moving mechanism assembly (FRU)

9.3.15.1 Double Sided Mechanism Lock Assembly

1. Refer to *Chapter 9.3.15* for details.
2. Remove the screw pad. Unscrew 1 M3 x 10 stainless round inner head screw from the support arm lock with M3 inner hexagon spanner to remove the support arm lock.



3. Unscrew 4 M5 X 16 stainless steel round inner head screws from the double sided mechanism lock assembly with M5 inner hexagon spanner to remove the double sided mechanism lock assembly.



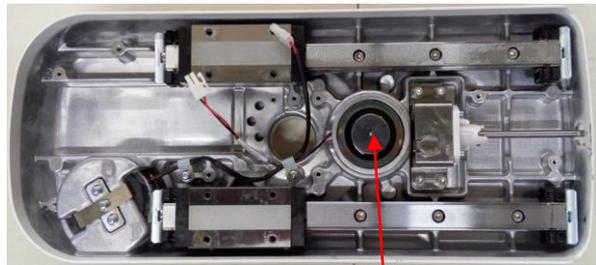
Double sided mechanism lock assembly

9.3.15.2 Electrical Magnet

1. Refer to *Chapter 9.3.15* for details.
2. Split the bracket of the moving assembly from the Electromagnet 75 kgf.



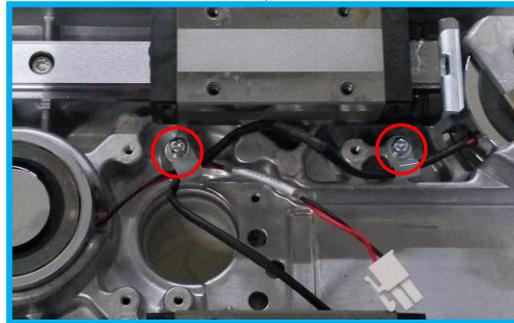
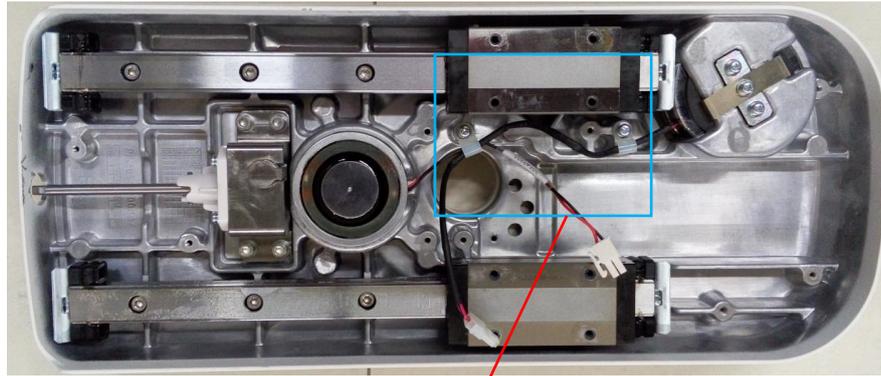
Shift lower bracket of the moving mechanism



Electromagnet 75 kgf

3. Unscrew 2 M4 X 12 cross panhead screws on UC-0.5 lock knob with screwdriver (M3, M4) to remove the UC-0.5 from the wires.

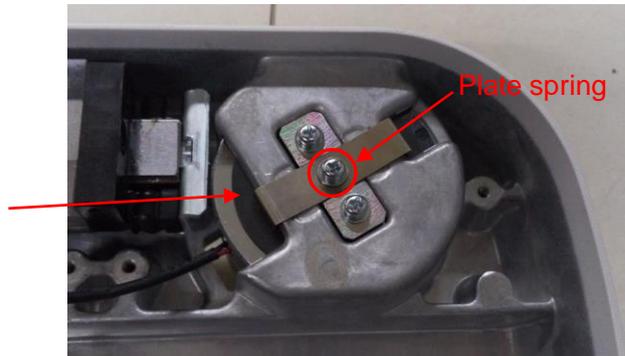
Note: Ensure the lock knob orientation is correct when installing in reverse.



4. Unscrew 1 M4 X 12 cross panhead screw with the screwdriver (M3, M4) to remove the 120 kgf magnetic navigation plate.

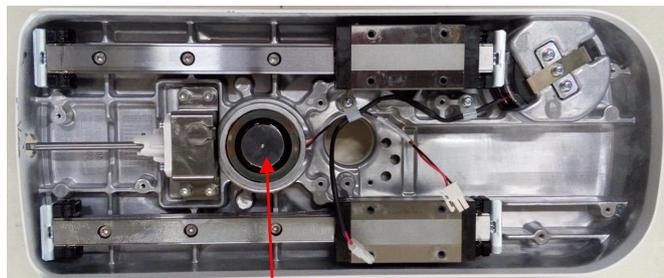
Note: The plate spring should face the magnet when installing the electrical magnet.

Electromagnet
120kgf



5. Unscrew 1 M4 X 12 cross panhead screw with the screwdriver (M3, M4) to remove the 75 kgf magnetic navigation plate.

Note: The plate spring should face the magnet when installing the electrical magnet.



Electromagnet 75 kgf

9.3.16 Main Unit Rear Cover Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

3. Push the inner hexagon spanner towards the arrow's direction to pull it out.

Note: Do not pull out the inner hexagon spanner directly because of the strength.



4. Unscrew 2 screw pads B and 2 screw pads C from the main unit back cover. Unscrew 4 M4 X 12 cross panhead screws from the back cover of the main unit with the screwdriver (M3, M4) to remove the back cover gently (FRU).



Main unit back cover assembly (FRU)

9.3.17 Main Unit Left Cover Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16 for details.
2. Unscrew 3 M4 X 12 cross panhead screws on the left cover with screwdriver (M3, M4) to remove the left cover of the main unit.

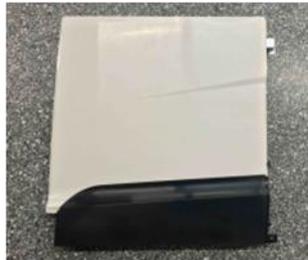
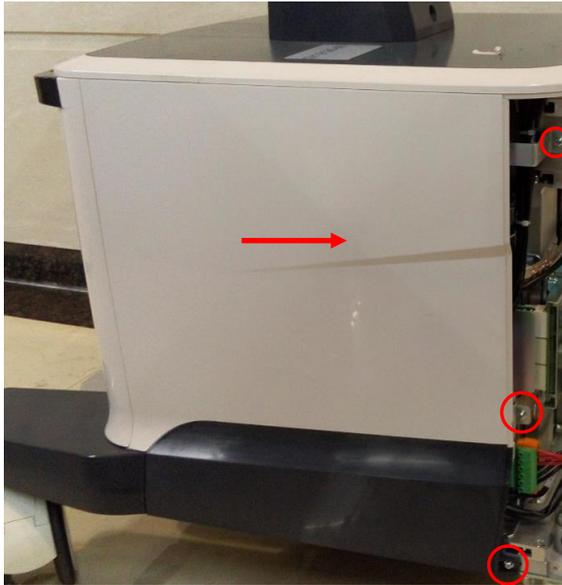


Main unit left cover assembly

9.3.18 Main Unit Right Cover Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16 for details.
2. Unscrew 3 M4 X 12 cross panhead screws on the right cover with screwdriver (M3, M4) to remove the right cover of the main unit.

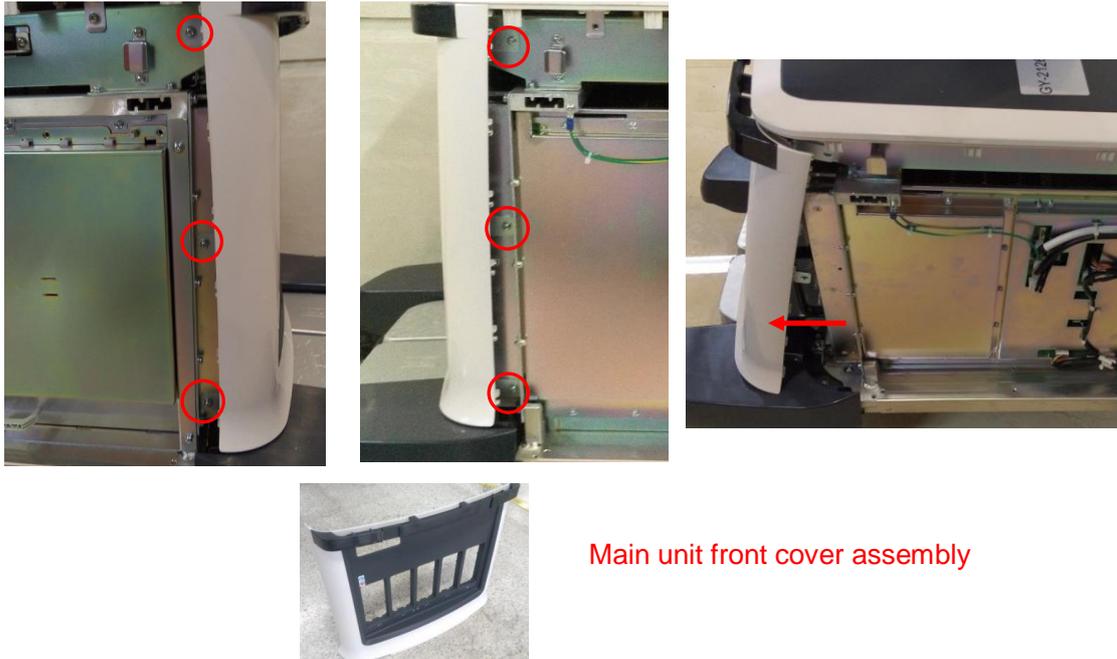


Main unit right cover assembly

9.3.19 Main Unit Front-top Cover Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.17 and 9.3.18 for details.
2. Unscrew 6 M4 X 12 cross panhead screws with the screwdriver (M3, M4) to remove the front cover of the main unit (do not scratch the right/left brake-pedal).



Main unit front cover assembly

9.3.20 Turbine Cover

The disassembly tool: cross-headed screwdriver (M3, M4).

Unscrew 1 M4 X12 cross panhead screwdriver with the screwdriver (M3, M4) to lift the turbine cover up towards the arrow in the figure 2, and then remove the turbine cover towards the arrow in figure 3.



Figure 1



Figure 2



Figure 3



Turbine cover

9.3.21 Turbine Protective Shell Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.20 *Turbine Cover* for details.
2. Unscrew 2 M4 X 12 cross panhead screws on both left and right side with screwdriver (M3, M4) to remove it.



3. Open the pivot of the turbine cover towards the arrow's direction in figure 1; pull the turbine cover inside towards the arrow's direction in figure 2; remove the turbine cover towards the arrow's direction in figure 3.



Figure 1



Figure 2



Figure 3

4. Open the pivot of the turbine cover towards the arrow's direction gently. The stand column of the turbine cover falls off. Then, remove the turbine cover (FRU).



Lift column

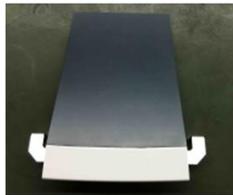


Turbine cover assembly (FRU)

9.3.22 Main Unit Top Cover/Main Unit Top Cover Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16, 9.3.17, 9.3.18, 9.3.19 and 9.3.20 for details.
2. Unscrew 2 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove the front cover of the main unit.

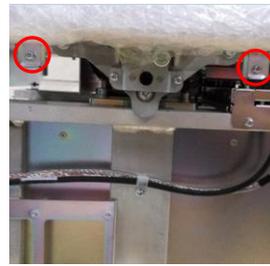


Front cover assembly of the main unit

3. Unscrew 8 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove the upper front cover of the main unit.



Front



Back



Left



Right

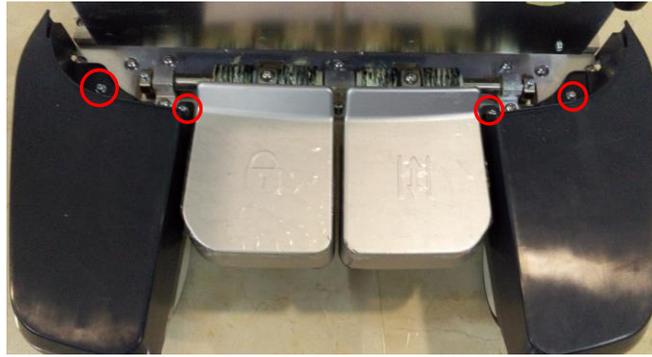


Top cover assembly of the main unit

9.3.23 Right/Left Brake Pedal

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.19 for details.
2. Unscrew 4 M4 X 12 cross panhead screws with cross-headed screwdriver (M3, M4).



Left pedal



Right pedal

9.3.24 Machine Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), anti-electrostatic glove

9.3.24.1 TR64 PCBA

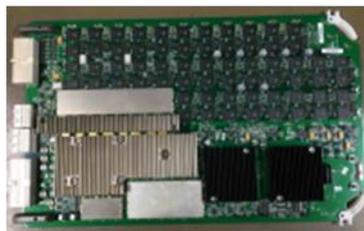
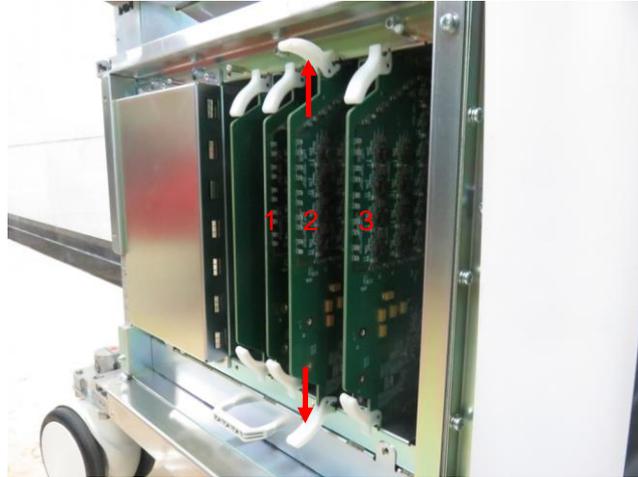
1. See 9.3.16, 9.3.17 for details.
2. Unscrew 6 M4 X 12 cross panhead screws with cross-headed screwdriver (M3, M4) to remove the shield cover of the machine.



3. Wear the anti-electrostatic glove. After opening the clips for 3 TR boards, TR 64 board PCBA can be removed if it has been out of slot. (If TR 64 board still has CW assembly, the method for installing/disassembling CW assembly can be found at step 2 in 9.3.24.2 CW Assembly).

Note: Installing in reverse:

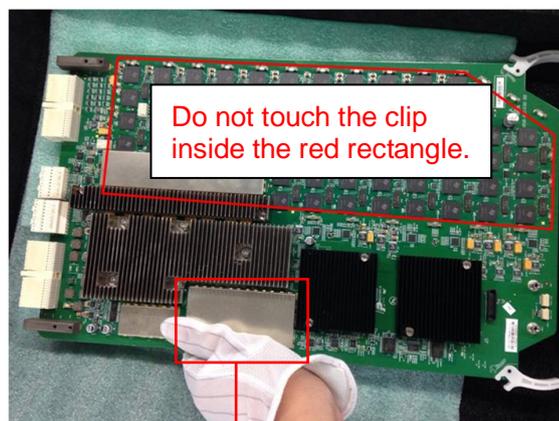
- If machine only contains one CW assembly, only the middle one (position 2) of three TR64 boards can be installed with CW Assembly.
- Three TR64 boards are exactly same. If machine is equipped with three CW board, the order of the installment is not enforced,
- Close the clips for TR64 boards.



TR64 board PCBA (FRU)

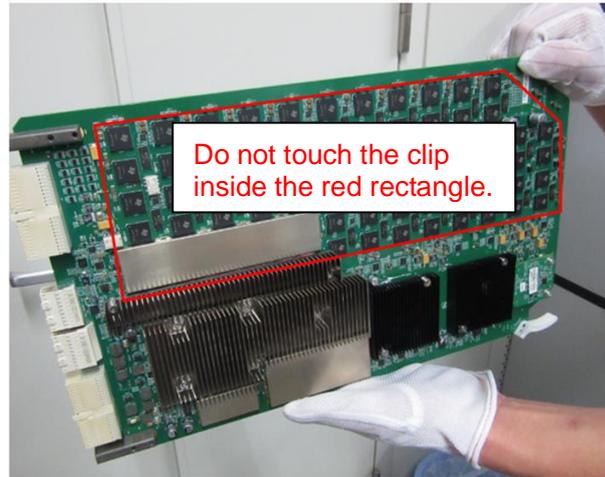
■ Notes for TR64 board assembly/disassembly:

- a) Hold the radiator shield cover and lift the board up. See the figure below.

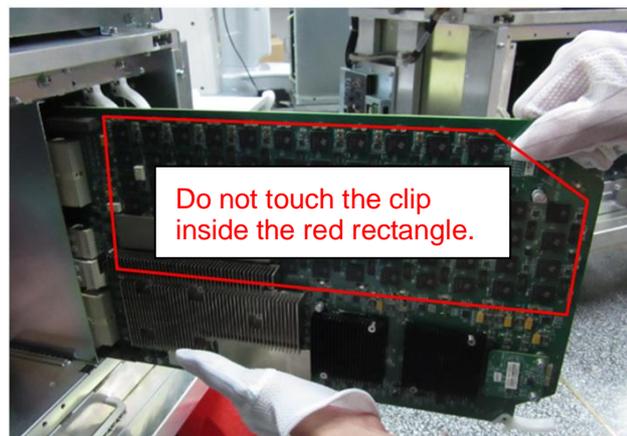


Radiator shield cover

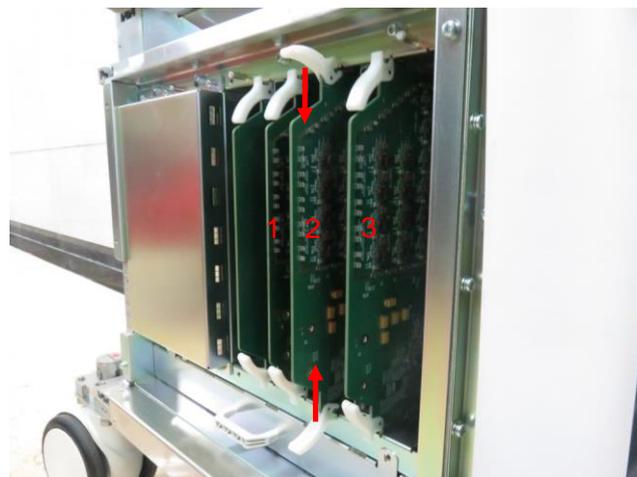
- b) Hold the board bottom on one hand, and hold the board clip on the other hand. See the figure below.



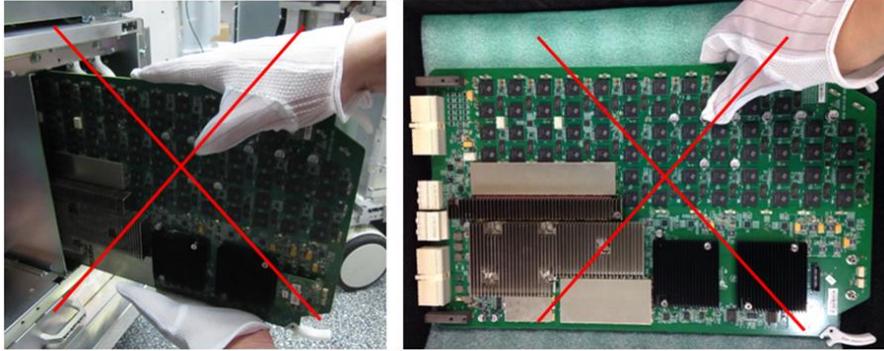
c) Insert the board into the system. See the figure below.



d) Push the clips of the TR64 board to tighten the TR64 board.

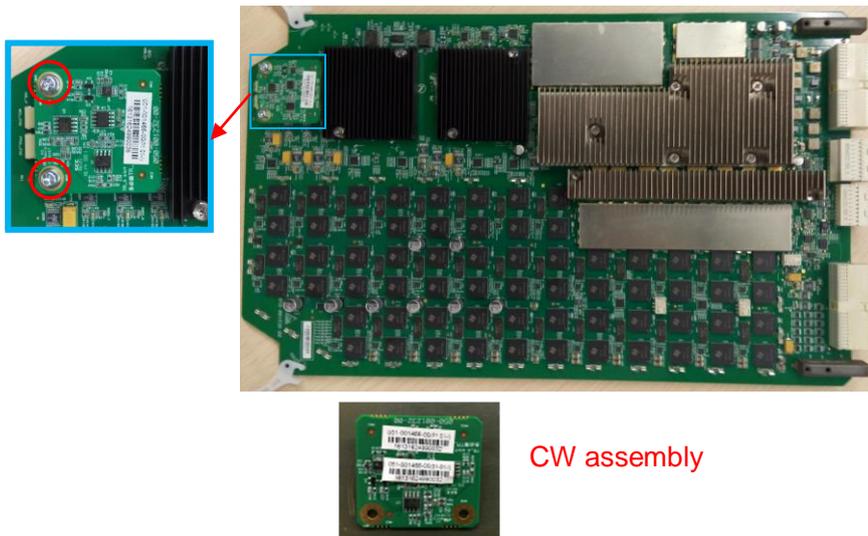


➤ Incorrect demonstration of TR64 board:



9.3.24.2 CW Assembly

1. See 9.3.24.1 TR 64 PCBA for details.
2. Unscrew 2 M3 X 8 cross panhead screws from the CW assembly (if machine only contains one CW assembly, only the second TR board is equipped with CW board; If machine has three CW assemblies, CW assembly should be removed from every TR64 board.) with the screwdriver (M3, M4) to remove the CW assembly.

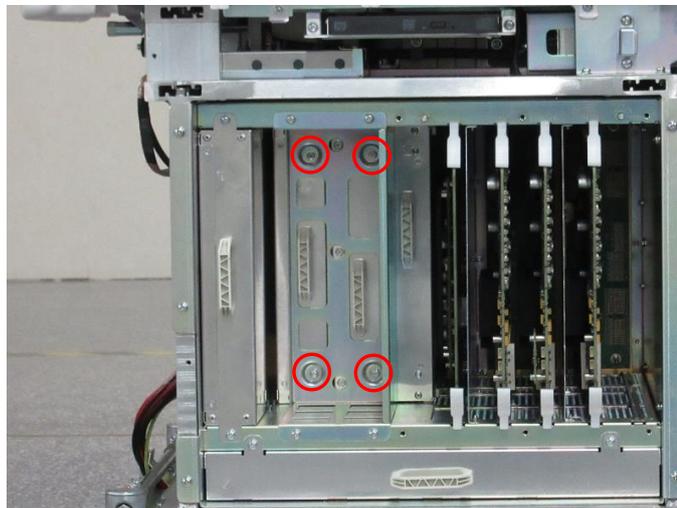


9.3.24.3 Engine Board PCBA

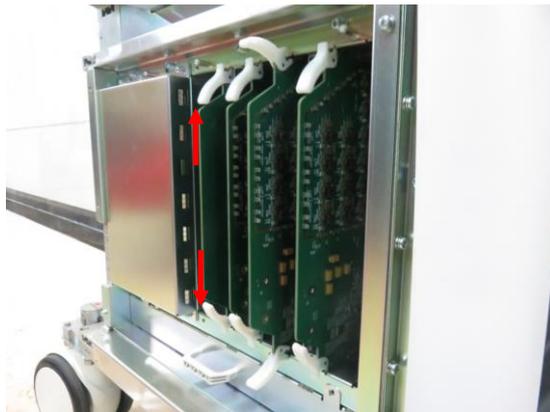
1. See Chapter 9.3.16 Main Unit Rear Cover Assembly and 9.3.17 Main Unit Left Cover Assembly for details.
2. Unscrew 12 M4 X 12 cross panhead screws to remove two shield cover of the machine.



3. Unscrew 4 M4 X 12 cross panhead screws to remove PC box.



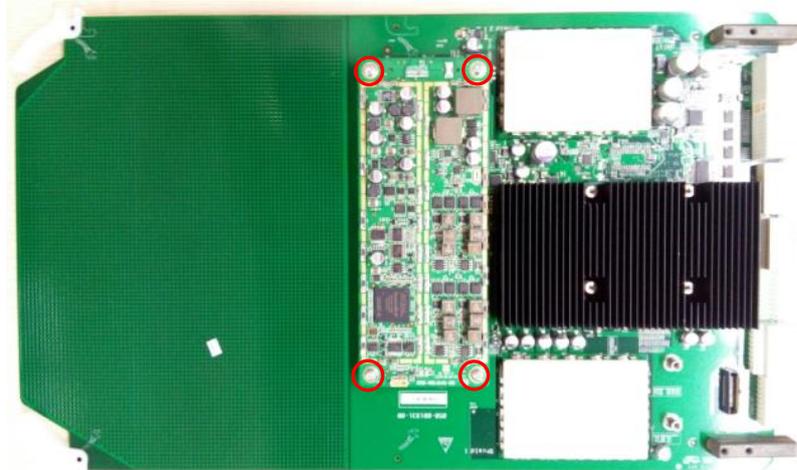
4. Open the clip to remove the engine board PCBA. See *Chapter 9.3.24.1* for details.



Engine board PCBA

9.3.24.4 4D Module

1. See 9.3.24.3 *Engine Board PCBA* for details.
2. Unscrew 4 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove 4D assembly.



4D Module

9.3.24.5 Inlet Fan Assembly

1. See 9.3.16, 9.3.17 for details.
2. Unscrew 2 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove 4D assembly to remove the inlet fan assembly.

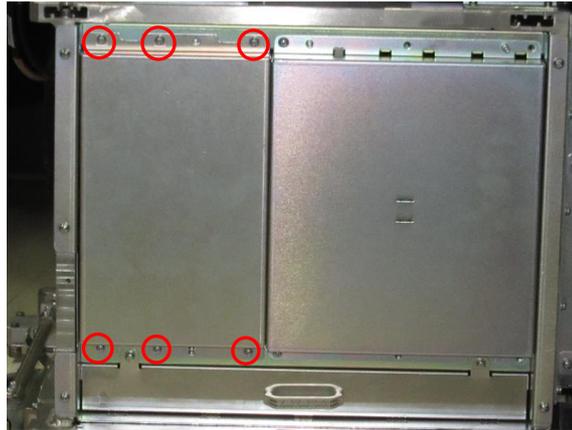


Inlet fan assembly (FRU)

9.3.24.6 PHV/PC/DC Box Assembly

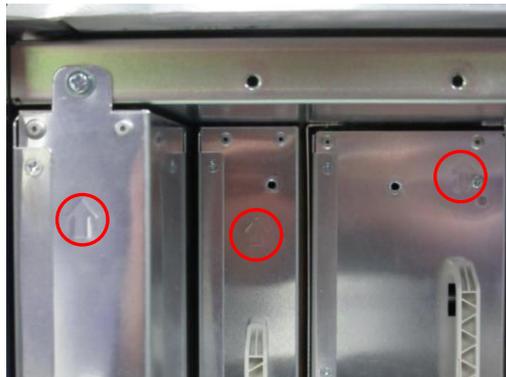
The disassembly tool: cross-headed screwdriver (M3, M4).

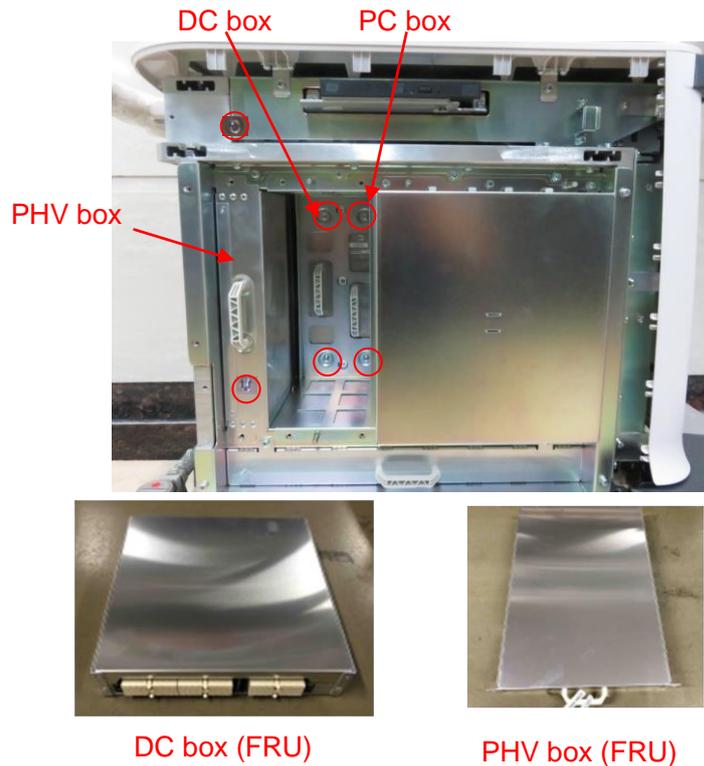
1. See 9.3.16, 9.3.17 for details.
2. Unscrew 6 M4 X 12 cross panhead screws from the left shield cover with cross-headed screwdriver (M3, M4) to remove the left shield cover.



3. Unscrew two small pan-head screws (M4*12) from PHV box assembly with the screwdriver (M3, M4) to pull the PHV box assembly out (FRU). Unscrew four small pan-head screws (M4*12) from chassis plate to remove it. Then, pull the DC box assembly (FRU).

- Note:**
- In case of the distortion of the pin, pull DC box assembly and PHV box assembly out without shaking.
 - The arrow should face upwards when installing.





9.3.25 PC Main Board Assembly

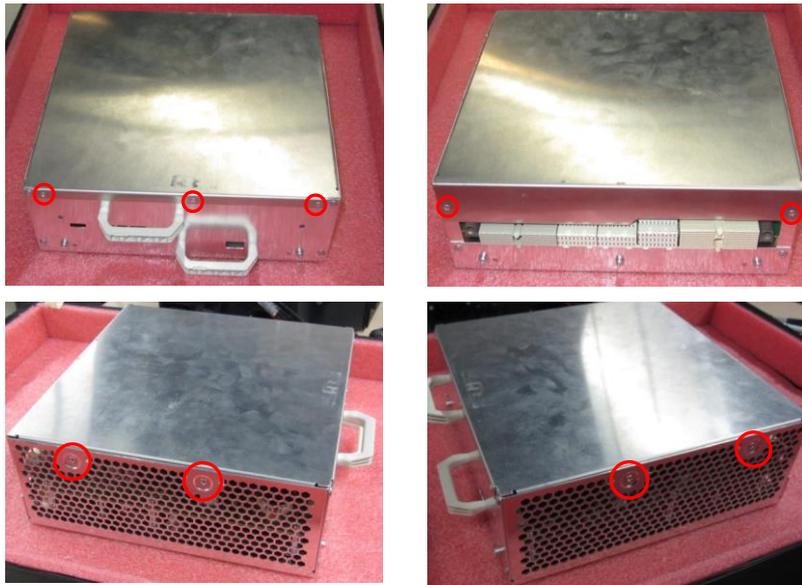
The disassembly tool: cross-headed screwdriver (M2, M3, M4), diagonal cutting pliers.

1. Remove PC box assembly, see 9.3.24.3 *Engine Board PCBA Assembly* for details.

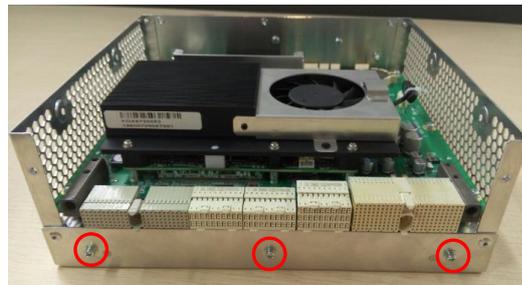
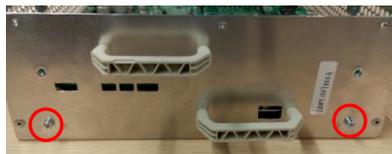
- Note:**
- In case of the distortion of the pin, pull PC box assembly out without shaking.
 - The arrow should face upwards when installing.



2. Unscrew 9 M3 X 8 cross sunk head screws with screwdriver (M3, M4) to remove PC box assembly.



3. Unscrew 5 M3 X 8 cross panhead screws from PC box assembly with the screwdriver (M3, M4) to remove PC main board assembly.



9.3.25.1 Button Battery

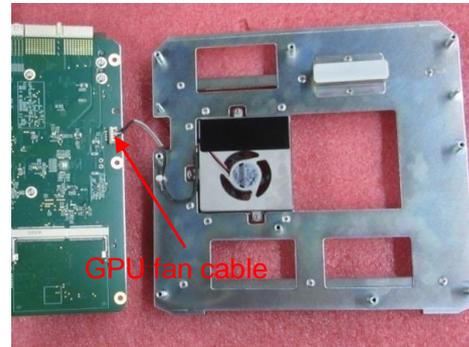
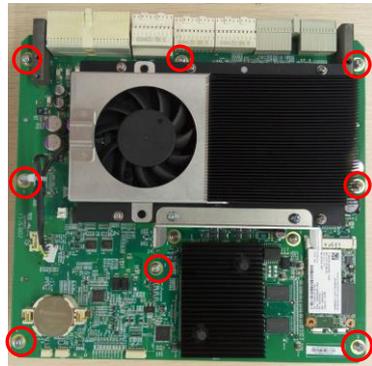
1. See *Chapter 9.3.24.6 and 9.3.25* for details.
2. Take the button battery out (Lithium 3V 620mAh CR2450).



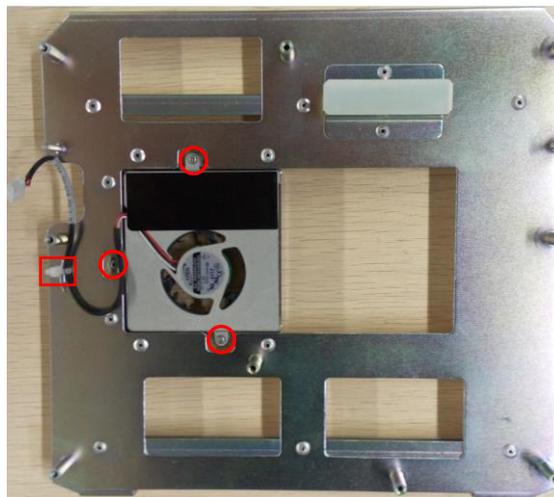
Button battery Lithium 3V 620mAh CR2450

9.3.25.2 GPU Fan

1. See *Chapter 9.3.25* for details
2. Unscrew 8 M3 X 8 cross panhead screws from PC main unit assembly with screwdriver (M3, M4) to remove GPU fan assembly (equipped with the digital board).



3. Cut the cable tie CHS-3X100 with diagonal cutting pliers. Unscrew 3 M2 X 4 cross panhead screws from GPU fan with M2 screwdriver to remove GPU fan (FAN 12V 7.5CFM 34dB 70*67*12mm) from the metal of the digital board.

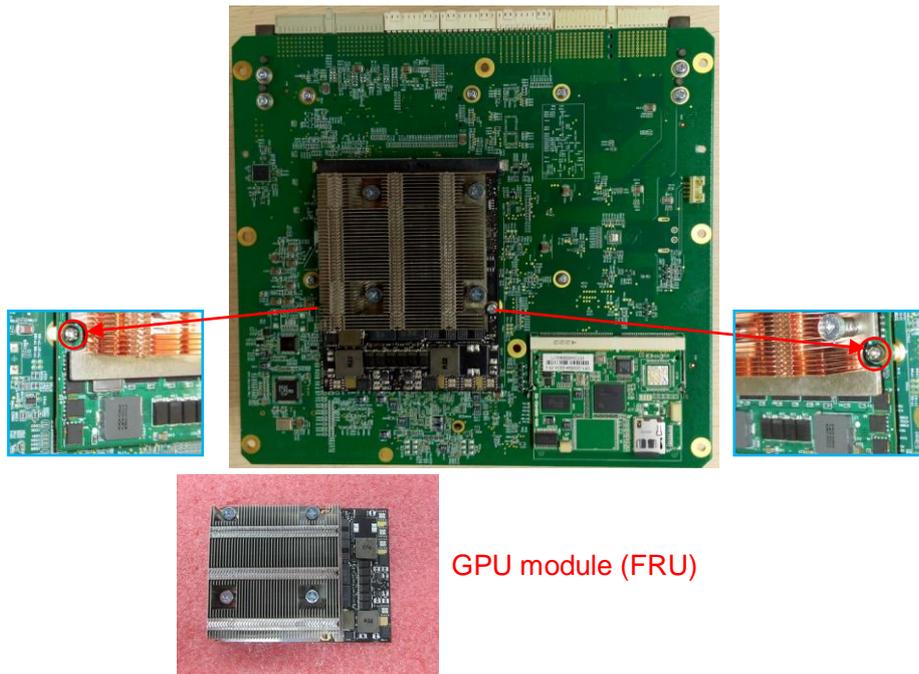


FAN 12V 7.5CFM 34dB 70*67*12mm

9.3.25.3 GPU Module

1. See *Chapter 9.3.25.2* for details.
2. Turn PC main board assembly. Unscrew 2 cross panhead screws GB/T818-2000 M3X6 color-zinc plated from GPU board assembly with the screwdriver (M3, M4) to remove GPU board assembly (FRU).

