

# About This Manual

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Product Model: P20/P20 Pro/P15/P22/P25/P10 Plus/P30VO/P40VO

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- 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.

## Documentation

Understand the meanings of the following items clearly before reading this manual.

Item	Meaning
	Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a potentially hazardous situation which, if not avoided, may result in malfunction or damage of the system.
	Indicates a potentially biological hazardous situation which, if not avoided, may result in disease transmission.
<b>NOTE</b>	Indicates precautions or recommendations that should be used in operating the system.
<b>Boldfaced Word</b>	Indicates controls on the control panel, or on-screen objects such as menu items or keys.
Click	Move the cursor to the controls on the display and press the confirm key on the control panel.
>	Select a menu item or a key following the path.

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# Contents

<b>1</b>	<b>Safety .....</b>	<b>1</b>
1.1	Intended Use .....	2
1.2	Safety Precautions .....	2
1.2.1	Electrical Safety .....	2
1.2.2	Mechanical Safety .....	4
1.2.3	Accessories Caring .....	4
1.2.4	Biohazard Considerations .....	5
1.3	Acoustic Power Principle .....	5
1.3.1	Biological Safety .....	6
1.3.2	ALARA .....	6
1.3.3	Mechanical and Thermal Indices .....	6
1.3.4	Transducer Surface Temperature Limits .....	7
1.3.5	Imaging Functions that Change Acoustic Output .....	8
<b>2</b>	<b>Unpacking and System Checks .....</b>	<b>9</b>
2.1	Unpacking .....	10
2.2	System Connection .....	13
2.3	Power On/Off .....	14
2.4	System Checks .....	14
2.4.1	Unpacking Checks .....	14
2.4.2	General Checks .....	15
2.4.3	Functional Checks .....	17
2.4.4	Mechanical Checks .....	18
2.4.5	Image Tests .....	20
<b>3</b>	<b>Principle Descriptions .....</b>	<b>23</b>
3.1	System Block Diagram .....	24
3.2	Hardware Description .....	25
3.2.1	Probe Board .....	25
3.2.2	SBF Board .....	26
3.2.3	High-Voltage Board .....	27
3.2.4	Touch-Screen Board .....	29

3.2.5 Internal IO Board.....	30
3.2.6 External IO Board 1.....	30
3.2.7 External IO Board 2.....	30
3.2.8 External IO Board 3 .....	30
3.2.9 Key Panel .....	31
3.2.10 Battery Monitor Board.....	32
3.2.11 Power Indicator Board .....	32
3.2.12 Power Switch Board .....	32
3.3 Software Description.....	34
3.3.1 Structure.....	34
3.3.2 Workflow .....	35
<b>4 Parts Disassembly .....</b>	<b>37</b>
4.1 LCD Monitor.....	38
4.2 Monitor Arm.....	40
4.3 Pull Keyboard.....	41
4.4 Control Panel and Trackball .....	45
4.5 Touch Screen .....	47
4.6 Hard Disk .....	48
4.7 DVD Drive .....	50
4.8 Ultrasound Unit.....	52
4.9 Main IO board assembly .....	54
4.10 Power Supply .....	55
<b>5 Wiring Descriptions .....</b>	<b>57</b>
5.1 Concerns for Wiring .....	58
5.2 Pin Connection .....	61
5.2.1 P50 Key panel, USB and Audio Cable .....	61
5.2.2 P50 Touch Screen Panel to Key panel Cable.....	62
5.2.3 P50 Internal IO Board to Battery Monitor Board Cable.....	63
5.2.4 P50 Charging Monitor Board Power Output Cable.....	64
5.2.5 P50 Charging Monitor Board and Battery Supply Connector Cable.....	64
5.2.6 P50 Charging Monitor Board Power Input Cable.....	65
5.2.7 P50 Internal IO Board to Power on/off Board Cable.....	65
5.2.8 P50 Internal IO Board to Touch Screen Ethernet Cable.....	66
5.2.9 P50 Internal IO Board to External IO Board 2 USB Cable .....	66

5.2.10 P50 Charging Monitor Board Connector Cable.....	67
5.2.11 P50 Internal IO Board to Main Board PS2 Cable.....	68
5.2.12 P50 Key panel to Knob Board Cable.....	69
5.2.13 P50 Display to Video Card HDMI Cable .....	70
5.2.14 P50 Display to Internal IO Board Video Power Cable .....	71
5.2.15 P50 Video Card to External IO Board HDMI Cable .....	72
5.2.16 P50 Video Card to display HDMI Cable .....	73
5.2.17 P50 Main Board to External IO Board 2 Gigabit Ethernet Cable .....	74
5.2.18 P50 Internal IO Board to Display Video Power Cable .....	75
5.2.19 P50 Main Board to External IO Board 2 S-VIDIO Cable .....	75
5.2.20 P50 Video Card to External IO Board DVI Cable.....	76
5.2.21 P50 Video Card to External IO board 1 VGA Cable .....	76
5.2.22 P50 Key panel to Internal IO Board Power Cable.....	77
5.2.23 P50 Internal IO Board to External IO Board 2 Print Cable.....	78
5.2.24 P50 Video Card to External IO Board 3 CVBS Signal Cable .....	79
5.2.25 P50 Internal IO Board to External Printer Cable.....	79
5.2.26 P50 Isolation Transformer to ATX Power Input Cable.....	80
5.2.27 P50 Internal Footswitch Cable.....	80
5.2.28 P50 Internal IO Board to VBF Board Serial Cable.....	81
5.2.29 P50 ATX Power Cable .....	81
5.2.30 P50 Slide Switch Cable.....	82
5.2.31 P50 EMC Subjugation Board to Isolation Power Supply Board Cable.....	82
5.2.32 P50 AC Filter to Power Switch Cable .....	83
5.2.33 P50 EMC Subjugation Board to Power Switch Cable.....	83
5.2.34 P50 Isolation Transformer to External Printer Power Supply Cable.....	83
5.2.35 P50 Isolation Transformer to Ground Post Earth Wire.....	84
5.2.36 P50 SATA Hard Dick Signal Cable .....	84
5.2.37 P50 SATA Hard Disk Power Cable.....	84
5.2.38 P50 DVD Drive Power & SATA Signal Cable .....	85
5.2.39 P50 Case USB3.0 Cable .....	85
5.2.40 P50 ECG Signal Cable.....	86
5.2.41 P50 Pencil Probe Signal Cable .....	86
5.2.42 P50 Touch Panel to Touch Screen EDP Cable.....	87
5.2.43 P50 Touch Panel to Touch Screen USB+KEY Cable .....	88

## Contents

---

5.2.44 P50 Touch Panel to USB Updating Board Cable.....	88
5.2.45 P50 Internal IO board to Ultrasound Unit Casing Fan Connector Cable .....	89
5.2.46 P50 Internal IO Board to Main Board Gigabit Ethernet Cable.....	89
5.2.47 P50 Internal IO Board to Main Board 12V Power Supply Cable.....	90
5.2.48 P50 PS-ON/5VSB Signal Cable .....	90
5.2.49 P50 Internal IO Board to Main Board Power Switch Cable.....	91
5.2.50 P50 Internal IO Board to Main Board Audio Cable .....	91
5.2.51 P50 Internal IO Board to Main Board Serial Cable.....	92
5.2.52 P50 Charging Monitor Panel to Coupling Gel Power Supply Cable.....	93
5.2.53 P50 Back Casing Fan Conversion Cable .....	93
5.2.54 P50 Main Board USB3.0 Cable.....	94
5.2.55 P50 Coupling Gel Heating Temperature Measurement Cable.....	94
5.2.56 P50 Coupling Gel Heating Power Input Cable.....	94
5.2.57 P50 Internal IO Board to Main Board USB2.0 Cable .....	95
5.2.58 P50 Internal IO Board to Video Card 12V Power Supply Cable.....	95
5.2.59 P50 Key panel to Side USB Board Cable.....	96
5.2.60 P50 External IO Board 2 to External IO board 1 and External IO board 3 Cable....	96
5.2.61 P50 Main Board Case to Key panel Audio Conversion Cable .....	97
5.2.62 P50 Touch Screen Ground Cable.....	97
5.2.63 P50 Case to Key panel Aluminum Plate Ground Cable .....	98
5.2.64 S40 Isolation Transformer to Isolation Power Supply Board Connector Cable .....	98
5.2.65 P50 Trackball Cable.....	98
5.2.66 P50 Main Board to SBF Board USB3.0 Cable.....	99
5.2.67 P50 USB Board Ground Cable .....	99
5.2.68 P20 Touch Panel to Updating Board Cable .....	100
5.2.69 P20 Pull Keyboard Cable.....	100
5.2.70 P20 Pull Keyboard Conversion Cable .....	101
5.2.71 Main Board Casing Fan .....	101
5.2.72 Back Casing Fan .....	102
5.2.73 Ultrasound Unit Casing Fan .....	102
<b>6 Software Installation and Update.....</b>	<b>105</b>
6.1 Installing aconfig File .....	106
6.1.1 Tool Preparation .....	106
6.1.2 Acquiring Control Number .....	106

---

6.1.3 Operations.....	106
6.1.4 Result Verification .....	107
6.2 Activating the Dongle (Update Keypass File).....	108
6.2.1 Tool preparation .....	108
6.2.2 Operations.....	108
6.2.3 Result verification.....	110
6.3 Updating the Application Update .....	110
6.3.1 Tool Preparation.....	110
6.3.2 Operations.....	110
6.3.3 Result verification.....	112
6.4 Installing the Operating System (Kernel update).....	112
6.4.1 Tool Preparation.....	112
6.4.2 Operations.....	113
6.4.3 Result Verification .....	114
6.5 Updating the Touch-Screen Software.....	114
<b>7 Settings Import/Export.....</b>	<b>117</b>
7.1 Versions of System Settings and Probe Table .....	118
7.2 System Settings .....	118
7.2.1 System Settings Export.....	118
7.2.2 System Settings Import.....	119
7.3 Application Presets.....	119
7.3.1 Customizing Application Presets.....	119
7.3.2 Exporting Application Presets .....	120
7.3.3 Importing Application Presets .....	120
<b>8 System Software Tests.....</b>	<b>121</b>
8.1 Testing System Software .....	122
8.1.1 Testing Software Activation.....	122
8.1.2 Storage Test.....	123
8.1.3 FIFO Test .....	123
8.1.4 FIFO Wave-Detector Test .....	123
8.1.5 Analogue-to-Digital Conversion Test .....	123
8.1.6 Speaker Test .....	123
8.1.7 Probe, HV and Temperature Test.....	123
8.1.8 Monitor Test.....	124

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## Contents

---

8.2	System Simulation Test .....	124
8.2.1	Virtual Probe .....	124
8.2.2	System Simulation Operation .....	125
8.2.3	Probe Power Test .....	125
8.3	Touch-Screen Testing Software .....	126
8.3.1	Testing Software Enable .....	126
8.3.2	USB Port Test .....	126
8.3.3	Display Test .....	127
8.3.4	Key panel Update.....	127
8.3.5	Key panel Emulations Test .....	127
<b>9</b>	<b>System Troubleshooting.....</b>	<b>129</b>
9.1	Fault Diagnostics .....	130
9.1.1	Startup Faults .....	131
9.1.2	Operating Faults.....	132
9.2	System Troubleshooting.....	133
9.2.1	On-Site Inspection .....	133
9.2.2	Fault Identification.....	134
9.2.3	Fault Resolution.....	134
9.2.4	Post Maintenance .....	134
<b>10</b>	<b>System Maintenance .....</b>	<b>137</b>
10.1	Cleaning the System.....	138
10.2	Probe Maintenance .....	139
10.2.1	Cleaning the Probe.....	139
10.2.2	Disinfecting and Sterilizing the Probe.....	140
10.2.3	To Sterilize the Probe.....	143
10.2.4	Disinfecting and Sterilizing the Probe Cable.....	143
10.2.5	Storage and Transportation .....	144
10.3	Biopsy Bracket Maintenance.....	145
10.3.1	Cleaning the Biopsy Bracket .....	145
10.3.2	Sterilizing the Biopsy Bracket .....	145
10.3.3	Storage .....	146
10.4	Equipment Disposal .....	146
10.5	Customer Service .....	146
	<b>Appendix Renewal Parts .....</b>	<b>147</b>

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# 1 Safety

This chapter describes the important information for operating this ultrasound system. To ensure the safety of both operator and patient, please read the relevant details in this chapter carefully before using this system.

You should be thoroughly familiar with the precautions provided in this manual. Otherwise, the manufacturer is not responsible for the effects on safety, reliability and performance of the ultrasound system.

### 1.1 Intended Use

The Digital Color Doppler Ultrasound System is a general-purpose ultrasonic imaging instrument intended for use by a qualified physician for evaluation of Fetal, Abdominal, Pediatric, Small Organ (breast, testes, thyroid), Cephalic (neonatal and adult), Trans-rectal, Trans-vaginal, Peripheral Vascular, Cerebral Vascular, Musculo-skeletal (Conventional and Superficial), Cardiac (pediatric and adult), Trans-esoph (Cardiac), Laparoscopic, OB/Gyn and Urology.

The ultrasound system also provides the measurement and calculation packages used for clinical diagnosis purposes. For details, please refer to the advanced user manual.

**Contraindication:** The ultrasound system is not intended for ophthalmic use or any use causing the acoustic beam to pass through the eye.



Precautions must be considered in the use of any application. Otherwise, it may result in system damage or serious injury.

### 1.2 Safety Precautions

Read and understand all precautions in this manual before attempting to use the system. Keep this manual with the system at all times. Review the procedures for operation and safety precautions periodically.

#### 1.2.1 Electrical Safety



- Only qualified physicians or sonographers can perform ultrasound scanning on human subjects for medical diagnostic reasons.
- Any unauthorized personnel should not tamper with the main unit of the system.
- Do not service or maintain the system while it is in use with a patient.
- Do not position the system to make it difficult to disconnect the system from the mains supply.
- Do not use the system with flammable anaesthetics (category AP) or flammable anaesthetics with oxidants (category APG).
- Do not use the system with other equipment such as an electric knife, high-frequency therapy equipment, or a defibrillator. Otherwise, electrical shock may occur.
- Connect the protective earth conductor only before powering on the system. Disconnect the ground wire only after powering off the system. Otherwise, electrical shock may occur.
- Connect the system to the other electrical equipment by using the potential-equalization lead wire before connecting the power plug of the system to an electrical outlet.