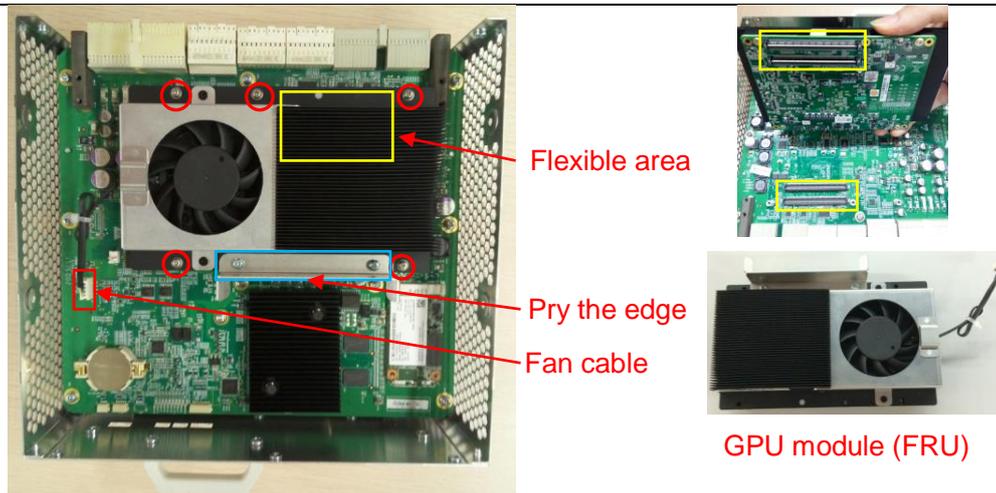
Note: All cross panhead screws should be installed without the pads in case of the damage to the electrodes around the screws when installing in reverse.



9.3.25.4 CPU Module

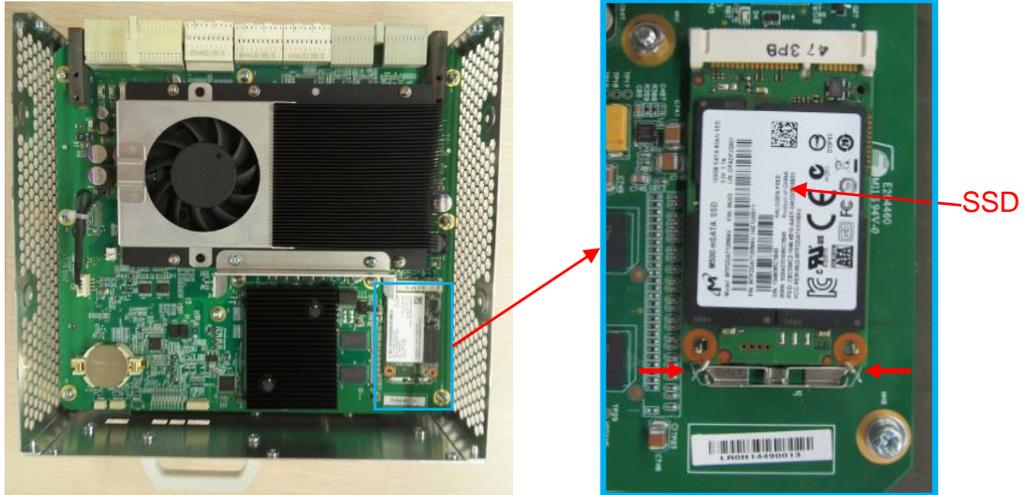
1. See *Chapter 9.3.25* for details.
2. Unplug fan cable. Unscrew 5 M2.5 X 20 cross panhead screws with screwdriver (M3, M4) to remove CPU module. Pull the fan cable of the CPU module (FRU) from PC main board assembly.

Note: Pry the edge where the metal is in the CPU assembly as shown in the figure. Lift it upward after one socket becomes loosen. Align the pin with the socket, and the screw holes when installing reversely. Press the yellow square to plug the CPU assembly into the slot.



9.3.25.5 SSD

1. See *Chapter 9.3.25* for details.
2. Press the clip to remove the SSD towards the arrow' direction.



9.3.25.6 PC Carrier Board

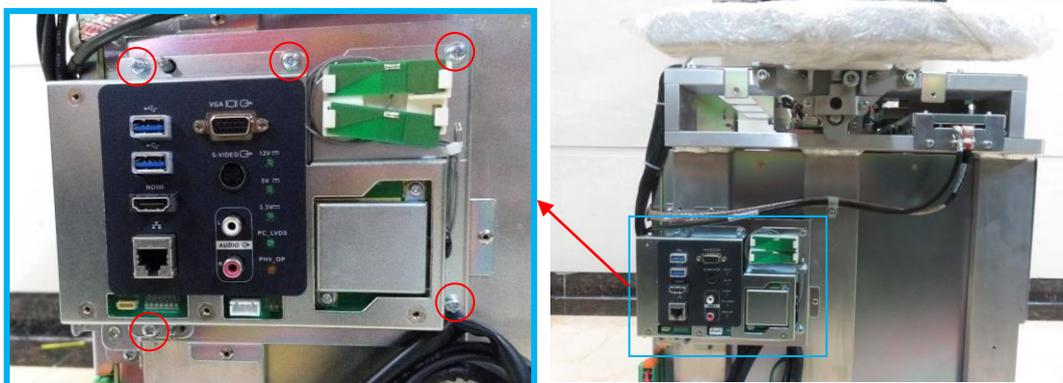
1. See *Chapter 9.3.25, 9.3.25.2, 9.3.25.3, 9.3.25.4 and 9.3.25.6* for details.
2. The rest (including button battery) is PC carrier board (FRU)



PC carrier board (FRU)

9.3.26 Wireless Net Adapter

1. See *9.3.16* for details.
2. Unscrew 2 M3 X 8 cross panhead screws from the shield cover of the wireless net adaptor with the screwdriver (M3, M4) to remove the shield cover.



3. Unplug 2 cable connectors from the wireless net adaptor.



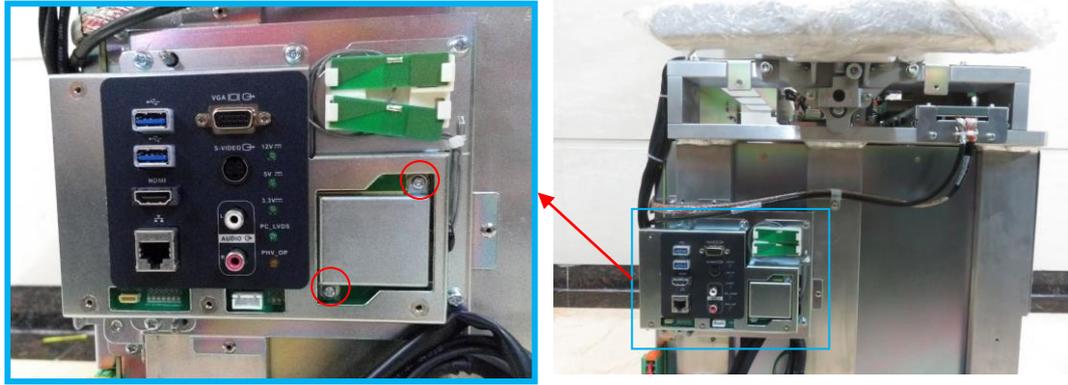
4. Open the clip of the wireless net adaptor. The adaptor goes upwards 45°. Then remove the adaptor.



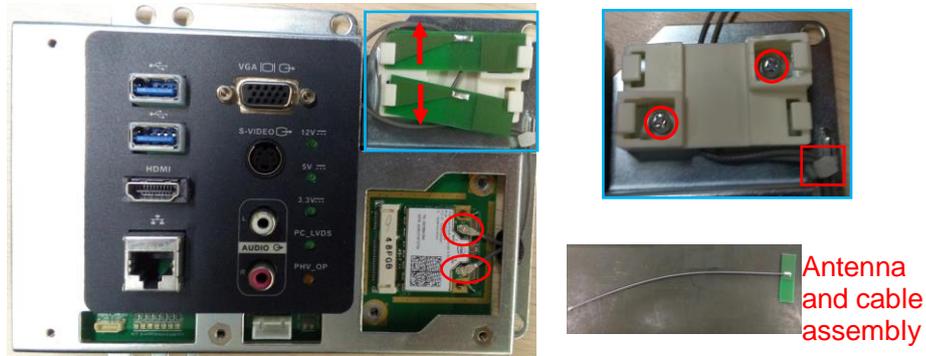
Wireless adaptor

9.3.27 Antenna and Cable Assembly

1. See *Chapter 9.3.26* for details.
2. Unscrew two small panhead screws (M3*8) from wireless network adaptor cover to remove it.
3. Push the antenna cable board out towards the arrow's direction. Cut the tie cable CHS-3X100mm with diagonal cutting pliers. Unscrew 2 M3 X8 cross panhead screws with the screwdriver (M3, M4) to remove the bracket of the antenna and cable.



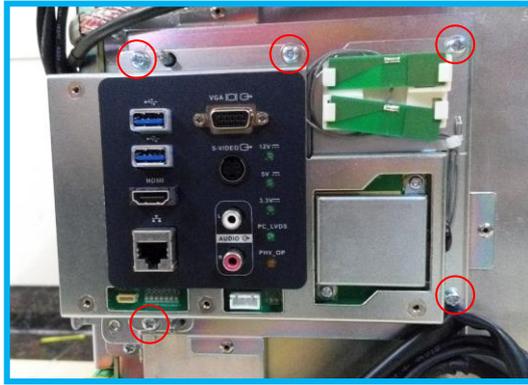
4. Push the antenna board towards arrow's direction. Unplug 2 cable plugs from the wireless network adaptor. Cut the tie cable CHS-3X100mm with diagonal cutting pliers. Unscrew 2 M3 X8 cross panhead screws with the screwdriver (M3, M4) to remove the bracket of the antenna and cable. Pull the antenna and cables from the $\phi 6.4$ ring (FRU).



9.3.28 IO Assembly

1. See *Chapter 9.3.16*, *Chapter 9.3.26* and *Chapter 9.3.27* for details.
2. Unscrew 5 M4 X 12 cross panhead screws from IO assembly with the screwdriver (M3, M4) to pull the IO assembly out of the main board slot (FRU).

NOTE: Avoid applying pressure to the cable hidden behind the IO assembly when installing IO assembly.

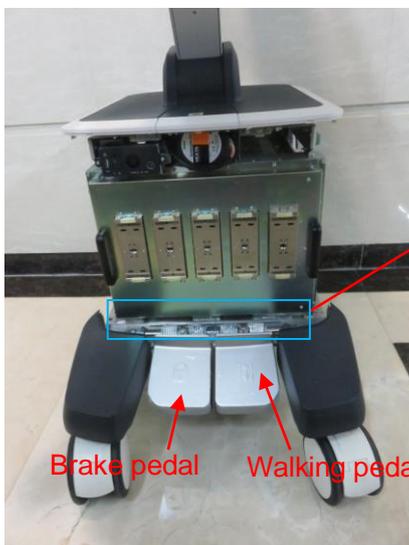


IO international (FRU)

9.3.29 Probe Board Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.19 for details.
2. Step on the brake pedal and the walking pedal. Unscrew 2 M4 X12 cross panhead screws with the screwdriver (M3, M4) to remove the protective board.



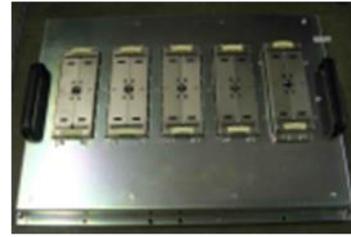
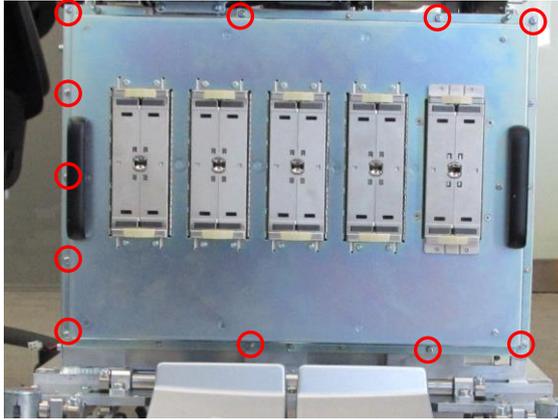
Brake pedal Walking pedal



Protective board



3. Unscrew 11 M4 X12 cross panhead screws with the screwdriver (M3, M4) and pull the probe board assembly (FRU).

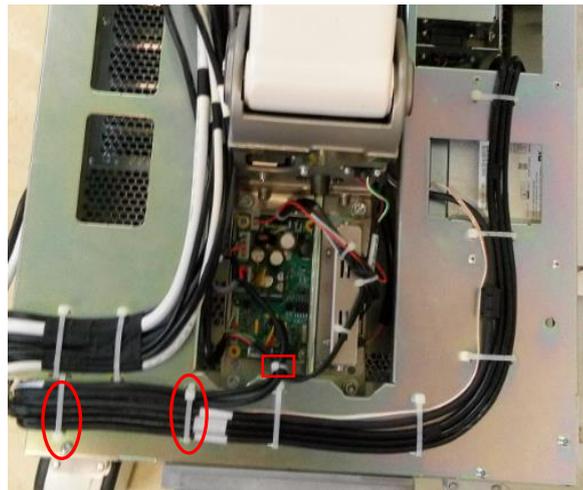


Probe board assembly (FRU)

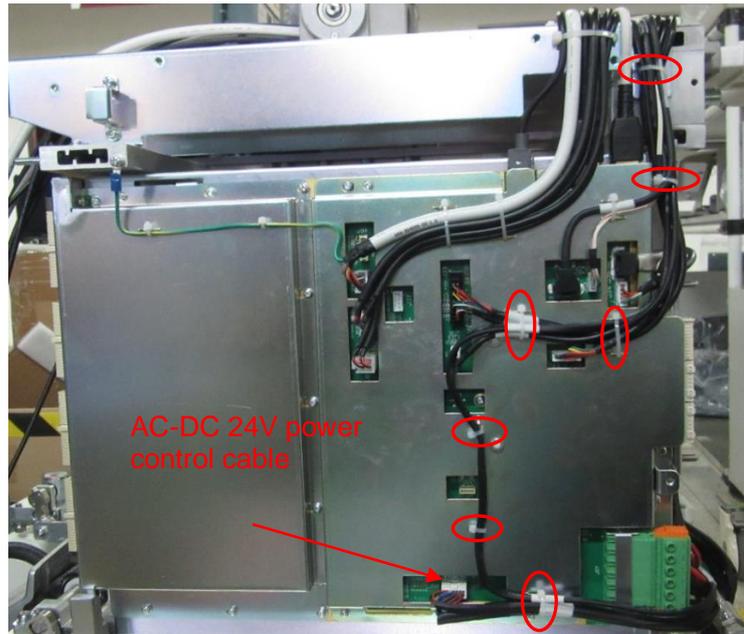
9.3.30 Electronics Assembly on the Base

The disassembly tool: cross-headed screwdriver (M3, M4), inner hexagonal wrench, diagonal cutting pliers, anti-electrostatic glove

1. See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20 and 9.3.22 for details.
2. Cut 2 tie cables CHS-3X150 and one tie cable CHS-4X100 with the diagonal cutting pliers.



3. Cut 7 tie cables CHS-3X100 with diagonal cutting pliers.



4. Wear the anti-electrostatic glove. Press the clip towards the arrow's direction to pull AC-DC 24V power control cable out of the mother board assembly. Push the lock of the 12 V power output towards the arrow's direction in figure 2, and then pull the cables out.

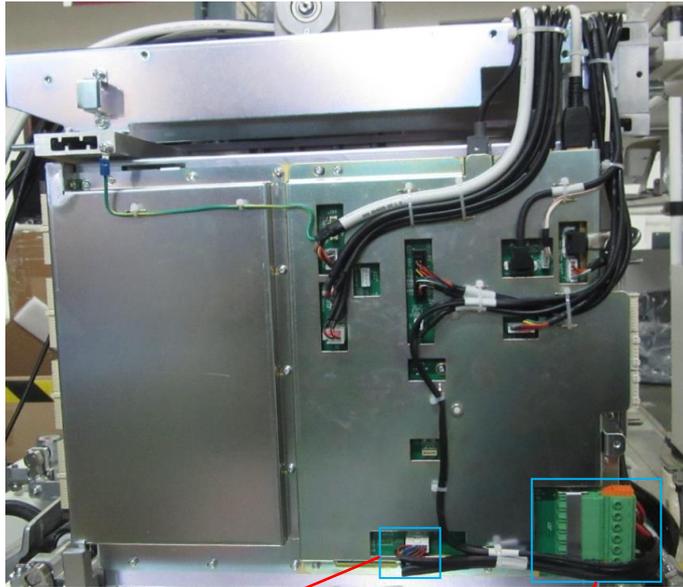


Figure 1

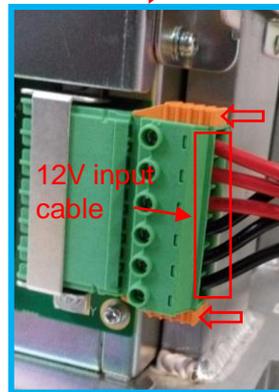
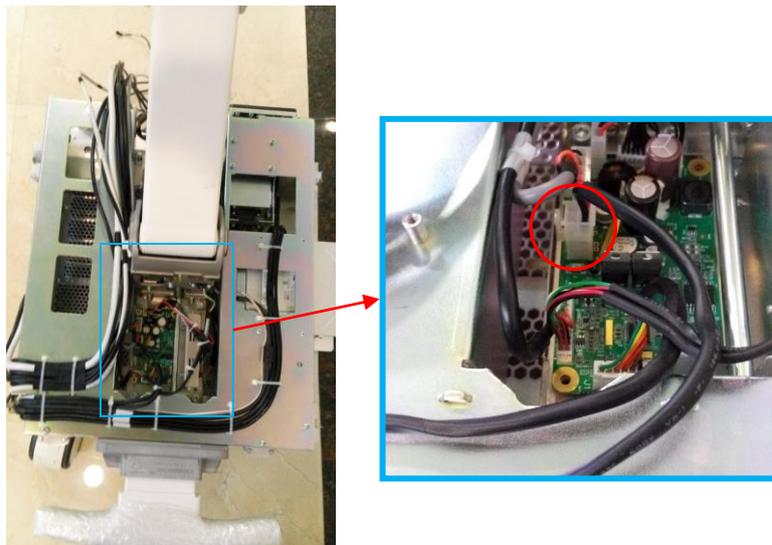


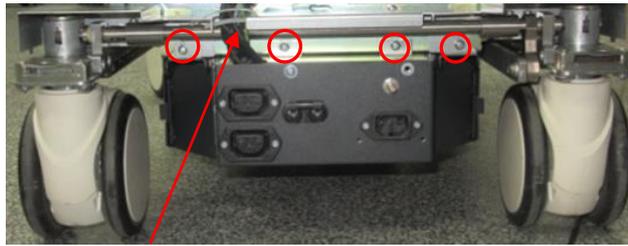
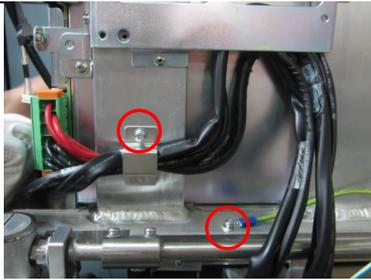
Figure 2

5. Pull AC_DC 24V power output cable out of the stand column assembly.



6. Unscrew the M4 cross panhead screw and M4 X12 cross panhead screw with the screwdriver (M3, M4), cut off CHS-4X150 cable tie fastening protective shield with diagonal cutting pliers, then unscrew 4 M4 X10 inner hex head screws (with elastic washers) with inner hexagonal wrench (M4) to take off protective shield and pull the electronics assembly on the base.

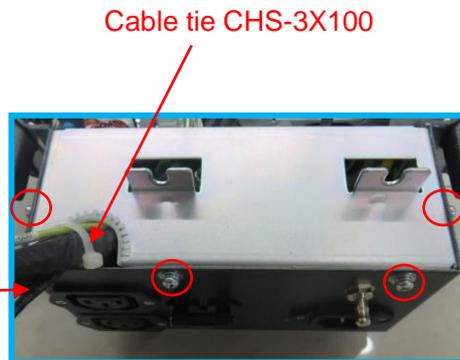
NOTE Lift the electronics assembly up to remove it.



CHS-4X150 cable tie

9.3.30.1 Power Input Assembly

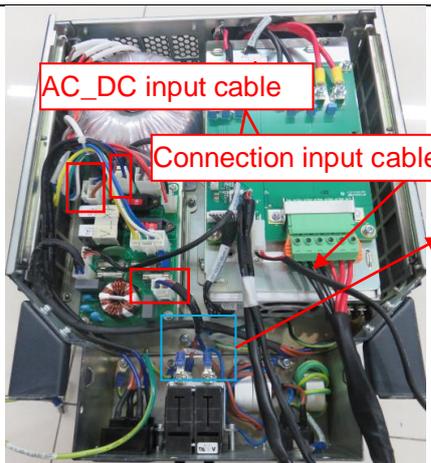
1. See *Chapter 9.3.30* for details.
2. Unscrew 4 M4 X 12 cross panhead screws from the power input cover with cross-headed screwdriver (M3, M4) and cut off CHS-3X100 to remove the power input cover.



Cable tie CHS-3X100

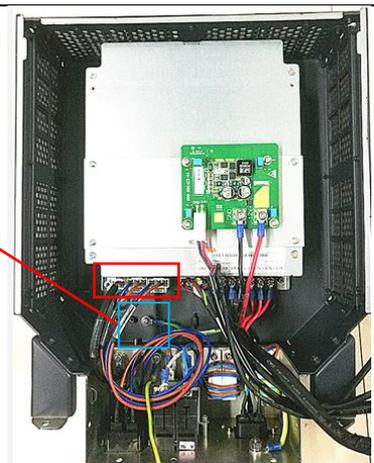
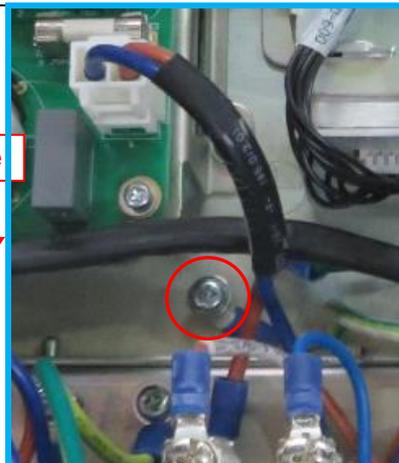
3. Unplug 3 auxiliary cables, remove a M4 X 8 screw on the grounding cable (009-005569-00) with the screwdriver (M3, M4).

NOTE The cables should be against the bottom of the cable box when installing in reverse.



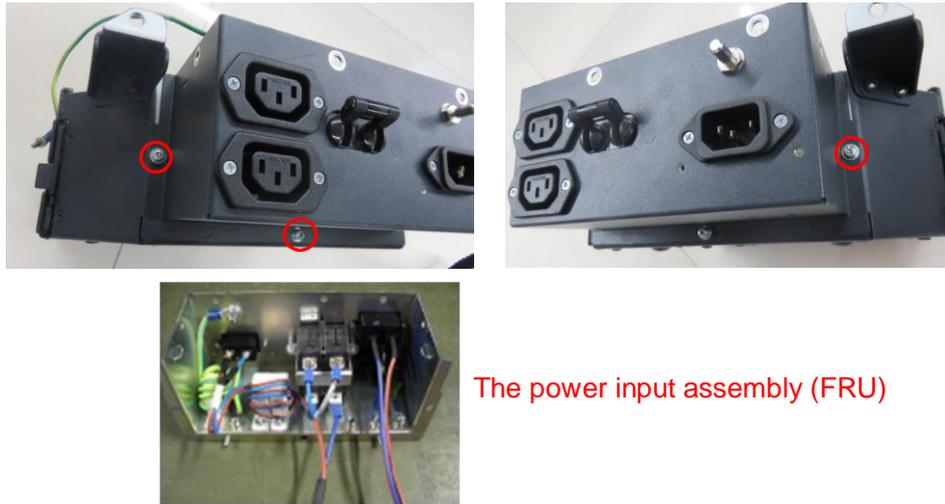
AC_DC input cable

Connection input cable



UR POWER

4. Unscrew 3 M3 X 8 screws with cross-headed screwdriver (M3, M4) to remove the power input assembly (FRU).

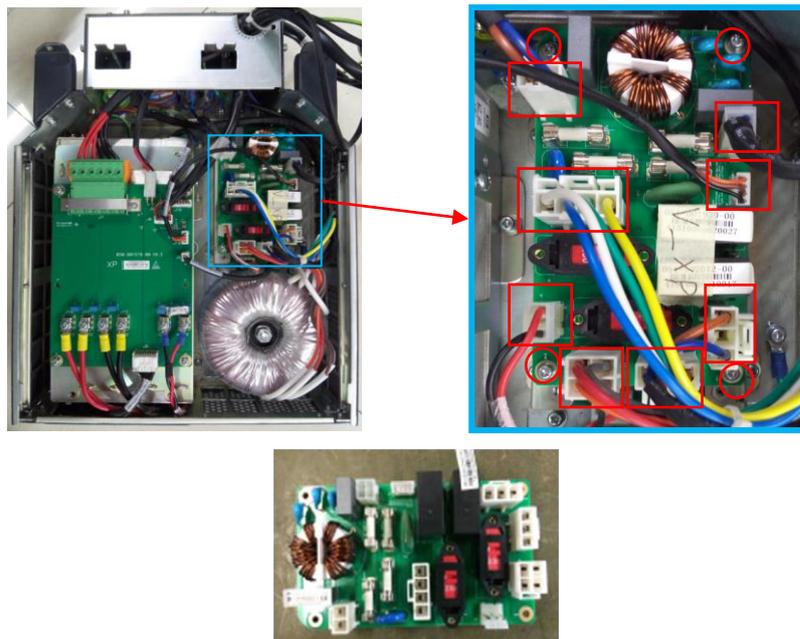


The power input assembly (FRU)

9.3.30.2 AC Connection 220V/AC Connection 110V

NOTE: This chapter is not used to OB/GYN machine.

1. See *Chapter 9.3.30* for details.
2. Unplug 8 plugs shown in the following figure from the AC connection board. Unscrew 4 M3 X8 cross panhead screws from AC connection board with the screwdriver (M3, M4) to remove the board (FRU).

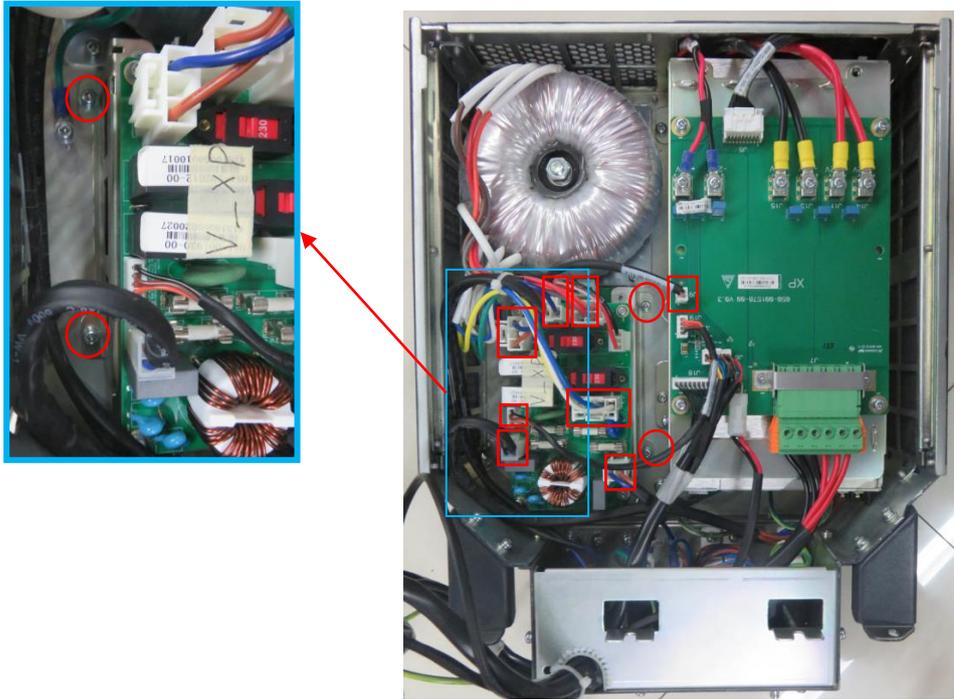


AC connection 220V or 110V (FRU)

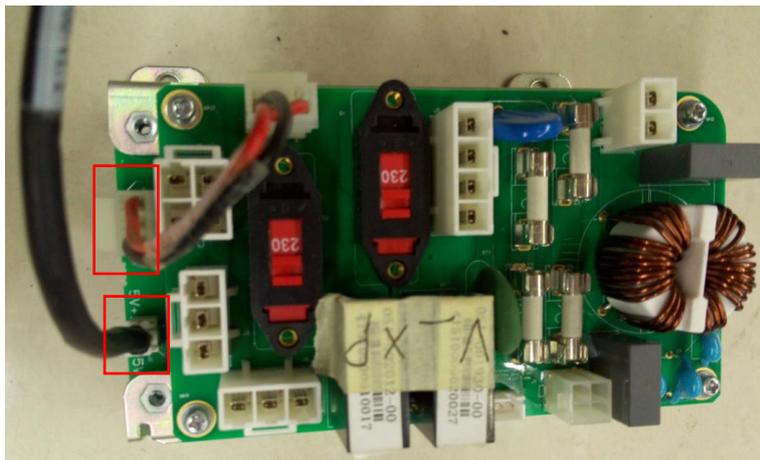
9.3.30.3 5V Board Assembly

NOTE: This chapter is not used to OB/GYN machine.

1. See *Chapter 9.3.30* for details.
2. Unplug 8 plugs shown in the following figure from the AC connection board and AC power assembly. Unscrew 4 M3 X8 cross panhead screws from AC connection board with the screwdriver (M3, M4) to remove the 5V module assembly.

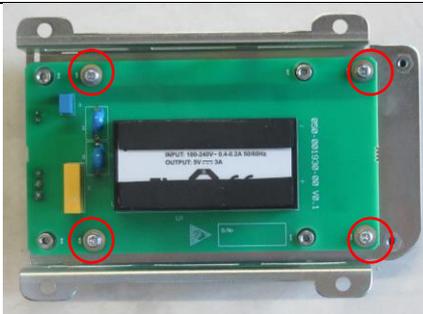


3. Unplug 2 plugs from the 5V board assembly.



4. Unscrew 4 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove 5V assembly (FRU).

NOTE Place the socket according to the figure below when installing in reverse.



5V board assembly (FRU)

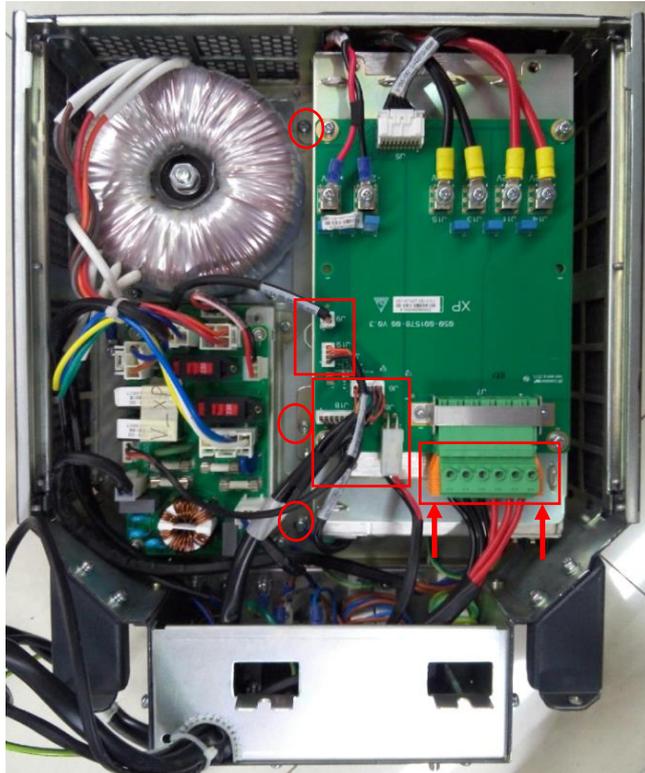
9.3.30.4 AC Power Assembly

NOTE: This chapter is not used to OB/GYN machine.

1. See *Chapter 9.3.30* for details.

9-60 Structure and Assembly/Disassembly

2. Unplug 6 cables from the AC power assembly. Unscrew 4 M4 X8 cross panhead screws and one M4 X 8 panhead screw from the AC power assembly to remove the AC power assembly (FRU).

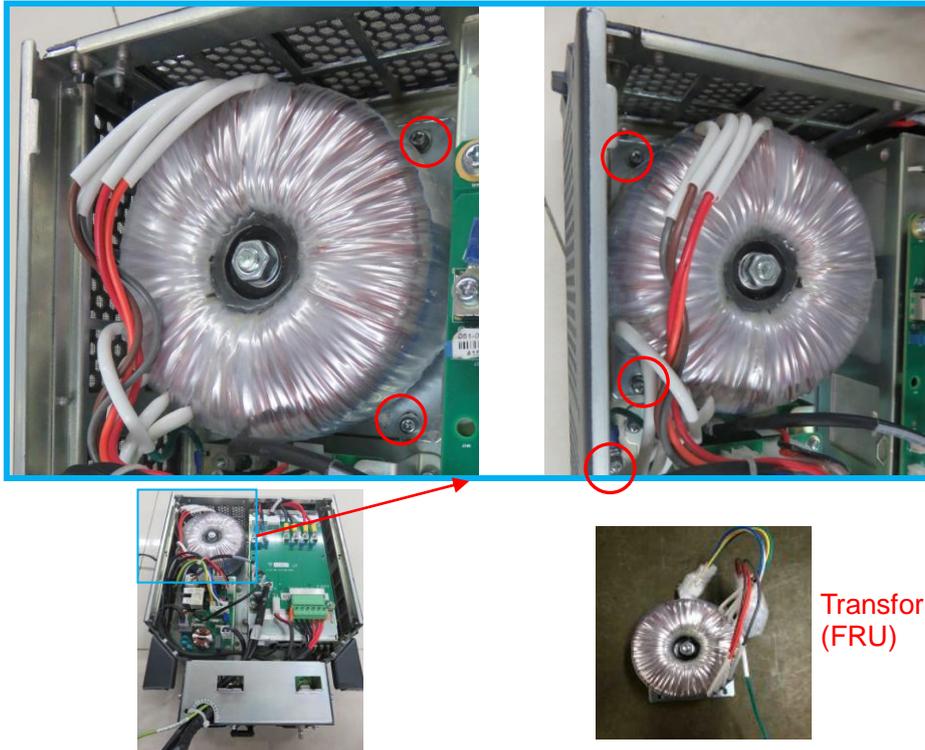


AC power assembly (FRU)

9.3.30.5 Transformer

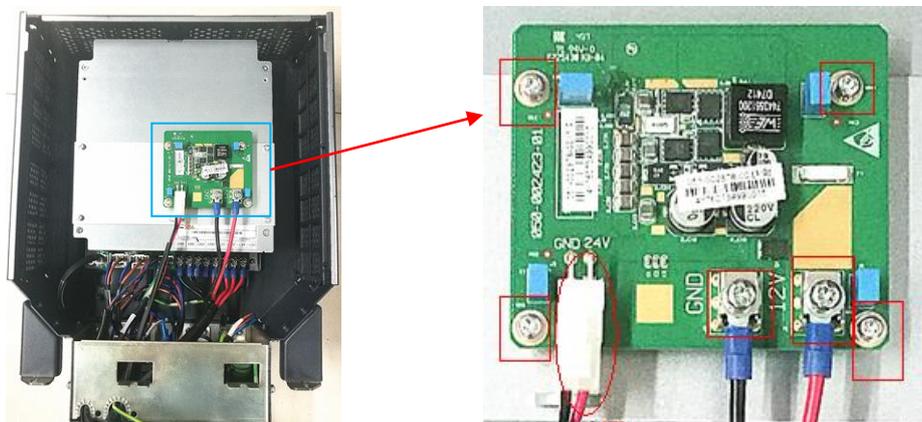
NOTE: This chapter is not used to OB/GYN machine.

1. See *Chapter 9.3.30* for details.
2. Unscrew one M4 X 8 cross panhead screw and 4 M4 X 8 cross panhead screws from the grounding terminal of the transformer with the screwdriver (M3, M4) to remove the transformer (FRU).



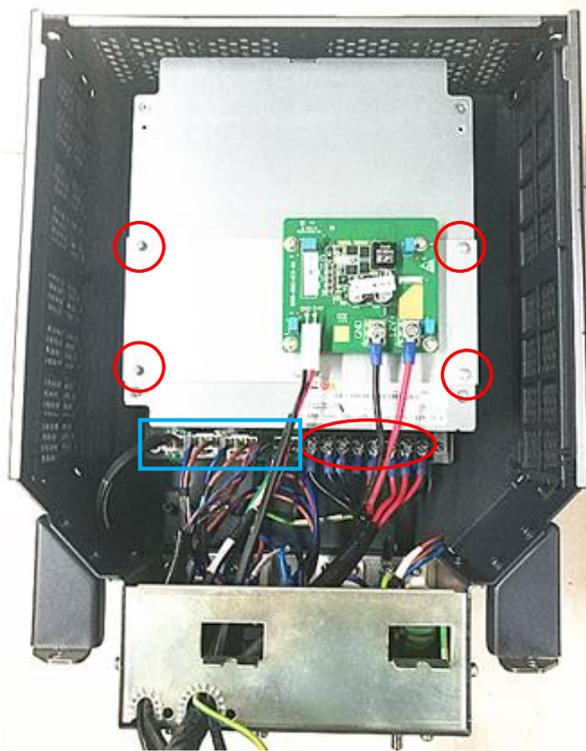
9.3.30.6 24V Power Board

1. See 9.3.30 for details.
2. Unplug 1 plug shown in the following figure from the board. Unscrew six M4X8 cross panhead screws with the screwdriver (M3, M4) to remove the 24V Power Board (FRU).



9.3.30.7 AC Power Assembly (UR POWER)

1. See 9.3.30 for details.
2. Unplug 4 plugs. Unscrew four M3X8 cross panhead screws from 24V transformer board and eight screws from AC power assembly with the screwdriver (M3, M4) to remove the 24V Power Board (FRU).



3. Unscrew four M3X8 cross panhead screws from AC Power assembly with the screwdriver (M3, M4) to remove AC power assembly (FRU).



AC power assembly (UR POWER/FRU)

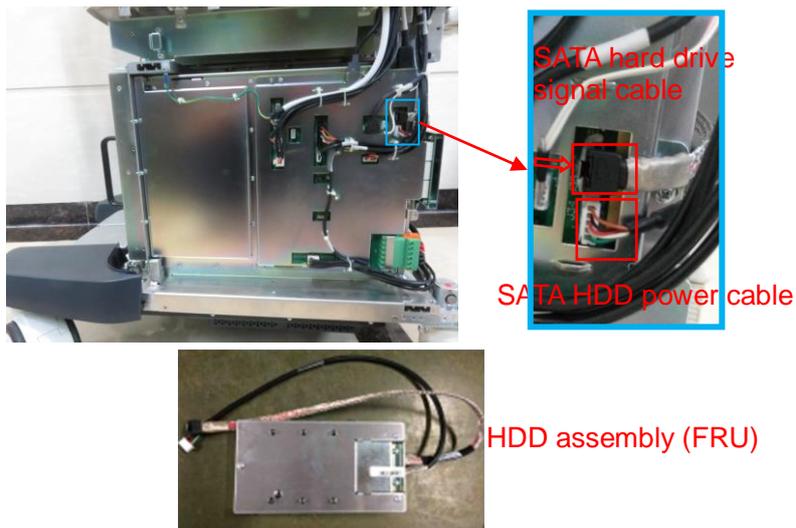
9.3.31 HDD Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16, 9.3.17 for details.
2. Unscrew 2 M4 X 12 cross panhead screws on the HDD assembly and one M4 X 12 cross panhead screw from the fixing knob UC-1.5 with the screwdriver (M3, M4).



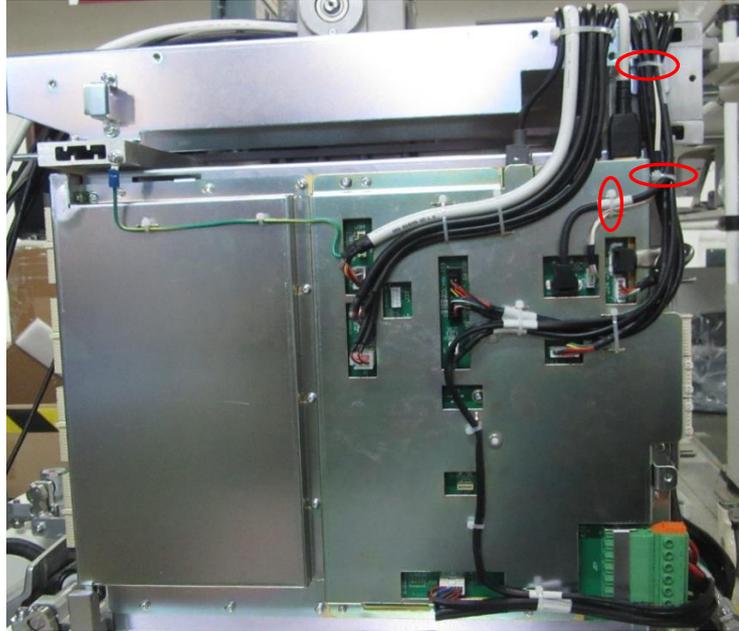
3. Press the lock towards the arrow's direction, and unplug the HDD signal cable of SATA and the HDD power supply cable of SATA, and then remove the HDD assembly (FRU).



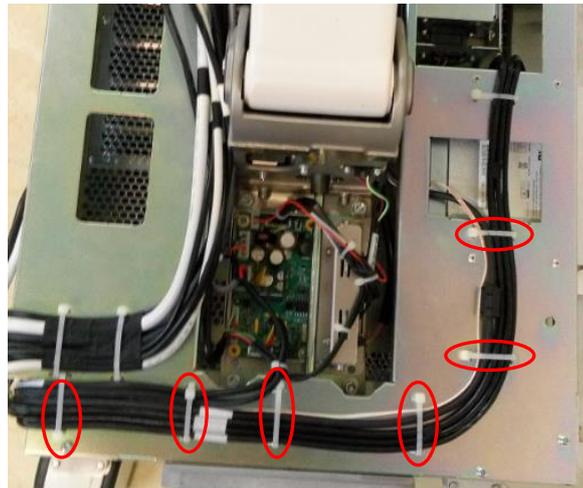
9.3.32 DVD Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

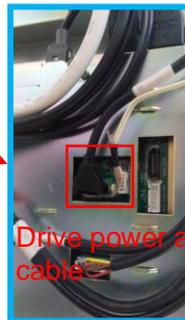
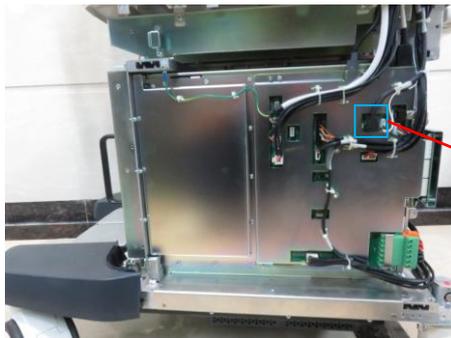
1. See 9.3.16, 9.3.17, 9.3.18 and 9.3.19, 9.3.20 and 9.3.22 for details.
2. Cut 3 tie cables CHS-3X100 with diagonal cutting pliers.



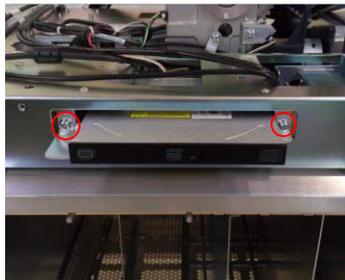
3. Cut 6 tie cables CHS-4X150 with diagonal cutting pliers.



4. Unscrew 2 M4 X12 cross panhead screws from DVD assembly with the screwdriver (M3, M4), and unplug the power supply cable of the driver and the SATA cable (009-004588-00) from the right side of the main unit, and then remove DVD assembly (FRU).



Drive power and round SATA cable

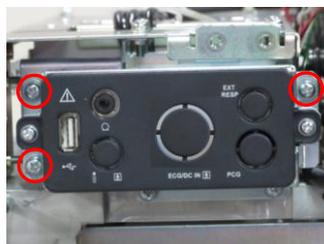


DVD assembly (FRU)

9.3.33 Front Output panel

The disassembly tool: cross-headed screwdriver (M3, M4).

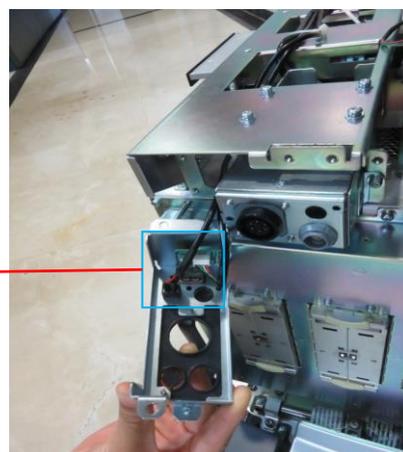
1. See 9.3.16, 9.3.17, 9.3.18 and 9.3.19, 9.3.20 and 9.3.22 for details.
2. Unscrew 3 M4 X 12 screws from the output board assembly with cross-headed screwdriver (M3, M4).



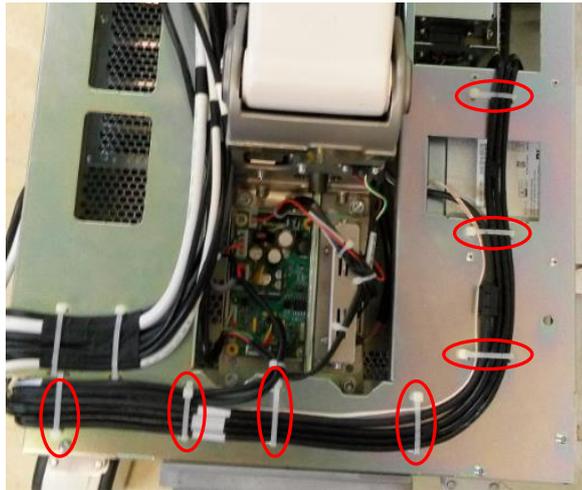
3. Unplug USB cable from the USB transforming board.



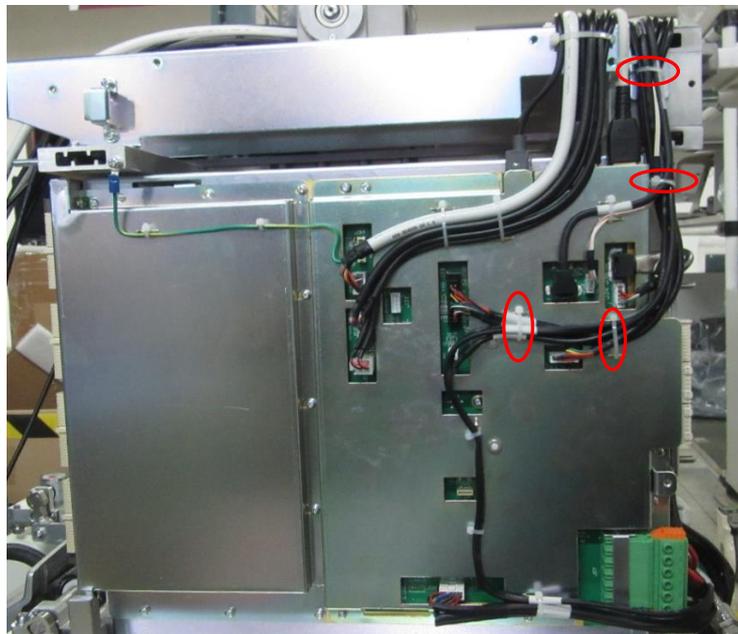
USB connection cable



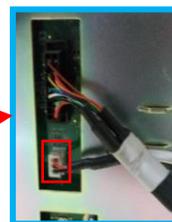
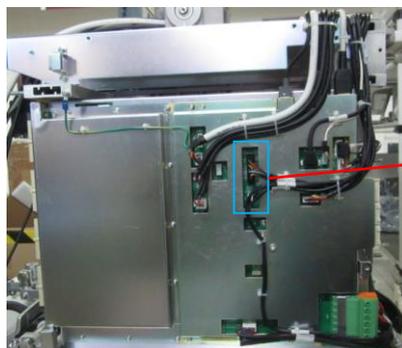
4. Cut 7 tie cables CHS-4X150 with diagonal cutting pliers.



5. Cut 4 tie cables CHS-3X100 with diagonal cutting pliers.



6. Unplug MIC signal cable from the right mother board to remove the output board.



MIC signal cable

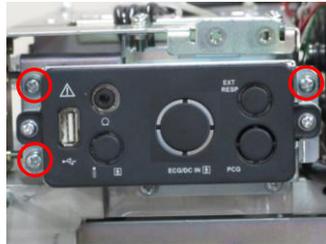


Front in assembly

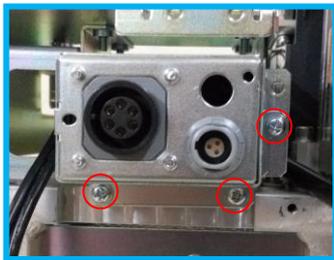
9.3.34 ECG Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16, 9.3.17, 9.3.18 and 9.3.19 for details.
2. Unscrew 3 M4 X 12 screws from the output board assembly with cross-headed screwdriver (M3, M4).



3. Unscrew 3 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove ECG assembly.



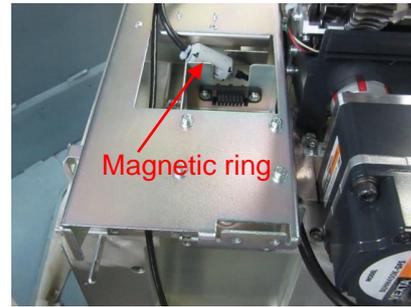
ECG assembly

9.3.35 Signal Cable of ECG Module

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See Chapter 9.3.33 step 1 to 5 for details.
2. See Chapter 9.3.34 for details.
3. Unplug the ECG module signal connector from the right side of the device.
4. Unscrew 2 M3 X10 cross panhead screws with the screwdriver (M3, M4) to remove the signal cable of ECG module.

Note: Put the magnetic ring into the bracket of the main unit when installing in reverse.

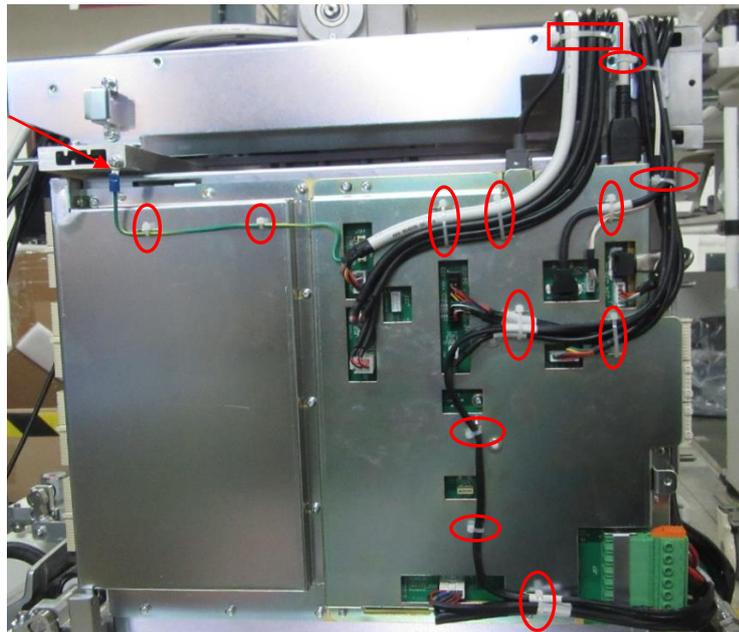


9.3.36 Mother Board Assembly

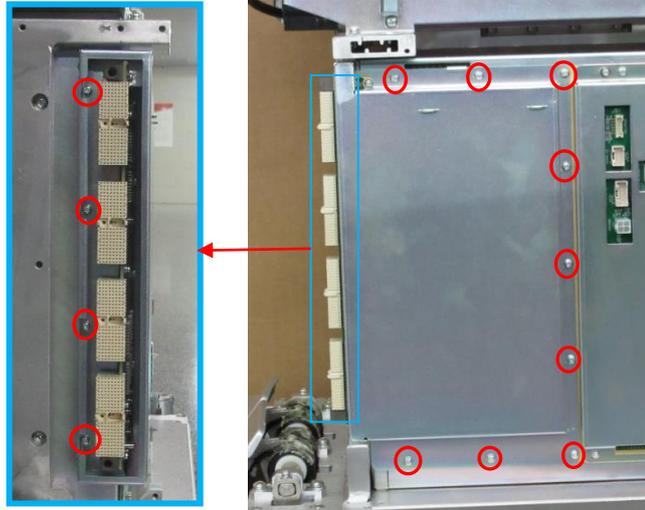
The disassembly tool: cross-headed screwdriver (M3, M4), anti-electrostatic glove

1. See 9.3.16, 9.3.17, 9.3.18 and 9.3.19 and 9.3.24.1, 9.3.24.6 and 9.3.26 for details.
2. Cut 12 tie cables CHS-3X100 and one tie cable CHS-4X150 with the diagonal cutting pliers. Unscrew the power supply terminal on the primary monitor, touch screen and control panel with the screwdriver (M3, M4).

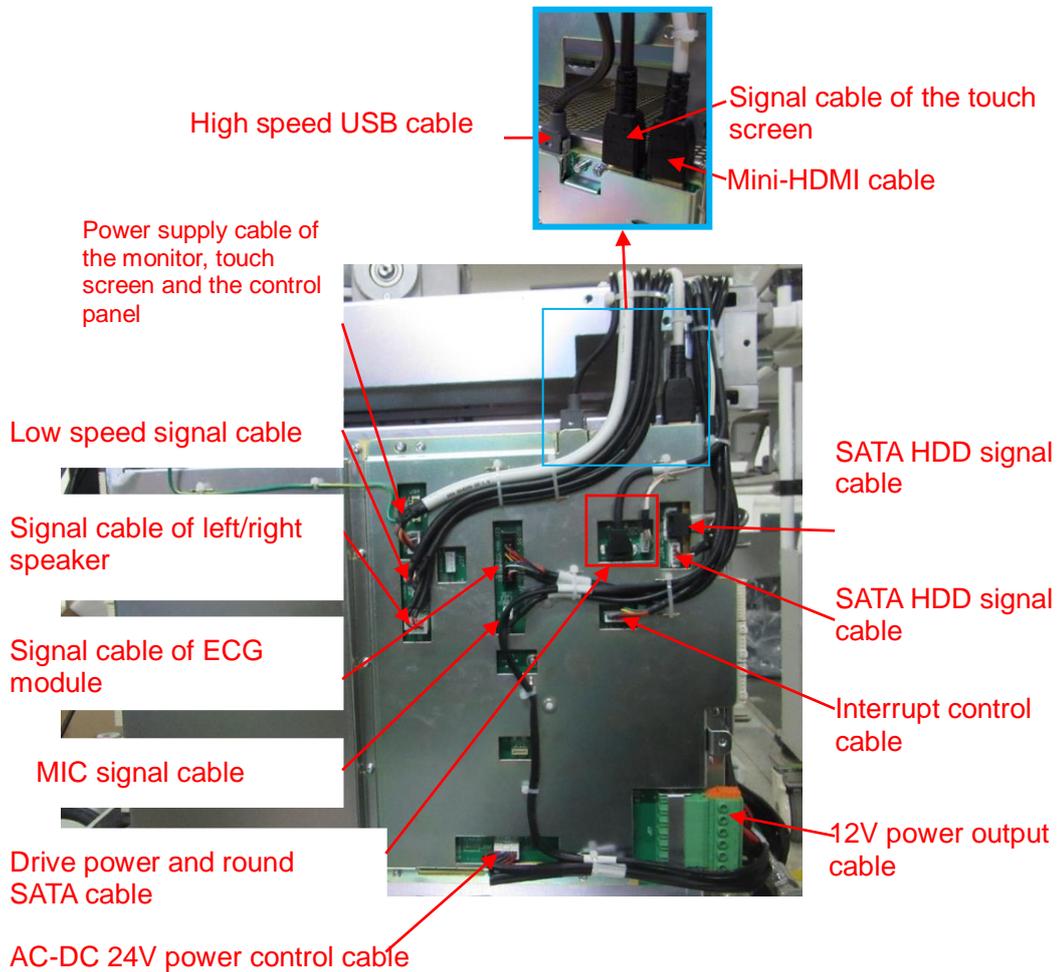
The power supply terminal on the primary monitor, touch screen and control panel



3. Wear the anti-electrostatic glove. Unscrew 13 M3 X 8 cross panhead screws with the screwdriver (M3, M4) to remove the shield cover of the mother board.



4. Unplug all cables on the mother board.

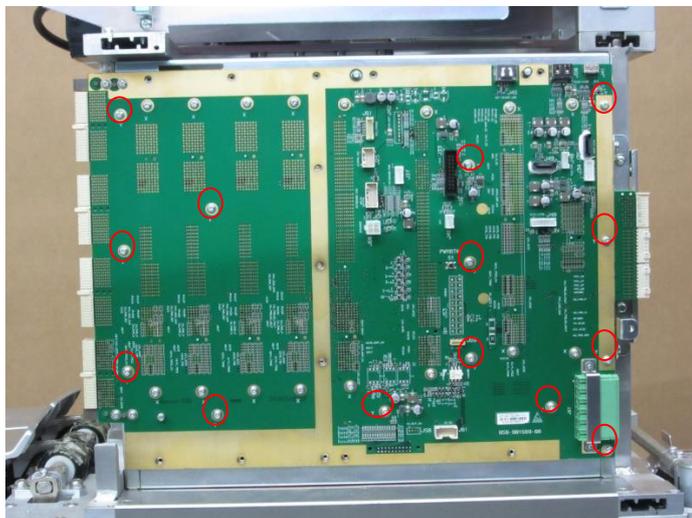


5. Unscrew 4 M4 X 12 cross panhead screws from the shield cover of the mother board with cross-headed screwdriver (M3, M4) to remove the shield cover of the mother board.



6. Unscrew 14 M3 X 8 screws (marked with Y) with cross-headed screwdriver (M3, M4) to remove the mother board assembly (FRU).

NOTE Disassemble PC/PHV/DC/TR assembly and TR64 board PCBA/engine PCBA first, and then remove the mother board assembly. Otherwise, unplugging the mother board with the force will lead to the damage to the socket of the mother board.



Mother board assembly (FRU)

9.3.37 Housing Assembly of the Main Unit

The disassembly tool: spanner (sharp nose pliers), cross screwdriver (M3, M4), inner hexagon spanner (M5, M6).

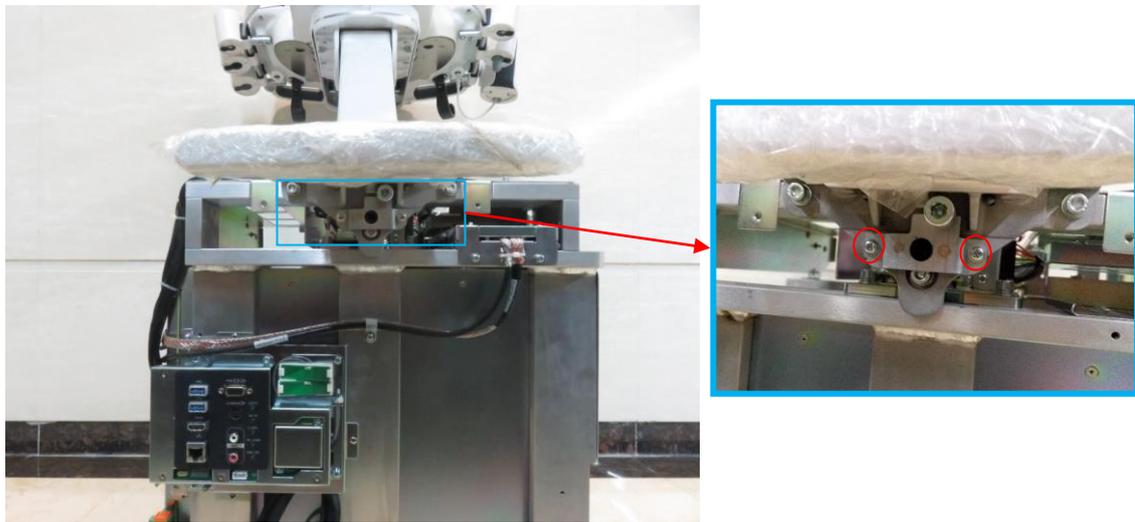
See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21 and 9.3.22 for details.

9.3.37.1 The Back Handle of the Main Unit

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5).

1. See 9.3.16 for details.
2. Unscrew 2 M3 X 8 cross panhead combination screws on the rocker arm plate with the screwdriver (M3, M4) to remove the electrical rocker arm.

Note:	Align the hexagon of the electrical rocker arm with the hexagon socket head when installing. Be aware of the slot of the electrical rocker arm.
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Fixing ring of the rocker arm

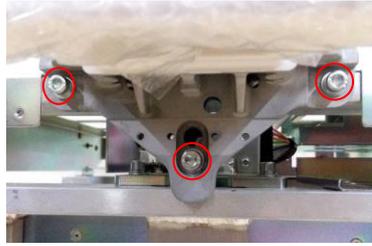


Rocker arm

Electrical rocker arm



3. Unscrew 3 M6 X 20 round inner head screws (with the pad) with the M6 inner head spanner to remove the back handle of the main unit.

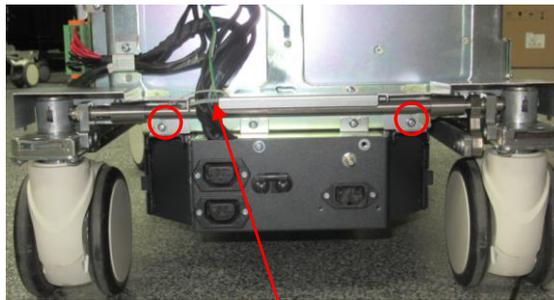


Back handle of the main unit

9.3.37.2 Back Rod of the Brake Pedal

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See 9.3.16 for details.
2. Cut off CHS-4X150 cable tie fastening protective shield with diagonal cutting pliers, then unscrew 2 M4 X10 inner hex head screws (with elastic washers) with inner hexagonal wrench (M4) to take off protective shield.



CHS-4X150 cable tie

3. Unscrew 4 M4 X 12 cross panhead screws with the screwdriver (M3, M4) to push the sleeve towards the arrow's direction, and then remove the sleeve and the back rod of the brake pedal.

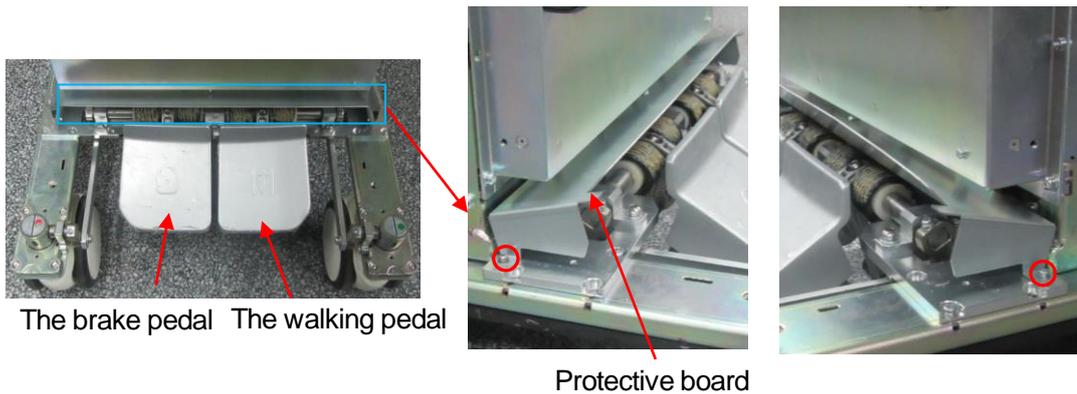


9.3.37.3 Left/Right Brake Rod Assembly

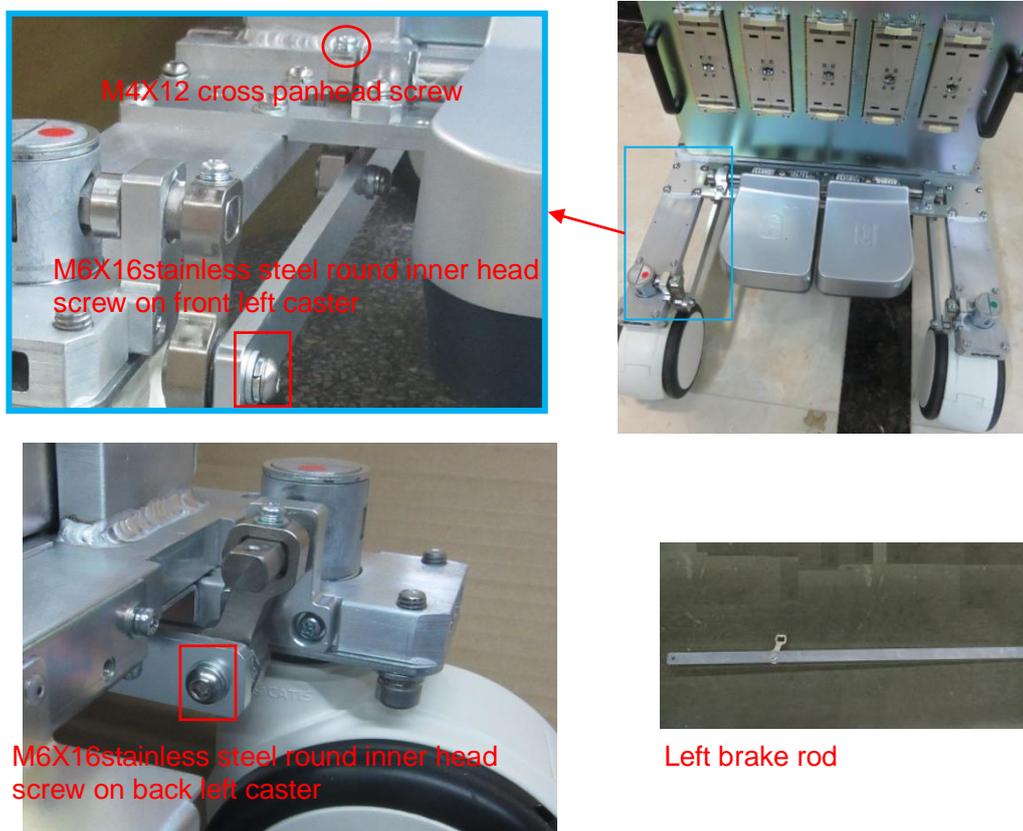
The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5).

1. See 9.3.16, 9.3.17, 9.3.18, 9.3.19 and 9.3.23 for details.

- Step on the brake pedal and the walking pedal. Unscrew 2 M4 X 12 cross panhead screws with cross-headed screwdriver (M3, M4), then take off protective board.



- Open the brake pedal. Unscrew 1 M4 X 12 cross panhead screw with the screwdriver (M3, M4) from the left front caster. Unscrew 2 M6 X 16 stainless steel round inner head screw from the front/back left back caster to remove the left brake rod.



- Unscrew one M6 X 16 stainless round inner head screw with the M6 inner hexagon spanner, and unscrew one M4 X 12 cross panhead screw with the screwdriver to remove the right brake rod.



M4X12 cross panhead screw



M6X16 stainless steel round inner head screw



Right brake rod

9.3.37.4 Central Brake Pedal Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5).

1. See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.23 and 9.3.37.3 for details.
2. Unscrew 8 M6 X 16 stainless steel round inner head screws by M6 inner hexagon spanner to remove the central brake pedal assembly (FRU).

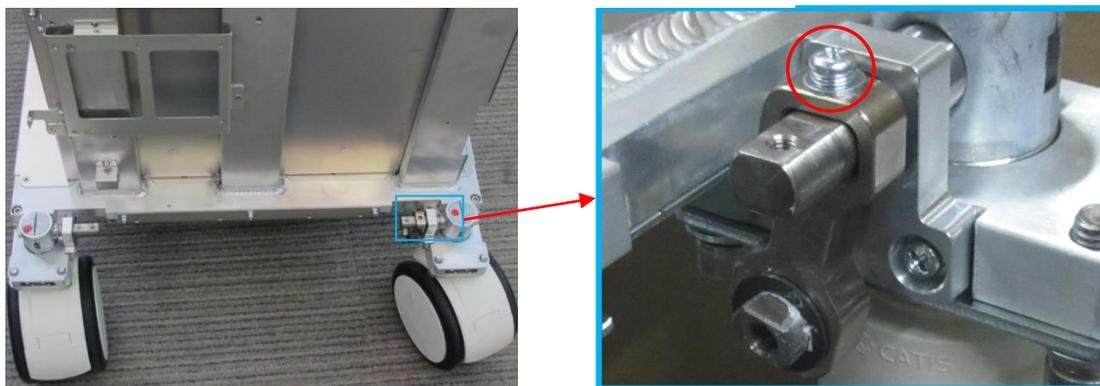
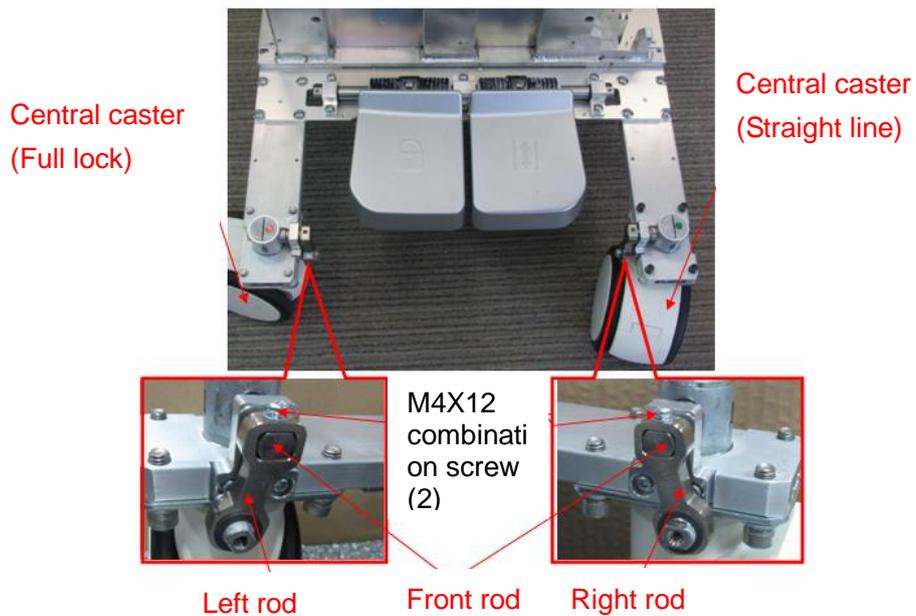


Central brake pedal assembly (FRU)

9.3.37.5 Full Lock Caster/Straight Line Caster

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5).

1. See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.23, 9.3.37.2 and 9.3.37.3 for details.
2. Unscrew 3 M4 X 12 cross panhead screws (front left, back left, front right) with the screwdriver (M3, M4) to remove the left rod and the right rod.



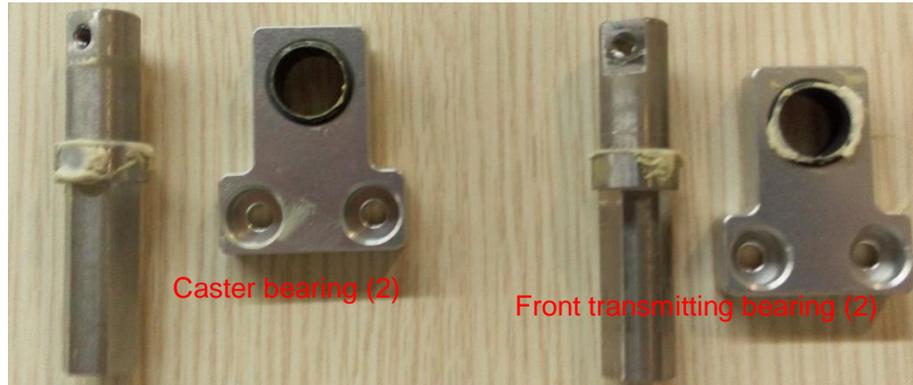
- Step on two pedals. Unscrew 4 M4 X 12 screws (2 screws on each side) with the screwdriver (M3, M4) to remove two caster bearings and two rotating bearings.

Note: Place two back rotating bearings level when installing them.



4. Unscrew 4 M4 X 12 screws (2 screws on each side) with the screwdriver (M3, M4) to remove two caster bearings and two front transmitting bearings.

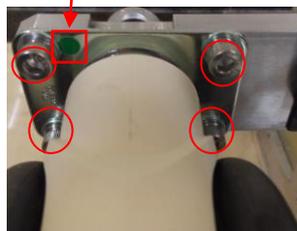
Note: Place two back rotating bearings level when installing them.



5. Lay the main unit bracket to the left side or the right side. Use M8 inner hexagon spanner to unfasten 16 M8 X 25 round inner head screws (with the pad) on one straight line caster (marked with the green spot) and 3 full lock casters (marked with the red spot) to remove the casters.

Note: In case of the fall of the parts, be careful of the operation.

Straight line caster



Full lock caster



Caster: 125mm Straight line caster
Chloroprene rubber wheel



Caster: 125mm Full lock caster
Chloroprene rubber wheel

9.3.37.6 Motor-driven Lift Mechanical Assembly

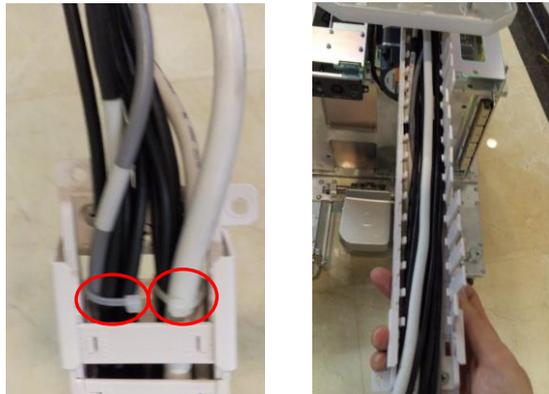
The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5, M6).

1. The disassembly method to moving assembly type in first step is different to that of non-moving assembly type.

■ Moving assembly type

9-78 Structure and Assembly/Disassembly

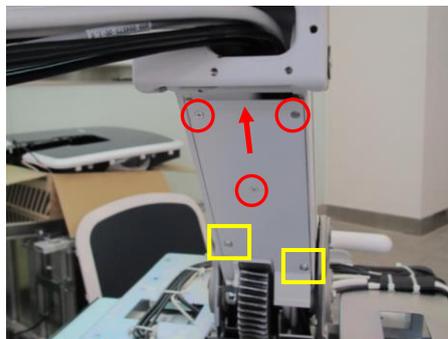
- a) See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21 and 9.3.22 for details.
- b) Cut 2 tie cables CHS-3X100 off with the diagonal cutting pliers, and open the cover of one side.



- c) Unscrew 2 M4 X 12 cross panhead screws on both sides with screwdriver (M3, M4) to the drag chain and the bracket.

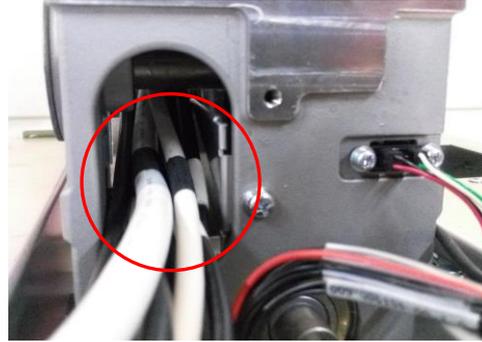


- d) Unscrew 3 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove the cable shield cover.