- Do not place the multiple socket-outlet on the floor.
- The video printer should be connected to the specific interface by using the cable provided by the manufacturer. Otherwise, electrical shock may occur.
- Within the environment that is 1.8 meters (6 feet) around a patient, connect peripherals to the auxiliary power outlet which is capable of isolation protection; or, power the peripherals by the auxiliary output cable or the isolation transformer complied with EN/IEC 60601-1, or the power input of the same safety level.
- Within the patient environment, when removing the covers or the connectors from the non-medical electrical equipment without tools during maintenance, calibration or other operations, do not touch the parts of the non-medical electrical equipment and the patient simultaneously.
- Use only the probes provided by the manufacturer. Otherwise, the system will not perform, and an accident such as a fire may result in the worst case.
- Only the peripherals and accessories provided or recommended by the manufacturer can be used. Using other devices or accessories may degrade the system performance and even cause electrical shock.
- Do not pour any fluid onto the system surfaces, as fluid seepage into the electrical circuitry may cause excessive electrical current leakage or system failure. If any water is spilled onto the system carelessly, stop using the system and contact the local distributor immediately.
- The AC power plug for the system is a three-prong grounded plug and should never be adapted to any two-prong outlet or by using an adapter. Connect the AC power plug of the multiple socket-outlet to a hospital-grade power outlet.
- If the system is transported to the operating environment with a great temperature change, leave it for approximately 4 hours before powering it on. Ensure that the temperature and humidity inside and around the system are equivalent before an operation.
- Do not use the system around a strong electric field, a strong electromagnetic field, or the devices which generate radio waves, such as a radio, cellular telephones, or transceivers. Using the system in an improper environment may result in malfunction or damage.
- Select the conformed multiple socket-outlet with protective grounding, and ensure that its maximum output power exceeds the requirement of the system.
- The multiple socket-outlet can only be used to provide power to the recommended peripherals of the system.
- Do not connect other devices to the multiple socket-outlet. Otherwise, the rated output power of the multiple socket-outlet may be exceeded, and it may result in failure.



- Accessory equipment connected to the analog and digital interfaces must be certified according to the respective EN/IEC standards (for example, EN/IEC 60950 for data processing equipment and EN/IEC 60601-1 for medical equipment). Furthermore, all configurations shall comply with the system standards EN/IEC 60601-1.
- Do not use an endocavitary probe on the body surface of a patient. Otherwise, the electromagnetic compatibility of the probe may be degraded.
- If the non-medical electrical equipment used with the system is supplied by a multiple socket-outlet with separating transformer, connect the AC power plug of the multiple socket-outlet to a hospital-grade power outlet. Consult a professional to ensure that the connection complies with the safety standards.

### 1.2.2 Mechanical Safety



- To avoid possible personnel injury and system damage, move the system slowly and carefully.
- During the movement, the system could cause injury if the casters roll over feet or into shins. Exercise extreme caution while moving the system for a long distance, and up or down the ramp.
- Lock the foot brakes after arrival.



- Do not place other objects on top of the control panel. Do not sit on the control panel or any other part of the system.
- Disconnect the footswitch and the power cable before moving the system.
- Do not knock or shake the system.
- Ensure that the casters are intact and can rotate well before moving the system.
- Always use the handle to move the system.
- Ensure that the foot brakes are released and all cables are away from the casters before moving the system.

### 1.2.3 Accessories Caring



- Disconnect the probe from the system after freezing an image or powering off the system. Otherwise, the system or the probe could be damaged.
- Do not use the footswitch in the operating room.
- Use the probe carefully. If any part of the transducer surface is scratched, stop using the probe immediately. Otherwise, electrical shock may occur.
- After disinfecting the accessories, wash out chemicals or discharge gases thoroughly from the accessories. Residual chemicals or gases could result in damage to the accessories, and be harmful to human bodies.

- Only trained physicians or sonographers under ultrasound guidance can handle the biopsy needle guides. During the operation, the operator must observe proper needle insertion sequencing with the needle guide to avoid undue discomforts, unnecessary risks or injuries to the patient.
- Use the legally marketed probe sheath. Refer to package labeling to determine latex content. Natural rubber latex may cause anaphylactic reactions in some individuals. Avoid contact with items containing natural rubber latex. Refer to the FDA Medical Alert, March 29, 1991.
- Use the legally marketed coupling gel in accordance with relevant local regulations. Read and understand all precautions in the relevant manual of the coupling gel before use.
- Prepare, use, store and dispose the cleaner, disinfectant and sterilant according to the instructions provided by manufacturers.



- Do not disconnect the probe during the real-time scan. Otherwise, it may damage the probe and the system.

#### 1.2.4 Biohazard Considerations



- To minimize the risk of cross-contamination or infectious diseases when performing a biopsy, the operator should wear disposable gloves, protective clothing or protective goggles if it is needed. Follow the working regulations strictly in case the skin contacts the samples.
- Some disinfectants or sterilants are acid or alkaline. Use them with caution, and prevent hands or clothing from coming into direct contact with them. Wash hands or eyes immediately in case of any contamination by disinfectants.
- Dispose of cleaners, disinfectants or solutions in accordance with local standards or regulations.

### 1.3 Acoustic Power Principle



- Perform ultrasound procedures prudently under the guidance of the ALARA (as low as reasonably achievable) principle. Only expose the patient to the lowest practical transmit power levels in the shortest possible period to achieve a satisfactory diagnosis.
- Freeze the image at any time if you are not operating the system for a long period of time.
- Do not scan the same part of an patient continuously or expose the patient to prolonged scanning. Doing so may harm the patient.
- Do not expose the fetus to prolonged scanning in the Doppler mode.

- Although the output power is automatically controlled for the selected applications, high TI values should be kept to a minimum or avoided in obstetric applications.
- You should be familiar with the performances and operations of the system, observe the ultrasound output parameters on the screen at all times.

### 1.3.1 Biological Safety

Diagnostic ultrasound is recognized as being safe, but the possibility of biological effects exists when using it in high exposure levels and long exposure times. Thus ultrasound should be used in a prudent manner to provide medical benefit to the patient.

### 1.3.2 ALARA

It is required to practice ALARA when using ultrasound energy. Practicing ALARA ensures that the total energy level is controlled below a low enough level at which bioeffects are not generated while diagnostic information is being accumulated. The total energy is controlled by output intensity and total radiation time. The output intensity necessary for examinations differs depending on the patient and the clinical case.

Not all examinations can be performed with an extremely low level of acoustic energy. Controlling the acoustic level at an extremely low level leads to low-quality images or insufficient Doppler signals, adversely affecting the reliability of the diagnosis. However, increasing the acoustic power more than necessary does not always contribute to an increase in quality of information required for diagnosis, rather increasing the risk of generating bioeffects.

The operator must take responsibility for the safety of patients and utilize ultrasound deliberately. Deliberate use of ultrasound means that output power of ultrasound must be selected based on ALARA. Additional information regarding the concept of ALARA and the possible bioeffects of Ultrasound is available in a document from the AIUM (American Institute of Ultrasound Medicine) title “Medical Ultrasound Safety”.

### 1.3.3 Mechanical and Thermal Indices

The display of the ultrasound system consists of two parts: Thermal Index (TI) and Mechanical Index(MI).

#### ■ MI/TI Explanation

In October 1987, the American Institute of Ultrasound in Medicine (AIUM) ratified a report prepared by its Bioeffects Committee (Bioeffects Considerations for the Safety of Diagnostic Ultrasound, J Ultrasound Med.,Sept. 1988: Vol. 7, No. 9 Supplement), sometimes referred to as the StoweReport, which reviewed available data on possible effects of ultrasound exposure. Another report “Bioeffects and Safety of Diagnostic Ultrasound” dated January28, 1993, provides more current information.

- Mechanical Index (MI)

Mechanical bioeffects are threshold phenomena that occur when a certain level of output is exceeded. The threshold level varies, however, with the type of tissue. The potential mechanical bioeffects varies with peak pressure and ultrasound frequency. The MI accounts for these two factors. The higher the MI value, the greater the likelihood of mechanical bioeffects occurring. There is no specific MI value that means that a mechanical effect is actually occurring. The MI should be used as a guide for implementing the ALARA principle.

- Thermal Index (TI)

The TI value informs the operator about the conditions that might lead to an increase in temperature at the surface of the body, within the body tissue, or at the point of focus of the ultrasound beam on bone. That is, the TI value informs the operator about the potential temperature rise in body tissue. It is an estimate of temperature increase in body tissue with specific properties. The actual amount of any temperature rise is influenced by factors such as tissue type, vascularity, mode of operation and others. The TI value should be used as a guide for implementing the ALARA principle.

Depending on the examination and type of tissue involved, TI could be one of three types:

- Soft Tissue Thermal Index (TIS) is used when imaging soft tissue only, it provides an estimate of potential temperature rise in soft tissue.
- Bone Thermal Index (TIB) is used when bone is near the focus of the image as in the third trimester, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.
- Cranial Bone Thermal Index (TIC) is used when bone is near the skin surface as in transcranial examination, it provides an estimate of potential temperature rise in the bone or adjacent soft tissue.

- **MI/TI Display**

TI and MI values are displayed in real time on the screen. The operator should observe these index values during examinations and ensure that exposure time and output values are maintained at the minimum amounts needed for effective diagnosis.

The MI and TI precision is 0.1.

### **1.3.4 Transducer Surface Temperature Limits**

For probes intended for internal applications, e.g. the endocavitary or transesophageal probes, the surface temperature of the probe may be changed by adjusting the system parameters.

The maximum surface temperature of the endocavitary probes is 43°C. To protect the patient against the harm of excessive temperature, the probe stops working automatically when its temperature reaches the limit. The surface temperature of the probe is displayed on the right side of the screen.

PAT: 37 °C	PAT: Patient Threshold Temperature
TIP: <28 °C	TIP: Transducer Tip Temperature

### 1.3.5 Imaging Functions that Change Acoustic Output

The qualified operator may use the system controls to limit the ultrasound output and to adjust the quality of the images. The operator should observe the acoustic output display for possible effects.

There are three categories of system controls relative to output. They are controls that have direct effect on the output, controls that indirectly control output and controls that are receiver controls.



## **2    Unpacking and System Checks**

This chapter describes how to unpack, assemble, connect, power on/off this ultrasound system, and system checks are also detailed herein. The unpacking, general and functional checks are necessarily performed after you assemble the ultrasound system for the first time. The functional checks are necessarily performed after you service the ultrasound system.

### 2.1 Unpacking

Before unpacking, check if the label is normal. If the label is normal, now start unpacking.

One hex key wrench and one pair of scissors are needed for the unpacking.

1. Use the scissors to cut off the binding straps of the case, and remove the wrapping films.



**Figure 2-1 Removing the Straps and Films**

2. Take down the top cover of the case, squeeze the buckles and pull them out to remove the case.

**NOTE:**

Prevent the case from touching the ceiling or other items when lifting up the case.



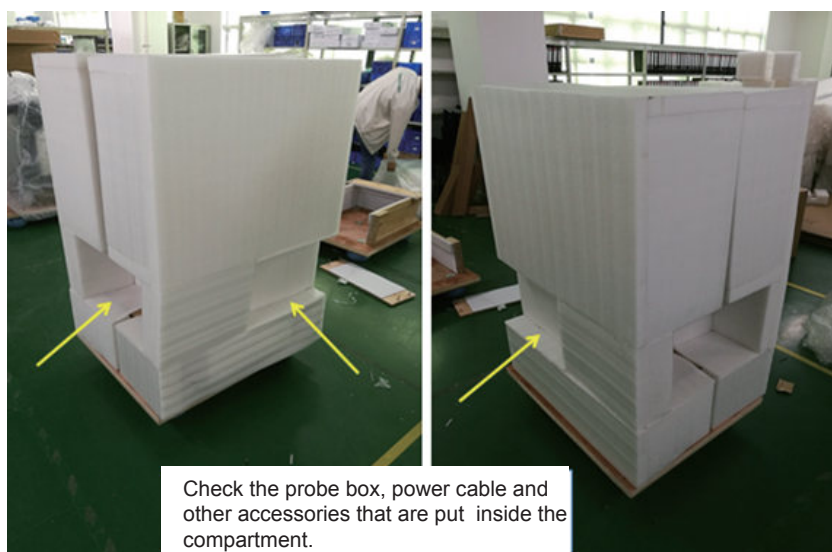
**Figure 2-2 Removing the Case**

3. Cut off the packing tapes, and remove the four corner protectors.



**Figure 2-3 Removing the Corner Protectors**

4. Check the storage compartments in the cotton protectors, and take out all packed-accessories: probe, users manual, power cable and so on, and check the accessories to avoid missing.



**Figure 2-4 Taking Out the Accessories Box**

5. Remove the left and the right cotton protectors, and remove the front baffle with a hex key wrench.



**Figure 2-5 Removing the Front Baffle**

6. Unlock the four casters.



**Figure 2-6 Releasing the Four Casters**

7. Pull out part of the system carefully, and leave the back of the system out of the fixed baffle, and lift up the system, and then place it on the ground.



**Figure 2-7 Pulling Out the System**

**NOTE:**

When moving the system, only carry the bottom of the system, and hold the control panel section. Do not hold the left and right cable hangers to prevent them from breaking.

### 2.2 System Connection




Ensure the mains supply works with the required voltage of the system power connector board before you connect the system to the mains supply. Voltage: 110-127V/220-240V~ ; frequency: 50/60Hz; power: 500VA.

Perform the following steps:

1. Connect the power grounding cable to the grounding terminal.



## 2 Unpacking and System Checks

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2. Connect one end of the power cable to the mains power socket on the system, and connect the other end of the power cable to the mains power that is suitable for medical equipment.
3. Set the power switch on the peripheral device panel to the  position.  
For details on connecting the peripheral device, please refer to the basic user manual.



### 2.3 Power On/Off

#### ■ To power on the system

1. Set the power switch on the power supply panel to the  position.
2. Press the  button on the left side to power on the system.

All operating indicators illuminate, the initial screen and the application mode screen appear after the system completes the initialization.

#### ■ To power off the system

1. Press the  button on the left side to power off the system.
2. Set the power switch on the power supply panel to the  position.

### 2.4 System Checks

System checks consist of unpacking, general, functional, mechanical and image checks.

#### 2.4.1 Unpacking Checks

##### ■ To check the equipment

You should check the LCD monitor and main unit covers, and ensure there are any scratches or damages after the unpacking.

##### ■ To check accessories

You should tick off accessories on the packing list, and ensure all accessories are of the correct types and PN.

Packing List					
PL No.				F/N: 910-01708-	
Digital Color Doppler Ultrasound System					
Item	Description&Part Number				
1	Main Unit	P/N:	4006	S/N:	1 Set
2	Probe	P/N:	S/N:	S/N:	1 Set
	Probe	P/N:	S/N:	S/N:	1 Set
	Probe	P/N:	S/N:	S/N:	1 Set
3	Accessories				
	User Manual	P/N:	4710		1 PC
	Acoustic Output Tables for Transducers	P/N:	4710		1 PC
	Warranty card	P/N:	4100.00023A02		1 PC
	Product certificate	P/N:	4100.01608A03		1 PC
	Coupling gel	P/N:	2301.0099		1 PC
	Power supply cord	P/N:	2275.00145A01		1 PC
	Grounding wire	P/N:	2275.002804		1 PC



## 2.4.2 General Checks

### ■ Overview

You can check the following items or log with the user to make the diagnostics.

- Any exceptions occurred during system running
- Accidental exception
- Other requirements proposed by the user

### ■ Operating Environment

You should check the operating environment of the system. The measurement accuracy is closely related to humidity, measurement application and circuit.

The system insulation worsens with life-to-date depreciation or malfunction, and the measurement error may be larger with a greater humidity.

### ■ System Configuration

You should check the system configuration, including system settings, contrast and brightness of the LCD monitor, optional probes.

### ■ To check system settings

Press the **Setup** key on the key panel to display **System Setting** menu. You can check the relevant settings by viewing this menu.

### ■ To check contrast and brightness of LCD monitor

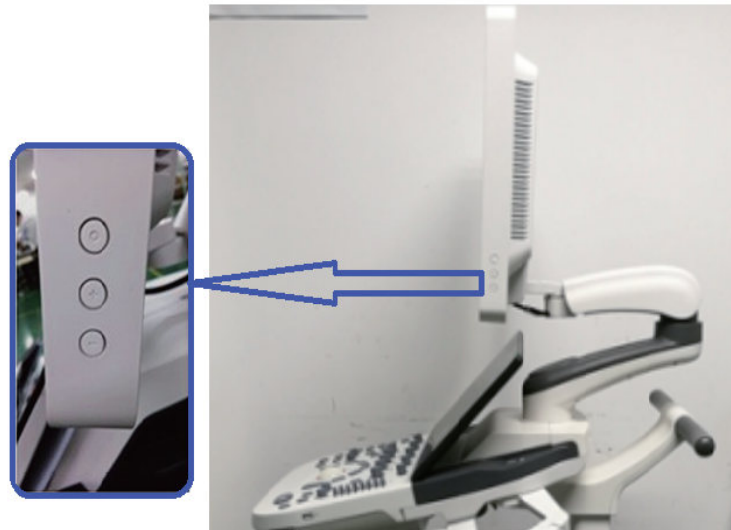
Adjusting the LCD monitor's brightness and contrast is one of the most important factors for obtaining the optimum image.

The proper setup displays a complete gray scale. The lowest level of black should just disappear into the background and the highest white should be bright, but not saturated.

## 2 Unpacking and System Checks

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Use the buttons located on the side of the monitor to adjust the brightness and contrast settings of the monitor.



- Press the **O** key to enter the monitor menu.
- Press the **-** key to display the settings menu for **Contrast**. Pressing the **-** key can decrease the value of the contrast; pressing the **+** key can increase the value.
- Press the **+** key to display the setting menu for **Brightness**. Pressing the **+** key can increase the value of the brightness; pressing the **-** key can decrease the value. You can also press the **Fn** key and the Up/Down arrow key simultaneously to adjust the display brightness.

### ■ To check probe

Perform the following steps to check the basic functions of the probe.

1. Connect the probe (for example: L742) to the ultrasound system.
2. Ensure the touch screen displays the correct icons for the probe. Tap an icon , and the system automatically enters the B mode.
3. Select **CFM** to enter the Color Flow mode, and ensure color ROI displays on the screen. Adjust the color gain to the maximum to check whether color noise is normal.
4. Press the **⏮** (freeze) key, replay the cine by using the trackball to check whether data display correct.
5. Select **M** to enter the M mode, press the **Update** key to ensure the M trace displays, and TGC, depth and frequency can be adjusted.
6. Select **PW** to enter the PW mode, press the **Update** key to ensure the spectral Doppler trace displays and no nosies exist.
7. Select **THI** to ensure the system enters the THI mode.



8. Disconnect the probe from the ultrasound system.

Repeat steps above to check other probes.

#### ■ To check system information

Press the **Setup** key on the key panel to display the **System Information** menu. You can check the system information by viewing this menu.

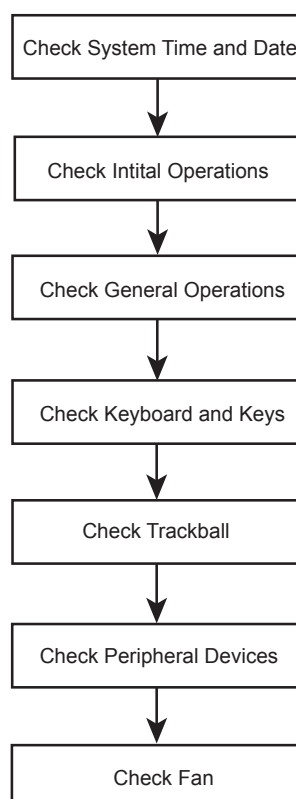
#### ■ To check system running status

You can check the following items to identify whether the system runs well.

- All menus or screens can be displayed normally.
- Measurements can be performed in every exam mode.
- All display mode can be switched normally.
- The desired probe can be selected.

### 2.4.3 Functional Checks

#### ■ Workflow



#### ■ Checklist

System Time and Date

## 2 Unpacking and System Checks


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Ensure system time and date are consistent with the current time and date.

### ■ Initial Operations

- Features can be applied in every exam mode.
- Images can be scanned normally by using the corresponding probe and can be printed out.
- Peripheral devices can work normally.


### ■ General Operations

- The  (freeze) key can respond.
- The **Gain** knob can be rotated normally.
- The B/M/CFM/PW/CW mode can be switched from one to another.

### ■ Key panel and Keys

- Keys can respond to the up-down and left-right functional tests.
- The **Print** key can respond when the video printer is connected.

### ■ Trackball

1. Press the  (freeze) key to enter the frozen mode, and start the measurement by pressing the **Calc** or **Caliper** key.
2. The trackball can be moved well from left to right and up to down.

### ■ Peripheral Devices

- The DVD drive can eject normally.
- The circuit breaker can work normally.
- The probe can be disconnected normally.
- The connected probe can work normally.

### ■ Fan

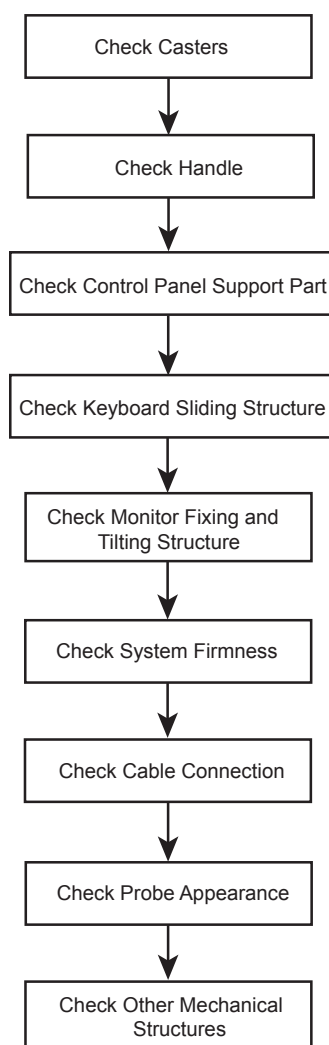
- Fan works well when the ultrasound system is powered on.
- No noises are produced during fan working.

## 2.4.4 Mechanical Checks

### ■ Workflow

#### **NOTE:**

The ultrasound system is verified to work abnormally if some functional test fails. In this case, you should stop using the system immediately and seek for help.



### ■ Checklist

Parts	Check Items
Casters	<ul style="list-style-type: none"> <li>• No cracks on the casters.</li> <li>• Foot brakes work well.</li> <li>• Casters are connected well without deviations, and fixing screws are firm without any visible damages.</li> <li>• Casters and fixing screws should be fastened by using a hex key wrench.</li> </ul>
Handle	<ul style="list-style-type: none"> <li>• No cracks on the front and back handles.</li> <li>• Shake front and back handles with hands to ensure they are firm.</li> </ul>
Control Panel Support Part	Shake the whole support part with hands to ensure it is firm.

## 2 Unpacking and System Checks

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Parts	Check Items
Key panel Sliding Structure	<ul style="list-style-type: none"><li>• No visible deformation or cracks on the guide rail of the key panel.</li><li>• The key panel can be pushed in or pulled out.</li><li>• The key panel is embedded in the guide rail firmly by shaking the key panel with hands.</li><li>• Inspect connection cables by pulling out the key panel, and ensure they are connected well and complete.</li></ul>
Monitor Fixing and Titling Structure	<ul style="list-style-type: none"><li>• The monitor is connected well without deviations.</li><li>• The monitor can be tilted forward or backward, and also can be swiveled to left or right. No noises are produced during the adjustment.</li><li>• The monitor is connected well by swiveling it left or right.</li></ul>
Peripheral Devices	Shake peripheral devices with hands to ensure they are connected firmly.
Cables	<ul style="list-style-type: none"><li>• No cracks or damages on the cables inside or outside the system.</li><li>• Drag the cables to ensure they are connected well.</li></ul>
Probe	No cracks, deformations or damages on the probe.
Other Parts	No cracks or exposed conductive parts.

### 2.4.5 Image Tests

#### ■ B Image Test

Adjust the B gain to the maximum in accordance with depths or frequencies, and check the following items in the B mode.

- The initial echo field of the image should be displayed in an appropriate brightness without any aberrations.
- No unexpected stripes caused by artifacts are displayed on the image.

#### ■ THI Image Test

Adjust the B gain to the maximum in accordance with depths or frequencies, and check the following items in the THI mode.

- The initial echo field of the image should be displayed in an appropriate brightness without any aberrations.

- No unexpected stripes caused by artifacts are displayed on the image.

### ■ CFM/PDI/TDI Image Test


Adjust the B gain and ROI to the maximum with the default depth and frequency, adjust the CFM/PDI/TDI gain until few color interferences occur. In this case, there are no unexpected stripes on the image. However, it is normal if some color noises appears accidentally.

### ■ PW/CW Image Test

Adjust the PW/CW gain in the real time PW/CW mode, until a clear spectral Doppler image displays. Adjust the pulse repetition frequency, and no noises appears on the image.

### ■ 3D Image Test

Perform the following steps to take the test.

1. Select a probe type and an exam type, the system automatically enters the B mode.
2. Ensure no unexpected stripes are displayed on the image.
3. Press the  (freeze) key, and tap **3D** to enter the 3D mode.
4. Ensure the 3D image is not separated or deformed.

### ■ 4D Image Test

Perform the following steps to take the test.

1. Select a probe type and an exam type, the system automatically enters the B mode.
2. Ensure no unexpected stripes are displayed on the image.
3. Press the **3D/4D** key, then tap **4D > Start** to enter the 4D mode.
4. Ensure 4D probe motor start working, and run at a uniform speed.
5. Ensure the 4D image is not separated or deformed.
6. Quit 4D imaging, and ensure 4D probe stop working immediately.

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# **3 Principle Descriptions**

This chapter provides hardware and software descriptions, you should read these descriptions thoroughly before attempting to service the ultrasound system.

### 3.1 System Block Diagram

The ultrasound system consists of MPC probe board, SBF board, VHV high-voltage board, QM87 industrial main board, 750TI video card, key panel, main board of the touch screen, internal IO board, external IO board 1, external IO board 2, external IO board 3, charging monitor board, battery monitor board, power indicator board, and power switch board.

They are described as follows:

- Core unit includes MPC probe board, SBF board and VHV high-voltage board. Core unit accomplishes the transmit and acquisition of ultrasound beams, the compound of AD sampling beams and the process of Doppler signals.
- QM87 industrial board and 750TI video card provide the hardware control for the ultrasound system.
- Key panel and touch screen are in ergonomic design.
- Internal IO board provides the signal transition.
- External IO board outputs the signals of video, audio, and printing controller.
- Charging monitor board controls the mains supply and battery supply, the status indicator, and the power button.
- Battery monitor board provides real-time monitoring of the battery.
- Power indicator board indicates status of the power.
- Power button board controls the startup and stop of the system.

Connections between boards are shown in Figure 3-1.