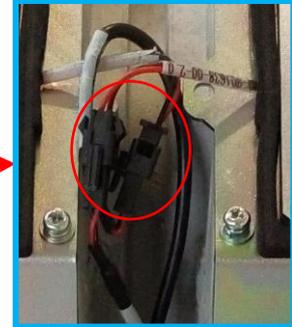
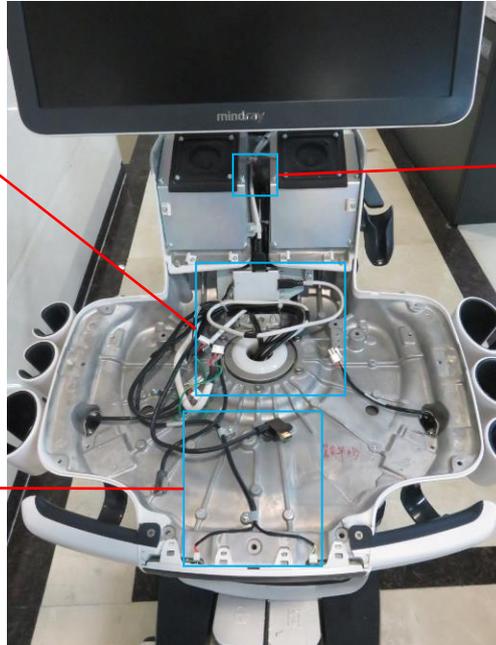
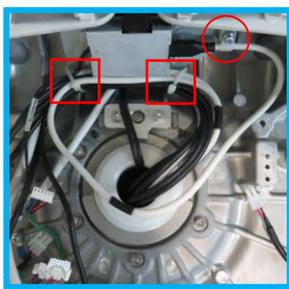
NOTE	The cable shield cover can be removed without untightening two screws marked with the square. It may produce the circuit risk if the pads of two screws fall into the internal.
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- e) Take the cables out of the hole from the lower stand column, and then take the cables out of the hole from the stand column base.

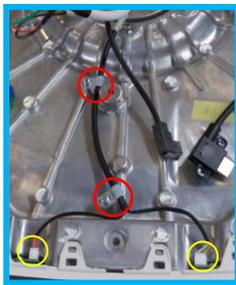


■ Non-moving assembly type

- a) See *Chapter 9.3.6, 9.3.8 and 9.3.9* for details.
- b) Unscrew 3 M4 X 12 cross panhead screws on UC-0.5 with the screwdriver (M3, M4) to pull the cables out, and cut two tie cables CHS-4X150 off Open the clip from the left/right speaker assembly. Drag the power supply cable to the base of the keyboard.

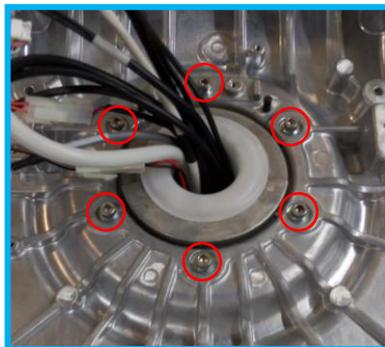


Power supply cable of left/right speaker assembly



Note: Tie the cables according to the figure shown below when installing.

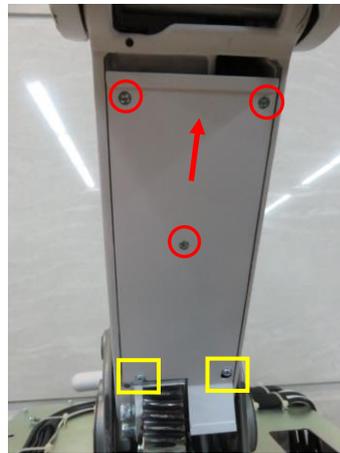
- c) Unscrew 6 M5 X 16 round inner head screw from the keyboard base by M5 spanner to remove the keyboard base upwards.



- d) Unscrew 3 M4 X 12 cross panhead screws from the lower support arm cover with the screwdriver (M3, M4) to remove the lower support arm cover.

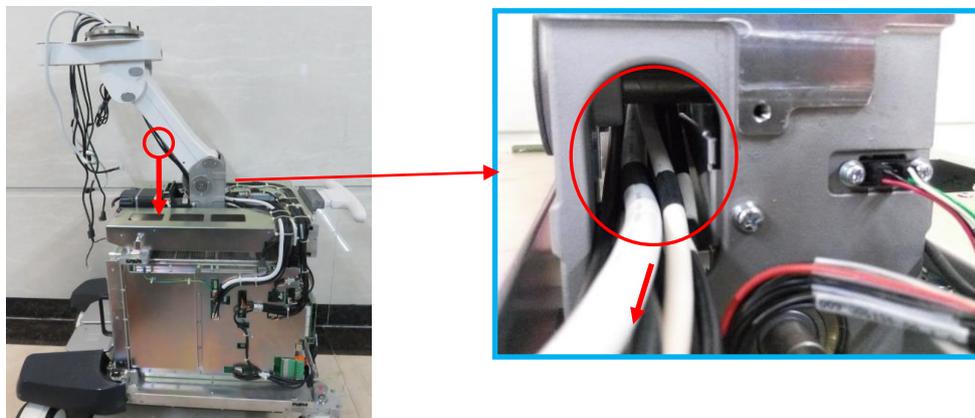


- e) See 9.3.16, 9.3.17, 9.3.18, 9.3.19, 9.3.20, 9.3.21 and 9.3.22 for details.
- f) Unscrew 3 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove the cable shield cover.



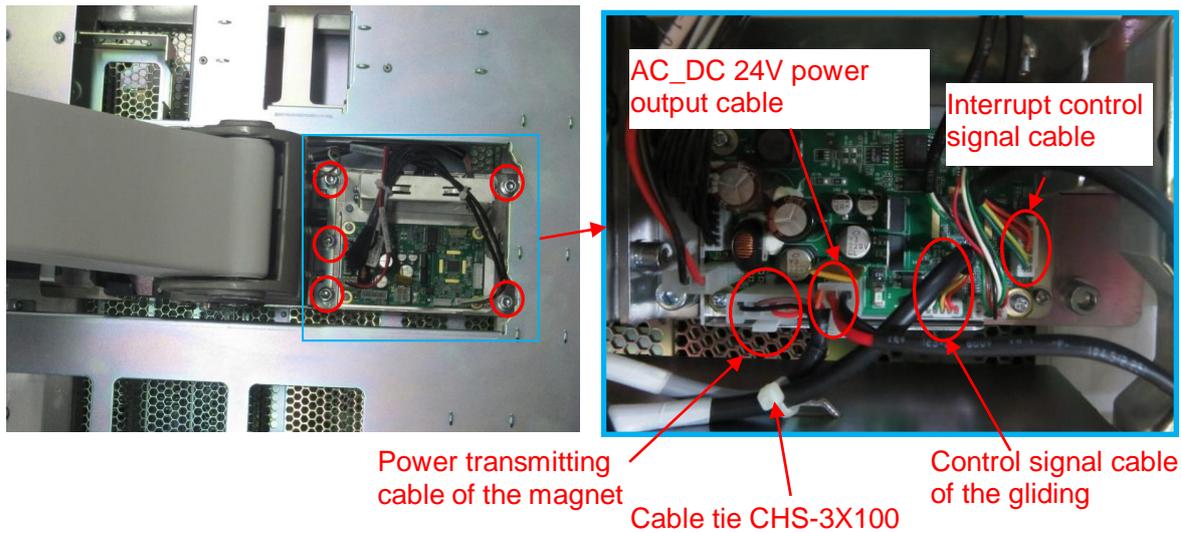
NOTE The cable shield cover can be removed without untightening two screws marked with the square. It may produce the circuit risk if the pads of two screws fall into the internal.

- g) Take the cables out of the hole from the lower stand column, and then take the cables out of the hole from the stand column base.



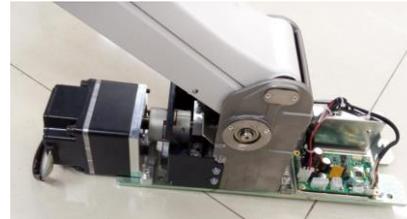
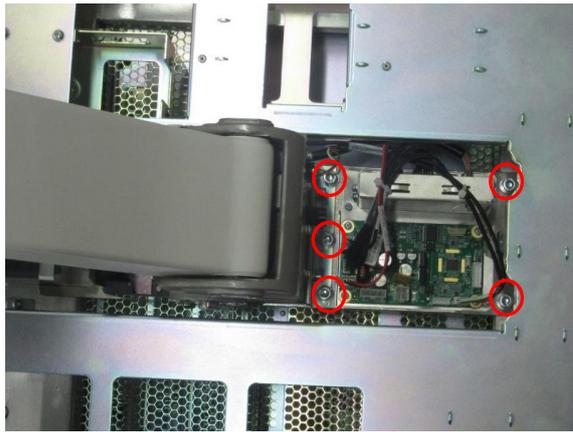
- 2. See Chapter 9.3.37.1 for details.

3. Cut the cable tie CHS-3X100 with the diagonal cutting pliers. Unplug 4 plugs from the descending control panel.



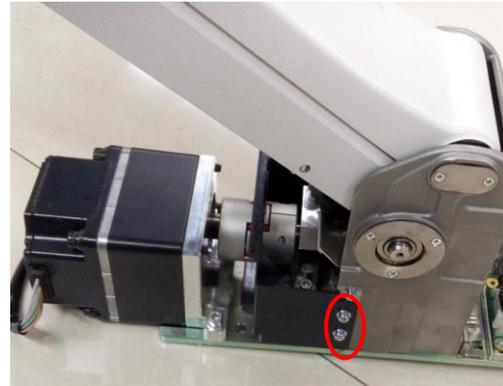
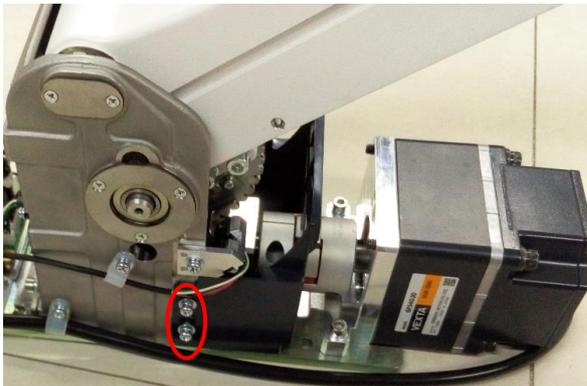
4. Unscrews 7 M6 X 20 round inner head screws (with the pad) with the M6 spanner to remove the motor-driven lift mechanical assembly (equipped with the position signal cable, Motor-driven lift mechanical assembly and the lift control PCBA assembly), power transmitting cable of the magnet and control signal cable of the gliding.

NOTE	Insert 7 M6 X 20 round inner head screws (with the pad) into fixing hole of motor-driven lift mechanical assembly when installing in reverse, and then install the electrical ascending/descending assembly.
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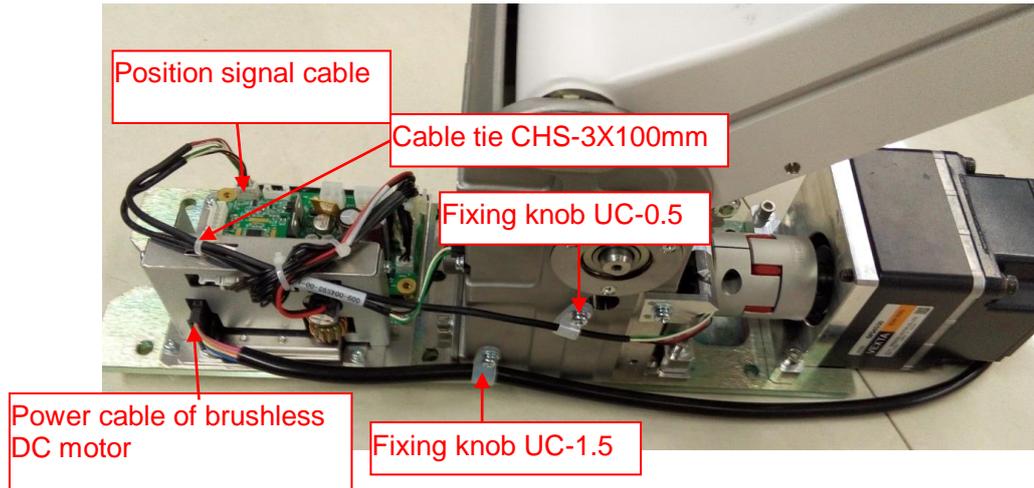
The motor-driven lift mechanical assembly (equipped with the position signal cable, the motor-driven lift mechanical assembly and the lift control PCBA assembly, turbine protection bracket).

5. Unscrew 4 M4 X 12 cross panhead screws with screwdriver (M3, M4) to remove turbine support bracket.

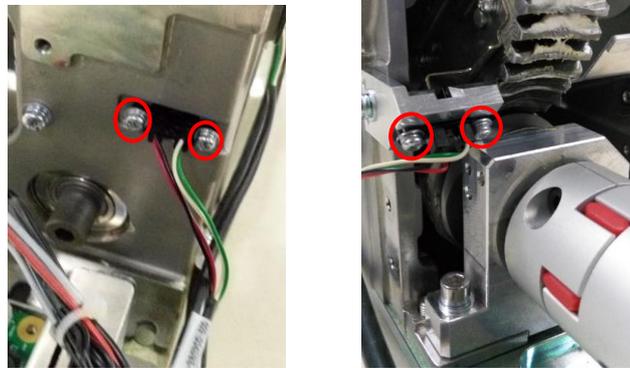


6. Unscrew 2 M4 X 12 cross panhead screws on UC-1.5 and UC-0.5 fixing knob with the screwdriver (M3, M4) to cut off the tie cable CHS-3X100mm from the position signal cable. Pull the position signal cable and the brushless DC motor from the lift control PCBA assembly.

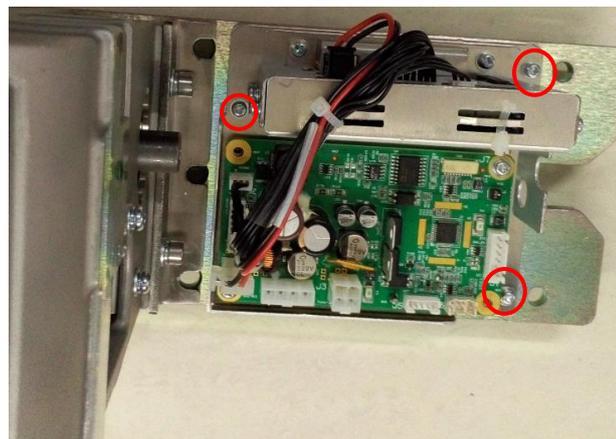
NOTE Let the position signal cable through the bales when installing.



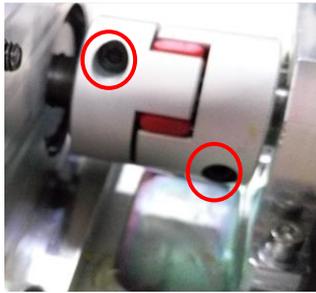
7. Unscrew 4 M3 X 8 cross panhead screws from the anti-collision sensor with the screwdriver (M3, M4) to remove the signal cable.



8. Unscrew 3 M3 X 8 cross panhead screws with screwdriver (M3, M4) to remove lift control PCBA assembly.



9. Use M5 inner hexagon spanner to unfasten 2 screws on the coupling.



10. Use M6 inner hexagon spanner to unfasten 4 fixing screws (with the pad) to remove the motor-driven lift mechanical assembly.

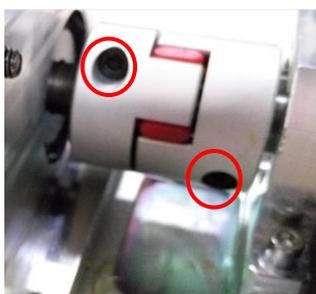


The electrical ascending/descending mechanism (FRU)

9.3.37.7 Lift Control PCBA Assembly

The disassembly tool: cross-headed screwdriver (M3, M4).

1. See *Chapter 9.3.37.6* for details.
2. Use M5 inner hexagon spanner to unfasten 2 screws on the coupling.



3. Use M6 inner hexagon spanner to unfasten 4 fixing screws (with the pad) to remove the motor-driven lift mechanical assembly (FRU).



The lift control PCBA assembly (FRU)

9.3.37.8 Turbine Support Bracket

The disassembly tool: cross-headed screwdriver (M3, M4).

See *Chapter 9.3.36.6* for details.

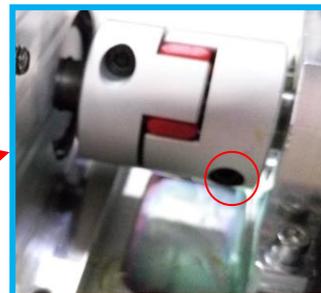
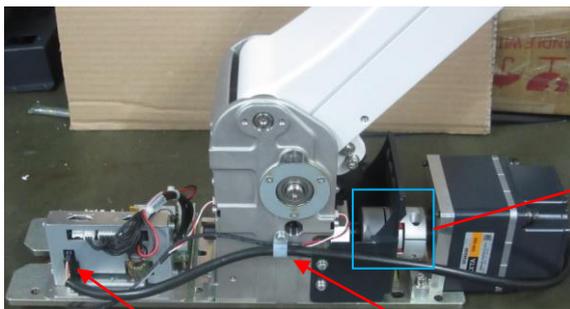


Turbine support bracket

9.3.37.9 The Motor of Electrical Ascending/Descending Mechanism

The disassembly tool: M5, M6 Inner hexagon spanner

1. See 9.3.16, 9.3.17, 9.3.18 and 9.3.19, 9.3.20, 9.3.21 and 9.3.22 for details.
2. Unscrew one small combination screw M4 X12 from the UC-1.5 with the screwdriver (M3, M4). Pull the cable of the brushless DC motor from the lift control PCBA assembly. Use M5 inner hexagon spanner to unfasten 1 screw on the coupling.



Cable of the brushless DC motor Fixing knob UC-1.5

3. Use M6 inner hexagon spanner to unfasten 4 fixing screws (with the pad) to remove the motor-driven lift mechanical assembly (MOTOR brushless DC 24V 50 W reduction ratio).



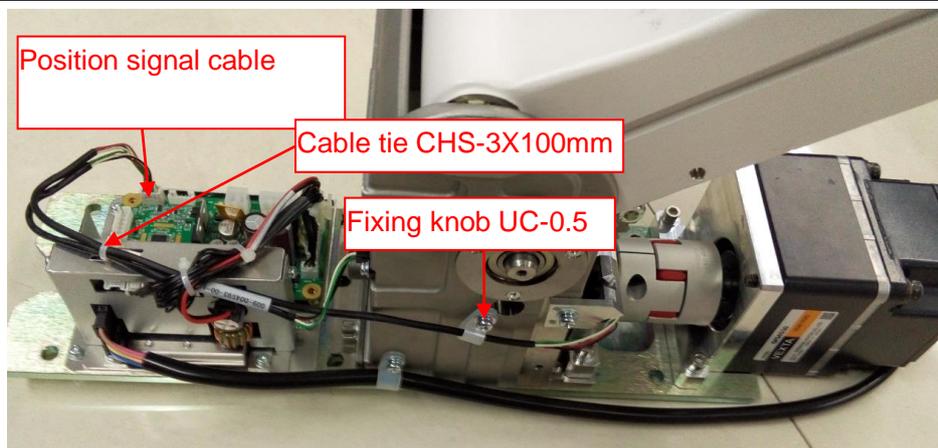
MOTOR brushless DC 24V 50 W
reduction ratio 30

9.3.37.10 Sensor

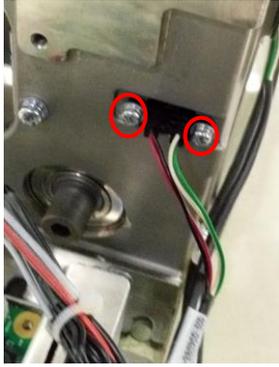
The disassembly tool: cross-headed screwdriver (M3, M4).

1. See Chapter 9.3.37.6 for details.
2. Unscrew 2 M4 X 12 cross panhead screws on UC-1.5 and UC-0.5 fixing knob with the screwdriver (M3, M4) to cut off the tie cable CHS-3X100mm from the position signal cable. Pull the position signal cable from the lift control PCBA assembly.

NOTE Let the position signal cable through the bales when installing.



3. Unscrew 4 M3 X 8 cross panhead screws from the anti-collision sensor with the screwdriver (M3, M4) to remove the signal cable.

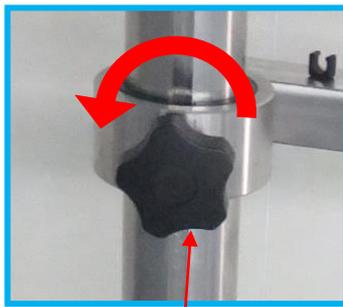


9.3.38 Magnetic Generator Trolley

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M5).

9.3.38.1 Sliding Pole Assembly

1. Hold the sliding pole assembly on one hand, and loosen the sliding pole anticlockwise on another hand. Lift the sliding pole straight up.



Adjusting knob

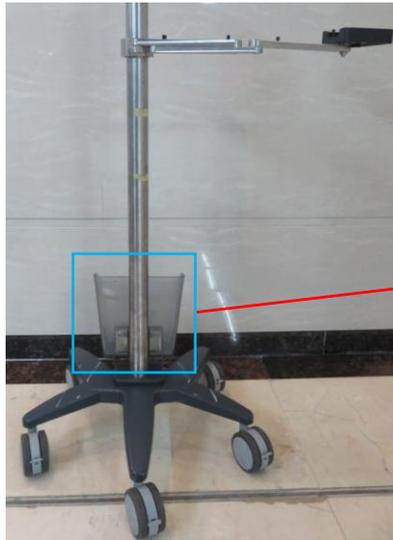


Sliding pole assembly

Note: In case of the scratch to the antiskid thermal shrinkage pole, loosen the adjusting knob completely.

9.3.38.2 Connecting Base Assembly

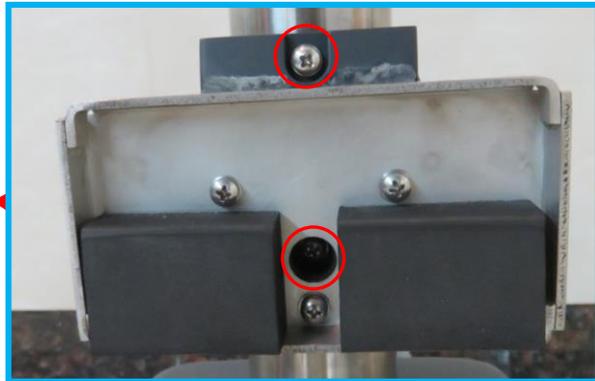
1. Shake the storage tray gently with two hands holding the edge of the storage tray. Lift the storage tray up.



Storage tray



2. Unscrew M4 X12(M3*2, M4*2) stainless cross panhead combination screws from the connecting base to remove the base.

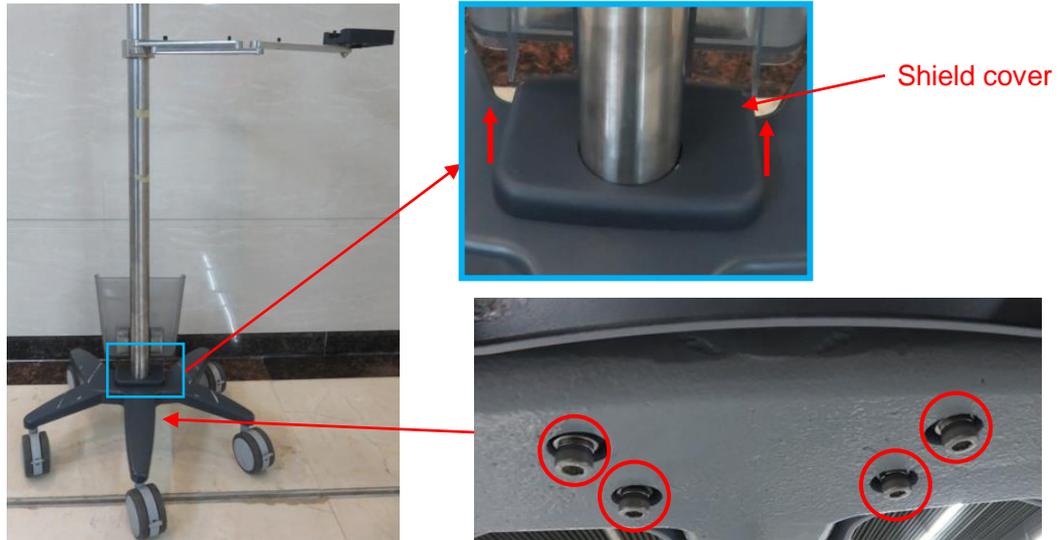


Connecting base assembly (FRU)

9.3.38.3 Bottom Cover

1. Remove the shield cover from the fixture. Unscrew the M6 X 30 (*4) round inner head screws (with the pad) with M6 spanner to lift the upper part of the standing pole.

Note: In case of the scratch to the base assembly when removing the standing pole, check whether the shield cover is lifted completely.
In case of injury to the personnel, hold the standing pole when untightening the inner screws.



Trolley bottom view

2. Unscrew M6 X 20 (*5) round inner head screws (with pads) with the M6 screwdriver to remove the bottom cover.



Bottom cover (FRU)

9.3.38.4 Casters

1. Use the spanner (equipped in FRU) to remove the five casters respectively.

Note: In case of the trolley falling, please uninstall the caster one after one. Do not uninstall the casters in one time.



Caster and spanner (FRU)

9.3.39 Magnetic Navigator

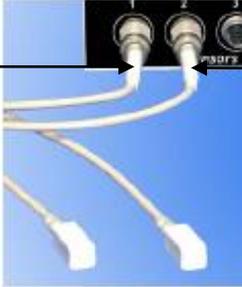
Note: Place the set of the magnetic navigator away from the electromagnetic interference sources, such as power filter, signal indication, magnetically activated metal materials, cell phone in the use of the devices.

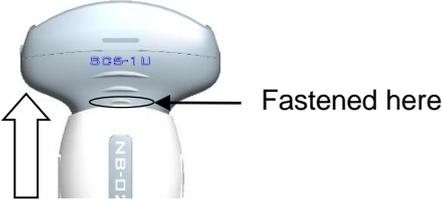
Plug the auxiliary output power supply cable, data cable, magnetic generator and sensor to the magnetic navigator respectively following the arrow's guide.



The description of the magnetic navigator is given in details. See the table below.

No.	Device Name	Port	Description
<1>	Auxiliary output power supply cable	Power supply port	Plug the auxiliary output power supply cable to the port of the magnetic navigator, and connect the power supply. Note: please use the auxiliary output power supply cable equipped with the Ultrasound System.
<2>	USB data cable	USB port	Plug one end of the USB data cable to the USB port of the magnetic navigator, and another end to the USB port of the Ultrasound System.

No.	Device Name	Port	Description
<3>	Magnetic generator	Transmitter port	<p>Plug the magnetic generator to the Transmitter port. Place it around the patient's shoulder or two sides of the patient's abdomen. The magnetic generator should be frontal-faced with the lesion. The frontal face of the magnetic generator keeps 20-60 cm from the target within the scope 30 cm up/down and 28 cm left/right.</p> <p style="text-align: center;">Front </p> <p>NOTE: keep the magnetic generator away from the metal devices or electromagnetic interference.</p>
<4>~<8>	Sensor (2), Positioning (probe) navigation support Motion (abdomen) sensor support	Positioning (probe) sensor port Motion (abdomen) sensor port	<p>1. Plug two sensors to positioning (probe) sensor port  and motion (abdomen) sensor port  respectively.</p> <p></p> <p>2. Positioning (probe) navigation support: fix the support to the probe. See the method below:</p> <ul style="list-style-type: none"> ● The plastic markers on the probe and on the navigation support must be on the same side. <p style="text-align: center;">  </p> <ul style="list-style-type: none"> ● The silk prints on the probe and the navigation support must be on the same side.

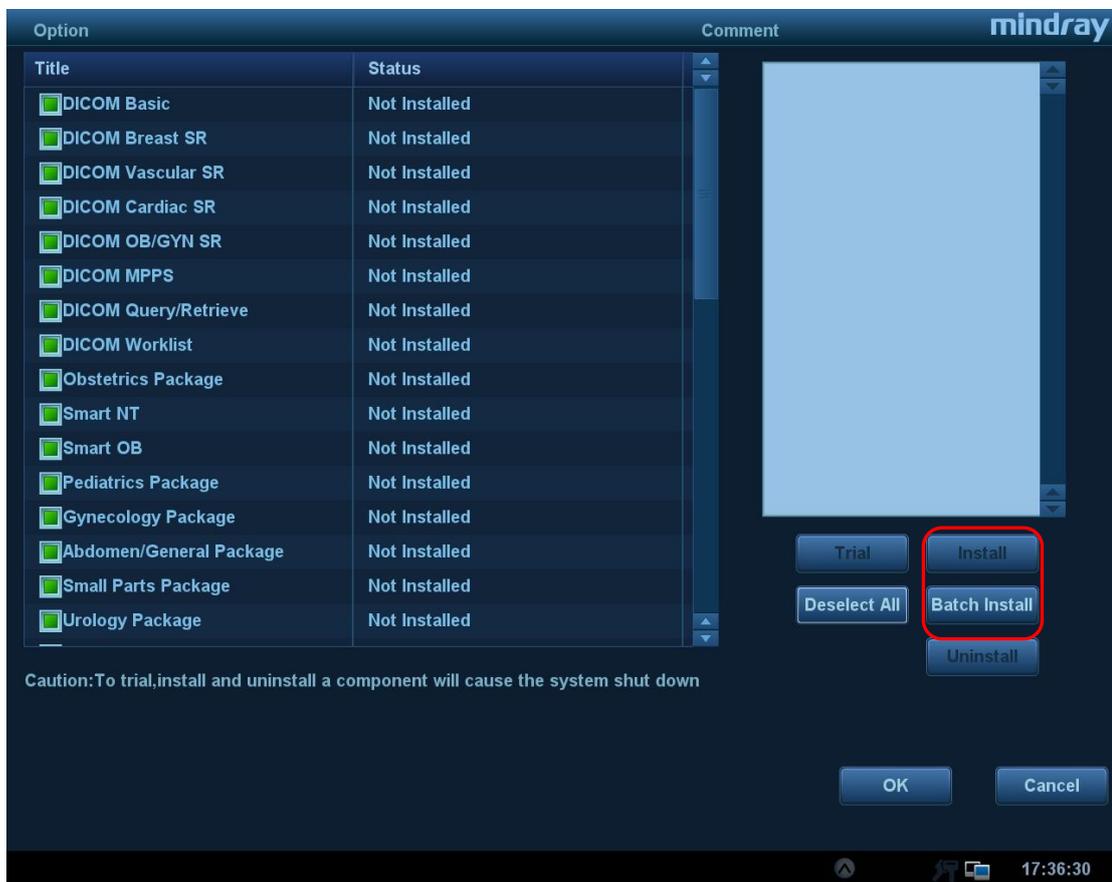
No.	Device Name	Port	Description
			<div data-bbox="890 315 1086 383">Silk print on the probe</div> <div data-bbox="895 454 1091 521">Silk print on the support</div>  <ul style="list-style-type: none"> ● Push the navigation support fastened following the arrow's guide.  <p>Fastened here</p> <p>3. Positioning (probe) sensor: fix the positioning (probe) sensor which is already plugged in positioning (probe) sensor port to the cavity of the positioning (probe) navigation support following  guide.</p>  <div data-bbox="810 1464 1011 1496">Face downward</div>  <div data-bbox="1011 1294 1150 1420">Positioning (probe) navigation support</div> <div data-bbox="1054 1498 1385 1529">Positioning (probe) sensor</div> <p>Note: if failed to plug the positioning (probe) sensor following  guide, it may lead to non-correlation of spatial positioning.</p> <p>4. Motion (abdomen) sensor: fix the motion (abdomen) sensor which is already plugged in motion (abdomen) sensor port to the cavity of the motion (abdomen) sensor support following  guide.</p>

No.	Device Name	Port	Description
			<div data-bbox="1038 259 1206 589" data-label="Image"> </div> <p data-bbox="1007 607 1209 636">Face downward</p> <p data-bbox="751 674 1442 831">5. Motion (abdomen) sensor support: stick the sensor support against the top left of the patient's abdomen with the medical plasters (below left costal arch, right above the navel, the area where the skin moves apparently with the respiration).</p> <div data-bbox="927 853 1318 1003" data-label="Image"> </div>
<9>	Magnetic navigator	/	Place the magnetic navigator behind the Ultrasound System. Power on the navigator to enable the positioning function.

10 Installing Options

10.1 Installing Optional Software

1. Copy optional key file to USB flash disk and plug USB flash disk to the port.
2. Open **Setup** menu. Select [Maintenance]→[Option]. Select the software package to be installed from the list.

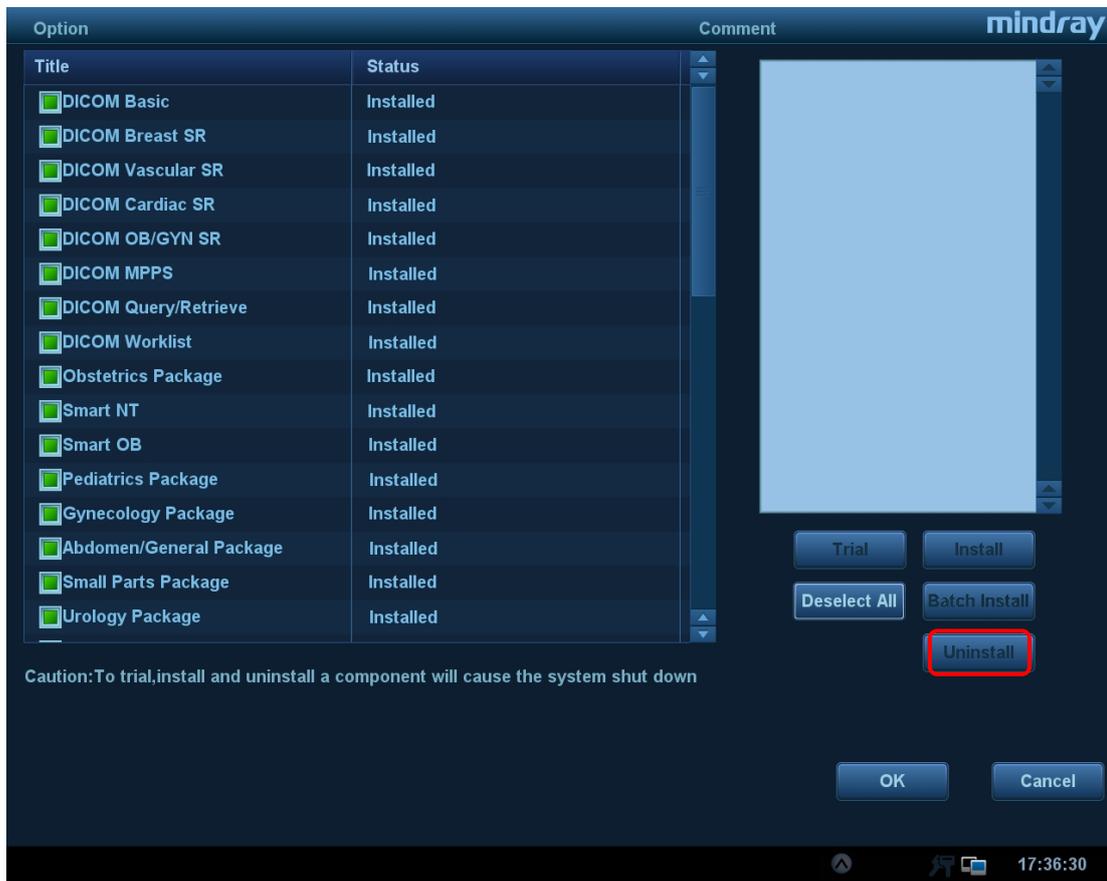


3. Click [Install]. Select key file from the dialog box, and then click [OK].
4. Select more than 1 option from the list and click [Batch Install] to install more than 1 option. Choose the folder path. The system installs the option according to the corresponding key.
5. The options become **Installed** after the key files are installed. The corresponding function is activated after returning from preset.

NOTE: After all modules are installed, please go to the previous interface to confirm.

■ Uninstall

1. Select the software package to be uninstalled from option list.
2. Click [Uninstall] and the **Confirm** dialogue box opens. Click [OK];



3. Return to the system preset interface. The option status changes into **Uninstalled**.

NOTE: The uninstallation function is exclusive to internal users. The service engineers must log in the system with the account of **Service**, and then conduct the uninstallation.

10.2 Installation of Hardware Optional Function

Hardware configuration list that the product supports is displayed below:

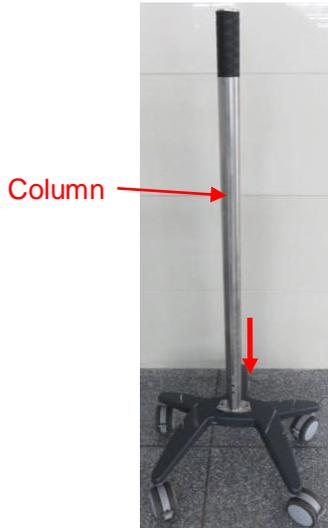
No.	Material No.	Material Description	Material and pictures	Remarks	Installation reference
1.	115-032776-00	ECG module kit (AHA)		Optional, including DC-IN cable and lead	Referring to 9.3.34
2.	115-032777-00	ECG module kit (IEC)			
3.	115-032775-00	CW Module Kit		Optional. Support the maintenance and the upgrade	Referring to 9.3.24.2
4.	115-039264-00	WIFI module kit		Optional. Support the maintenance and the upgrade. Including installation board, antenna, etc.	Referring to 9.3.27
5.	115-041416-00	Magnetic Transmitter Trolley Kit		Option	

6.	120-004738-00	Probe Adapter PCM-SU01		Optional	参考 10.2.2
7.	115-046246-00	Signal Cable ASSY for Pen Probe		Optional	10.2.3
8.	115-046245-00	4D/TEE module kit		Support the maintenance and the upgrade	9.3.24.4

10.2.1 Magnetic Transmitter Trolley Assembly

The disassembly tool: cross-headed screwdriver (M3, M4), inner hex spanner (M6).