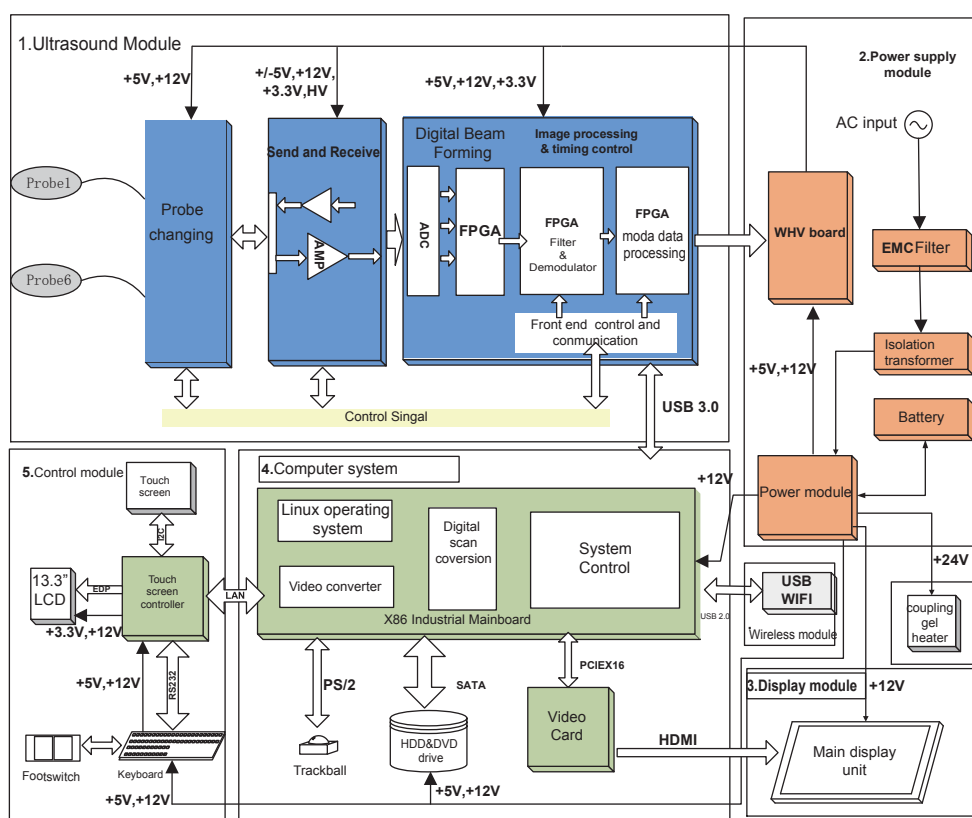


Figure 3-1 System Block Diagram

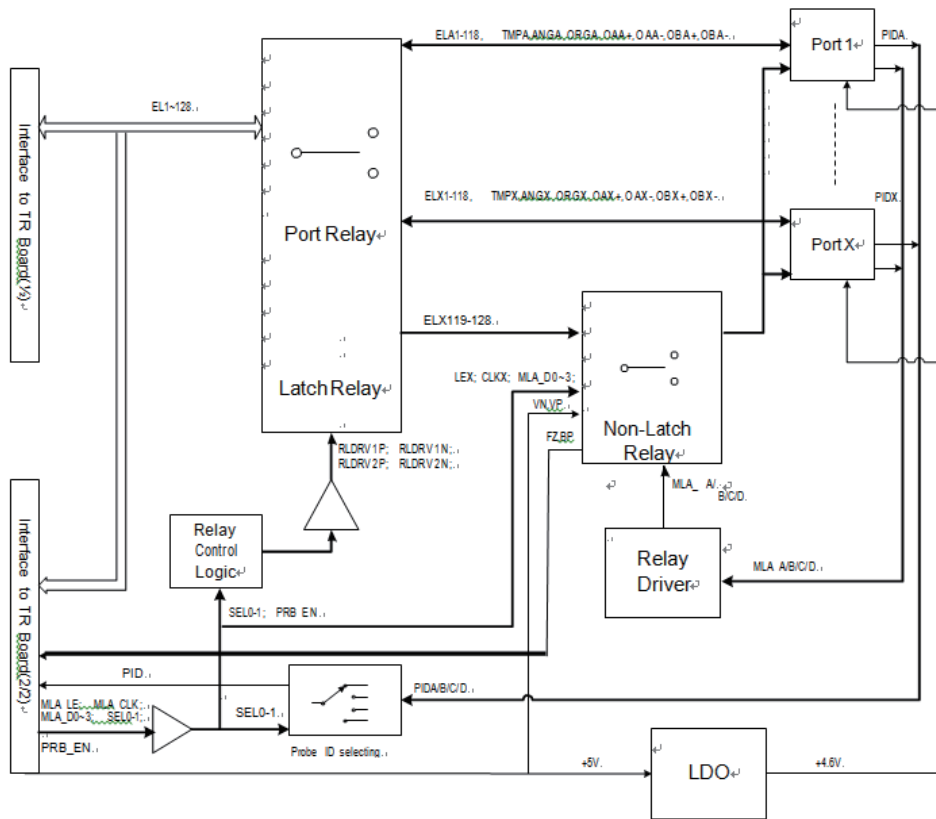
## 3.2 Hardware Description

### 3.2.1 Probe Board

The probe board provides the signal selection for each probe port, serves as the part of probe ports to switch between signal transmit and signal acquisition, thus achieves the selection function for probe ports.

The probe board provides 4-identical probe ports. The probe board supports 128 array element probe, 192 array element probe, and volume probe, and also reserve the pencil probe port.

The probe board serves as a bridge between the probe and the ultrasound system. The probe board communicates with the ultrasound system by J1 and J2 connectors, and delivers the signals of probe to the ultrasound system; delivers the stimulus signals of the ultrasound system to the probe through J1 and J2 connectors. The probe board implements the signal switching by using the relay switch. The function block diagram is as follows.



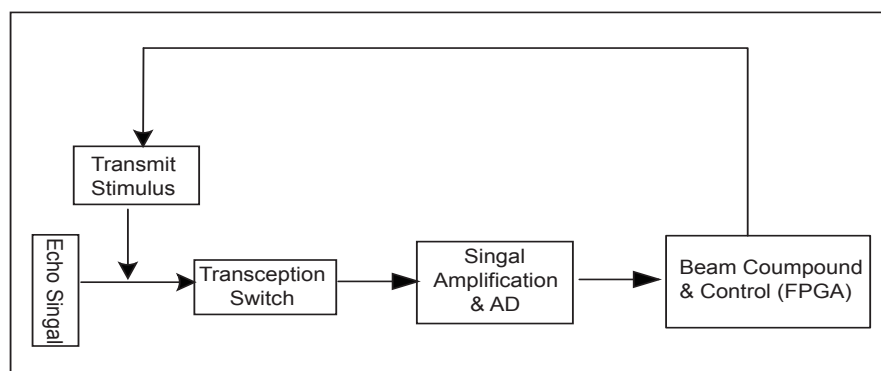
**Figure 3-2 Probe Board Diagram**

This probe board adopts +5V and +12V DC power source. The working current of +5V and +12V is approx. 500mA, and powered by the power system of the ultrasound system.

The relay on the probe board mainly switches the data signals of the ultrasound system to different probe ports, including 4 probe ports (P1, P2, P3, P4) and 2 connectors (J1, J2).

#### 3.2.2 SBF Board

SBF board is an ultrasound signal processing board, used to control the transmit and acquisition of ultrasound beam, perform the relevant post processing.



**Figure 3-3 SBF Board Diagram**

The FPGA produces and transmits stimulus signals to high-voltage board, then the high-voltage board produce and transmits the high voltage to transducer to generate ultrasound signals. The transmitting signals will reflect if encountering obstacles. The echo signal will be sampled by AD (AFE5808A), and transmit to FPGA, accomplishes beam compound and dynamic focusing in FPGA, the processed echo signals are finally transmitted to the ultrasound system through USB3.0, thereafter, the signal becomes on received ultrasound beam. There is a transception switch MAX4936A between the transmission and reception, and it is used to isolate transmit stimulus from echo signal, i.e. identifying transmit stimulus to be high-voltage signal and echo signal to be small signal. Under the control of FPGA, the recurring signal processing produces a ultrasound image, and displays it on the monitor.

### 3.2.3 High-Voltage Board

High-voltage board provides various of power supplies for the ultrasound system. The mains supply (including +5V and +12V) is transformed by voltage booster, DC-DC conversion and LDO conversed circuit to the desired voltage, such as -12V, +3.3V, +2.5V, +2V, +5V, +HV, -HV, VPP, VNN. VHV diagram is shown in Figure 3-4.

### 3 Principle Descriptions

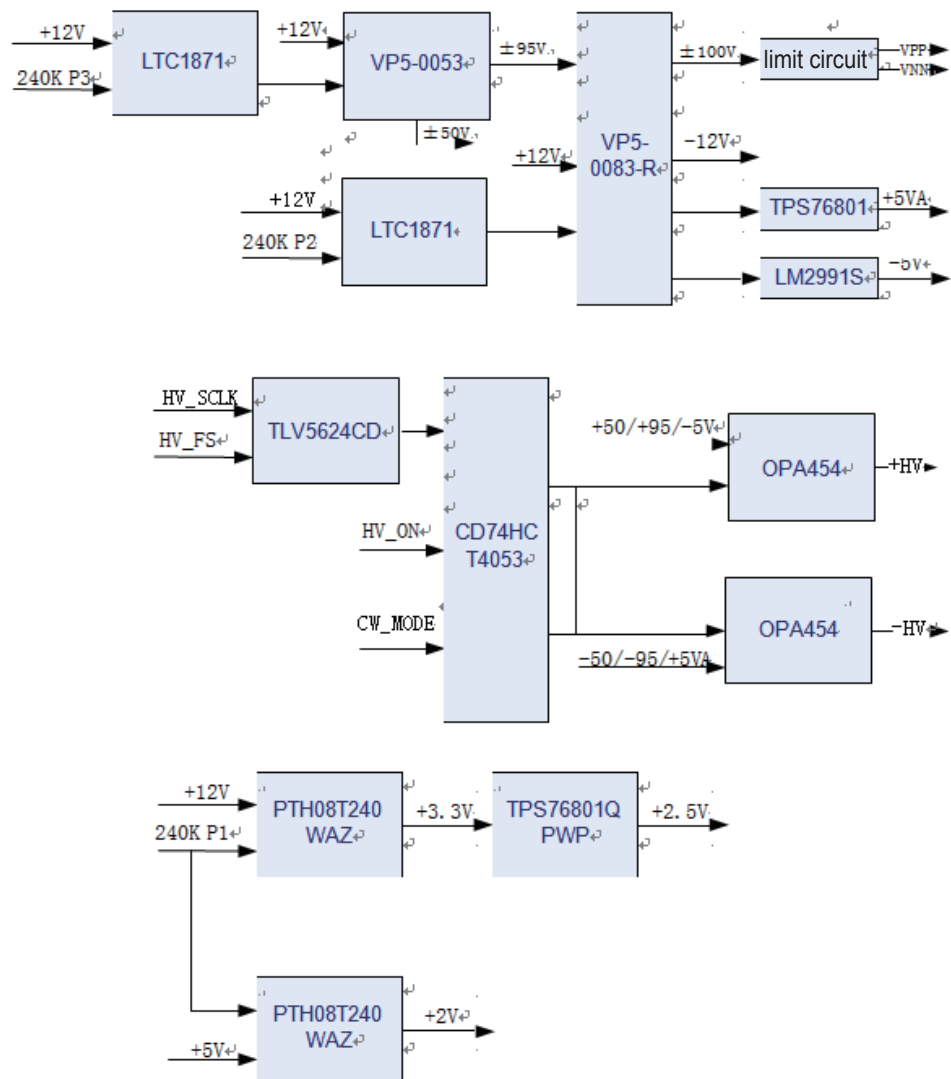
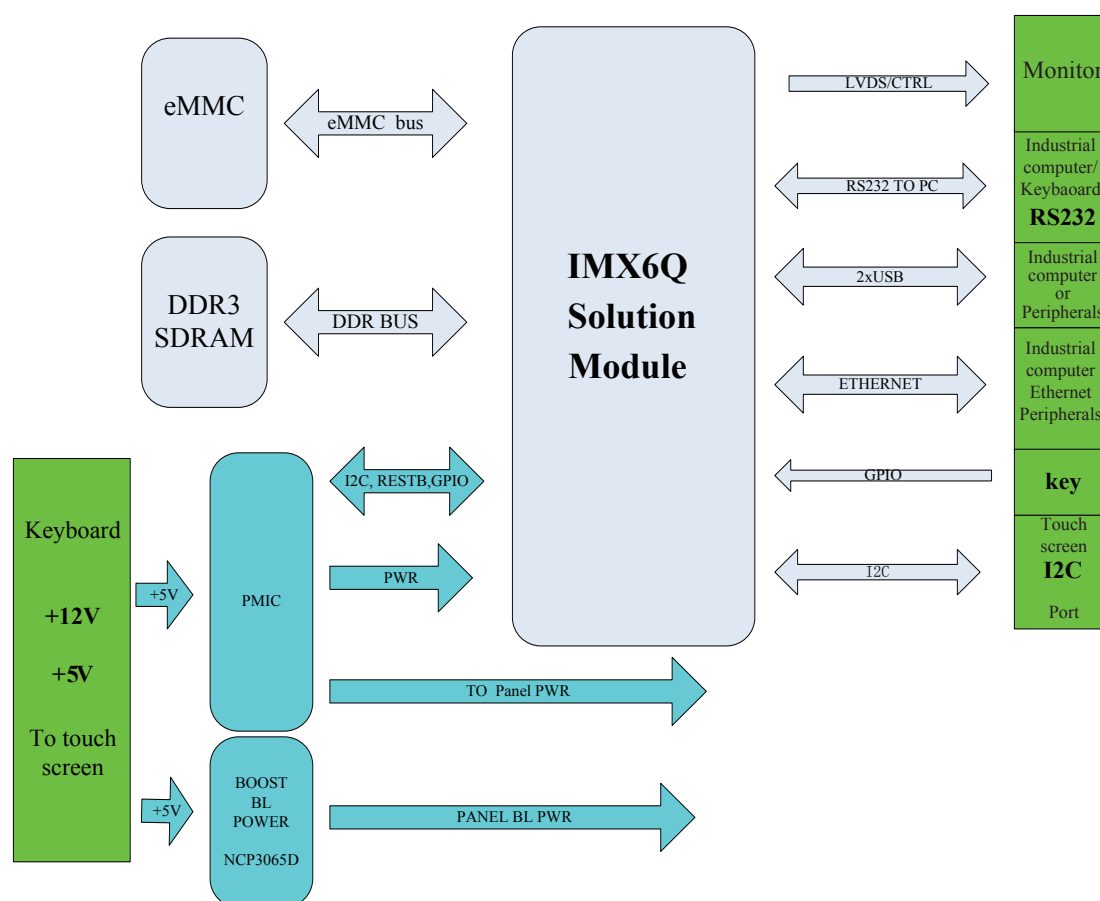


Figure 3-4 High-Voltage Board Diagram

### 3.2.4 Touch-Screen Board

Touch-screen board is the core of the touch screen operations, it is based on IMX6 Q hardware architecture and Linux operating system. You can implement some features by tapping buttons on the touch screen. The touch-screen board diagram is shown in Figure 3-5.



**Figure 3-5 Touch-Screen Board Diagram**

The touch-screen board uses RS232 and the key panel to communicate with the industrial computer through Ethernet. Besides, it has a USB2.0 port for the external devices, which is located at the bottom of the key panel used to update the touch-screen software.

The touch-screen board stores the system files in eMMC format with two DDR3(32/64BIT) storages. The ultrasound system configures a display screen of 13.3 inch.

### 3.2.5 Internal IO Board

Internal IO board is mainly used for conversion between main board signal and power, and offers power to the cards and the chips, and undertakes the signal transfer for all the interfaces including USB, serial port, Ethernet signal, PS2 signal, audio signal, IIC signal, print control signal, power on/off signal, etc. The system diagram is shown in Figure 3-6.