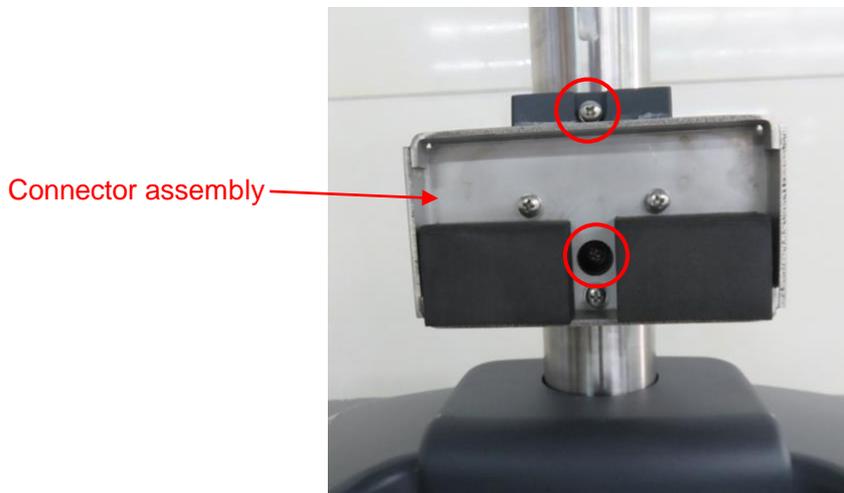
1. Lay the column onto the base assembly. Hold the column with one hand and use the other hand to screw the M6X40 (*4) screws(with flash/ elastic washer) into the Endeavour base assembly tightly with M6 inner hex spanner.



2. Cover the column with protective shield downwards.



3. Tighten screws M4X12 (*2) with cross-headed screwdriver (M3, M4) to fix the connector assembly onto the column.



4. Align the basket onto the connector assembly and press downwards to assemble the basket.



Check if it is well attached

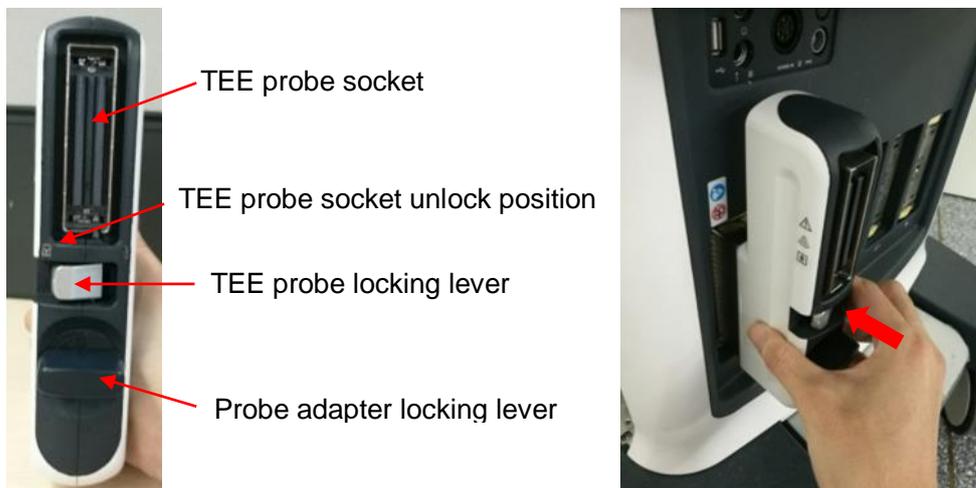
5. Loosen the regulating handle of the cantilever assembly and then cover the handle to the column. Tighten the handle to assemble the cantilever assembly to the column.

Note:	<p>Before assembly, check if the regulating handle is completely unscrewed to prevent scratching the anti-slip heat-shrinkable sleeve on the column by the stud.</p> <p>2. When tightening the handle, make sure the stud is aligned with the groove on the column.</p>
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10.2.2 Probe Adapter Installation

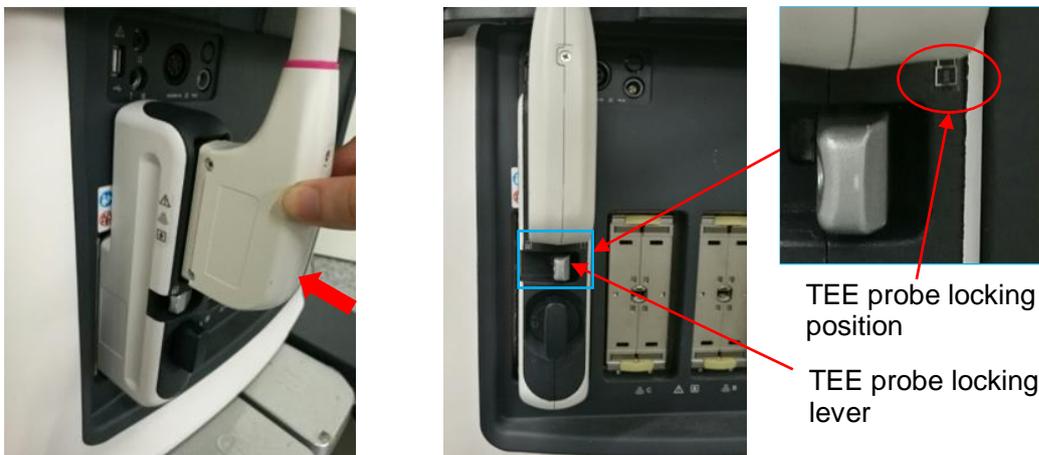
1. Firstly, move the probe adapter locking lever to horizontal direction and keep TEE probe locking lever to unlock position. Then, push probe adapter to probe port slowly and carefully while keeping the socket position upward.



2. Move the probe adapter locking lever to vertical position through 90° clockwise and lock it.



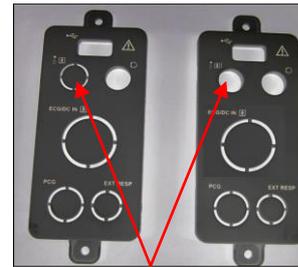
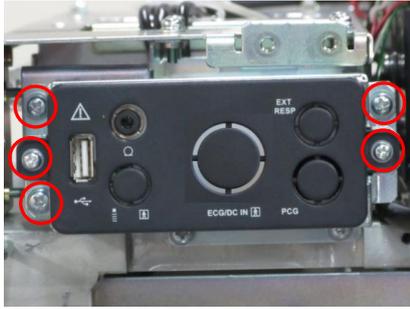
3. Stick the TEE probe connector to TEE probe socket and keep the cable upward, then move the lever to locking position in order to lock the TEE probe, achieving the installation of probe adapter and TEE probe.



10.2.3 Pencil Probe Signal Cable Assembly

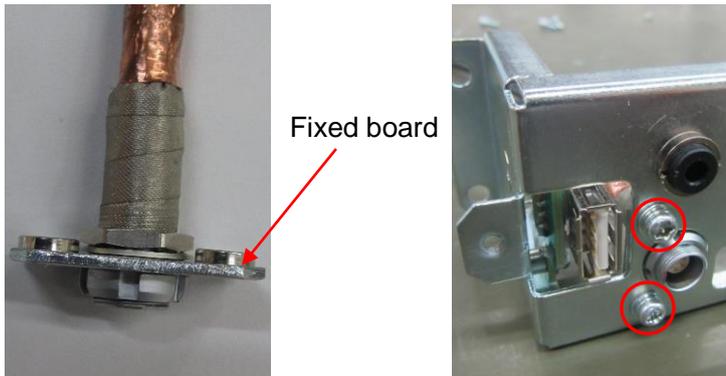
The disassembly tool: cross-headed screwdriver (M3, M4), sharp nose pliers.

1. See 9.3.16 Back Cover of the Main Unit, 9.3.17 Left Side-panel of the Main Unit, 9.3.18 Right Side-panel of the Main Unit, 9.3.19 Front Cover of the Main Unit, 9.3.20 Turbine Cover, 9.3.21 Turbine Cover Assembly, 9.3.22 Front Upper Cover of the Main Unit/Front Upper Cover Assembly of the Main Unit for details.
2. Unscrew five cross panhead screws M4X12 on ECG board and front output panel through cross-headed screwdriver (M3, M4). After that, open front output panel and remove ECG board as well as pencil probe knockout cover on ECG board.



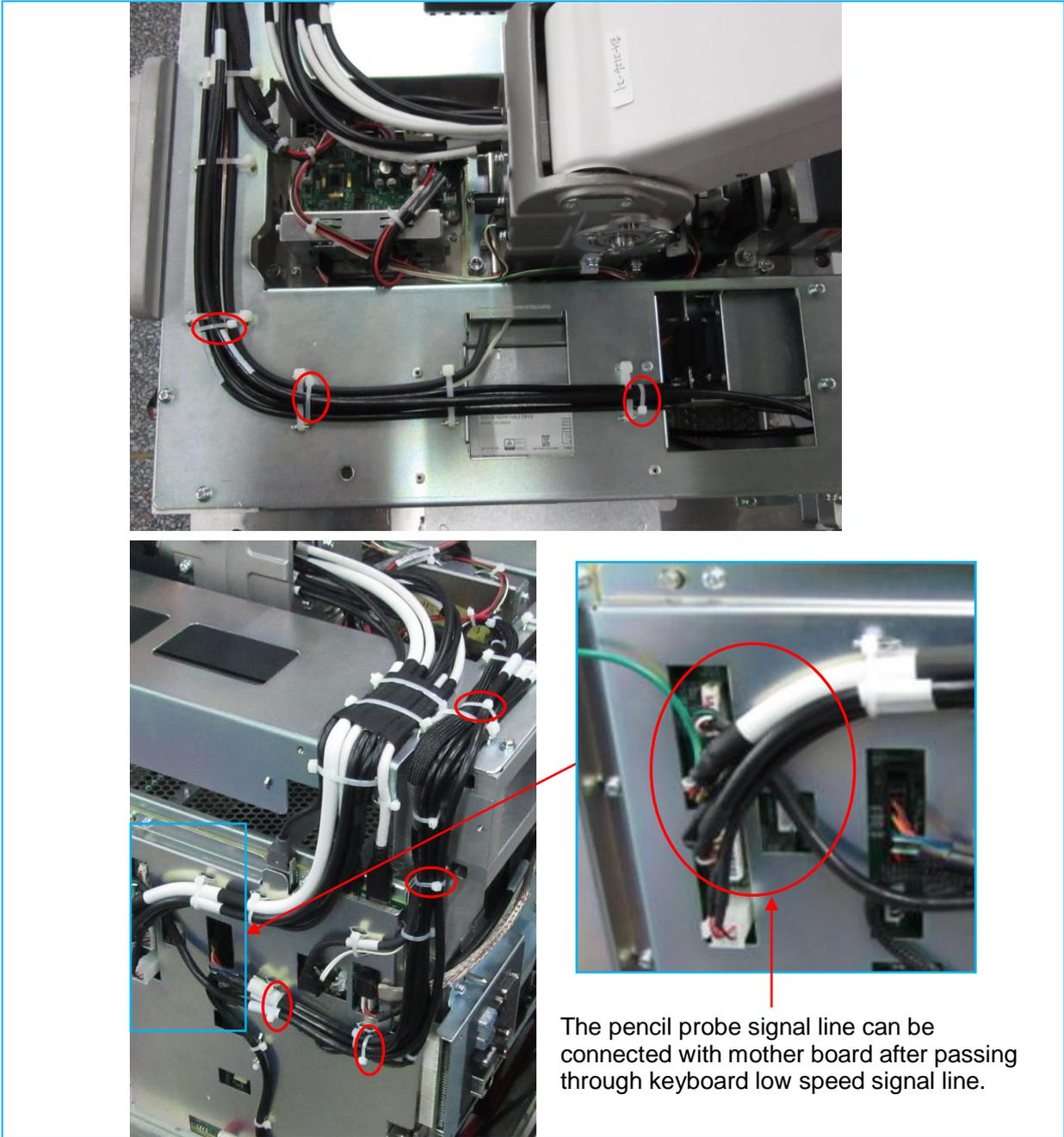
Comparison before and after removing pencil probe knockout cover

3. Install fixed plate of pencil probe signal line assembly to front output panel metal part through two cross panhead screws M3X8.



4. Fix the front output panel with ECG board again through five cross recessed small pan head screws M4X12.

5. Move the pencil probe signal line from top table of main unit to the mother board side. The pencil probe signal line along MIC signal line and other lines is fixed by seven cable ties CHS-3X100mm. The pencil probe signal line can be connected with mother board after passing through keyboard low speed signal line.



The cover can back to the original position through inverse operation of step1.

11 System Diagnosis and Support

11.1 General Status Indicator

11.1.1 Indicators on Control Panel

Status indicators	Icon	Status definition and description
Power-on status indicator		The indicator is off when the system is turned off; Press the button, the indicator blinks green, and then blinks orange. The indicator becomes green (the start-up is a short process.)
AC indicator		The indicator is green at AC supply.
Standby status indicator		The standby indicator blinks orange. Other status: light off
Hard disk indicator		The indicator light flashes in green when the hard disk is reading or writing. The indicator is off if the read and the write are not preceded.

11.1.2 The Status Indicator of the Batteries on IO Rear Board

Status indicators	Icon	Status definition and description
CPU power supply module 12 V Status indicator	12V 	Power on. The indicator is on (green), which indicates D+12V output of CPU module is normal.
Digital board power supply 5V Status indicator	5V 	Power on, and indicator is on (green), which indicates 5V output is normal
Digital board power supply 3.3V Status indicator	3.3V 	Power on, and indicator is on (green), which indicates 3V output is normal
Digital signal indicator PC_LVDS_OK	PC_LVDS	Power on. The indicator is on (green), which indicates that the digital signals outputted by CPU module are locked logically.

Program control signal indicator PHV_OP	PHV_OP	Reserved, off.
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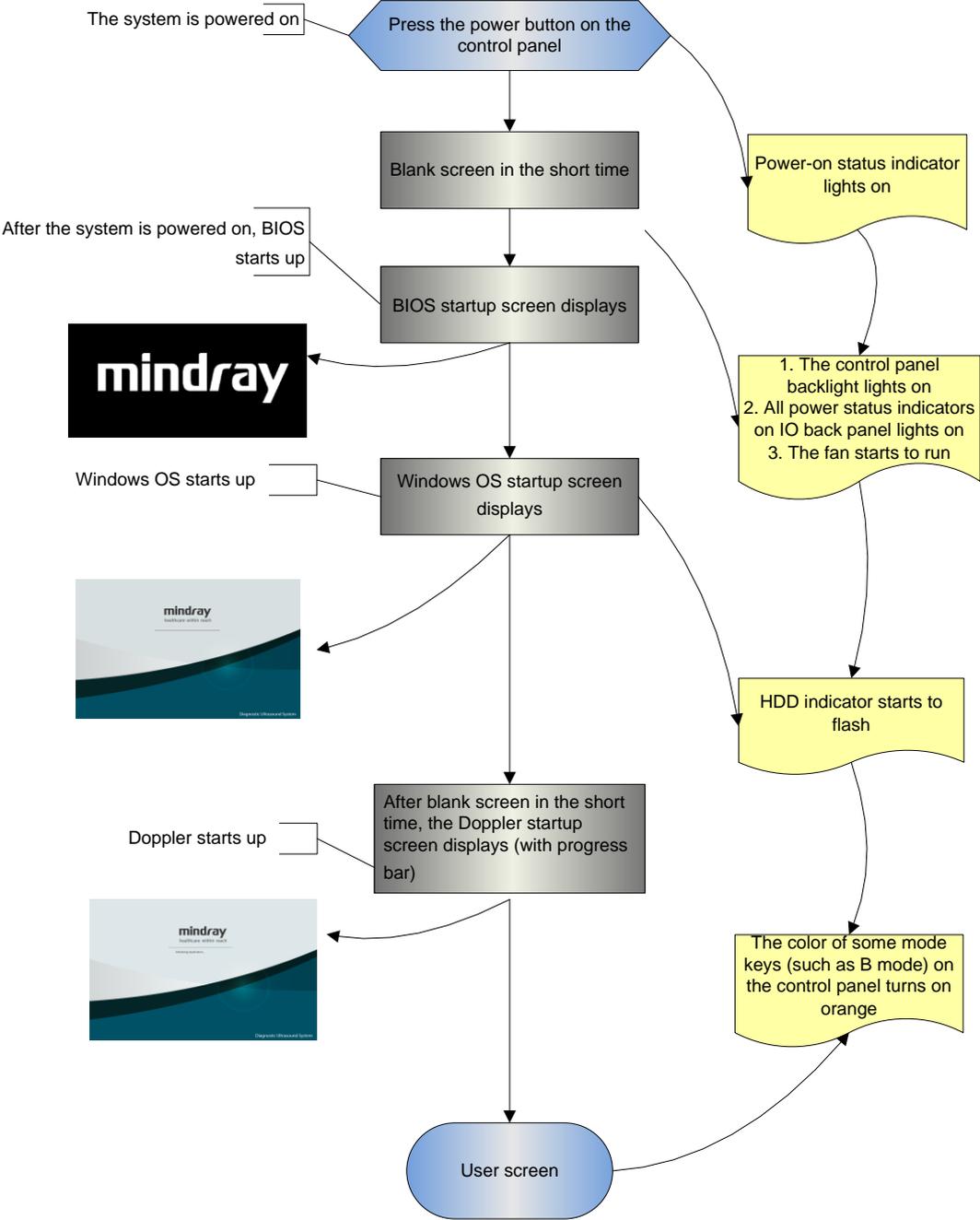
11.1.3 Display Status Indicator

Status indicators	Icon	Status definition and description
Display status Indicator	 At the right bottom of the display	The indicator is off if there is no power supply input. The indicator is green when there is sync signal input. The indicator is orange when there is no sync signal input.

11.1.4 Status of Entire Device

Status of Entire Device	Status definition and description	Enter status	Exit status
Scanning status	Power-on status indicator is green Freeze button is white	Entering or exiting the scanning status via the [Freeze] key	
Freezing status	Power-on status indicator is green Freeze button is blue	Entering or exiting the freezing status via the [Freeze] key	
Screen-saver status	The logo "mindray" scrolls. Turn the backlight of the control panel off. The system is frozen.	There is no operation for the time set first, and then the system would enter into the screen-saver status from the frozen status automatically.	When you press any keys on the control panel, the system would return to the frozen status. The brightness and the backlight of the control panel restore to previous status.
Standby status	The standby indicator blinks orange.	1 Short-press the power button, and then the system enters stand-by status by choosing from the status popped on the screen. 2 There is no operation for the time set first, and then the system would enter into the stand-by status from the screen-saver status automatically.	The system restores to the frozen status after restarting by short-pressing the power button.
Power-off status	The system is on the power-off status (with AC power input), and only the AC indicator is on.	Short-press the power button, and then the system is powered off by choosing from the status popped on the screen.	Start the system by short-pressing the power button.

11.2 Starting Process of the Whole Machine



11.3 Alarming and Errors

The warning alert appears when the abnormality occurs to the device. The LOGO file is saved in the system log.

NOTE: *Date* represents the date; *Time* represents the time; *Errorcode* represents the error code; [XXX] represents the place where the test happens.[YYY] represents the button and the encoder silk print.

11.3.1 The voltage of system power is abnormal

Alarming tips	Log records	Suggestion
Errorcode real-time battery runs out, please contact service staff.	"Date" "Time" "Errorcode": System Monitor: Real time clock battery, Current voltage: [VVV] V, Lower Limit voltage:[LLL]V.	Replace the button battery. Replace the CPU module if the problem still exists.
N/A	"Date" "Time" "Errorcode": System Monitor: Power supply alert! [XXX], Current voltage: [VVV] V, Limit voltage:[LLL]~[HHH]V.	Replace FRU, or application FRU. The FRU related to the power supply, refer to the list of error code.

11.3.2 Abnormal Temperature

Alarming tips	Log records	Suggestion
N/A	"Date" "Time" "Errorcode": System Monitor: Temperature alert! [XXX], Current temperature: [VVV] °C, Limit temperature:[LLL]~[HHH]°C. The monitoring: PCT1, PCT2, PCT3, PCT4, T_DCDC	Record whether the device is running under lower or higher temperature.
"Errorcode" CPU temperature warning! Shut down in XX seconds	"Date" "Time" "Errorcode": System Monitor: Temperature alert! [XXX], Current temperature: [VVV] °C, Upper Limit temperature:[HHH]°C.	Exclude the situation of the temperature and the air condition. Replace the CPU fan if there is abnormality to the CPU fan. If the problem is not solved with these methods, please replace CPU module.
"Errorcode" CPU temperature warning! Shut down in XX seconds	"Date" "Time" "Errorcode": System Monitor: Temperature alert! [XXX], Current temperature: [VVV] °C, Upper Limit temperature:[HHH]°C.	Exclude the situation of the temperature and the air condition. Replace the GPU fan if there is abnormality to the GPU fan. If the problem is not solved with these methods, please replace GPU module.

"Errocode" FPGA temperature warning! Shut down in XX seconds	"Date" "Time" "Errocode": System Monitor: Temperature alert! [XXX], Upper Limit temperature:[HHH]°C. The monitoring: RX1 Tj, RX2 Tj, RX3 Tj, DSP Tj.	Exclude the situation of the temperature and the air condition. Replace the device fan if there is abnormality to the device fan. If the problem is not solved with these methods, please replace FRU. Refer to error code for details.
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11.3.3 Fan Error

Alarming tips	Log records	Suggestion
Fans need maintenance, please contact service engineers	"Date" "Time" "Errocode": System Monitor: Fan alert! [XXX], Current speed: [VVV] rpm, Lower Limit speed: [LLL] rpm.	Replace inlet fan of the main unit.
"Errocode" CPU temperature warning! Shut down in XX seconds CPU needs to be maintained.	"Date" "Time" "Errocode": System Monitor:CPU Temperature alert! Fan alert! [XXX], Lower Limit speed: [LLL] rpm.	Replace CPU fan.

11.3.4 PHV Error

Alarming tips	Log records	Suggestion
Transmitting voltage error and the image does not appear, please restart the device.	"Date" "Time" "Errocode": System Monitor:HV supply alert! [XXX], Current voltage: [VVV] V, Limit voltage:[LLL]~[HHH]V.	Restart the device to recheck the problem. If the problem still exists, it maybe the error on the program control voltage. Replace the PHV box. For this problem, you need to make sure which part does the error occur, probe or PHV box.
	"Date" "Time" "Errocode": System Monitor:PHV hardware over voltage protection.	Restart the device to recheck the problem. If the problem still exists, replace the PHV box.
	"Date" "Time" "Errocode": System Monitor:PHV hardware over current protection.	Restart the device to recheck the problem. If the problem still exists, replace the PHV box or TR board.
	"Date" "Time" "Errocode": System Monitor:HV supply alert! [XXX] Voltage protect.	Restart the device to recheck the problem. If the problem still exists, replace the PHV box or TR board.
	"Date" "Time" "Errocode": System Monitor:[XXX] over temperature protect.	Exclude the situation of the temperature and the air condition. Replace the device fan if there is abnormality to the device fan. If the problem still exists, replace PHV box.
	"Date" "Time" "Errocode": System Monitor:[XXX] over current or over power protect.	Restart the device to recheck the problem. If the problem still exists, replace the PHV box or TR board.

11.3.5 4D Board Error

Alarming tips	Log records	Suggestion
N/A	"Date" "Time" "Errocode": System Monitor:4D driver board over temperature protection.	Replace 4D assembly
N/A	"Date" "Time" "Errocode": System Monitor:4D driver board over current protection.	Replace 4D assembly or 4D probe
N/A	"Date" "Time" "Errocode": System Monitor:4D power supply over voltage protection.	Replace 4D assembly

11.3.6 Other Errors

Alarming tips	Log records	Suggestion
N/A	"Date" "Time" "Errocode": System Monitor: [XXX] initialization error!	Reinstall the system software, If the problem still exists, replace FRU, refer to the list of error code.
E001 lift panel is blocked, please check.	"Date" "Time" E001: System Monitor: Lift blocked alert! software protect!	Clear the stuff that blocks the lift mechanism. Check whether there is a hard protection log below, follow up the next method if there exists the log. Replace the electrical lift assembly (difficult to replace in the field).
N/A	"Date" "Time" E002: System Monitor: Lift blocked alert! hardware protect!	Clear the stuff that blocks the lift. If it shakes at the highest or lowest position, replace the position sensor. If it shakes in the middle, replace the electrical lift mechanism (difficult to replace in the field).
"Errocode" [XXX] button; it may be blocked.	"Date" "Time" "Errocode": System Monitor: Key stuck alert! [XXX] is stuck!	Press for many times. Replace the button FRU if the problem still exists.
N/A	"Date" "Time" "Errocode": System Monitor:[XXX] abnormal alert!	Replace the electric motor or lift control assembly.
N/A	"Date" "Time" E010: System Monitor: Motor driving board alert! Motor control board and motor driving board communication error!	Replace the electrical control panel or electrical drive board.
N/A	"Date" "Time" E011: System Monitor: Motor control board alert! Motor control board and motor driving board communication error!	Replace the electrical control panel or electrical drive board.

"Errocode" [XXX] button; it may be blocked.	"Date" "Time" "Errocode": System Monitor: Key stuck alert! [YYY] key is stuck!	Check whether it can be solved manually. Replace the upper cover of the keyboard or encoder.
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11.3.7 Error Code List

The error code is shown below:

Error code	The place where the test happens	FRU where the test happens
V001	A12_ACDC	DC box assembly Source: AC power supply assembly Load: DC box assembly, PHV box assembly, PC carrier board assembly, GPU module assembly; Engine board: TR board, monitor material package, touch screen assembly, upper cover of the keyboard, coupling gel heating cup.
V002	DP5V	DC box assembly Source: DC box assembly Load: IO assembly, PC carrier board assembly, DVD assembly, hard disk assembly, touch screen assembly, USB interface
V003	AP6V	DC box assembly Reserved
V004	AP5V7	DC box assembly Source: DC box assembly Load: probe board assembly, engine board, TR board
V005	N12V	DC box assembly Source: DC box assembly Load: TR board
V006	N5V7	DC box assembly Source: DC box assembly Load: PC carrier board assembly, TR board
V007	AP2V9	DC box assembly Source: DC box assembly Load: TR board, IO assembly
V008	STB5V	DC box assembly Source: DC box assembly Load: PC carrier board assembly, CPU module assembly
V009	AP3V8	DC box assembly Source: DC box assembly Load: TR board
V010	AP1V4	DC box assembly Source: DC box assembly Load: TR board

V011	AP2V1	DC box assembly Source: DC box assembly Load: TR board
V012	DP3V3	DC box assembly Source: DC box assembly Load: probe board assembly, engine board, IO assembly
V013	VCC5V	PC carrier board assembly Source: DC box assembly Load: PC carrier board assembly
V014	VDD3V3	PC carrier board assembly Source: DC box assembly Load: PC carrier board assembly
V015	VDD2V5	PC carrier board assembly Source: PC carrier board assembly Load: PC carrier board assembly
V016	VDD1V8	PC carrier board assembly Source: PC carrier board assembly Load: PC carrier board assembly
V017	VDD1V5	PC carrier board assembly Source: PC carrier board assembly Load: PC carrier board assembly
V018	VDD1V2	PC carrier board assembly Source: PC carrier board assembly Load: PC carrier board assembly
V020	VDDN5V7	PC carrier board assembly Source: DC box assembly Load: PC carrier board assembly
V019	VBAT	PC carrier board assembly Source: button battery Load: CPU module assembly
V021	24V	Lift control panel assembly Source: AC power supply assembly Load: electrical lift, electrical lift board
V022	RX1_Vccint	TR board Source: TR board Load: TR board
V023	RX1_Vccbram	TR board Source: TR board Load: TR board
V024	RX1_Vccaux	TR board Source: TR board Load: TR board
V025	RX2_Vccint	TR board Source: TR board Load: TR board
V026	RX2_Vccbram	TR board Source: TR board Load: TR board

V027	RX2_Vccaux	TR board Source: TR board Load: TR board
V028	RX3_Vccint	TR board Source: TR board Load: TR board
V029	RX3_Vccbram	TR board Source: TR board Load: TR board
V030	RX3_Vccaux	TR board Source: TR board Load: TR board
V031	DSP_Vccint	Engine board Source: engine board Load: engine board
V032	DSP_Vccbram	Engine board Source: engine board Load: engine board
V033	DSP_Vccaux	Engine board Source: engine board Load: engine board
T001	PCT1	PC carrier board assembly (CPU&GPU)
T002	PCT2	PC carrier board assembly (MF FPGA)
T003	PCT3	PC carrier board assembly (Air Outlet)
T004	PCT4	PC carrier board assembly (Air Inlet)
T005	T_DCDC	DC Box Assembly
T006	CPU Temperature	CPU Module Assembly
T007	GPU Temperature	GPU Module Assembly
T008	RX1 Tj	TR Board
T009	RX2 Tj	TR Board
T010	RX3 Tj	TR Board
T011	DSP Tj	Engine Board
F001	Fan_80_J6	Inlet fan assembly [FAN_IN_TACH0 (J6)]
F002	Fan_80_J6	Inlet fan assembly [FAN_IN_TACH1 (J6)]
F003	Fan_80_J6	Inlet fan assembly [FAN_IN_TACH2 (J6)]
F004	Fan_60_J3	Inlet fan assembly [FAN_IN_TACH3(J3)]
F005	Fan_60_J3	Inlet fan assembly [FAN_IN_TACH4(J3)]

F006	Fan_60_J1	Inlet fan assembly [FAN_IN_TACH5(J1)]
F007	Fan_60_J1	Inlet fan assembly [FAN_OUT_TACH0(J1)]
F008	Fan_120_J2	Inlet fan assembly [FAN_OUT_TACH1(J2)]
F009	Fan_120_J4	Inlet fan assembly [FAN_OUT_TACH2(J4)]
F010	Fan_CPU	GPU Fan
F011	Fan_GPU	GPU Fan
I001	DC-DC 7462	DC Box Assembly
I002	PC carrier board 7462_A	PC carrier board Assembly
I003	PC carrier board 7462_B	PC carrier board Assembly
E001	EL_S_Protect	Height Control Panel Assembly
E002	EL_H_Protect	Height Control Panel Assembly
E003	Upkey	Height Control Panel Assembly
E004	Downkey	Height Control Panel Assembly
E005	MoveKey	Height Control Panel Assembly
E006	Motor_Sensor	Height Control Panel Assembly
E007	Motor_OVP	Height Control Panel Assembly
E008	Motor_UVP	Height Control Panel Assembly
E009	Motor_OSP	Height Control Panel Assembly
E010	Motor_ComErr	Height Control Panel Assembly
E011	Motor_ComErr_S	Height Control Panel Assembly
E012	Key_Stuck	Top Cover Assembly of the Keyboard
P001	PHV1P	PHV box assembly Source: PHV box assembly Load: TR board
P002	PHV1N	PHV box assembly Source: PHV box assembly Load: TR board
P003	PHV2P	PHV box assembly Source: PHV box assembly Load: TR board
P004	PHV2N	PHV box assembly Source: PHV box assembly Load: TR board
P005	PHV1P_PHV2P	PHV box assembly Source: PHV box assembly Load: TR board
P006	PHV1N_PHV2N	PHV box assembly Source: PHV box assembly Load: TR board

P007	PHV1P_PHV1N	PHV box assembly Source: PHV box assembly Load: TR board
P008	PHV2P_PHV2N	PHV box assembly Source: PHV box assembly Load: TR board
P009	HVP	PHV box assembly Source: PHV box assembly Load: probe
P010	HVN	PHV box assembly Source: PHV box assembly Load: probe
P011	CWP	PHV box assembly Source: PHV box assembly Load: TR board
P012	CWN	PHV box assembly Reserved
P013	BIAS	PHV box assembly Reserved
P014	PHV_OVP_H	PHV box assembly
P015	PHV_OCP_H	PHV box assembly Source: PHV box assembly Load: probe, TR board
P016	PHV1P_VP	PHV box assembly Source: PHV box assembly Load: TR board
P017	PHV1N_VP	PHV box assembly Source: PHV box assembly Load: TR board
P018	PHV2P_VP	PHV box assembly Source: PHV box assembly Load: TR board
P019	PHV2N_VP	PHV box assembly Source: PHV box assembly Load: TR board
P020	CWP_VP	PHV box assembly Source: PHV box assembly Load: TR board
P021	CWN_VP	PHV box assembly Reserved
P022	PHV_DCDC_OTP	PHV box assembly
P023	PHV_LDO_OTP	PHV box assembly
P024	PHV1P_OPP_OCP	PHV box assembly Source: PHV box assembly Load: TR board

P025	PHV1N_OPP_O CP	PHV box assembly Source: PHV box assembly Load: TR board
P026	PHV2P_OPP_O CP	PHV box assembly Source: PHV box assembly Load: TR board
P027	PHV1N_OPP_O CP	PHV box assembly Source: PHV box assembly Load: TR board
D001	FourD_OTP	4D assembly
D002	FourD_OCP	4D assembly
D003	OVP_bst_S	4D assembly

11.4 Self Test

11.4.1 Self Test Introduction

The self test function, adopted by the Ultrasound System, is used to test the connection of hardware board and running status of the device. According to the access authority and tests, there are three types of tests: production self test, maintenance self test and user self test. This chapter describes the maintenance self test and user self test in detail.

11.4.2 Operation Procedures of Maintenance Self Test

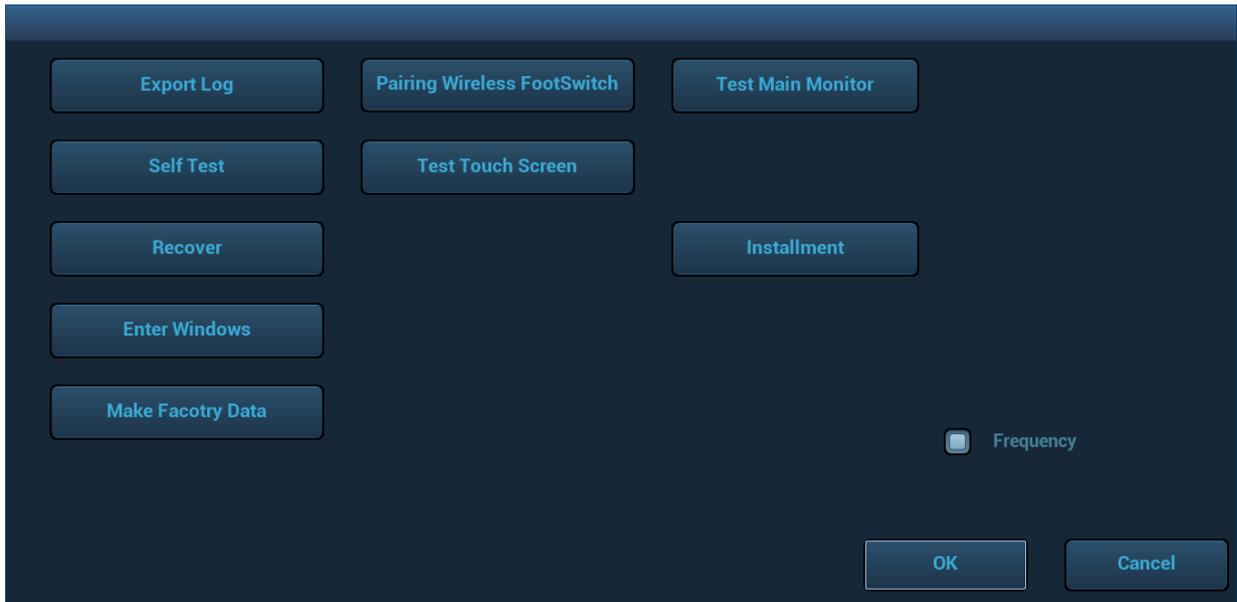
NOTE: All tasks running on Doppler should be completed before entering system self test, otherwise the self test system fails to respond. It is recommended to start self test software to perform the self test right after the system get started.

1. **Switch account**, type service password and service account to log in.
2. **Select [Setup]→[Maintenance]→[Setup].**

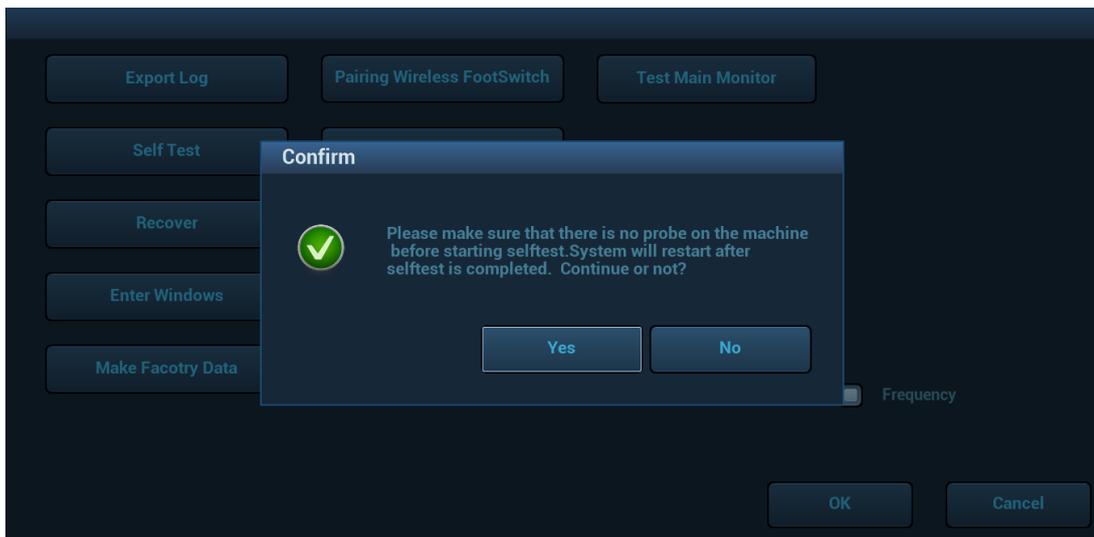
Click [Self Test] out of dialog box.

NOTE: if the current Doppler system is in Chinese, the self test performs Chinese system self test.

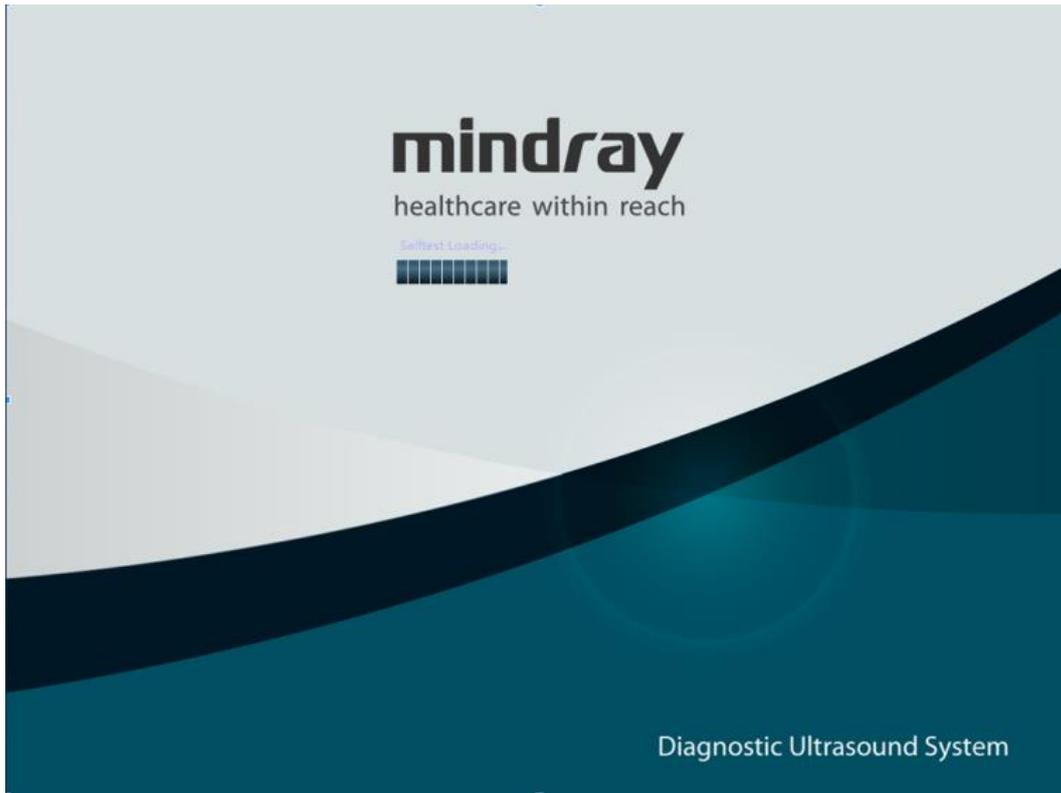
NOTE: if the current Doppler system is not in Chinese, the self test performs English system self test.



3. The dialog box appears to remind the restart of the system. Then, click [Yes].



4. The booting screen of system self test appears.



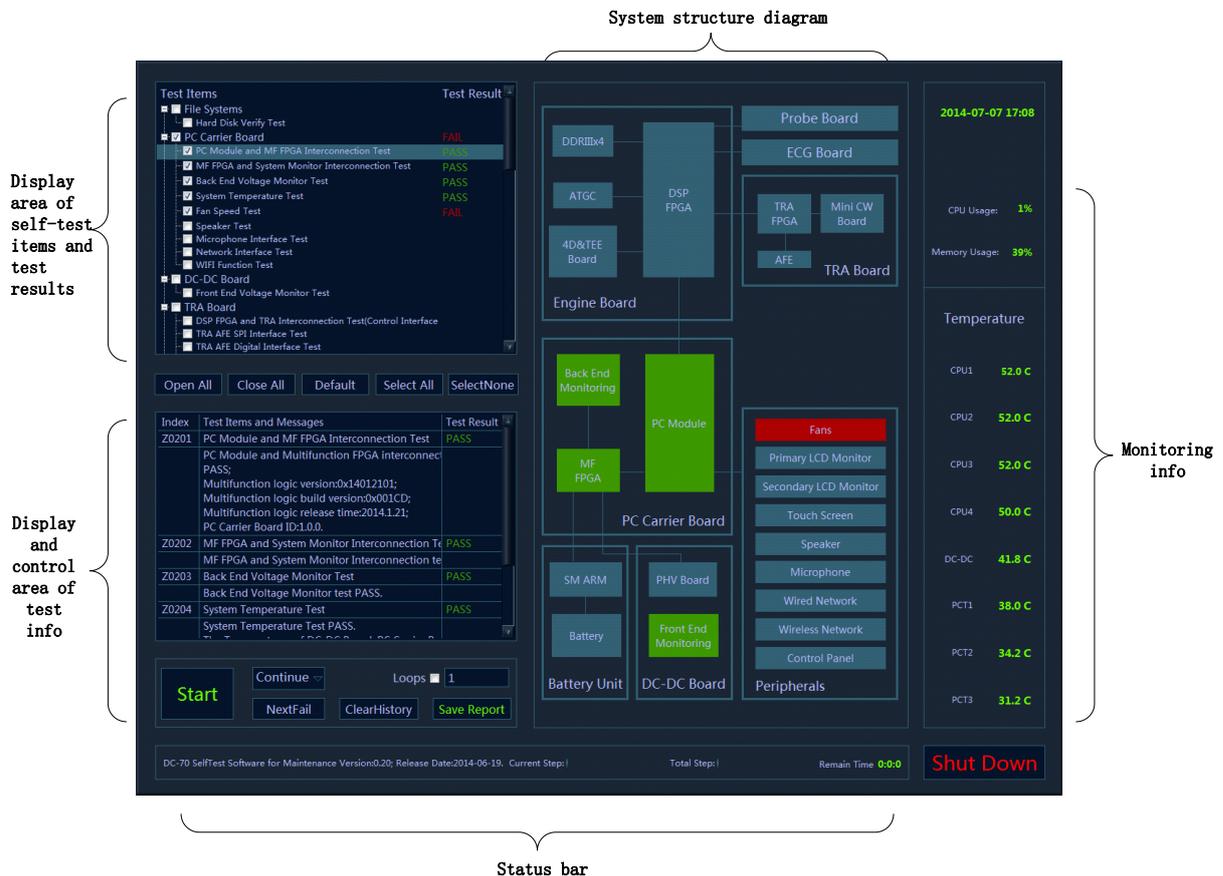
5. Configure related preset items on maintenance self test interface. After finishing the configuration, click [Start] to perform self test. See the table below:

Button Name	Description
[Open All]	Click to unfold all items that are folded.
[Close All]	Click to fold all items that are unfolded.
[Default]	The system selects the item tests to be performed.
[Select All]	Click to select all the test items.
[Select None]	Click to deselect all test items.
[Continue/Stop]	The options: [Continue] and [Stop] are available. If [Continue] is under selection, the test will continue to perform tests even if some of the tests fail. On the contrary, if [Stop] is under selection, the test stops once the failure of the test occurs.
[Start]	Click to perform tests for selected items one by one while the button turns to [Stop]. During the test, the test stops if you click [Stop]. After the test is completed, the [Stop] button turns to [Start], and starts the next new test.
[Next Fail]	After the test is completed, click [Next Fail]. The program goes for next failure item and makes the test information displayed on the top of the list. If the program reaches the bottom, it re-starts to search from the top of the list.
[Clear History]	Click to clear off the test data in <i>Test Items</i> and <i>Messages</i> and to initialize the system structure diagram to original status.
[Loops]	It is used to control loop test. Tick the check box and type the times for loop test in the right box. The test will be performed according to the times typed. If the loop time is less than 1, it continues the loop test until the user stops testing or encounters the error.

[Save Report]	The dialog box to remind the user of exporting the report appears by clicking the button. Plug the removable storage device, and select related logic drive, and then click [OK]. The test data is saved to the selected root directory. The button is disabled if the removable storage device is not plugged in.
[Shut Down]	Close the program, and shut down the device. The system reminds the user of saving the test report to removable storage device when shutting down the device.
NOTE: the test item is partitioned to parent-test item according to the board in the test area. The parent-test item contains many sub-test items. The test item can be customized according to the requirement. If the test item is selected (<input checked="" type="checkbox"/> being ticked), this item moves to the testing list; otherwise, this item is not in the testing list if the test item is not selected (<input type="checkbox"/> not being ticked).When a parent-test item is selected, all sub test items of this item are selected by default; otherwise, when deselecting a parent test item, all sub-tests of this item are deselected by default.	

Description:

The user can see production, maintenance and user self test interface from the screen. The production and maintenance self test interfaces can be divided into five areas.



1. Self test status display

The version and release date of the self test software appear on the top left of the status bar when the self test program is running. Ultrasound System Self Test Software for Maintenance Version: xx; Release Date: YYYY-MM-DD. The software version in the status bar becomes the name of current test during the test. The current test progress and overall test progress are displayed simultaneously on the status bar.

Beyond that, the status bar shows the remaining time of the test.

2. Monitoring information

Monitoring information include: current time, CPU occupation rate, memory occupation rate, CPU temperature, DSP FPGA temperature, TRA FPGA temperature, TRB FPGA temperature, TRC FPGA temperature (if TRA, TRB and TRC is not detected, FPGA temperature will not be displayed on the interface).

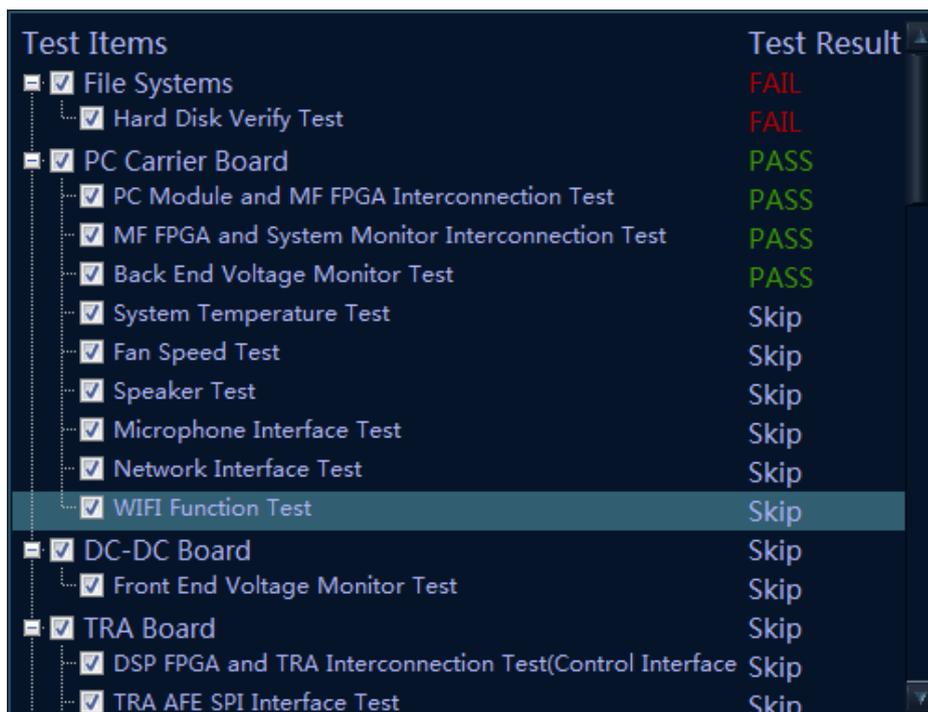
If the temperature exceeds the working temperature, the temperature status in progress bar appears in red.

3. System dialog box

The color of the element in the system dialog box changes according to test results during test process. If the test fails, the element becomes red *FAIL*; if the test succeeds, it becomes green *PASS*. If the color of the element keeps the same, it indicates the test is not preceded.

4. Test information

The test result is displayed after the test is completed. Green *PASS* indicates the pass of the sub-item. Red *FAIL* indicates the failure of the sub-item. If the item has not been tested, it appears in grey *Skip*. If the board and the assembly are not in the place, it appears in grey *N/A*. Red *Error* appears as the test item error occurs. The test result of parent test item is the aggregate for the test results of all selected sub-test items. If there is *FAIL* test in the selected list, the test result of parent test item is *FAIL*. As long as the test result of the selected item is *PASS*, the test result of parent test item would be *PASS*.As shown in the following figure.



Test Items	Test Result
<input checked="" type="checkbox"/> File Systems	FAIL
<input checked="" type="checkbox"/> Hard Disk Verify Test	FAIL
<input checked="" type="checkbox"/> PC Carrier Board	PASS
<input checked="" type="checkbox"/> PC Module and MF FPGA Interconnection Test	PASS
<input checked="" type="checkbox"/> MF FPGA and System Monitor Interconnection Test	PASS
<input checked="" type="checkbox"/> Back End Voltage Monitor Test	PASS
<input checked="" type="checkbox"/> System Temperature Test	Skip
<input checked="" type="checkbox"/> Fan Speed Test	Skip
<input checked="" type="checkbox"/> Speaker Test	Skip
<input checked="" type="checkbox"/> Microphone Interface Test	Skip
<input checked="" type="checkbox"/> Network Interface Test	Skip
<input checked="" type="checkbox"/> WIFI Function Test	Skip
<input checked="" type="checkbox"/> DC-DC Board	Skip
<input checked="" type="checkbox"/> Front End Voltage Monitor Test	Skip
<input checked="" type="checkbox"/> TRA Board	Skip
<input checked="" type="checkbox"/> DSP FPGA and TRA Interconnection Test(Control Interface	Skip
<input checked="" type="checkbox"/> TRA AFE SPI Interface Test	Skip

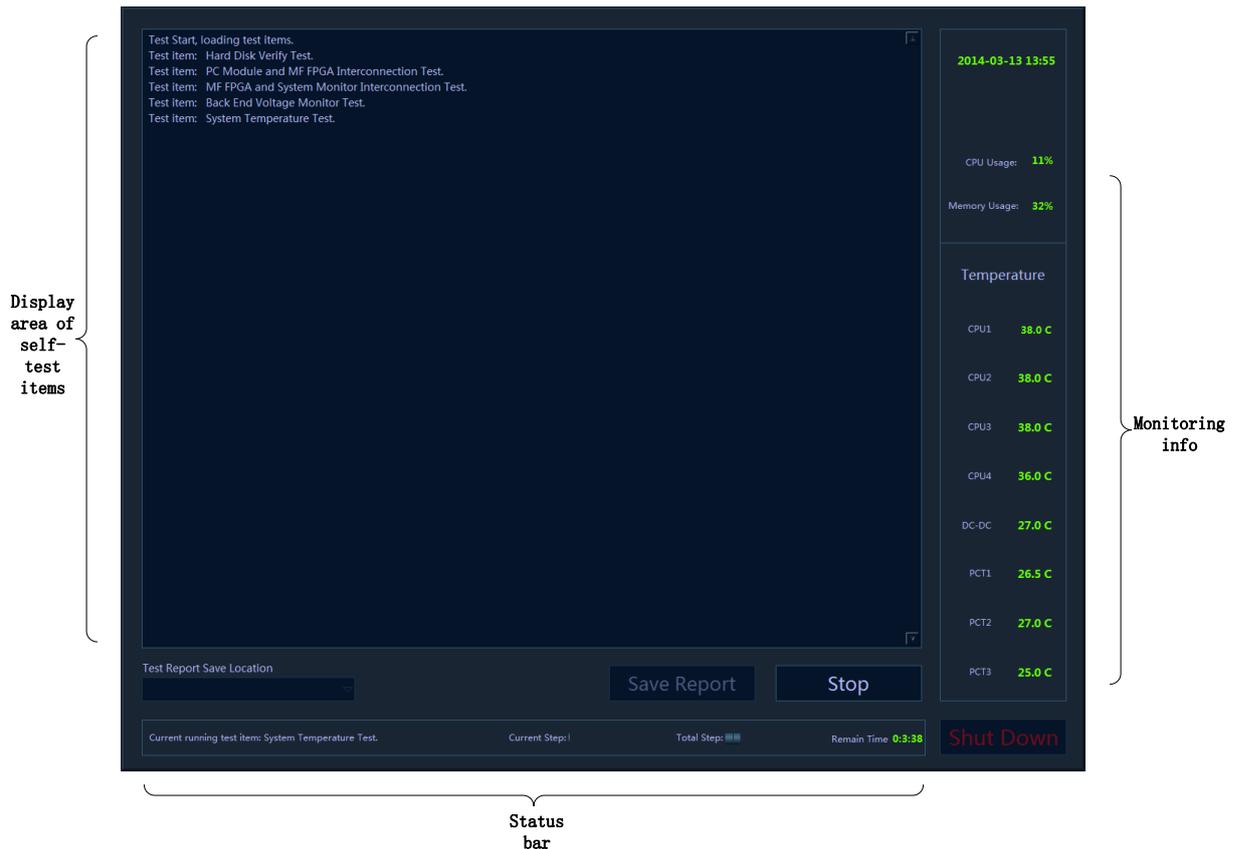
Click each test item in *Test Items* list. The program searches for related test result of each test item. The detail of the test is shown as well. See the figure below:

Index	Test Items and Messages	Test Result
Z0101	Hard Disk Verify Test	FAIL
	Hard Disk Verify test FAIL. Failed to open the result file. ***** Please check all the boards or modules as follow: Hard Disk Data.	
Z0201	PC Module and MF FPGA Interconnection Test	PASS
	PC Module and Multifunction FPGA interconnect PASS; Multifunction logic version:0x14012101; Multifunction logic build version:0x001CD; Multifunction logic release time:2014.1.21; PC Carrier Board ID:1.0.0.	
Z0202	MF FPGA and System Monitor Interconnection Test	PASS

The number to the test item appears in front of the name of test item. The number format is: ZXXYY. XX represents sequence number of the first level for item test and YY represents the second level. For example: the number of “the power monitor test” is Z0203, in which “02” represents the second test item on the first level and 03 represents the tenth test item on PC board.

11.4.3 User Self Test

Start the device. Press <Setup> button. Select [Maintenance]→[Setup]→[Self Test] to perform the operation.



There are three divisions in user self test interface: display area of self test item, monitoring information and status bar. The functions on monitoring information are same with those on user self-test interface. The self-test area only displays the item that has been tested, but not the test result.

Item	Description
[Start/Stop]	Click to perform tests for selected items one by one while the button turns to [Stop]. The test stops during the test if you click [Stop]. After the test is completed, the [Stop] button turns to [Start], and starts the next new test.
[Test Report Save Location] check box	Displays the logic drive of removable storage medium (USB flash disk, removable hard disk, etc.) connecting to the system. The check box is disabled in test process. If there is no removable storage medium, click the control to remind the user of inserting the removable storage medium.
[Save Report] button	Saves the test data to the root directory of selected logic drive. The button is disabled when the logic drive is deselected or in test process.
[Shut Down] button	Close the program, and shut down the device. The system reminds the user of saving the test report to removable storage device when shutting down the device.

Start the test when entering user self test. After finishing the test, the number of test item only displays on the screen if there is *FAIL* test item. For example, if the “system voltage monitoring” fails, only Z0210 displays on the screen. The test item for Z0210 corresponds with the system voltage test by viewing the appendix.

The dialog box of PASS appears only with all test items passing, as shown below:



11.4.4 Test Report

11.4.4.1 Test Report

The default format of test report is HTML. The test report can be browsed via Internet Explorer. The format is shown below:

The screenshot shows a test report interface. On the left is a tree view of test items under 'DC-70 SelfTest'. The tree includes 'System Information', 'PASS Testitems' (with sub-items Z0201 through Z0601), and 'Skip Testitems'. On the right, the 'Maximum Temperature' test results are displayed as a table:

Maximum Temperature	
CPU1	41.0 C
CPU2	41.0 C
CPU3	41.0 C
CPU4	41.0 C
DC-DC	32.0 C
AFE	31.0 C

Z0201 PC Module and MF FPGA Interconnection Test
Board/Module PC Carrier Board
Test Result **PASS**
Message PC Module and Multifunction FPGA interconnection test PASS;
Multifunction logic version:0x14012101;
Multifunction logic build version:0x001CD;
Multifunction logic release time:2014.1.21;
PC Carrier Board ID:1.0.0.

Z0202 MF FPGA and System Monitor Interconnection Test
Board/Module PC Carrier Board
Test Result **PASS**
Message MF FPGA and System Monitor Interconnection test PASS.

Z0203 Back End Voltage Monitor Test
Board/Module PC Carrier Board
Test Result **PASS**
Message Back End Voltage Monitor test PASS.

On the left side lie the test items. The items are classified according to test results. Click the test item on the left side, and the test data of the test item displays in the report.

The test information lies on the right side and includes:

- 1 Report name;
- 2 The time that report generates, and software version information;
- 3 Screenshot of system structure diagram;
- 4 System information;
- 5 Highest temperature;
- 6 Test item data of *FAIL* test (if there is no *FAIL* test item, the directory does not unfold);
- 7 Test item data of *PASS* test (if there is no *PASS* test item, the directory does not unfold);
- 8 Test item data of *Skip* test (if there is no *Skip* test item, the directory does not unfold).

Test data format of each test item is shown below:

Z0201 PC Module and MF FPGA Interconnection Test

Board/Module	PC Carrier Board
Test Result	PASS
Message	PC Module and Multifunction FPGA interconnection test PASS; Multifunction logic version:0x14012101; Multifunction logic build version:0x001CD; Multifunction logic release time:2014.1.21; PC Carrier Board ID:1.0.0.

in which, Z0201 refers to the index of test item;

[Board/Module] refers to the board and module that test item lies in.

[Test Result] refers to the result of test item.

[Information] refers to the information of the test item.

11.4.4.2 Test Data Storage

Take the time as the report name, and package it to zip.file format.

The test report is saved under the directory of *D:\DC9\Log\SelftestReport*. 20 copies of test reports at most.

Non-loop test

The test result will be compressed into zip.file format and saved under the directory of *D:\DC9\Log\SelftestReport* to non-loop test. One zip file owns one report.

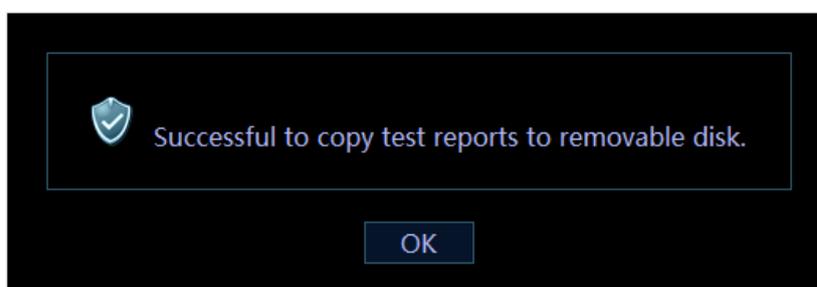
Loop test

Click [Save Report] after finishing the test. The loop test is compressed into a zip file package and saved under the directory of *D:\DC9\Log\SelftestReport*. There are N reports in zip file package where the reports are put into the folder of *Test Report Loop_N*. The test results are *PASS* and *FAIL*. N is the loop time of the test.

11.4.4.3 Test Data Export

Plug USB flash disk or removable storage medium to the port of the device.

The user chooses the logic drive of removable storage medium. Click [Save Report] on test interface to export the test data to root directory of the logic drive. The folder's name is *Test Report*. The dialog box appears after the test report is saved successfully.



See *Appendix A* for details in test items.

NOTE: It is not operational for users if there is no removable storage medium to the computer.

12 Care and Maintenance

12.1 Overview

The maintenance procedure in this chapter is only for recommendation.

12.1.1 Tools, Measurement Devices and Consumables

Table 12-1 The list for Tools and Measurement Devices

Tools/Measurement Devices	Qty.	Remarks
Plastic and resin container	1	Used to contain the physiological saline and two probes available in the container.
Soft brush	1	The size is similar to that of the brush. The material of the brush should be soft.
Small plastic bowl	1	Used to contain soap-suds
Safety testing device	1	See Appendix A for details
Inner hexagon spanner	2	M8 and M5 inner hexagon spanner

Table 12-2 Consumables List

Consumable	Qty.	Remarks
Aluminum foil	About 1 meter long	/
Physiological saline	About 1000 mL	Reach the half of the container to submerge the probe in the saline. (See Appendix A for details) (Concentration 0.85% to 0.95%)
Mild soap-suds	About 400 mL	/
Dry soft cloth	5 pieces	/

12.1.2 Routine Maintenance Items

Table 12-3 The list for Maintenance Items and Maintenance Frequency

No.	Item	Frequency	Method
1.	Dust-proof cover cleaning	1 time/month	See <i>Chapter 12.2.1</i>
2.	The monitor and the touch screen cleaning	1 time/month	Ditto
3.	Trackball cleaning	1 time/month	Ditto
4.	Control Panel/minor panel cleaning	1 time/month	Ditto
5.	Probe cleaning (head of the probe)	Every time after use	Ditto
6.	Probe cable and connector cover cleaning	1 time/month	Ditto
7.	Holder cleaning (including probe and gel holders)	1 time/month	Ditto
8.	Cover cleaning	1 time/month	Ditto
9.	Peripherals cleaning	1 time/month	See <i>Chapter 12.2.2</i>
10.	Probe appearance check	1 time/day	See <i>Chapter 12.3.1</i>
11.	Check for power supply cable, power supply plug and the circuit breaker.	1 time/month	See <i>Chapter 12.3.1</i>
12.	Check for peripherals and optional functions	1 time/year	See <i>Chapter 12.3.3</i>
13.	Mechanical safety check	1 time/year	See <i>Chapter 12.3.4</i>
14.	Check for electrical safety	1 time/year	See <i>Appendix A</i>

12.2 Cleaning

12.2.1 System Cleaning

12.2.1.1 Cleaning Flow

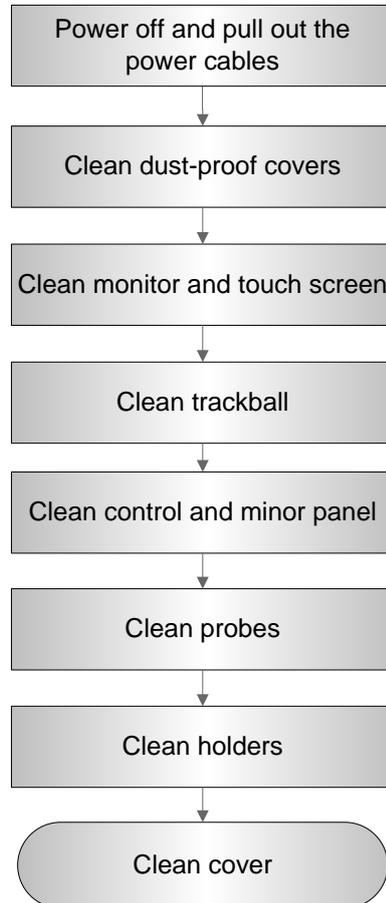


Fig 12-1 The View of Cleaning Maintenance

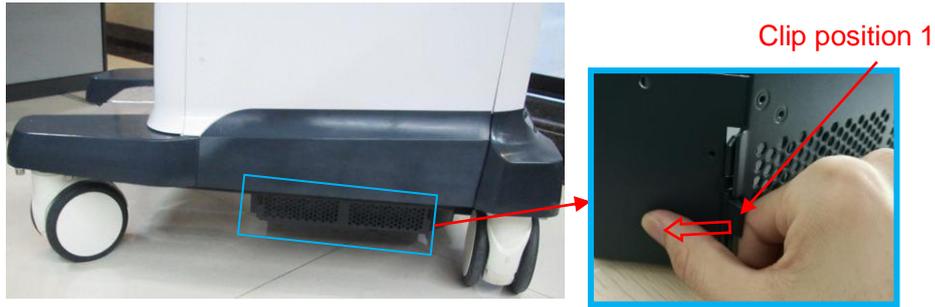
⚠WARNING: Before cleaning the system, be sure to turn off the power and disconnect the power cord from the outlet. If you clean the system while the power is “On”, it may result in electric shock.

12.2.1.2 Procedures

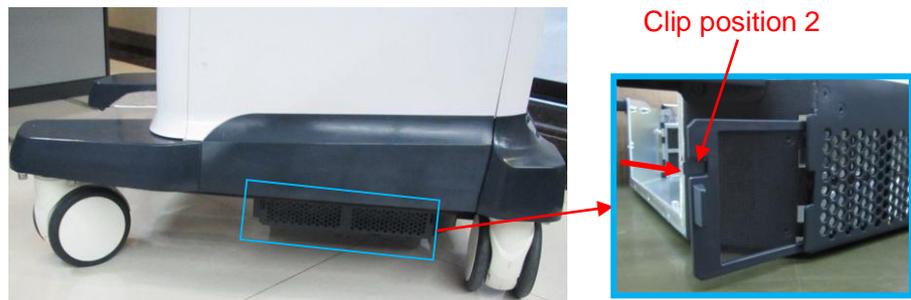
1. Dust-proof cover cleaning

- Tool: soft brush
- Method:
 - a) Remove dust-proof mesh before cleaning.

Hold electronics assembly on the base and push the clip by the index figure, pull out the dust-proof cover.



NOTE: If you can not pull out the dust-proof cover after the above operations being taken, please pull the other clip and pull out the dust-proof cover at the same time.



- b) Cleaning the dust-proof mesh---use soft brush to clean off the dust on the mesh;
- c) Installing dust-proof mesh.

Insert 4 dust-proof covers into the slot of the base box. Push the mesh towards the arrow's direction.



Manual operation, check whether the breaker works well.

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

2. Monitor cleaning (touch screen)

- Tool: dry soft cloth, clean water and soap-suds.
- Method:

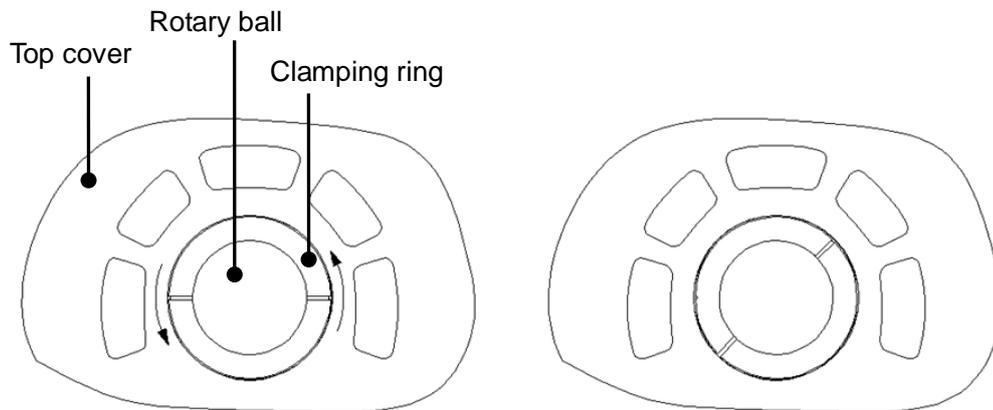
Use dry clean soft cloth to clean monitor and touch screen. If there are any stains, use dry soft cloth or mild soap-suds to clean to clean off, and then air dry it.

3. Trackball cleaning

- Tool: tissue, dry soft cloth, mild soap-suds

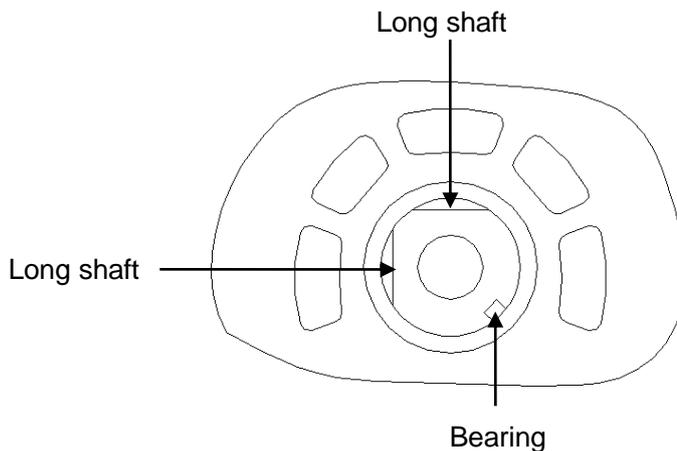
- Disassembling the trackball:

Press the bulges on the clamping ring with both hands and turn the ring about 45° counterclockwise until it lifts. Take out the ring and the rotary ball. Be careful not to drop the ball. As shown below:



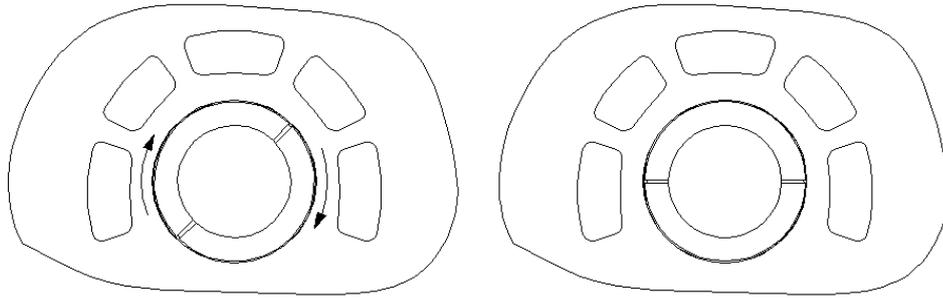
- Cleaning:

Clean the two long shafts, the bearing, plastic cover and the internal area of clamping ring (see the illustration below) with clean soft dry cloth or tissue.



- Restoration installation:

Put the rotary ball back in the trackball mechanism and put the clamping ring back in, turn the ring clockwise until the bulges are flush with the top cover, and the ring clicks and locks, which means the ring is secured. See the illustrations below.



4. Control panel cleaning

- Tool: dry soft cloth, mild soap-suds
- Method:

Use dry soft cloth to clean control panel (including keystroke, encoder, locking lever). Or use mild soap-suds to clean off the stains, and then use dry clean soft cloth to dry it. If it is difficult to clean the control panel, please remove the caps of the encoders, and then use mild soap-suds to clean off.

NOTE: Keyboard on the control panel should be cleaned periodically; otherwise, keys maybe blocked by dirt, which result in key malfunction and buzzer dinging.

5. Probe cleaning

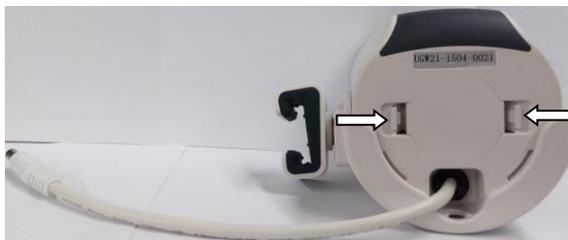
- Tool: dry soft cloth, mild soap-suds
- Method:

- a) Use dry soft cloth to clean off the dust on probe head, connector cover and its cables.
- b) Use soft brush to clean off the dust on the terminal of the probe connector.
- c) If there are any stains, use the mild soap-suds to clean off the dust on the appearance of the cables and connector cover. Then air dry it.

NOTE: the probe connector cannot be cleaned with wet cloth.

6. Gel heater cleaning

- a) Unplug the gel heater and remove it from the gliding track of the probe.
- b) Press the pad on the bottom cover to remove the bottom cover.



- c) Use mild soap-suds or the water to clean the heater appearance and the cable.

Do not use the organic solvent to clean the gel heater if any water is sprayed on or into the system. Reuse it until the appearance becomes dry.

Do not use the acetone. Do not use sharp-edged material (like steel wool) to clean the gel heater.

Clean the box of the gel heater regularly. Reinstall it to the bottom of the gel heater after it becomes dry.

d) Remove the cover and clean the cover.

7. Holder cleaning

■ Tool: dry soft cloth, soft brush, mild soap-suds

■ Method:

- a) Use soft dry cloth to clean off the dust on probe and gel holder and its gap; use the soft brush to clean off the dust from gaps and probe holders of smaller intracavity probes.
- b) If there are still stains, remove the probe holder. Use mild soap-suds to clean off the stains. Re-install it after being air dried.
- c) Gel heater: unplug the cable of gel heater, and take off the heater. Use the mild soap-suds to clean the heater. Use soft brush to clean the holes. Use soap-suds to clean off the stains, and re-install it after air-dry.

8. Device cover cleaning

■ Tool: dry soft cloth, mild soap-suds

■ Method:

Use soft cloth to clean off the dust on the device cover (the part exposed). Or use mild soap-suds to clean off the stains, and air dry it.

NOTE: it is preferred to use soft brush to clean off the dust on the port or socket rather than wet cloth (such as probe socket, IO board and ports and sockets on power supply board).

12.2.2 Peripherals Cleaning

Perform the cleaning according to the reality. The test items without the configurations can be ignored.

Table 12-4 List for peripherals cleaning

Item	Procedures	Process Description
1.	Color/Black/White video printer	Use soft dry cloth to clean off the dust and stains on the cover. Remove the cover to clean the internal of the printer. It is necessary to abide by the operation procedures in <i>Operator's Manual</i> to clean the printer.
2.	Graph/text printer	Use soft dry cloth to clean off the dust and stains on the cover. Remove the cover to clean the internal of the printer. It is necessary to abide by the operation procedures in <i>Operator's Manual</i> to clean the printer.
3.	Footswitch	Use the dry soft cloth and soap-suds to clean off the dust and stains on footswitch and the cables.
4.	Barcode reader	Use dry soft cloth to clean the glass board of the scanner, and the clean off the dust on the cables and the bracket. Please abide by the operation manual on the scanner to perform the cleaning.

12.3 Check

12.3.1 General Check

Table 12-5 The list for general check

No.	Item	Method
1.	Probe	a) Visual estimation, check whether there are any cracks and distention to probe head. b) Visual estimation, check whether there is aging or peeling; c) Visual estimation, check whether there is the foreign matters or dirt to the probe's connector.
2.	Power supply cable and socket	a) Visual estimation, check whether there are creases, cracks or aging to the power supply cable; b) Manual operation, check whether the plug of the power supply is fixed well. No loose or crack occurs.
3.	The circuit breaker	Manual operation, check whether the breaker works well.

12.3.2 System Performance Check

It is an effective method to perform checks on product performance. It is necessary to select more. The routine maintenance is not required.

Table 12-6 System function list

No.	Item	Method
1.	B Mode	Verify the basic operation in B mode. Check the basic software and hardware assembly which affect B-mode operation.
2.	Color mode	Check the basic operation in Color mode. Check the basic software and hardware assembly which affect Color mode operation.
3.	Doppler mode (PW/CW)	Verify basic operation in Doppler mode. Check the basic software and hardware assembly which affect Doppler mode operation.
4.	M mode	Check the basic operation in M mode. Check the basic software and hardware assembly which affect M-mode operation.
5.	Measurement (General measurement, optional application measurement for 2D, M, Doppler)	Scan the gray scale on body mark mode. Use controls to measure the accuracy of the distance and the area. Verify the measurement accuracy by employing the performance test.
6.	Keyboard test	Test the keyboard to verify the keys on the keyboard.