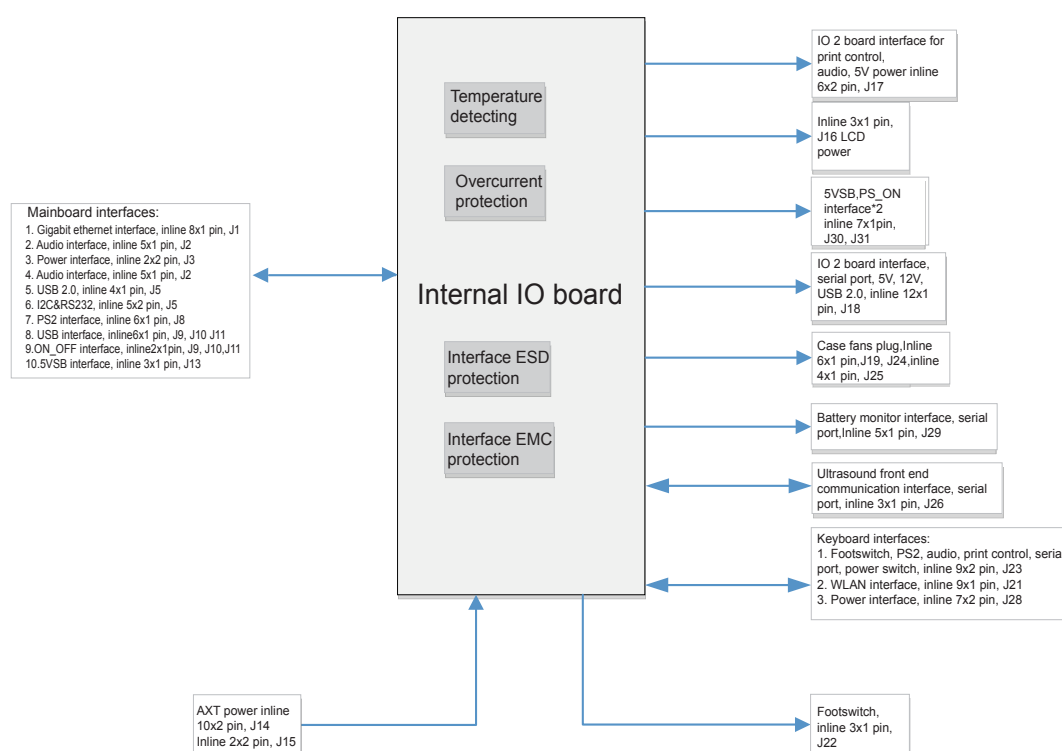


Figure 3-6 Internal IO Board Diagram

### 3.2.6 External IO Board 1

External IO board 1 provides standard ports which are extended from PC main board and video card, including VGA port and RGB port.

### 3.2.7 External IO Board 2

External IO board 2 provides standard ports which are extended from PC main board and video card, including S-video port, network port, audio port, and video printing port.

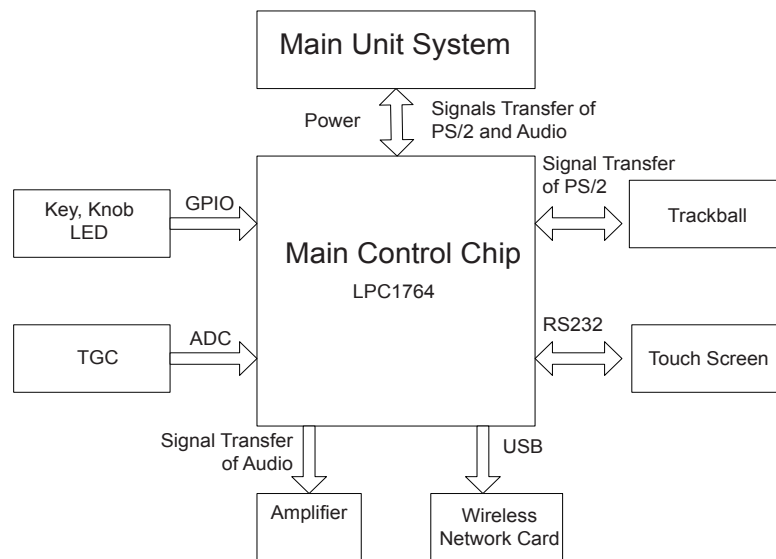
### 3.2.8 External IO Board 3

External IO board 3 provides standard ports which are extended from PC main board and video card. The ports contains a functional video port and four non-functional ports , which is S-video port, video port, audio port and other video port, and non-functional ports do not involved in specific circuit.

### 3.2.9 Key Panel

Key panel is a man-machine control platform, consisting of key panel, knob board and trackball.

- Key panel and knob board are used to scan keys, control indicators, converse and receive coder data and TGC data, and communicate with the main unit through serial port.
- Trackball communicates with the main unit system directly through PS/2.



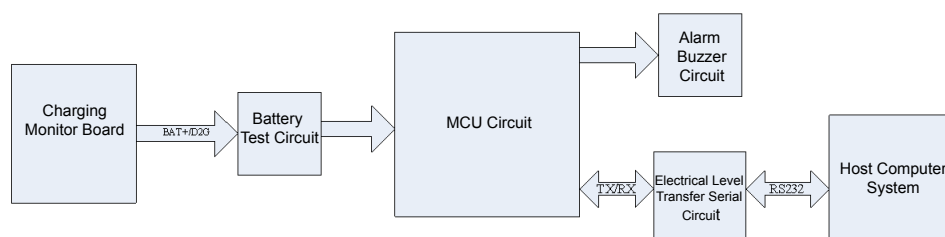
**Figure 3-7 Key Panel board Diagram**

Key panel is an important part for external data transmission. Key panel can be divided by features into MCU circuit, DC/DC conversion circuit, key control circuit, coder control circuit, LED drive circuit and A/D acquisition circuit.

- CPU is the core of key panel, used to process various information. It contains one MCU (NXP1764) chip and external circuits.
- DC/DC provides different levels for key panel
- Key control circuit is hardware of key processing.
- Coder control circuit converses mechanical actions to recognizable signals for MCU.
- LED control circuit indicates LED status.
- A/D acquisition circuit converses analogue signals provided by slide pots to recognizable signals for MCU.

### 3.2.10 Battery Monitor Board

Battery monitor board connects charging monitor board and the industrial main board, and acquires the status of charging and discharging, and acquires the magnitude of voltage, and then converses these information through MCU, and delivers these information through serial port to the system, and receives alarm command from the system to activate alarm buzzer. The principle diagram is shown in Figure 3-8.



**Figure 3-8 Principle of Battery Monitor Board**

### 3.2.11 Power Indicator Board

Power indicator board indicates the status of the power. Charging monitor board controls the LED indicator lights by detecting different voltage value to indicates different status of the power.

**Table 3-1 Power Indicator Light**

Indicator	Name	Mains Supply	Battery Supply
☼	Battery Charging Indicator	Yellow, charging	Off
		Green, fully charged	
⚡	Mains Supply Indicator	Green	Off
⊕	Battery Discharging Indicator	Off	Green, full capacity
			Yellow, low capacity
			Extremely low capacity. The system will automatically shut down. The buzzer beeps.

### 3.2.12 Power Switch Board

Power switch board controls startup and shutoff of the system.



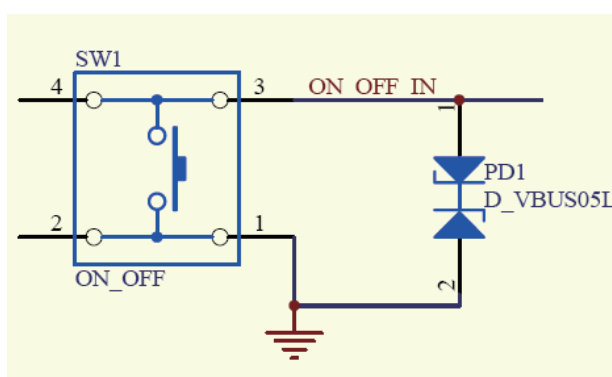


Figure 3-9 Principle of Power Switch Board

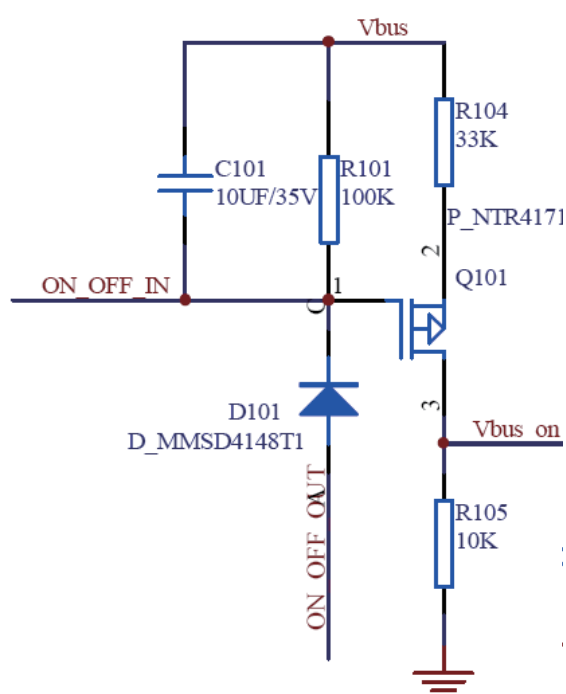


Figure 3-10 Power switch Principle of Charging Monitor Board

#### ■ To Power On the System

1. Establish standby voltage of 5VSB.
  - Mains supply: standby voltage established automatically with mains supply, even in the status of power-off.
  - Battery supply: press the power button to establish standby voltage before start the system.
2. Press the power button.
  - a. ON\_OFF\_IN signal downs the ON\_OFF\_OUT signal with low-level output through the power-on/off controlling of charging monitor board.

- b. Send the ON\_OFF\_OUT signal to the main board.
- c. Upon receiving the ON\_OFF\_OUT signal, the main board sends PSON low-level output signal to the PSON receiving terminal of ATX power.
- d. ATX power starts to supply electricity of 12V, 5V and 3.3V.
- e. The system starts to work normally.

### ■ To Power Off the System

When the system is powered on by battery supply or mains supply.

- Press the power button: when the main board receives low-level output signal of ON\_OFF\_OUT, the system enters the status of soft power off. After the system powers off completely, the main board sends PSON high-level output signal to ATX power to shut down all power output.
- Press and hold the power button till the system is forcibly stopped by the main board, and then the main board sends the PSON high-level output signal to ATX power to stop all power output.

## 3.3 Software Description

### 3.3.1 Structure

Software system consists of hardware layer, operating system layer, intermediate layer and application layer.

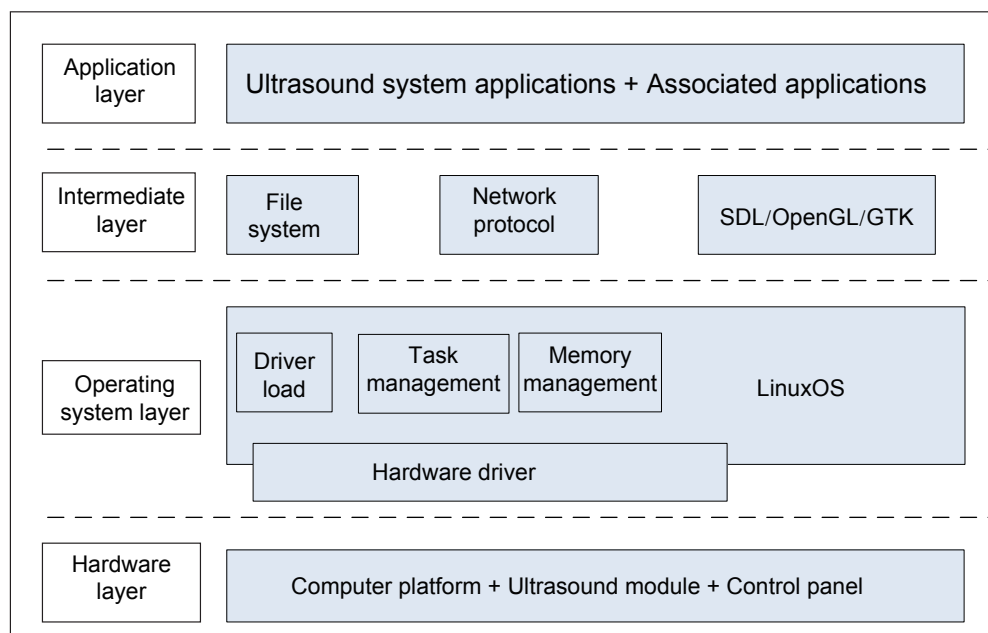


Figure 3-11 Software System Structure

System module can be divided by applications into imaging mode, system setting and system function. The system module is shown in Figure 3-12.

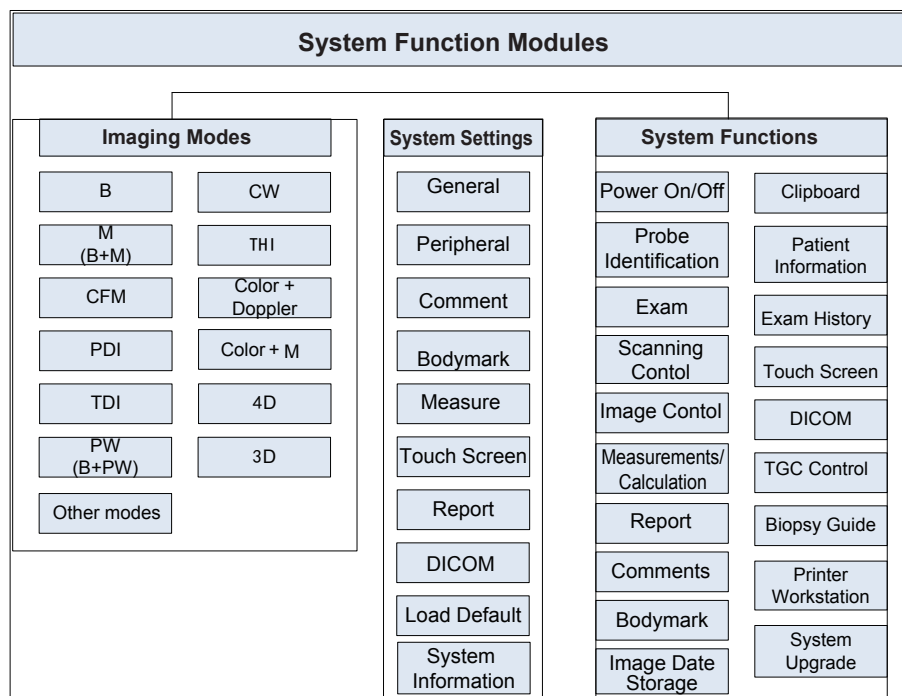
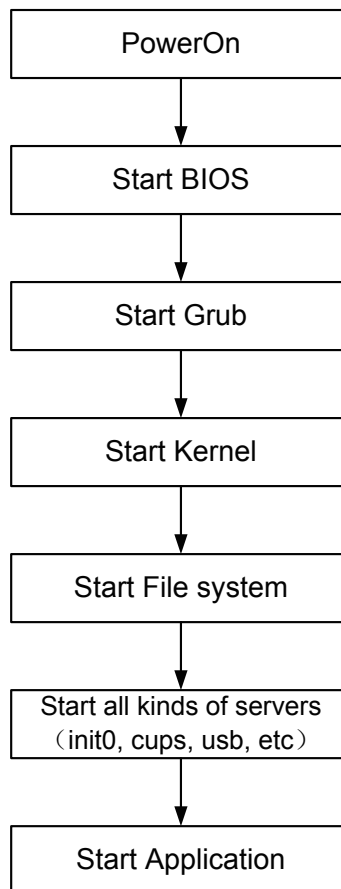


Figure 3-12 System Module

### 3.3.2 Workflow

Software system is an ultrasound system program on basis of linux operating system. Its workflow is shown as Figure 3-13.