No.	Item	Method
7.	LCD	Please refer to LCD checking methods to verify LCD display and parameters adjustments.
8.	Software menu testing	Test the display of the software function to verify the entering to menus and interfaces.
See Chapter 5.4 and Chapter 5.5.		

12.3.3 Check for Peripherals and Optional Functions

If there is no relevant module or option in the system configuration, the relevant check can be ignored.

Table 12-7 Peripheral and option checking list

Item	Item	Method
1.	Color/Black/White video printer	Check whether the output of video printer works well.
2.	Graph/text printer	Check whether the output of graph/text printer works well.
3.	Footswitch	Check whether the footswitch works as the system configures.
4.	DVD-RW	Check whether DVD-RW works well (burning, read/write and openness).
5.	Barcode reader	Check whether the reader works well and whether the output is correct.
6.	DICOM	Check whether DICOM works well, and verify whether sending images to DICOM server via the shortcut key is normal.
7.	ECG module	Check user's basic operation. Verify the implementation of ECG module.
See Chapter 5.3.		

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:

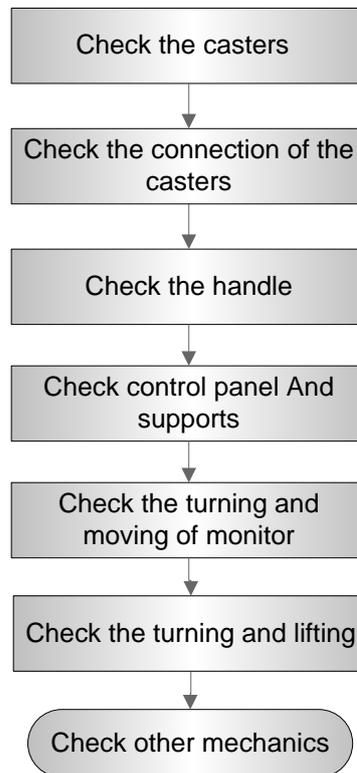
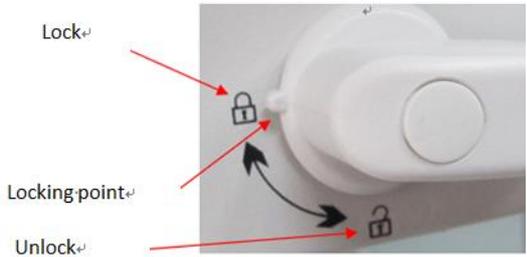


Fig 12-4 Mechanical Safety Inspection Flow

Table 12-8 Mechanical Safety Check

NO.	Item	Method	Tool
1.	Caster	Visually check to confirm there is no any crack.	none
2.	Connection of the caster	<ol style="list-style-type: none"> 1. Visually check to confirm that there is no screws and the connecting screws are free of breakage or falling off. 2. Check with the spanner to make sure that there is no looseness between the caster and the base connection screw. 	Inner hexagon wrench 8
3.	Central brake system	<p>Step the mechanical pedal, to stop the device.</p> <p>Step the walking pedal to make the device move, no turning.</p>	none
4.	Handle	<ol style="list-style-type: none"> 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
5.	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
6.	Fixing and rotating mechanism of the monitor	1. Visually check to confirm if any inclination happened to the monitor.	none
		2. Manually operate the monitor to make sure the monitor can move normally when it is turned left/ right, lifted/ lowered, and no abnormal sound exists.	none
		3. Manually turn the monitor supporting arm, the monitor can move up or down. When rotate the arm to the  position, the monitor will be locked in the middle position and can't move left or right. Make sure there is no obvious looseness.	none
		4. Open the back cover of the control panel. Check the screw M5 X16 is fastened or not with the M5 spanner. Check the cable by eyes to confirm that the connecting cable is free of looseness or scratch to see the core.	screwdriver, inner hexagonal wrench 5

NO.	Item	Method	Tool
7.	Lift and rotating mechanism	<p>a) Hold the ascending button of the handle to ascend the control panel. The ascending button is unable when reaching the height. No noise in the process.</p> <p>b) Hold the descending button of the handle to descend the control panel. The descending button is unable when reaching the bottom. No noise in the process.</p> <p>c) Rotate to  Press the lock on the control panel to lock or move the control panel.</p> <p>d) Unlock. Hold the lock on the control panel. The control panel can move within $\pm 90^\circ$. No noise in the process.</p> 	none
8.	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.

13 Troubleshooting of Regular Malfunctions

Note: deal with the error based on the field situation.

13.1 System Cannot Power On

13.1.1 Related Modules or Boards

No.	Descriptions	Remarks
1.	The circuit breakers	/
2.	5V board assembly	/
3.	AC power assembly	/
4.	DC box assembly	/
5.	Mother board assembly	/
6.	PC carrier board assembly	/
7.	CPU module assembly	/
8.	AC connection board PCBA	/

13.1.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Power-on status indicator	Backlight of the power button 
2	AC indicator	On the control panel 
3	Three power supply indicators	On IO back board. Defined as 3.3 V/5 V/12 V

13.1.3 Troubleshooting---System Cannot Power up

No.	Fault Description	Cause Analysis	Measure
1	Breaker tripping	AC power supply assembly error or 5V board assembly error	Replace AC power supply assembly or 5V board assembly
2	AC power indicator remains off;	1. No AC input; 2. Beaker cannot be closed 3. 5V board assembly error	1. Check the connection of AC 2. Close the breaker 3. Replace the 5V board assembly
3	AC power indicator: ON; Power on/off indicator: off after pressing the power button; Power status indicator: 3.3 V/5 V/12 V is off;	PC carrier board error	Replace PC carrier board
4	AC power indicator: ON; Power on indicator: green indicator blinks after pressing the power button; Power status indicator: 3.3 V/5 V/12 V is off;	CPU module assembly failed to send S3# invalid signal	Replace CPU module
5	AC power indicator: ON; Power on indicator: orange indicator blinks after pressing the power button; Power status indicator: 3.3 V/5 V/12 V is off;	There is no 12V output from AC power assembly	Replace AC power assembly
6	AC power indicator: ON; Power on/off indicator: green after pressing the power button; Power status indicator: 12 V is on; 3.3 V/5V/ is off;	There is no 3.3V,5V output from DC box assembly	Replace DC box assembly

13.2 System Cannot Start

13.2.1 Related Modules or Boards

No.	Description	Remarks
1	PC carrier board assembly	/
2	CPU module assembly	/
3	SSD card	/

13.2.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	The display and progress status when starting the system	/
2	Alarm and prompts when starting the system	/
3	Backlight status on the control panel	/
4	Display indicator	/

13.2.3 Troubleshooting—The System Cannot Start

No.	Fault Description	Cause Analysis	Solution
1	The backlight on the control panel is normal; the display is blank; no signal appears.	System powers on normally. Enter BIOS self-checking but BIOS screen does not appear. CPU module failure.	Replace CPU module
2	BIOS start-up graphics is normally displayed, but it does not proceed.	CPU module failure	Replace CPU module
3	“OPERATING SYSTEM NOT FOUND” appears.	Loading operation fails. Hard disk and root directory of SSD disk in operation system are corrupted.	Restore the operating system. If fails, replace the SSD disk.
4	BIOS start-up graphics appears, and then becomes black.	Unable to load the system. The system directory of SSD disk may be corrupted.	Restore the operating system. If fails, replace SSD disk.
5	System Doppler start-up graphics appears but it does not proceed.	Fail to load the system software. SSD disk or system software in SSD disk may be corrupted.	Restore the operating system. If fails, replace the SSD disk.

13.3 Image Problems

13.3.1 Related Modules or Boards

No.	Description	Remarks
1	PHV assembly	Power supply part
2	CW assembly	CW mode
3	TR board	/
5	Engine board	/
6	Probe board assembly	/

13.3.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Image feature, including dark strips and noise	Describe image characteristics in the following two lists.
2	Image appearance for varied probes connecting to varied sockets.	/
3	Imaging characteristics for varied probes connecting to varied/same interfaces.	It may happen because of any relay failure for probe switching or probe element switching.

13.3.3 Troubleshooting-Imaging

No.	Fault Description	Cause Analysis	Measure
1	Probe can be recognized but no echo signal in ultrasonic image region	PHV voltage error	Refer to 2.3.4
2	Dark strips appear on B image	Probe malfunction, eg. array corruption etc. Change another probe and check if the problem remains	Replace the probe.
		If the strip is not fixed well for a single probe, the probe board may go wrong.	Replace probe board assembly
		It should be TR board.	Replace TR board;
3	Noise appears in B or C image	Probe fault, change different probes and check if the problem remains.	Replace the probe.
		Other electrical equipment in the voltage is working, so that the probe may be influenced by common-mode interference	Confirm the cause of failure by powering off peripheral electrical equipment connecting to the main

		on the floor; Displays ripple-shaped interference signal on the image.	power
4	Abnormal CW Image	Abnormal CW image. CW transmitting power supply or CW board error.	Refer to 2.3.4 to replace CW board.

13.4 Probe Socket System Malfunction

13.4.1 Related Modules or Boards

No.	Description	Remarks
1	Probe board assembly	/

13.4.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Probe recognition of probes when connecting on the same or varied ports	/
2	Probe board ID of the system	/

13.4.3 Troubleshooting of Probe Socket System

No.	Fault Description	Cause Analysis	Solution
1	Probe cannot be recognized	This probe cannot be recognized if connected to all sockets, while other probes work well. The malfunction of the probe.	Replace the probe.
		This probe cannot be recognized when connected to a certain socket. Probe board malfunction.	Replace probe board assembly
		Arbitrary probe cannot be recognized on all sockets; The system cannot read the information from probe board ID; Probe board malfunction.	Replace probe board assembly

13.5 IO Interface System Failure

13.5.1 Related Modules or Boards

No.	Description	Remarks
1.	PC carrier board assembly	/
2.	CPU module assembly	/
3.	The top cover of keyboard assembly	/
4.	Mother board assembly	/
5.	Front input board assembly	/
6.	IO assembly	/
7.	Wireless net adapter material package	/

13.5.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Working conditions of IO USB interface.	/

13.5.3 Troubleshooting of IO Interface System

No.	Fault Description	Cause Analysis	Measure
1.	Two loudspeakers are mute.	Abnormal video circuit on PC carrier board	Replace PC carrier board
2.	Only one loudspeaker is mute.	Loudspeaker errors	Replace speaker assembly
3.	MIC malfunction	Abnormal video circuit on PC carrier board	Replace PC carrier board

4.	USB device cannot be recognized while connecting to the USB port	<p>Check whether USB can be recognized by PC device. If it cannot, it may be the problem of the device.</p> <p>If all USBs cannot be recognized, observe the 5V indicator.</p> <p>If the indicator is off, the 5V is abnormal. See V002 to troubleshoot the error.</p> <p>If the indicator is normal, it may be the problem of CPU module.</p> <p>If the USB on the control panel cannot be used and the touch screen cannot be operated, it may be the problem of USB HUB.</p> <p>If the USB interface becomes abnormal, it may be the problem of IO assembly.</p> <p>If the port on the front of the device becomes abnormal, it may be the problem of the mother board or front output board.</p>	<p>Replace according to the error analysis</p> <p>USB device</p> <p>5V power supply or FRU load (V002)</p> <p>CPU Module Assembly</p> <p>Top Cover Assembly of the Keyboard</p> <p>IO assembly</p> <p>Mother board assembly and front output assembly</p>
5.	Network disconnected or abnormal	If the network and the settings work well, the error may occur to IO board or CPU module.	Replace IO board or CPU module.
6.	Fail to recognize Wi-Fi	Wi-Fi material package, CPU module or PC carrier board error	Replace wireless network adaptor material package, CPU module or PC carrier board
7.	Normal primary monitor VGA(or HDMI or S-VIDEO) no display	PC carrier board error	Replace PC carrier board
8.	Normal primary monitor VGA(or HDMI) resolution	Not successful to adopt to the environment	Manual set VGA/HDMI resolution
9.	Normal primary monitor HDMI (or VGA) strips or blinking on the monitor	Poor HDMI or VGA signal	Replace HDMI or VGA or set resolution

13.6 Control Panel Failure

13.6.1 Related Modules or Boards

No.	Description	Remarks
1.	The top cover of keyboard assembly	/
2.	Small keyboard	/
3.	Trackball	/
4.	General encoder board	/
5.	single-encoder board	/

13.6.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Backlight of the control panel	/
2	Key sound of the control panel.	/
3	Response to general function keys on control panel.	/
4	Response to general key on keyboard.	/
5	Response to trackball operation	/
6	Response to slide the TGC sliders	/
7	Response to each encoder	/

13.6.3 Troubleshooting of Control Panel

No.	Fault Description	Cause Analysis	Solution
1	Buzzer alarms	Key blocked	Check the key on the control panel, press for many times
2	Some or a certain key fails	Upper cover error	Replace top cover assembly of the keyboard
3	Some or a certain key on the small keyboard fails.	Small keyboard error	Replace small keyboard
4	Trackball failed or abnormal	Dirt or obstacles jam in the trackball glove.	Open and clean the glove
		Improper settings of trackball speed in system preset;	Preset the system
		Degenerated trackball performance	Replace the trackball

5	Keys on the control panel work well, but single encoder does not work.	Single encoder error	Replace the encoder board
6	Control panel keys work well, but single TGC fails.	TGC board error	Replace TGC board.
	All TGC do not work.	The top cover of keyboard error	Replace the top cover of keyboard

13.7 LCD Display Failure

13.7.1 Related Modules or Boards

No.	Description	Remarks
1.	Display (Monitor) material package	/
2.	PC carrier board assembly	/
3.	CPU module assembly	/
4.	IO assembly	/
5.	Touch screen assembly	/
6.	Display signal adaptor board assembly	/

13.7.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Display module indicator	At the right bottom of the display
2	Backlight of the LCD	Brighter in the darkness
3	Video output interface of VGA, HDMI for IO assembly.	External LCD is needed.
4	Display mode of the LCD	Blank screen, "No Signal" or blurry screen, etc., appears.
5	Display mode of the touch screen assembly.	Blank screen, "No Signal" or blurry screen, etc., appears.

13.7.3 Troubleshooting of the Monitor

No.	Fault Description	Cause Analysis	Measure
1	Control panel powered on normally; No display (blank screen) on the LCD; Green indicator of the display is on.	Monitor error	Replace monitor package
2	Control panel powered on normally; one of indicators turns to blue. No display (blank screen) on the LCD; Display indicator is off.	Abnormal power supply of the monitor and the monitor error	Check the power supply for the monitor or replace the monitor material package
3	Control panel powered on normally; "No Signal" displays on LCD; Orange indicator of the display is on.	Normal touch screen, the image appears on the external monitor. Monitor signal transmitting plate or PC carrier board errors.	Replace the plate or PC carrier board.
		Normal touch screen, the monitor image appears. PC carrier board error	Replace PC carrier board
		Abnormal touch screen. CPU error.	Replace CPU module
4	LCD works normally; Touch screen blank.	Abnormal power supply of the touch screen and the touch screen error	Replace the power supply of the touch screen or touch screen assembly
5	LCD works normally; "No Signal"	CPU module error or PC carrier board error	Replace CPU module or PC carrier board

13.8 ECG Module Failure

13.8.1 Related Modules or Boards

No.	Description	Remarks
1	ECG assembly	/
2	Engine board	/

13.8.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	Wave features of ECG signal	/

13.8.3 Troubleshooting for ECG Module

No.	Fault Description	Cause Analysis	Solution
1	Fail to open ECG relevant functions.	ECG error.	Replace ECG module.
2	Enable ECG. The waveform of ECG appears as a signal line or the shape of the wave is abnormal.	ECG error.	Replace ECG module.

13.9 4D Troubleshooting

13.9.1 Related Modules or Boards

No.	Material Description	Remarks
1	4D probe	/
2	The material package of 4D module	/
3	Probe board assembly	/
4	Engine board	/

13.9.2 Key Points Supporting Troubleshooting

No.	Key Points Supporting Troubleshooting	Remarks
1	The shaking when moving the probe	The probe vibrates when moving towards one direction.
2	Abnormal shaking and noise	It happens when the abnormality occurs.

13.9.3 4D Drive Troubleshooting

No.	Fault Description	Cause Analysis	Measure
1	Enter 4D mode. The probe keeps still, no 4D image.	1 abnormal drive or drive output failed; 2 abnormal probe mechanism	Replace the material package of 4D module Replace 4D probe
2	Enter 4D. The probe vibrates. No 4D image.	Internal error of the probe. Cannot detect the central area.	Replace 4D probe
3	Enter 4D mode. 4D image, halt when working.	Abnormal drive circuit or 4D probe	Replace the material package of 4D module or 4D probe.
4	Enter 4D mode. the probe works well. No distortions on 4D image.	4D probe error	Replace 4D probe

Appendix A Electrical Safety

Inspection

The following electrical safety tests are recommended as part of a comprehensive preventive maintenance program. They are a proven means of detecting abnormalities that, if undetected, could prove dangerous to either the patient or the operator. Additional tests may be required according to local regulations.

All tests can be performed using commercially available safety analyzer test equipment. These procedures assume the use of a 601PRO_{XL} International Safety Analyzer or equivalent safety analyzer. Other popular testers complying with IEC 60601-1 used in Europe such as Fluke, Metron, or Gerb may require modifications to the procedure. Follow the instructions of the analyzer manufacturer.

The consistent use of a safety analyzer as a routine step in closing a repair or upgrade is emphasized as a mandatory step if an approved agency status is to be maintained. The safety analyzer also proves to be an excellent troubleshooting tool to detect abnormalities of line voltage and grounding, as well as total current loads.

ELECTRICAL SAFETY INSPECTION

1- Power Cord Plug

TEST PROCEDURE

◆ The Power Plug

The Power Plug Pins	No broken or bent pin. No discolored pins.
The Plug Body	No physical damage to the plug body.
The Strain Relief	No physical damage to the strain relief. No plug warmth for device in use.
The Power Plug	No loose connections.

◆ The Power Cord

The Power Cord	<p>No physical damage to the cord. No deterioration to the cord.</p> <p>--For devices with detachable power cords, inspect the connection at the device.</p> <p>--For devices with non-detachable power cords, inspect the strain relief at the device.</p>
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ELECTRICAL SAFETY INSPECTION

2- Device Enclosure And Accessories

TEST PROCEDURE

◆ Visual Inspection

The Enclosure and Accessories	No physical damage to the enclosure and accessories.
	No physical damage to meters, switches, connectors, etc.
	No residue of fluid spillage (e.g., water, coffee, chemicals, etc.).
	No physical damage to probe head (e.g., crack)
	No loose or missing parts (e.g., knobs, dials, terminals, etc.).

◆ Contextual Inspection

The Enclosure and Accessories	No unusual noises (e.g., a rattle inside the case).
	No unusual smells (e.g., burning or smoky smells, particularly from ventilation holes).
	No taped notes that may suggest device deficiencies or operator concerns.

ELECTRICAL SAFETY INSPECTION

3- Device Labeling

TEST PROCEDURE

Check the labels provided by the manufacturer or the healthcare facility is present and legible.

- *Main Unit Label*
- *Integrated Warning Labels*
- *Slope and High Voltage Caution Label*
- *Don't Stress Label*

ELECTRICAL SAFETY INSPECTION

4- Protective Earth Resistance

VOERVIEW

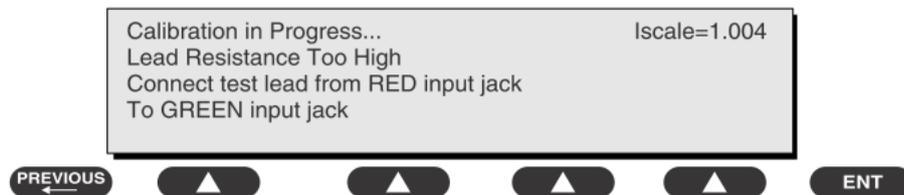
Protective Earth Resistance is measured using the RED test lead attached to the DUT Protective Earth terminal or Protective Earth Metal enclosure or equipotential terminal. Select the test current by pressing SOFT KEY 3 to toggle between 1AMP, 10AMP, and 25AMP. The front panel outlet power is turned off for this test.

The following conditions apply: L1 and L2 Open.

TEST PROCEDURE

◆ Prepare

- 1) First select the test current that will be used for performing the Protective Earth Resistance test by pressing AMPERES (SOFT KEY 3).
- 2) Connect the test lead(s) between the RED input jack and the GREEN input jack.
- 3) Press CAL LEADS. The 601PRO will measure the lead resistance, and if less than 0.150 Ohms, it will store the reading and subtract it from all earth resistance readings taken at the calibrated current.



- 4) If the calibration fails, the previously stored readings will be used until a passing calibration has occurred.

◆ Warning

During Earth Resistance testing, the DUT must be plugged into the 601PRO front outlet. If the DUT fails Earth Resistance, discontinue tests and label the device defective.

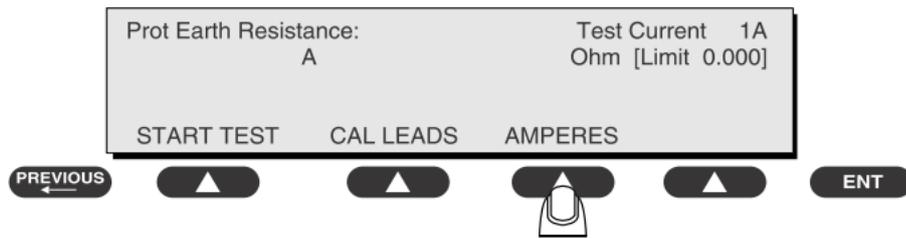
◆ Perform the Test

- 1) From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet.

ELECTRICAL SAFETY INSPECTION

4- Protective Earth Resistance

- 2) Attach the 601PRO RED input lead to the device's Protective Earth terminal or an exposed metal area.
- 3) Press shortcut key 3. The Protective Earth Resistance test is displayed.
- 4) Press SOFT KEY 3 to select a test current (1AMP, 10AMP, or 25AMP). The selected test current is displayed in the upper right corner of the display.



- 5) Press START TEST to start the test. The test current is applied while resistance and current readings are taken. This takes approximately 5 seconds.
- 6) Press the print data key at any time to generate a printout of the latest measurement(s).

◆ NOTE

When "Over" is displayed for Ohms, this signifies that a valid measurement was not obtained because either an open connection was detected or that the measurement was not within range. Readings greater than 9.999 Ohms will be displayed as Over.

◆ Failure

Once it reaches the limitation, stop using equipment. Check the protective earth connection between Protective Earth terminal and Protective Earth Metal enclosure and equipotential terminal; Retest and inform the Customer Service Engineer for analysis and disposal if still fail.

LIMITS

ALL COUNTRIES R = 0.2Ω Maximum

ELECTRICAL SAFETY INSPECTION

5- Earth Leakage Test

OVERVIEW

Run an Earth Leakage test on the device being tested before performing any other leakage tests.

Leakage current is measured the following ways:

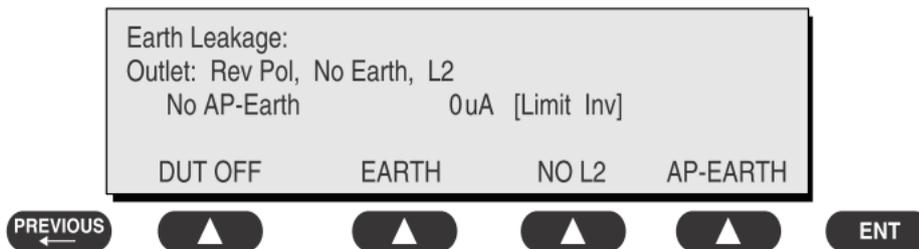
- ◆ Earth Leakage Current, leakage current measured through DUT outlet Earth
- ◆ Earth Leakage Current AP-EARTH (ALL Applied Parts connected to Earth), leakage current measured through DUT outlet Earth

There is no need to attach a test lead; the 601PRO automatically connects the measuring device internally.

TEST PROCEDURE

◆ Perform the Test

- 1) From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.
- 2) Attach the device's applied parts to the 601PRO applied part terminals if applicable.
- 3) Press shortcut key 4. The Earth Leakage test appears on the display, and the test begins immediately:



- SOFT KEY 1 toggles the DUT outlet Polarity from Normal to Off to Reverse.
 - SOFT KEY 2 toggles the DUT outlet from Earth to No Earth.
 - SOFT KEY 3 toggles the DUT outlet from L2 to No L2.
 - SOFT KEY 4 toggles the AP to Earth to No AP to Earth.
- 4) Press the print data key at any time to generate a printout of the latest measurement.

ELECTRICAL SAFETY INSPECTION

5- Earth Leakage Test

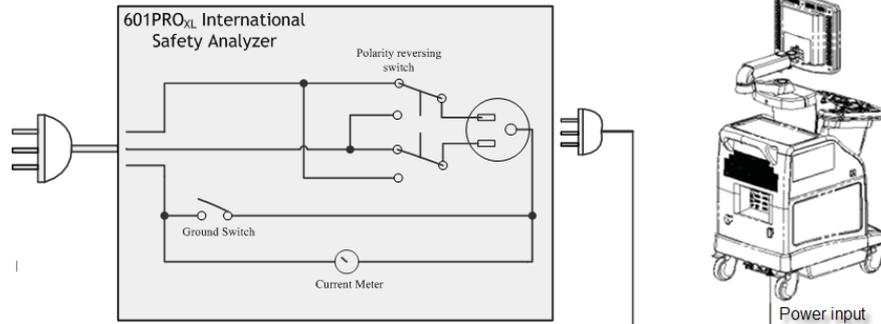


Figure 1 Earth leakage test

◆ Failure

Check any short-circuits of the Y capacitor on power unit. Replace a new one if any portion defective.

Check any broken of the Power Unit. Replace a new one if any portion defective.

Inspect mains wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

Change another probe to confirm if the fail is caused by console.

Inspect mains wiring for bad crimps, poor connections, or damage.

If the leakage current measurement tests fail on a new unit and if situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

UL60601-1:	300 μ A Normal Condition
	1000 μ A Single Fault Condition
IEC60601-1:	500 μ A Normal Condition
	1000 μ A Single Fault Condition

ELECTRICAL SAFETY INSPECTION

6- Patient Leakage Current

OVERVIEW

Patient leakage currents are measured between a selected applied part and mains earth. All measurements may have either a true RMS or a DC-only response.

TEST PROCEDURE

◆ Prepare

Perform a calibration from the Mains on Applied Part menu.

The following outlet conditions apply when performing this test:

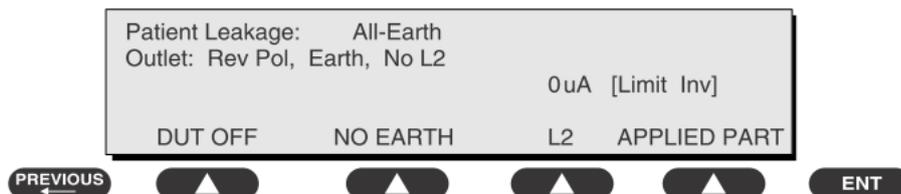
Normal Polarity, Earth Open, Outlet ON	Normal Polarity, Outlet ON
Normal Polarity, L2 Open, Outlet ON	Reversed Polarity, Outlet ON
Reversed Polarity, Earth Open, Outlet ON	Reversed Polarity, L2 Open, Outlet ON

◆ Warning

If all of the applied parts correspond to the instrument type, the applied parts will be tied together and one reading will be taken. If any of the applied parts differ from the instrument type, all applied parts will be tested individually, based on the type of applied part. This applies to Auto and Step modes only.

◆ Perform the Test

- 1) From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.
- 2) Attach the applied parts to the 601PRO's applied part terminals.
- 3) Press shortcut key 6. The Patient Leakage test is displayed, and the test begins immediately.



- 4) Press APPLIED PART (SOFT KEY 4) at any time to select the desired applied part leakage current.

ELECTRICAL SAFETY INSPECTION

6- Patient Leakage Current

- 5) Modify the configuration of the front panel outlet by pressing the appropriate SOFT KEY on the 601PRO.
- 6) Press the print data key at any time to generate a printout of the latest measurement.

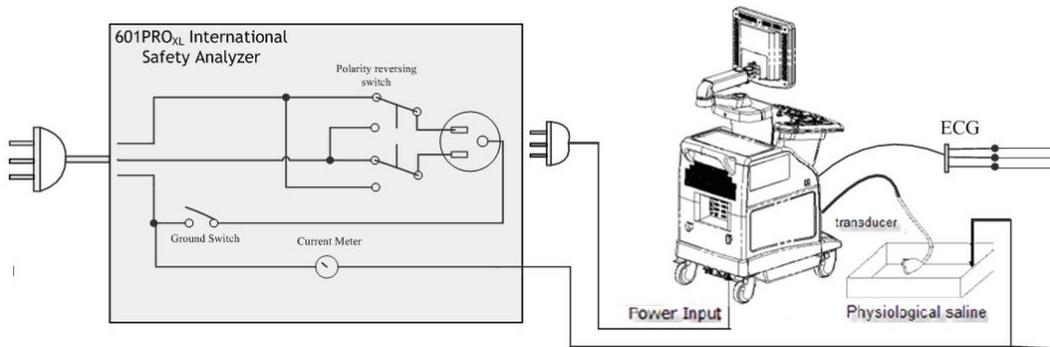


Figure 2 patient leakage Current

◆ NOTE

1, In addition to Probes ,Patient leakage current test should be perform if ECG or PCG parts used;

2, If the current test standard being used does not include Patient Leakage DC readings, or the DC option is not enabled, then DC readings will not be available through the APPLIED PART SOFT KEY selections. Refer to Chapter 8, Standards and Principles.

◆ Failure

Check any broken of the Applied parts. Replace any defective one.

Check any broken of the ECG/PCG module if used, Replace any defective one.

Check any broken of the Power Unit. Replace a new one if any portion defective.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

Change another probe to confirm if the fail is caused by console.

Inspect wiring for bad crimps, poor connections, or damage.

If the leakage current measurement tests fail on a new unit and if situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

ELECTRICAL SAFETY INSPECTION

6- Patient Leakage Current

All countries

For BF ECG input and transducer

100 μ A Normal Condition

500 μ A Single Fault Condition

ELECTRICAL SAFETY INSPECTION

7- Mains on Applied Part Leakage

OVERVIEW

The Mains on Applied Part test applies a test voltage, which is 110% of the mains voltage, through a limiting resistance, to selected applied part terminals. Current measurements are then taken between the selected applied part and earth. Measurements are taken with the test voltage (110% of mains) to applied parts in the normal and reverse polarity conditions as indicated on the display.

The following outlet conditions apply when performing the Mains on Applied Part test.

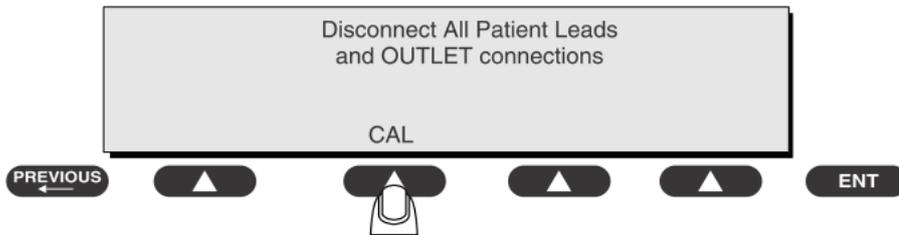
- Normal Polarity;
- Reversed Polarity

TEST PROCEDURE

◆ Prepare

To perform a calibration from the Mains on Applied Part test, press CAL (SOFT KEY 2).

- 1) Disconnect ALL patient leads, test leads, and DUT outlet connections.
- 2) Press CAL to begin calibration, as shown:



If the calibration fails, the previously stored readings will be used until a passing calibration has occurred. Also, the esc/stop key has no effect during calibration.

- 3) When the calibration is finished, the Mains on Applied Part test will reappear.

◆ Warning

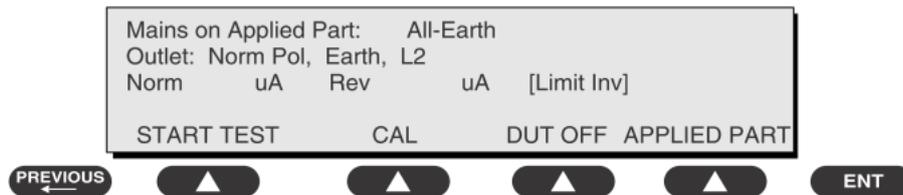
- 1) A 2-beep-per-second signal indicates high voltage present at the applied part terminals while a calibration is being performed.
- 2) High voltage is present at applied part terminals while measurements are being taken.

ELECTRICAL SAFETY INSPECTION

7- Mains on Applied Part Leakage

◆ Performance

- 1) From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601
- 2) Attach the applied parts to the 601PRO applied part terminals.
- 3) Attach the red terminal lead to a conductive part on the DUT enclosure.
- 4) Press shortcut key 7. The Mains on Applied Part test is displayed.



- 5) Select the desired outlet configuration and applied part to test using the appropriate SOFT KEYS:
- 6) Press START TEST (SOFT KEY 1) to begin the test.
- 7) Press the print data key to generate a printout of the latest measurement.

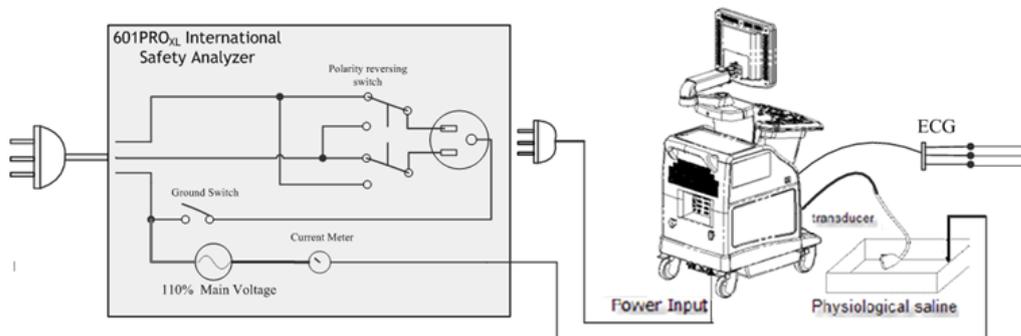


Figure 3 Mains on Applied part leakage

◆ NOTE

1, In addition to Probes ,Patient leakage current test should be perform if ECG or PCG parts used;

2, If all of the applied parts correspond to the instrument type, the applied parts will be tied together and one reading will be taken. If any of the applied parts differ from the instrument type, all applied parts will be tested individually, based on the type of applied part. This applies to Auto and Step modes only.

◆ Failure

Check any broken of the Applied part. Replace any defective one.

Check any broken of the ECG/PCG module if used, Replace any defective one.

ELECTRICAL SAFETY INSPECTION

7- Mains on Applied Part Leakage

Check any broken of the Power Unit. Replace a new one if any portion defective.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

Change another probe to confirm if the fail is caused by console.

Inspect wiring for bad crimps, poor connections, or damage.

If the leakage current measurement tests fail on a new unit and if situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

All countries:

For BF ECG input and transducer:

5000 μ A

ELECTRICAL SAFETY INSPECTION

8- Patient Auxiliary Current

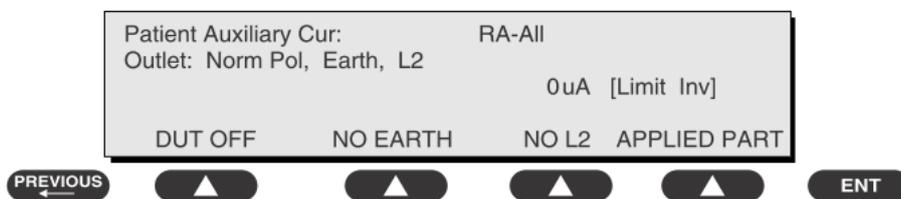
overview

Patient Auxiliary currents are measured between any selected ECG jack and the remaining selected ECG jacks. All measurements may have either a true RMS or a DC-only response.

TEST PROCEDURE

◆ Prepare

- 1) From the MAIN MENU, or with the outlet unpowered, plug the DUT into the 601PRO front panel outlet, and turn on the device.
- 2) Attach the patient leads to the 601PRO ECG jacks.
- 3) Define the Lead Types from the View Settings Option (refer to: Lead Type Definitions in Section 5 of this chapter).
- 4) Press shortcut key 8. The Patient Auxiliary Current test is displayed, and the test begins immediately. Display values are continuously updated until another test is selected.



- 5) Press SOFT KEYS 1-4 to select leakage tests
- 6) Press APPLIED PART (SOFT KEY 4) at any time to select the desired applied part leakage current:
- 7) Modify the configuration of the front panel outlet by pressing the appropriate SOFT KEY on the 601PRO:
- 8) Press the print data key at any time to generate a printout of the latest measurement.

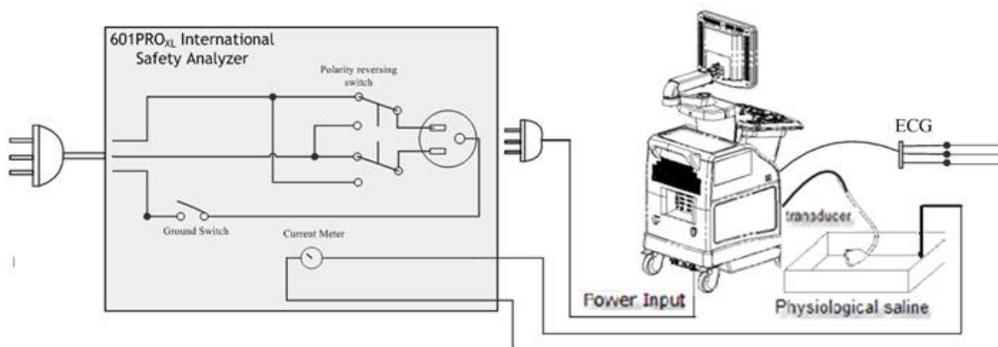


Figure 4 patient Auxiliary Current

ELECTRICAL SAFETY INSPECTION

8- Patient Auxiliary Current

◆ NOTE

If the current test standard being used does not include Patient Auxiliary Current DC readings, or the DC option is not enabled, then DC readings will not be available through the APPLIED PART SOFT KEY selections.