**Figure 3-13 Workflow**

To start up the ultrasound system,

1. Power on the system.
2. Start up BIOS to check whether the hardware works normally.
3. If the hardware works normally, start up Grub bootstrap program of the operating system.
4. Start up the kernel of Linux operating system by using Grub.
5. Start up file system and various service processes, such as init0, cups, usb.
6. Start up the software.

You can also control the ultrasound system by operating and checking interfaces

## 4 Parts Disassembly

This chapter contains information for disassembling the ultrasound system. You can assemble the system by performing disassembly procedures on the contrary. During the disassembly, cabling and wiring should be paid great attention, disassembled parts should be taken care. If you are not familiar to the replacement procedures, you are recommended to take photos during the disassembly and take them for assembly reference.

**NOTE:**

- Do not disassemble this system without the authorization of the manufacturer.
- Only replace with the components produced or approved by the manufacturer.

The system consists of the LCD display, monitor arm, touch screen assembly, key panel, trackball, PC key panel, hard disk, DVD drive, ultrasound unit, main IO board assembly, and power supply.

Tools includes,

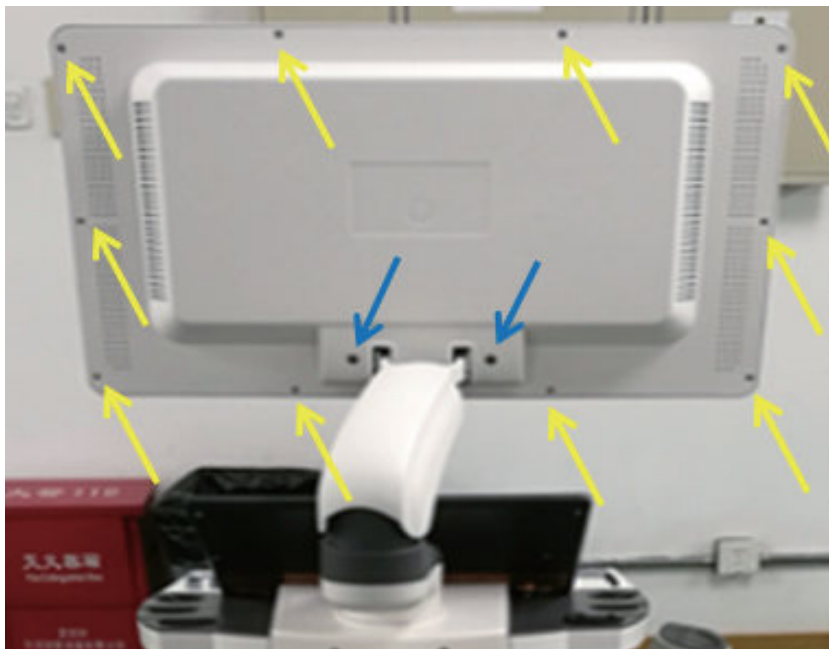
- one cross screwdriver (M3-M5)
- one long-handled cross screwdriver (length of handle is 300mm )
- one short-handled cross screwdriver (shorter than 100mm )
- one set of hex key wrench (including 3mm, 4mm, 5mm, 6mm, 10mm)
- one cutting pliers

### 4.1 LCD Monitor

One cross screwdriver is needed for the monitor disassembly.

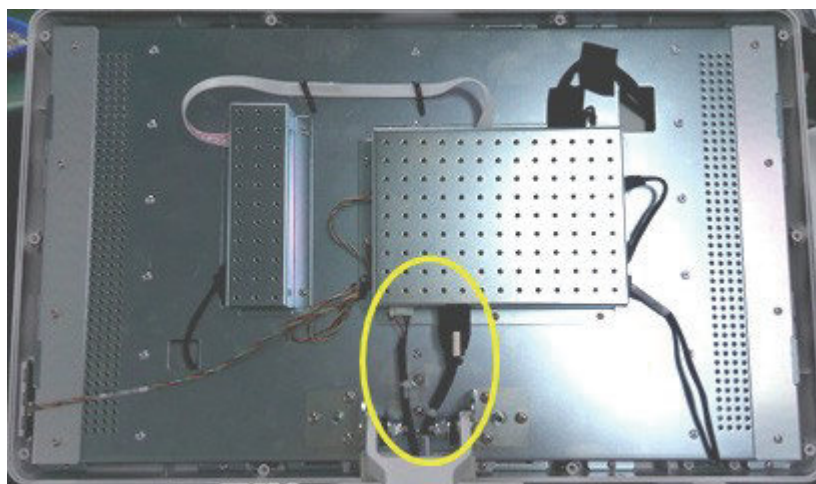
Perform the following steps,

1. Use the cross screwdriver to remove the two M4 screws for fixing the hinge and the ten M3 screws for fixing the monitor back cover. Flip the monitor down to remove the back cover.



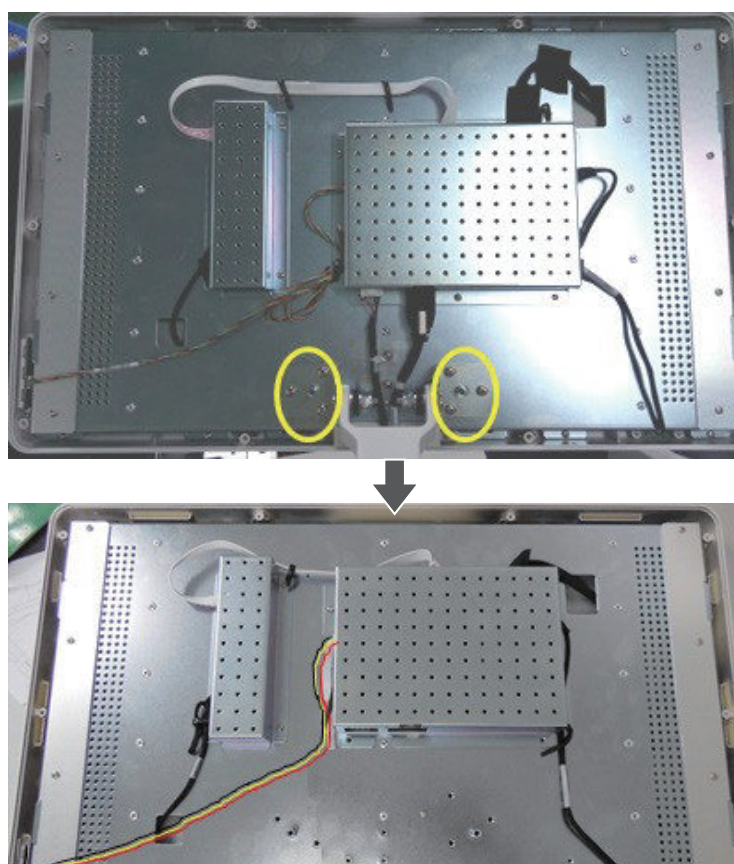
**Figure 4-1 Removing the Display Back Cover**

2. Cut off the binding strap and pull out the display connection cables.



**Figure 4-2 Removing Display Connection Cables**

3. Use the cross screwdriver to remove the six screws and take out the LCD monitor. Hold the LCD monitor to avoid falling during disassembly.



**Figure 4-3 Removing the Display**

### 4.2 Monitor Arm

One cross screwdriver, one short-handled screwdriver and two hex key wrenches (4mm and 5mm each) are needed for the monitor arm disassembly.

Procedure are as followed:

1. Disassemble the LCD monitor. For details, refer to Section 4.1 LCD Monitor.
2. Use the short-handled screwdriver to remove the four screws and take out the bottom cover of support platform.



**Figure 4-4 Removing Display Arm**

3. Remove the two screws for the cable fixing plate.





**Figure 4-5 Removing Cable Fixing Plate**

4. Remove the cable fixing plate, cut off the binding strap and pull out the display connection cables. Disconnect the cables of display and unit, and pull out the monitor arm assembly.

**NOTE:**

Pull out the monitor arm carefully to avoid any scratching of the connector cables of the display.



**Figure 4-6 Removing Arm Assembly**

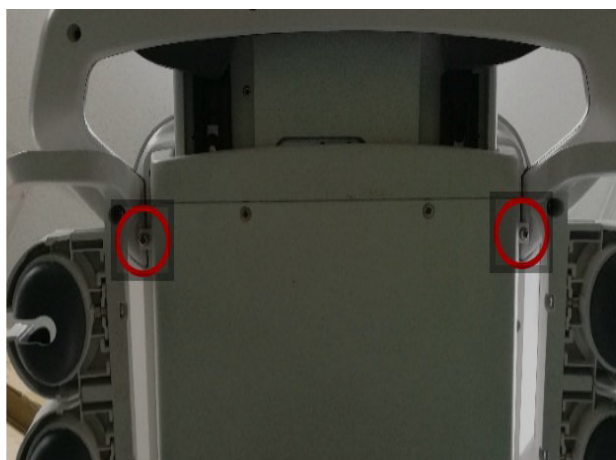
5. Remove the two screws for fixing the arm and pull out the arm assembly backwards.

### 4.3 Pull Keyboard

One cross screwdriver and one small cross screwdriver (3mm) are needed for the pull keyboard disassembly.

Perform the following steps:

1. Hold the pull keyboard assembly with your hand, and use the screwdriver to remove the two screws on the bottom cover of the control panel.



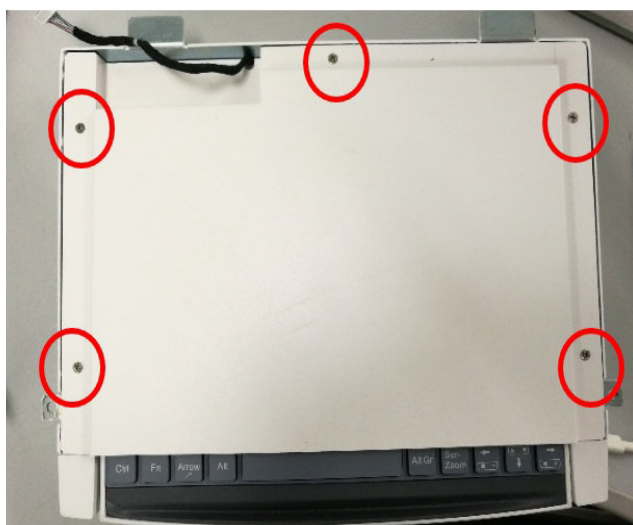
**Figure 4-7 Removing Screws Fixing Panel**

2. Pull out the pull keyboard assembly slightly to release it from the slot. Disconnect the cable, and take out the pull keyboard assembly.



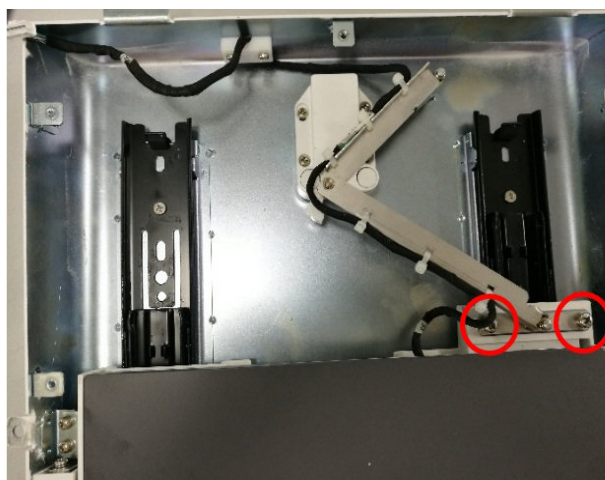
**Figure 4-8 Removing Pull Keyboard Assembly**

3. Use the screwdriver to remove the five screws on the top cover of the fixing assembly and remove the top cover.



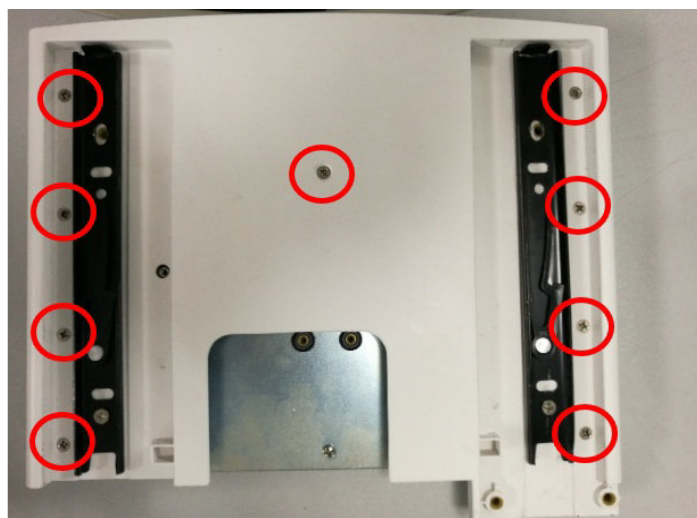
**Figure 4-9 Removing Screws Fixing Upper Panel**

4. Use the screwdriver to remove the two banking screws and separate the pull keyboard assembly and the last section of the telescopic slide from the telescopic slide.



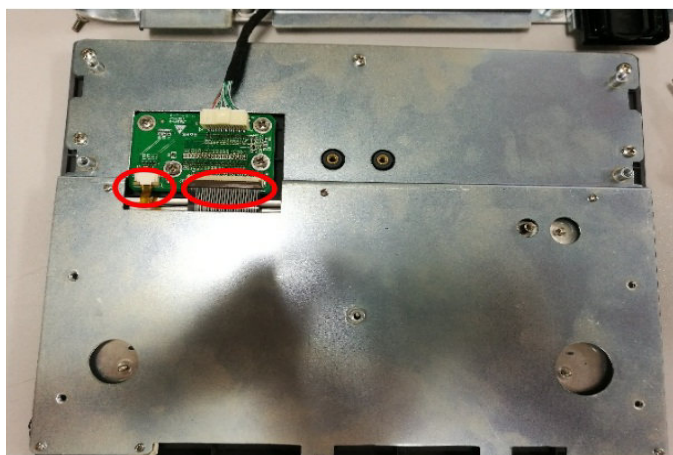
**Figure 4-10 Removing Banking Screws**

5. Use the screwdriver to remove the nine screws used to fix the top and bottom cover of the pull keyboard assembly, disconnect the cable that connect the matrix plate, and remove the top cover assembly of the pull keyboard.



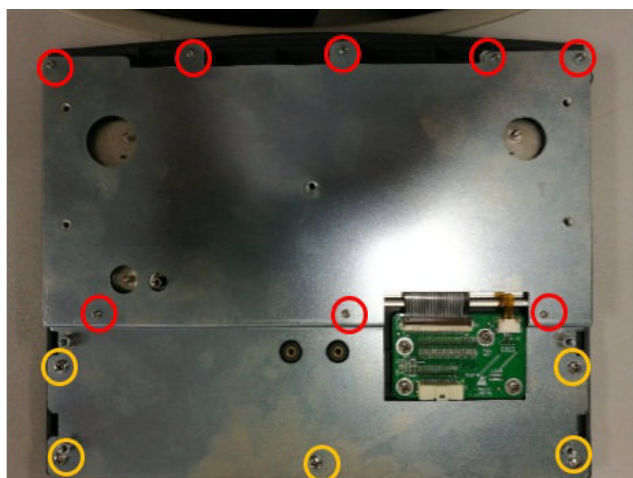
**Figure 4-11 Removing Screws Fixing Upper and Bottom Cover**

6. Remove the cable between the pull keyboard and the matrix panel.



**Figure 4-12 Removing Cable**

7. Use the screwdriver to remove the 5 screws and the small cross screwdriver to remove the eight screws used to fix the plastic cover, and then remove the pull keyboard.



**Figure 4-13 Removing Screws Fixing Plastic Cover**

#### **4.4 Control Panel and Trackball**

One cross screwdriver is needed for the keyboard and trackball disassembly.

Perform the following steps:

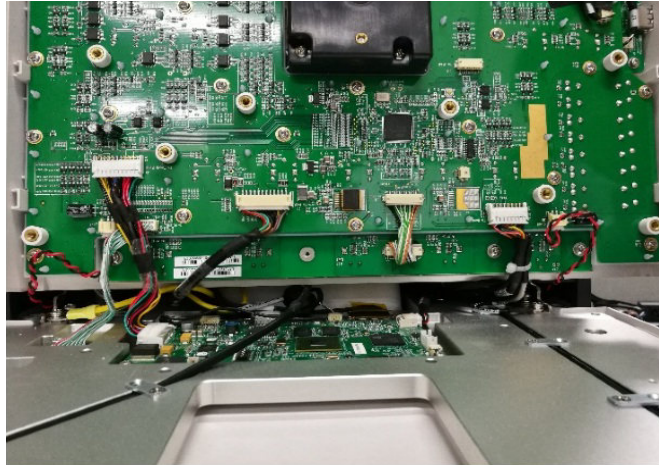
1. Remove the pull keyboard assembly.
2. Use the screwdriver to remove the six screws used to fix the probe holder hanger and remove the probe holder.
3. Use the screwdriver to remove the twelve screws used to fix the top cover of the control panel.



**Figure 4-14 Removing Screws Fixing Keyboard Top cover**

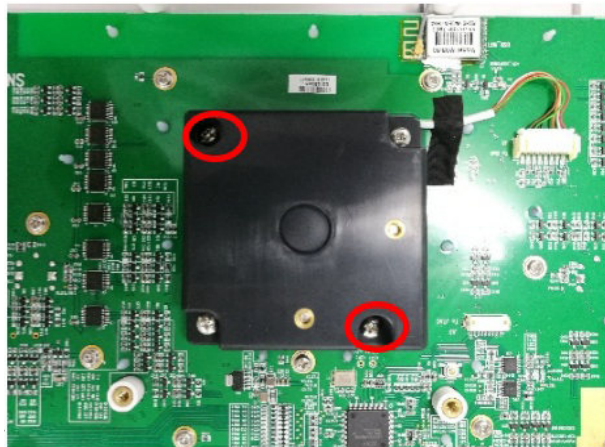


4. Disconnect the cable between the control panel and the system, and take out the control panel assembly. Disconnect the cable carefully to avoid damaging the plug and the socket.



**Figure 4-15 Disconnecting Cable**

5. Disconnect the plug of the trackball, remove the two screws used to fix the trackball, and take out the trackball.



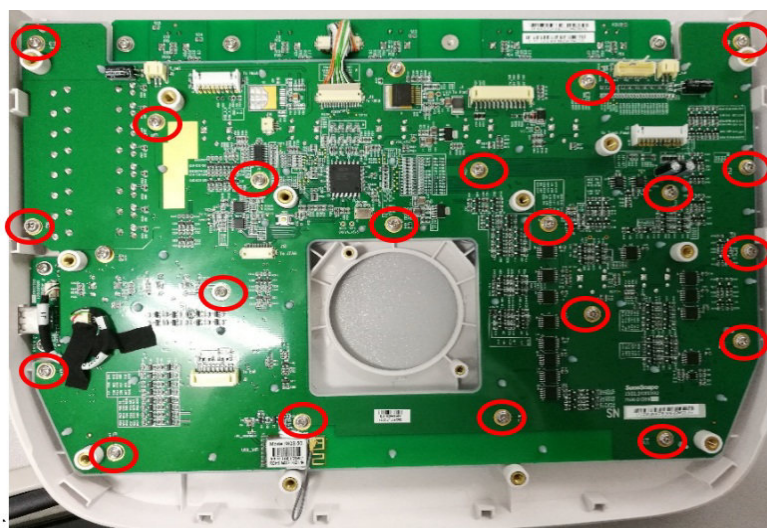
**Figure 4-16 Removing Screws Fixing Trackball**

6. Remove the key caps on the control panel assembly.



**Figure 4-17 Removing Key Caps**

7. Flip the control panel assembly, use the screwdriver to remove the twenty screws used to fix the board, and remove the control panel board.



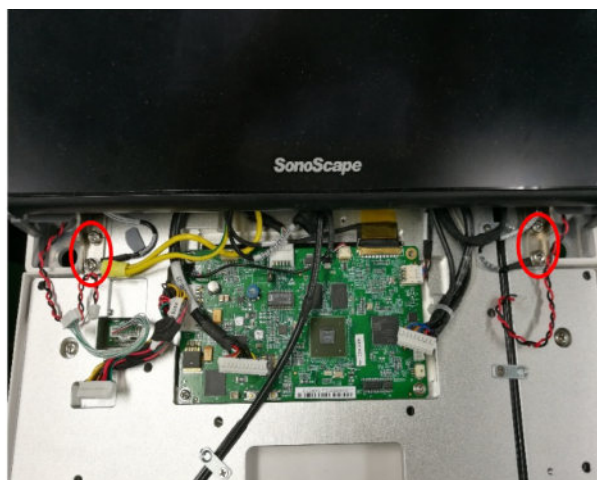
**Figure 4-18 Removing Screws Fixing Control Panel**

## 4.5 Touch Screen

One cross screwdriver is needed for the touch screen disassembly.

Perform the following steps,

1. Remove the control panel assembly.
2. Remove the cable connected to the touch panel. Use the screwdriver to remove the four screws fixed on the touch screen hinge and remove the touch screen assembly.



**Figure 4-19 Removing Screws Fixed on Hinges**

### 4.6 Hard Disk

One short-handle screwdriver is needed for the disassembly.

Perform the following steps,

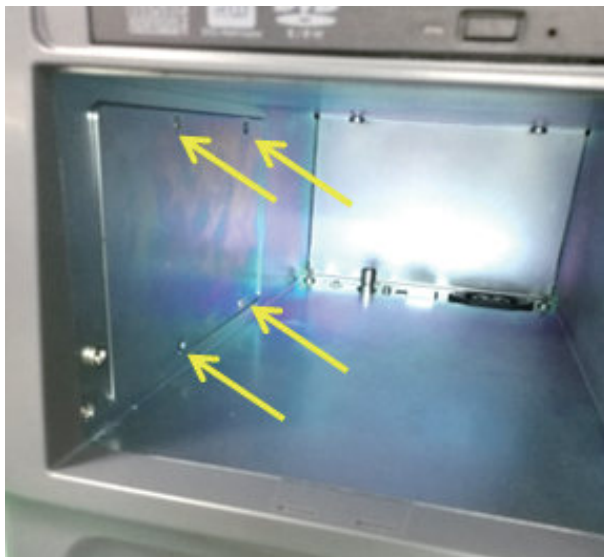
1. Remove the cover of the printer compartment.



**Figure 4-20 Removing the Cover of the Printer Compartment**



2. Use the screwdriver to remove the four screws on the left side of the printer compartment and take out the cover of the hard disk.



**Figure 4-21 Removing Hard Disk Cover**

3. Disconnect the SATA cable and remove the HDD by pulling it out.



**Figure 4-22 Removing Hard Disk**

### 4.7 DVD Drive

One screwdriver and one long-handled cross screwdriver are needed for the disassembly.

Perform the following steps,

1. Take out the cover of the printer compartment.



**Figure 4-23 Removing the Cover of the Printer compartment**

2. Remove the three countersunk screws on the both sides of the printer compartment.



**Figure 4-24 Removing Screws Fixed Printer Front Panel**

3. Remove the dust filter and dust-proof sponge on the right bottom of the unit, use the screwdriver to remove the two fixing screw (one on the left, the other one on the right), and then take out the front cover of the lower part of the unit.



**Figure 4-25 Removing Front Panel Cover**

4. Use the screwdriver to remove the two screws on the both sides of the bracket, and then take out the DVD driver together with the bracket and connector cables.



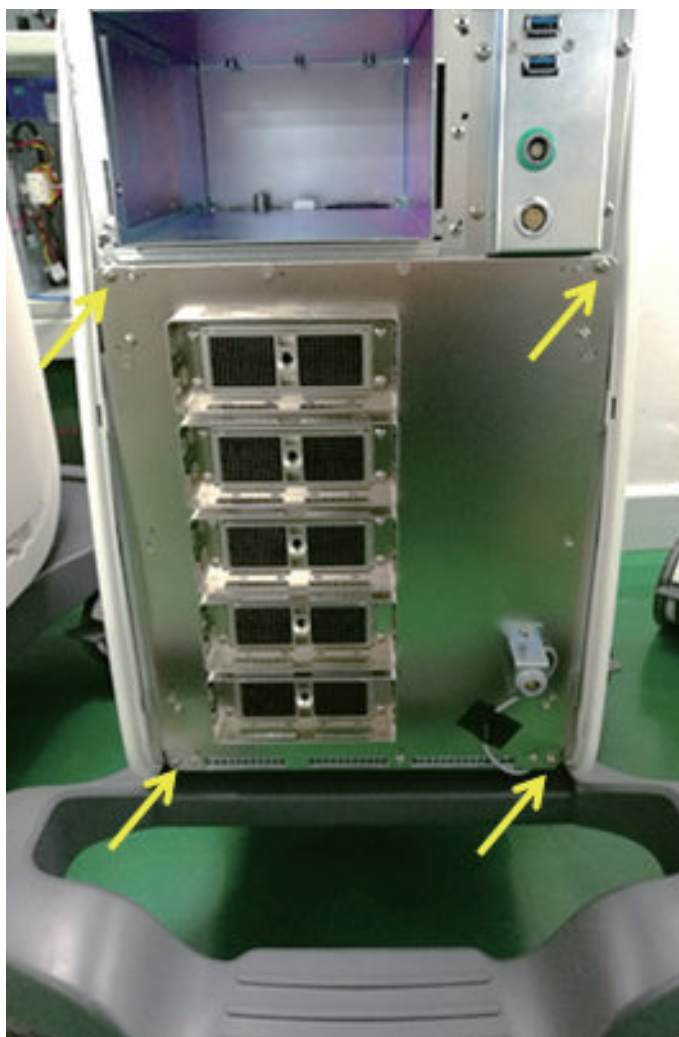
**Figure 4-26 Removing DVD Driver**

### 4.8 Ultrasound Unit

One screwdriver is needed for the ultrasound unit disassembly.

Perform the following steps,

1. Remove the front cover. For details, refer to 4.7 DVD Drive.
2. Use the screwdriver to remove the four screws that are used to fix the ultrasound unit.



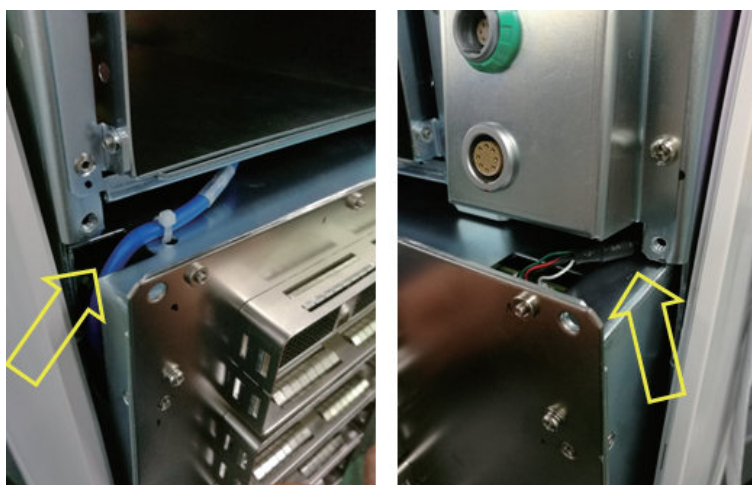
**Figure 4-27 Removing Screws Fixing the Ultrasound Unit**

3. Remove the fixing screws of the footswitch, and then remove the tape.



**Figure 4-28 Removing Footswitch Socket**

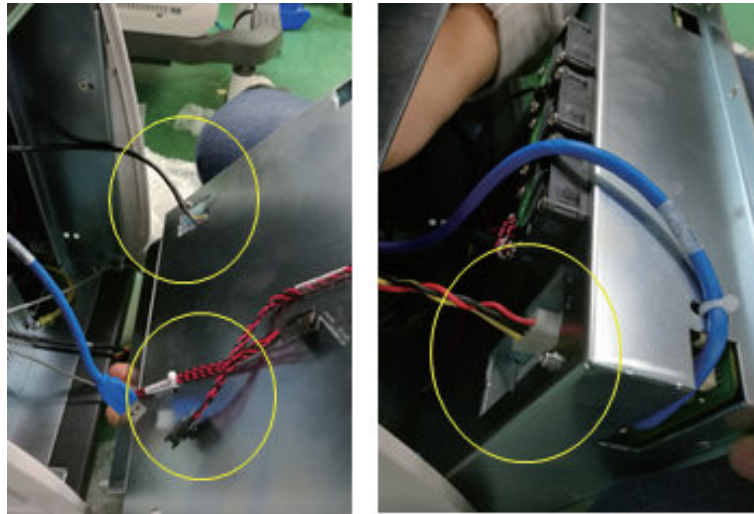
4. Drag out the ultrasound unit partly from the front view of the system, cut off the USB binding cable on the left, and then pull out the cable connector on the right.