◆ Failure

Check any broken of the AC cable. Replace a new one if any portion defective.

Check any broken of the enclosure. Replace any defective part.

Inspect wiring for bad crimps, poor connections, or damage.

Test the wall outlet; verify it is grounded and is free of other wiring abnormalities. Notify the user or owner to correct any deviations. As a work around, check the other outlets to see if they could be used instead.

Change another probe to confirm if the fail is caused by console.

Inspect wiring for bad crimps, poor connections, or damage.

If the leakage current measurement tests fail on a new unit and if situation cannot be corrected, submit a Safety Failure Report to document the system problem. Remove unit from operation.

If all else fails, stop using and inform the Customer Service Engineer for analysis and disposal.

LIMITS

All countries

For BF ECG input and transducer

100 μ A Normal Condition

500 μ A Single Fault Condition

ELECTRICAL SAFETY INSPECTION FORM

(Class I equipment)

Overall assessment:

- Scheduled inspection Test item: 1, 2, 3
- Unopened repair type Test item: 1, 2, 3
- Opened repair type, not modify the power part including transformer or patient circuit board Test item: 1, 2, 3, 4, 5
- Opened repair type, modify the power part including transformer or patient circuit board Test item: 1, 2, 3, 4, 5, 6, 7, 8

Location:			Technician:		
Equipment:			Control Number:		
Manufacturer:		Model:		SN:	
Measurement equipment /SN:			Date of Calibration:		
INSPECTION AND TESTING				Pass/Fail	Limit
1	Power Cord Plug				
2	Device Enclosure and Accessories				
3	Device Labeling				
4	Protective Earth Resistance		Ω		Max 0.2 Ω
5	Earth Leakage	Normal condition(NC)	___μA		Max: NC: 300μA(refer to UL60601-1) * NC: 500μA(refer to IEC60601-1) * SFC: 1000μA
		Single Fault condition(SFC)	___μA		
6	Patient Leakage Current	Normal condition(NC)	<input type="checkbox"/> BF___μA		Max: BF applied part: NC:100μA, SFC: 500μA
		Single Fault condition(SFC)	<input type="checkbox"/> BF___μA		
7	Mains on Applied Part Leakage		<input type="checkbox"/> BF___μA		Max: BF applied part: 5000μA
8	Patient Auxiliary Leakage Current	Normal condition(NC)	<input type="checkbox"/> BF___μA		Max: BF applied part: NC:100μA, SFC: 500μA
		Single Fault condition(SFC)	<input type="checkbox"/> BF___μA		

NOTE:

The equipment which sell to America shall comply with the requirement of UL60601-1, others shall comply with the requirement of IEC60601-1.

Name/ Signature: _____

Date: _____

Appendix B Phantom Usage

Illustration

Targets Disposal of Phantom KS107BD

A1—A5: Axial resolution target group B: Blind-area target group

C: Longitudinal target group D: Horizontal target group

E: Mimic tumor F: Mimic sac (diam 10mm) and stone

G Mimic sac (diam 6mm)

4. Line Target System

There are 8 groups of nylon line targets disposed as shown in the figure.

1. A1—A5:

Axial and lateral resolution target group. The distances between the horizontal branch and the acoustic window are 30, 50, 70, 120 and 160mm, the center horizontal distances between two adjacent lines of A1 and A2 groups are 1, 5, 4, 3, 2mm, A3~A5 groups are 5, 4, 3, 2mm. The center longitudinal distances between two adjacent lines of the longitudinal branches are 4, 3, 2, 1mm.

2. B:

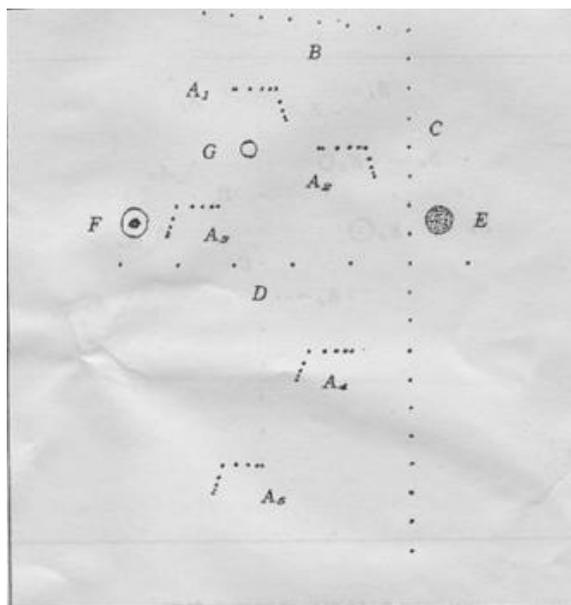
Blind-area target group. Center horizontal distance of adjacent lines is 10mm, distances to the acoustic window are 10, 9, 8, 7, 6, 5, 4, 3mm.

3. C:

Longitudinal target group. 19 target lines with a 10mm center distance between adjacent lines.

4. D:

Horizontal target group. 7 target lines with a 20mm center distance between adjacent lines.



Targets disposal- KS107BD

- A1—A4 Axial resolution target group
- B1—B4 Lateral resolution target group
- C Longitudinal target group
- D Horizontal target group
- E1—E3 Mimic sacs with diameters of 2, 4, 6mm

4. Line Target System

There are 8 groups of line targets disposed in TM material as shown in the figure.

1. A1—A4:

Axial resolution target group. The upmost lines in each target locate at the depth of 10, 30, 50, 70mm, the center longitudinal distances of each group (from the top down) are 3, 2, 1, 0.5mm, and the horizontal distance is 1mm.

2. B1—B4:

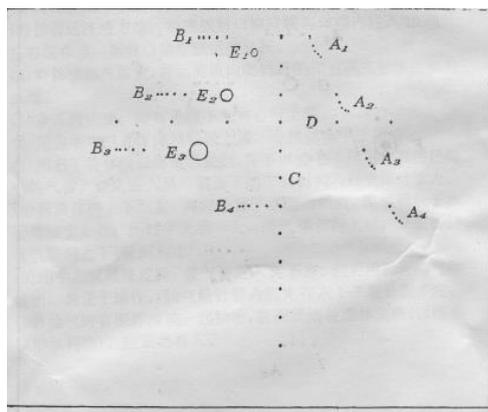
Lateral resolution target group. Locate at a depth of 10, 30, 50, 70mm, with a center horizontal distance of 4, 3, 2, 1mm in each group.

3. C:

Longitudinal target group. 12 target lines with a 10mm center distance between adjacent lines.

4. D:

Horizontal target group. Locate at a depth of 40mm, with a 20mm center distance between adjacent lines.



Appendix C Description of Self Test Items

C.1.1 Z0101 SSD Test

- Top test item

N/A

- Test content

Traverse all hard disk files from Doppler installation directory, compare and verify the files with the archived hard disk data.

- Analysis to test failure

The information “*Failed to open the result file*” indicates there is no verification file. The information “*The failed CRC: current verification value (verify failed file path; correct verification value)*” indicates the hard disk data is corrupted.

- Suggestion to failure test

Restore the hard disk data; replace the file under DC9 directory in C local disk with the *CRC_Result.txt* from the restore package.

C.1.2 Z0102 HDD Test

- Top test item

N/A

- Test Content

Test whether the operating system can recognize the HDD.

- Analysis to Test Failure

If the test result is NaN, it indicates the system does not recognize the HDD.

If the test result is Error, it indicates that the error happens when acquiring the HDD information from the operating system.

- Suggestion to Test Failure

If the test result is NaN, check the connection between the power supply cable and the data cable of HDD first, and then replace the HDD.

If the test result is Error, it is recommended to restart the device to retest first, and then to reinstall the operating system.

C.1.3 Z0201 PC module and MF FPGA Interconnection Test

- Top test item

N/A

- Test content

Test LPC interface communication between CPU module and MF FPGA.

- Analysis to test failure

Check whether *Windows* device manager recognizes *Ultrasound MultiFunction Device*. It cannot be recognized only with the drive not being installed properly.

The drive goes wrong if the test result appears *Error*.

CPU module and DSP FPGA has communication error if the test result is *FAIL*.

- Suggestion to failure test

Restore the device (OS+doppler) if the drive is not recognized.

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

It is recommended to replace CPU if the test result appears *FAIL*.

C.1.4 Z0202 Display Count Status Test

- Top test item

PC Module and MF FPGA Interconnection Test

- Test content

Check whether the black screen fault occurs during the Doppler running.

During the test, the self-test program reads the black screen count in the startup phase in the integral life cycle of the machine — start count (StartingCount) and the black screen count in the Doppler running phase in the integral life cycle of the machine — work count (WorkingCount).

- Analysis to test failure

If WorkingCount is not 0, the black screen fault occurs on the machine in the Doppler running phase. StartingCount is used only for reference and is not a basis for fault judgment.

Note: The final result of the test item is NaN regardless of the value of WorkingCount and StartingCount.

- Suggestion to failure test

If WorkingCount is not 0, it is recommended to replace the PC carrier.

C.1.5 Z0203 Fan Speed Test

- Top test item

PC Module and MF FPGA Interconnection Test.

- Test Content

Control the speed of 9 fans by ADT7462 drive to decide whether the fan speed can be controlled or not. Set 25% of working speed first, and then decide whether the fan is still working; set 100% working speed, and then decide whether the fan is still working; compare the changes of the fan speed under these conditions.

- Analysis to Test Failure

If the test result is Error, it indicates the error happens when the drive controls the hard disk.

If the test result is FAIL, check the information that the test report outputs. The report says "...fan speed: fan speed fails", which indicates the fan speed becomes abnormal; if the report says "the speed control fails:...", which indicates the fan speed control becomes abnormal.

- Suggestion to Test Failure

a) If the result is Error, it is recommended to restart the device to retest first, and then restore the device, and replace the PC carrier board finally.

b) If the fan speed and fan control become abnormal, it is recommended to check the connection among each fan first, and then replace the fan assembly.

C.1.6 Z0204 Back End Voltage Monitor Test

- Top test item

PC Module and MF FPGA Interconnection Test.

- Test content

Read+5V, +2.5V, +1.8V, +1.5V, +1.2V, -5.7V, +3.3V and voltage value of button battery via ADT7462, and decide whether it meets the requirement.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

The voltage value does not meet the requirement if the test result appears *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace button battery if VDDBAT voltage appears *FAIL*.

It is recommended to replace the PC carrier board if the other voltages appear *FAIL*.

C.1.7 Z0205 Speaker Test

- Top test item

N/A

- Test content

Play the music by pressing the speaker from left or right. Test whether audio clip, amplifier circuit or speaker function works well.

The dialog box appears from either left or right side to inquire the audibility of the speaker. If it is inaudible, click [Retry] to re-play the track of the music. If it fails after couple of times of retry, click [No, I Can't]. If it is audible, click [Yes, I Can].



- Analysis to test failure

The audio module or the speaker does not work well if the test result appears *FAIL*.

- Suggestion to failure test

It is recommended to check the speaker and wire material, and audio module. Then, replace CPU.

C.1.8 Z0206 Microphone Interface Test

- Top test item

N/A

- Test content

Test whether microphone interface on the device works well. First, the program informs to plug in the microphone. The sound waves appear on the screen as the sound arrives at the microphone. Only with the wave exceeds the exact value, does it pass through the test.

- Analysis to test failure

If the test result appears NaN, it indicates the microphone is not plugged in well or the circuit is not in the place.

The microphone's interface goes wrong if the test result appears *FAIL*.

- Suggestion to failure test

Ensure the microphone works well first. The sound waves appear on the screen if the sound arrives at the microphone. The interface does not work if the sound waves do not appear on the screen. It is recommended to replace the PC carrier board.

C.1.9 Z0207 WIFI Function Test

- Top test item

N/A

- Test content

Decide whether the wireless network adapter exists, and then search for SSID list.

- Analysis to test failure

The wireless network adapter is not recognized if the information "*No wireless device found*" appears.

Fail to find wireless hotspots if the information "*Wireless function test fails*" appears.

- Suggestion to failure test

Check whether the connection of wireless network adaptor is fixed well and wireless network adaptor is not forbidden if the information "*No wireless device found*" appears.

Check whether there is WIFI hotspot if the information "*WIFI Function test FAIL*" appears. If there is a hotspot, replace the wireless network adaptor.

C.1.10 Z0208 Wired Network Interface Test

- Top test item

N/A

- Test content

The program informs to plug in the network cable. The program decides the existence of the wired network adapter, and then decides whether the Ethernet works well.

- Analysis to test failure

The Ethernet cannot be recognized if the information "*No network adapter found*" appears.

The network cable cannot be recognized if the information “*No network cable plugged in*” appears.

Ethernet does not work well if the test appears *FAIL*.

- Suggestion to failure test

Please check the installation of the network drive if the information “*No network adapter found*” appears.

Please check the network cable if the information “*No network cable plugged in*” appears.

It is recommended to replace PC carrier board if the test result appears *FAIL*.

C.1.11 Z0301 DC-DC Voltage Monitor Test

- Top test item

PC Module and MF FPGA Interconnection Test.

- Test Content

Read +12V, +3.3V, +2.1V, +5V, +5.7V, -12V, -5.7V, +2.9V, +5V_STB, +3.8V, +1.4V voltage values on DC-Dc board via ADT7462 drive. Judge whether they match with the requirements.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The voltage value does not meet the requirement if the test result appears *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) It is recommended to replace DC-DC board if the test result is *FAIL*.

C.1.12 Z0401 Primary LCD Monitor I2C Interconnection Test

- Top test item

PC Module and MF FPGA Interconnection Test

- Test content

Test whether I2C communication serial port between MF FPGA and primary LCD monitor works well. The test generates primary LCD monitor's saver, and then restores it. Primary LCD monitor's brightness decreases, and then returns back. Read the hardware and software versions of primary LCD monitor.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

The interconnection between DSP FPGA and primary LCD monitor goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

Check whether the connecting material between primary LCD monitor and main unit is fixed well, and then replace primary LCD monitor if the test result is *FAIL*.

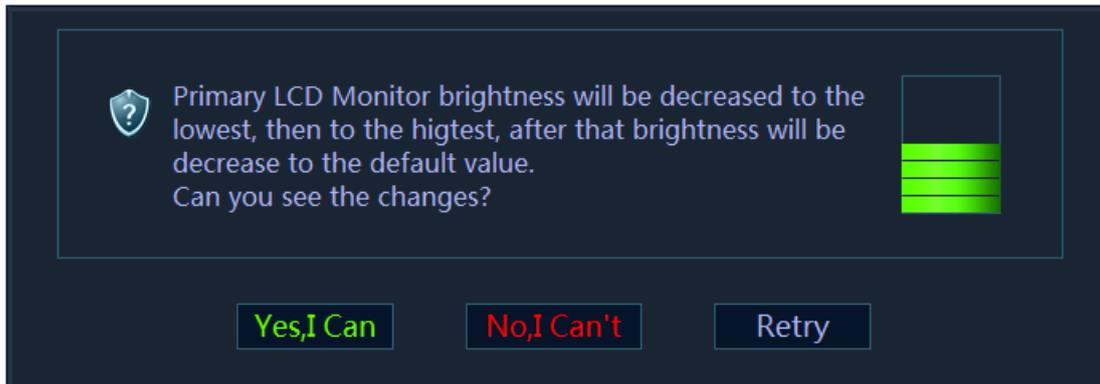
C.1.13 Z0402 Primary LCD Monitor Brightness Control Test

- Top test item

Primary LCD Monitor I2C Interconnection Test

- Test content

The dialog box appears when performing the test. The program controls the brightness of primary LCD monitor via I2C interface. The brightness goes down to the lowest, and then goes up to the highest, then gets back to normal. If backlight changes, click “Yes, I Can”, otherwise click “No, I Can’t”. If the user clicks “Retry” the system will repeat the procedure mentioned above.



- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

Brightness control of LCD monitor goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

It is recommended to replace primary LCD monitor if the test result is *FAIL*.

C.1.14 Z0403 Monitor Brightness Auto Adjust Function Test

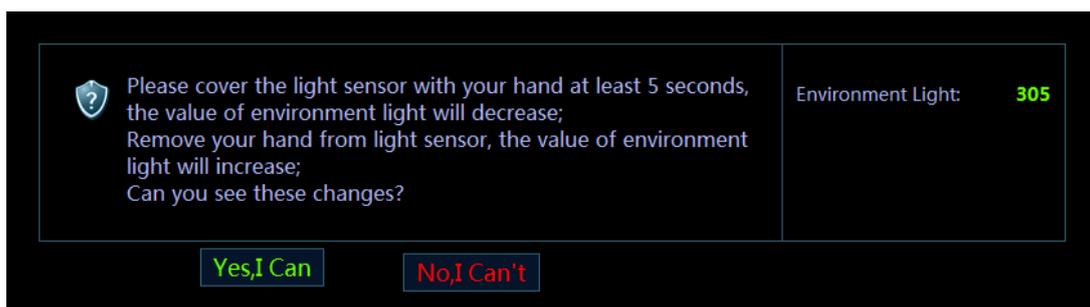
- Top test item

Primary LCD Monitor I2C Interconnection Test

- Test Content

The Doppler reads the brightness according to the brightness sensor on the main monitor. It can adjust the brightness degree. It is designed to test whether the brightness sensor can work. (Note: the self-test does not set the brightness for the monitor. Set the brightness via “Primary monitor control test” and “Secondary monitor control test”).

Adjust the light sensor of the primary monitor to light spot in bright circumstance. Do not perform the test in dark circumstances. The test program reads the circumstance light and shows it on the monitor. Block the light sensor with the hand. View whether the circumstance light changes or not (the test value can reach 50 if the light circumstance is well.)



- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

- Suggestion to Test Failure

If the circumstance light value is low, check whether the light sensor on the monitor is block or not.
 b) If the circumstance light keeps the same value, it is recommended to change the connection cable of the sensor light.

C.1.15 Z0501 Secondary LCD Monitor I2C Interconnection

Test

- Top test item

PC Module and MF FPGA Interconnection Test

- Test content

Test whether I2C communication serial port between MF FPGA and secondary LCD works well. The test generates secondary LCD's saver, and then returns back. Secondary LCD's brightness decreases, and then returns back. Read the hardware and software versions of secondary LCD.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

The interconnection between MF FPGA and secondary LCD goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

Check whether the connecting material between secondary LCD and main unit is fixed well, and then replace main monitor if the test result is *FAIL*.

C.1.16 Z0502 Secondary LCD Monitor Brightness Control

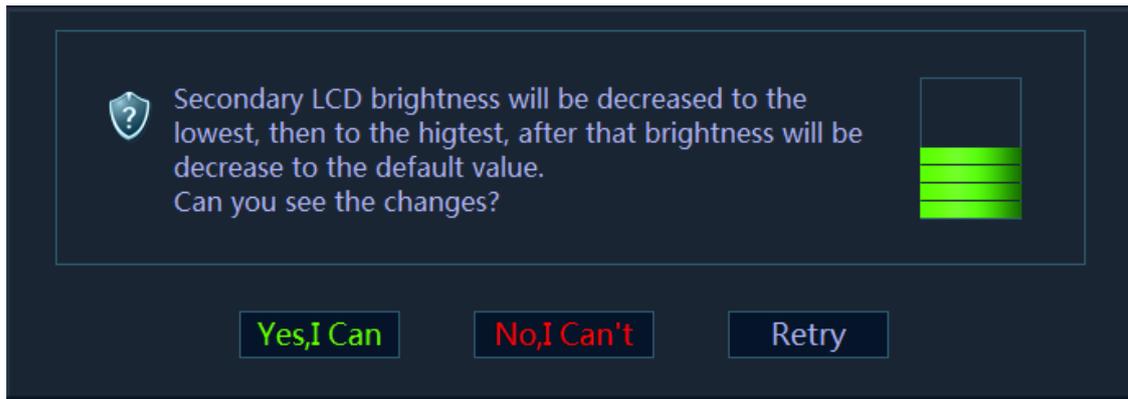
Test

- Top test item

Secondary LCD Monitor I2C Interconnection Test

- Test content

The dialog box appears when performing the test. The program controls the brightness of secondary LCD monitor via I2C interface. The brightness goes down to the lowest, and then goes up to the highest, then gets back to normal. If backlight changes, click "Yes, I Can", otherwise click "No, I Can't". If the user clicks "Retry" the system will repeat the procedure mentioned above.



- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

Brightness control of secondary LCD monitor goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

It is recommended to replace secondary LCD monitor if the test result is *FAIL*.

C.1.17 Z0601 Touch Screen USB Communication Test

- Top test item

N/A

- Test Content

Test whether the operating system can recognize the touch screen device.

- Analysis to Test Failure

If the test result is *FAIL*, it indicates the operating system cannot recognize the touch screen device.

- Suggestion to Test Failure

Check whether the cable of the touch screen is connected well or not.

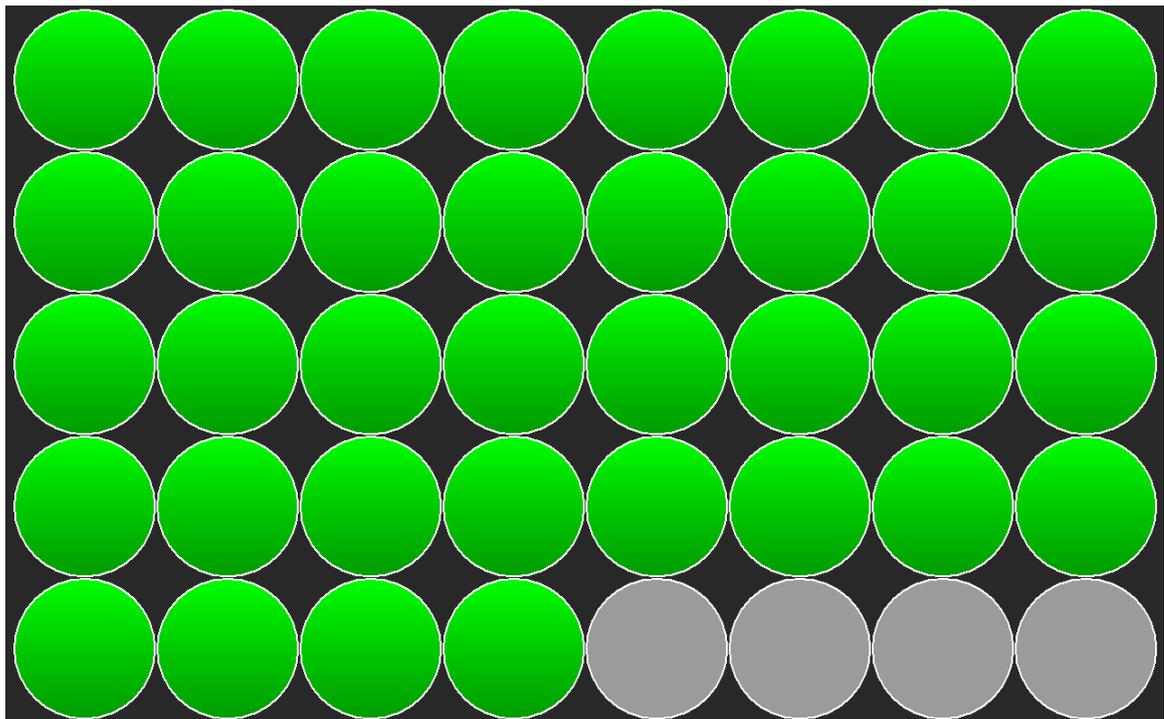
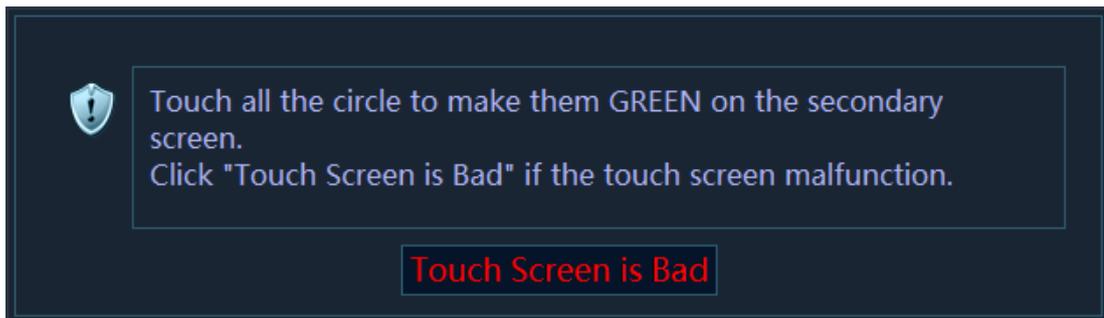
C.1.18 Z0602 Touch Screen Function Test

- Top test item

Touch Screen USB Interconnection Test.

- Test Content

The dialog box appears on the primary monitor when performing the test. It has to change the circle on the touch screen into green manually.



The program passes the test automatically if all circles turn into green. Click “Touch screen does not work well” when abnormality happens in the test.

- Analysis to Test Failure

N/A

- Suggestion to Test Failure

If the touch screen does not work at all, reinstall the system for the abnormal drive of the touch screen.

If some areas do not work, it is recommended to change the touch screen.

C.1.19 Z0701 Control Panel USB Interconnection Test

- Top test item

N/A

- Test content

Test USB communication between control panel and main unit works well via reading internal USB disk drive.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

The communication between control panel and main unit goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

It is recommended to replace control panel if the test result is *FAIL*.

C.1.20 Z0702 Control Panel Key, Encoder, TGC, Trackball

Function Test

- Top test item

Control Panel USB Interconnection Test

- Test content

Test whether the control panel keys, encoders, TGCs, trackball, backlight LEDs and indicating LEDs on the keyboard work well, and read board ID, keyboard FPGA version and program version.

- Test description

The keyboard test interface is shown as follows:



C.1.21 Z0703 Control Panel Key LED Test

- Top test item

Control Panel USB Interconnection Test

- Test content

The system automatically adjusts the color of LED (white and orange) and the brightness of trackball. The user can identify the changes.

- Test description

The following dialog box appears when performing test. The system changes the brightness of LED (white and orange) and trackball respectively and check whether the brightness of LED on the keyboard change accordingly. If LED brightness of the keyboard keeps identical as configured, click “LED is OK” to exit the dialog box. If not, click “LED is Bad” to exit the dialog box.



- Suggestion to failure test

Replace the control panel if LED brightness does not respond.

C.1.22 Z0801 Lift Control Interconnection Test

- Top test item

PC Module and MF FPGA Interconnection Test.

- Test Content

Check the 12C communication between the electrical ascending/descending control board and PC carrier board via reading the board information of the control board.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

If the test result is FAIL, it indicates the communication error between the electrical ascending/descending control board and PC board.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is FAIL, it is recommended to check the power-on of the electrical ascending/descending control board and the connection among the cables.

C.1.23 Z0802 Lift Control No Load Voltage Test

- Top test item

Lift Control Interconnection Test

- Test Content

Test software sends the order to get the electrical ascending/descending control board self-tested via 12C, and reads the idling voltage.

- Analysis to Test Failure

If the test result is FAIL, it indicates the idling voltage does not meet the requirement.

- Suggestion to Test Failure

It is recommended to replace AC-DC;

C.1.24 Z0901 MF FPGA and PHV ARM Interconnection Test

- Top test item

PC Module and MF FPGA Interconnection Test

- Test content

Test whether UART communication between DSP FPGA and PHV ARM works well. Send the order through PHV serial port drive, and re-read the data via the port.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

UART interconnection between FPGA and PHV ARM goes wrong if the test fails.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

C.1.25 Z0902 PHV Board Programmable Voltage Test

- Top test item

MF FPGA and PHV ARM Interconnection Test, TRC XCVR Bus Test

- Test Content

Three sets of programmable voltages from low to high (PHV voltage and CW voltage). Read the voltage via PHV board serial port and make the judgment.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The error may occur between the PHV and CW voltage if the test fails.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is still FAIL, it is recommended to replace PHV power supply board (TR64 error may lead to PHV or CW voltage failure).

C.1.26 Z0903 PHV Board HV Test

- Top test item

MF FPGA and PHV ARM Interconnection Test

- Test Content

Positive and negative 100 V of stationary power for PHV board reads the voltage via PHV board serial port.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

C-12 Description of Self Test Items

The positive and negative 100 V does not meet the requirement if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace PHV power supply board if the test result is *FAIL*.

C.1.27 Z1001 PC Module and DSP FPGA Interconnection

Test

- Top test item

N/A

- Test content

Test whether PCIe interface communication between CPU module and DSP FPGA works well.

- Analysis to test failure

Check whether *Windows* device manager recognizes *Ultrasound Backbone Device*. If the drive is not installed properly, it cannot be recognized.

The drive goes wrong if the test result appears *Error*.

CPU module and DSP FPGA has communication error if the test result is *FAIL*.

- Suggestion to failure test

It is recommended to restore the device if the drive is not recognized.

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace engine board if the test result is *FAIL*.

C.1.28 Z1003 DSP FPGA DDR3 (DIMM) Test

- Top test item

PC Module and DSP FPGA Interconnection Test

- Test Content

Read and write on the memory of the engine board and judge whether the data for the write and the input are the same.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between DSP FPGA and the memory occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) If the test result is *FAIL*, it is recommended to check the memory on the engine board.

C.1.29 Z1101DSP FPGA and 4D&TEE Board

Interconnection Test

- Top test item

PC Module and DSP FPGA Interconnection Test

- Test content

The program checks 4D probe is not plugged in, and then read the signal in the place to decide whether 4D&TEE board is in the place, then read 4D&TEE board's ID. The interconnection between DSP FPGA and 4D&TEE board works well if it appears non-0 and non-F.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

Mini 4D&TEE board is not in the place if the information "4D&TEE board is not in the place" appears or the circuit is not in the place.

The interconnection between DSP FPGA and 4D&TEE board goes wrong if the test fails.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device (OS+doppler) if *Error* re-appears.

It is recommended to replace 4D&TEE board if the test result is *FAIL*.

C.1.30 Z1102 TEE Angel Signal Test

- Top test item

DSP FPGA and 4D&TEE Board Interconnection Test

- Test Content

Read the value of TEE angle signal. The collecting of the TEE angel signal works well if the value keeps stable.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The interconnection of TEE angel signal goes wrong if the test appears *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace 4D&TEE board if the test result is *FAIL*.

C.1.31 Z1103 TEE Temperature Signal Test

- Top test item

DSP FPGA and 4D&TEE Board Interconnection Test

- Test Content

Read the value of TEE temperature signal. The collecting of the TEE temperature signal works well if the value keeps stable.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The interconnection of TEE temperature signal goes wrong if the test appears *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace 4D&TEE board if the test result is *FAIL*.

C.1.32 Z1104 4D&TEE Board Power Supply Voltage Test

- Top test item

DSP FPGA and 4D&TEE Board Interconnection Test

- Test Content

Enable 4D drive circuits+28 V power supply to obtain the voltage value through the monitoring circuit on the 4D board. If the voltage values is within the specifications, it indicates the voltage is normal.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The error may occur to 4D board + 28 V voltage if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace 4D&TEE board if the test result is *FAIL*.

C.1.33 Z1201 DSP FPGA and ECG Board Interconnection Test

- Top test item

PC Module and DSP FPGA Interconnection Test

- Test content

The program decides whether ECG is in the place, sends orders via ECG serial port, judges the returned data, and parses Bootloader version, board ID and software version.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

ECG board is not in the place if the information "*ECG board is not in the place*" appears or the circuit is not in the place.

The communication between ECG board and main board goes wrong if the information "*Failed to read the data on ECG board*".

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to replace ECG board if the test result is *FAIL*.

C.1.34 Z1202 ECG Board Self Test

- Top test item

DSP FPGA and ECG Board Interconnection Test.

- Test content

ECG sends self test order via ECG serial port when it is in the place and analyzes the self test result, and decides the status for A/D, Flash, DRAM, CPU, Watchdog, Voltage 33.

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

ECG board goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

C.1.35 Z1301 DSP FPGA and Probe Board FPGA

Interconnection Test

- Top test item

PC Module and DSP FPGA Interconnection Test

- Test Content

Test whether SPI interface communication between DSP FPGA on engine board and FPGA on probe board works well

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

Interconnection between DSP FPGA and FPGA goes wrong if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to change probe board if the test result is *FAIL*.

C.1.36 Z1302 HALL Signal Test

- Top test item

DSP FPGA and Probe Board FPGA Interconnection Test

- Test Content

Test the HALL signal connection between DSP FPGA on the engine board and the CPLD on the probe board. The test goes to four probe socket.(Note: if 4D board is not detected, it indicates 4D is not supported. Do not perform the test).

- Analysis to test failure

The drive goes wrong if the test result appears *Error*.

The HALL signal connection from CPLD to DSP FPGA goes wrong if the test result is *FAIL*.

- Suggestion to failure test

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is *FAIL*, replace the probe board first, and then the engine board.

C.1.37 Z1401 TRA Slot ID Test

- Top test item

PC Module and DSP FPGA Interconnection Test

C-16 Description of Self Test Items

- Test Content

Check whether TRA is in the place, and then read the slot ID of TR64 board (the slot ID can be set via the mother board).

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The error for slot ID of TRA board occurs if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is *FAIL*, replace the TRA first, and then replace the engine board.

C.1.38 Z1402 TRA XCVR Bus Test

- Top test item

TRA Slot ID Test, PC Module and DSP FPGA Interconnection Test

- Test Content

Test whether the control bus communication between DSP FPGA and XCVER of TRA FPGA works well via reading the register.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between DSP FPGA and TRA FPGA occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) It is recommended to change TRA board if the test result is *FAIL*.

C.1.39 Z1403 TRA DDRIII (DIMM) Test

- Top test item

TRA XCVR Bus Test

- Test Content

Read and write on the memory of the TRA and judge whether the data for the write and the input are the same.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between FPGA and the memory occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) If the test result is *FAIL*, it is recommended to check the TRA on the engine board.

C.1.40 Z1501 TRB Slot ID Test

- Top test item

TRA Slot ID Test

- Test Content

Check whether TRB is in the place, and then read the slot ID of TRB board (the slot ID of TR64 can be set via the mother board).

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The error for slot ID of TRB board occurs if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is *FAIL*, replace the TRB first, and then replace the engine board.

C.1.41 Z1402 TRB XCVR Bus Test

- Top test item

TRB Slot ID Test, PC Module and DSP FPGA Interconnection Test

- Test Content

Test whether the control bus communication between DSP FPGA and XCVR of TRB FPGA works well via reading the register.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between DSP FPGA and TRB FPGA occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) It is recommended to change TRB board if the test result is *FAIL*.

C.1.42 Z1503 TRB DDRIII (DIMM) Test

- Top test item

TRB XCVR Bus Test

- Test Content

Read and write on the memory of the TRB and judge whether the data for the write and the input are the same.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between FPGA and the memory occurs if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) If the test result is *FAIL*, it is recommended to check the TRB on the engine board.

C.1.43 Z1601 TRC Slot ID Test

- Top test item

TRB Slot ID Test

- Test Content

Check whether TRC is in the place, and then read the slot ID of TRC board (the slot ID of TR64 can be set via the mother board).

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The error for slot ID of TRC board occurs if the test result is *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

If the test result is *FAIL*, replace the TRC first, and then replace the mother board.

C.1.44 Z1602 TRC XCVR Bus Test

- Top test item

TRC Slot ID Test, PC Module and DSP FPGA Interconnection Test

- Test Content

Test whether the control bus communication between DSP FPGA and XCVR of TRC FPGA works well via reading the register.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between DSP FPGA and TRC FPGA occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) It is recommended to change TRC board if the test result is *FAIL*.

C.1.45 Z1603 TRC DDRIII (DIMM) Test

- Top test item

TRC XCVR Bus Test

- Test Content

Read and write on the memory of the TRC and judge whether the data for the write and the input are the same.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The connection error between FPGA and the memory occurs if the test result is *FAIL*.

- Suggestion to Test Failure

a) Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

b) If the test result is *FAIL*, it is recommended to check the TRC on the engine board.

C.1.46 Z1701 CW Board Position Test

- Top test item

TRB Slot ID Test, PC Module and DSP FPGA Interconnection Test

- Test Content

Check whether CW board is installed on the TRB.

- Analysis to Test Failure

No CW board on the TRB board or on three boards (the TRA/TRB/TRC boards) at the same time if the test result is *FAIL*.

The CW board is not detected on the TRA/TRB/TRC boards if the test result is *NaN*.

- Suggestion to Test Failure

The CW board should be installed on TRB. The test result will show the CW board position. Adjust the installation of the CW board based on the test result.

Check if the CW board on the TRB board when the test result is *FAIL*.

a) The CW board on the TRA or TRC board is not stratified if the TRB board has no CW board.

b) No CW board on the TRA and TRC board at the same time if the TRB board has the CW board.

C.1.47 Z1702 CW Board SPI Interface Test

- Top test item

CW Board Position Test

- Test Content

It is able to receive the data for CW mode.

- Analysis to Test Failure

The drive goes wrong if the test result appears *Error*.

The CW board interface goes wrong if the test result appears *FAIL*.

- Suggestion to Test Failure

Restart the device to perform the self test if the test result appears *Error*. It is necessary to restore the device if *Error* re-appears.

It is recommended to change CW board if the test result is *FAIL*.

C.1.48 Z1801 CPU Temperature Test

- Top test item

N/A

- Test Content

With the test software accelerating the workload, monitor whether the CPU temperature can meet the standard in 5 minutes. Click <Terminate Testing> to finish the test in the process.



- Analysis to Test Failure

If the test result is NaN, it indicates the user ends the test in the process.

If the test result is FAIL, it indicates the CPU temperature is too high.

- Suggestion to Test Failure

If the CPU temperature is too high, it is recommended to check CPU fan and the thermal adhesive of COME radiator.