**Figure 4-29 Removing USB Cables**

5. Disconnect the cable between the ultrasound unit and the system, and then take out the ultrasound unit.





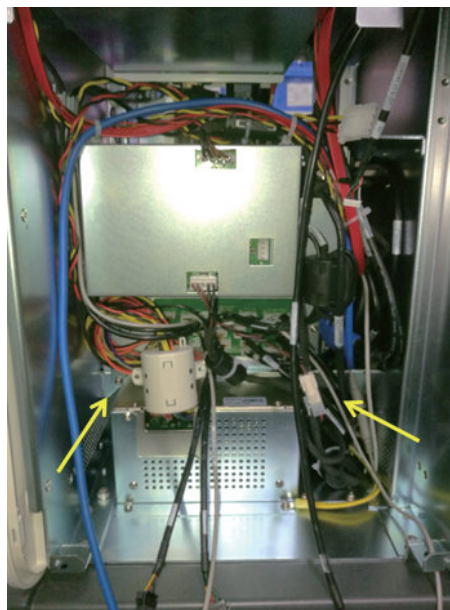
**Figure 4-30 Disconnecting the Ultrasound Unit to the System Connection Cables**

### 4.9 Main IO board assembly

One screwdriver and one cutting nippers are needed for the main IO board disassembly.

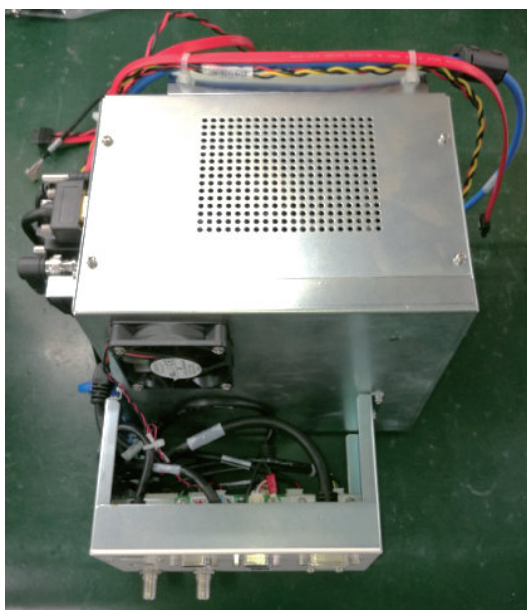
Perform the following steps,

1. Disassemble the front cover and the ultrasound unit. For details, refer to 4.8 Ultrasound Unit.
2. Pull out all cables connected to the main IO board, remove the screws that used to fixing the horizontal baffle, take out the horizontal baffle and then pull out the main IO board assembly completely.



**Figure 4-31 Removing Internal IO Board Cables**

3. Take out the assembly of the main IO board.



**Figure 4-32 Removing Main IO Board Component**

## **4.10 Power Supply**

One screwdriver and one cutting nippers are needed for the power supply disassembly.

Perform the following steps,

1. Remove the components of the main IO board. For details, refer to 4.9 Main IO board assembly
2. Use the screwdriver to remove the two screws on the bottom of the power cable, and pull out partly of the power supply cable, and disconnect the plug for power supply, and then pull out all power supply unit completely.



**Figure 4-33 Removing Power Supply Unit**

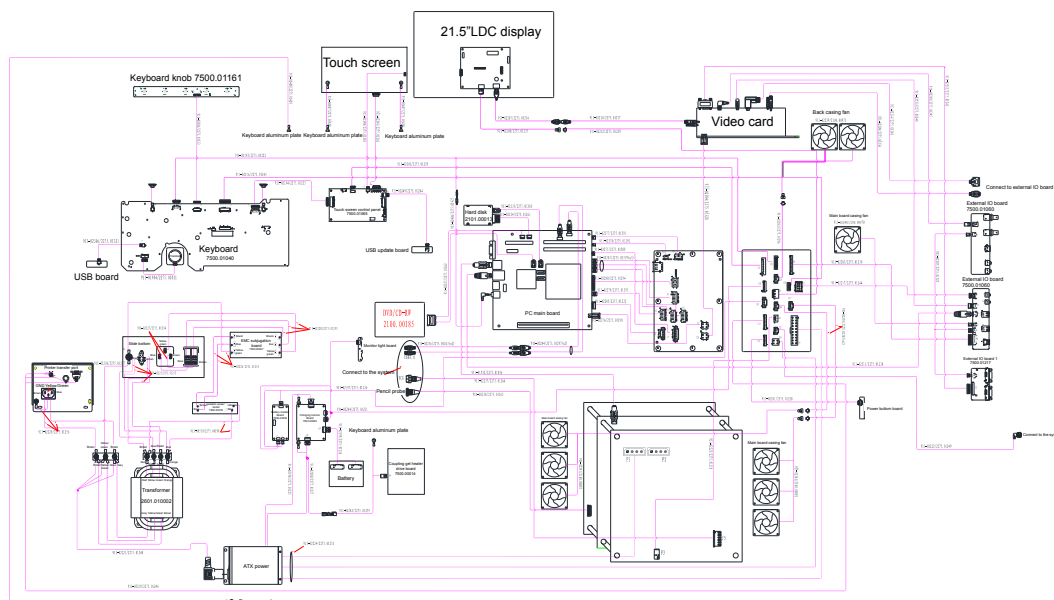


## 5 Wiring Descriptions

This chapter provides descriptions for pin connections between the boards inside the system. You should get a general overview of pins before the service.

### 5.1 Concerns for Wiring

The system connection method is as shown in the following figure.



**Figure 5-1 Overall System Connection**

Refer to the following table and sections

**Table 5-1 Codes and Names of Connection Cables**

No.	P/N	Description	Figure
1	2275.01222	P50 Key panel, USB and audio cable	See Figure 5-2
2	2275.01223	P50 Touch screen panel to key panel connector cable	See Figure 5-3
3	2275.01224	P50 Internal IO board to battery monitor board cable	See Figure 5-4
4	2275.01225	P50 Charging monitor board power output cable	See Figure 5-5
5	2275.01226	P50 Charging monitor board and battery supply connector cable	See Figure 5-6
6	2275.01227	P50 Charging monitor board power input cable	See Figure 5-7
7	2275.01228	P50 Internal IO board to power on/off board cable	See Figure 5-8
8	2275.01229	P50 Internal IO board to touch screen Ethernet cable	See Figure 5-9
9	2275.01230	P50 Internal IO board to external IO board 2 USB cable	See Figure 5-10
10	2275.01231	P50 Charging monitor panel connector cable	See Figure 5-11

No.	P/N	Description	Figure
11	2275.01232	P50 Internal IO board to main board PS2 cable	See Figure 5-12
12	2275.01233	P50 Key panel to knob board cable	See Figure 5-13
13	2275.01234	P50 Display to video card HDMI cable	See Figure 5-14
14	2275.01235	P50 Display to internal IO board video power cable	See Figure 5-15
15	2275.01236	P50 Video card to external IO board HDMI cable	See Figure 5-16
16	2275.01237	P50 Video card to display HDMI cable	See Figure 5-17
17	2275.01238	P50 Main board to external IO board 2 gigabit Ethernet cable	See Figure 5-18
18	2275.01239	P50 Internal IO board to display video power cable	See Figure 5-19
19	2275.01240	P50 Main board to external IO board 2 S-VIDEO cable	See Figure 5-20
20	2275.01241	P50 Video card to external IO board DVI cable	See Figure 5-21
21	2275.01242	P50 Video card to external IO board 1 VGA cable	See Figure 5-22
22	2275.01243	P50 Key panel to internal IO board power cable	See Figure 5-23
23	2275.01244	P50 Internal IO board to external IO board 2 print cable	See Figure 5-24
24	2275.01245	P50 Video card to external IO board 3 CVBS signal cable	See Figure 5-25
25	2275.01246	P50 Internal IO board to external printer cable	See Figure 5-26
26	2275.01248	P50 Isolation transformer to ATX power input cable	See Figure 5-27
27	2275.01249	P50 Internal footswitch cable	See Figure 5-28
28	2275.01250	P50 Internal IO board to VBF board serial cable	See Figure 5-29
29	2275.01251	P50 ATX power cable	See Figure 5-30
30	2275.01252	P50 Slide switch cable	See Figure 5-31
31	2275.01253	P50 EMC subjugation board to isolation power supply board cable	See Figure 5-32
32	2275.01254	P50 AC filter to power switch cable	See Figure 5-33
33	2275.01255	P50 EMC subjugation board to power switch cable	See Figure 5-34
34	2275.01256	P50 Isolation transformer to external printer power supply cable	See Figure 5-35

## 5 Wiring Descriptions

No.	P/N	Description	Figure
35	2275.01257	P50 Isolation transformer to ground post earth wire	See Figure 5-36
36	2275.01260	P50 SATA hard disk signal cable	See Figure 5-37
37	2275.01261	P50 SATA hard disk power cable	See Figure 5-38
38	2275.01262	P50 DVD Drive power & SATA signal cable	See Figure 5-39
39	2275.01263	P50 Case USB3.0 cable (dosage 2)	See Figure 5-40
40	2275.01264	P50 ECG signal cable	See Figure 5-41
41	2275.01265	P50 Pencil probe signal cable	See Figure 5-42
42	2275.01266	P50 Touch panel to touch screen EDP cable	See Figure 5-43
43	2275.01283	P50 Touch panel to touch screen USB+KEY cable	See Figure 5-44
44	2275.01284	P50 Touch panel to USB updating board cable	See Figure 5-45
45	2275.01285	P50 Internal IO board to ultrasound unit casing fan connection cable (dosage 2)	See Figure 5-46
46	2275.01289	P50 Internal IO board to main board Gigabit Ethernet cable	See Figure 5-47
47	2275.01290	P50 Internal IO board to main board 12V power supply cable	See Figure 5-48
48	2275.01291	P50 PS-ON/5VSB signal cable	See Figure 5-49
49	2275.01292	P50 Internal IO board to main board power switch cable	See Figure 5-50
50	2275.01293	P50 Internal IO board to main board audio cable	See Figure 5-51
51	2275.01294	P50 Internal IO board to main board serial cable	See Figure 5-52
52	2275.01470	P50 Charging monitor panel to coupling gel power supply cable	See Figure 5-53
53	2275.01296	P50 Back casing fan conversion cable	See Figure 5-54
54	2275.01297	P50 Main board USB3.0 cable (dosage 2)	See Figure 5-55
55	2275.01317	P50 Coupling gel heating temperature measurement cable	See Figure 5-56
56	2275.01318	P50 Coupling gel heating power input cable	See Figure 5-57
57	2275.01319	P50 Internal IO board to main board USB2.0 cable (dosage 3)	See Figure 5-58

No.	P/N	Description	Figure
58	2275.01320	P50 Internal IO board to video card 12V power supply cable	See Figure 5-59
59	2275.01321	P50 Key panel to side USB cable	See Figure 5-60
60	2275.01322	P50 External IO Board 2 to External IO board 1 and External IO board 3 Cable	See Figure 5-61
61	2275.01427	P50 Main board case to key panel audio conversion cable	See Figure 5-62
62	2275.01428	P50 Touch screen ground cable (dosage 2)	See Figure 5-63
63	2275.01429	P50 Case to key panel aluminum plate ground cable	See Figure 5-64
64	2275.00198	S40 Isolation transformer to isolation power supply board connection cable	See Figure 5-65
65	2275.01011	P50 Trackball cable	See Figure 5-66
66	2275.01036	P50 Main board to SBF board USB3.0 cable	See Figure 5-67
67	2275.01652	P50 USB board ground cable	See Figure 5-68
68	2275.01468	P20 Touch panel to USB updating board cable	See Figure 5-69
69	2275.01467	P20 pull keyboard cable	See Figure 5-70
70	2275.01701	P20 pull keyboard conversion cable	See Figure 5-71
71	2100.00970	Main board casing fan	See Figure 5-72
72	2100.00971	Back casing fan	See Figure 5-73
73	2100.00761	Ultrasound unit casing fan	See Figure 5-74

## 5.2 Pin Connection

### 5.2.1 P50 Key panel, USB and Audio Cable

P/N: 2275.01222

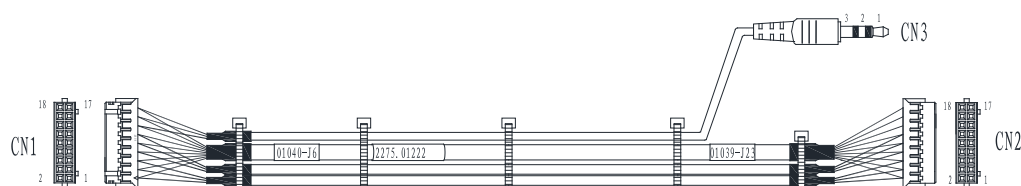


Figure 5-2 P50 Key panel, USB and Audio Cable

## 5 Wiring Descriptions

**Table 5-2 P50 Key panel, USB and Audio Cable Pins**

Signal	FSW2	FSW2	GND	P R T _ CTRL	P R T _ BUSY	GND	TBPS2DATA
Color	Red	White	Black	Green	Orange	Grey	Yellow
CN1	1	3	5	7	9	11	13
CN2	1	3	5	7	9	11	13
CN3	/	/	/	/	/	/	/
Remark	Shielded separately						

Signal	TBPS2CLK	GND	USB_D2+	USB_D2-	GND
Color	Brown	Shield	Orange/Blue twisted pair		Shield
CN1	15	17	2	4	6
CN2	15	17	2	4	6
CN3	/	/	/	/	/
Remark	Shielded separately				

Signal	USB_D3+	USB_D3-	GND	AUDIO_L0	AUDIO_R0	GND
Color	Orange/Blue twisted pair		Shield	Red	Black	Shield
CN1	8	10	12	14	16	18
CN2	8	10	12	/	/	/
CN3	/	/	/	1	2	3
Remark	Shielded separately					

Instructions:

- Connect CN1 to key panel 7500.01040 (J6).
- Connect CN2 to main board audio cable 2275.0142.
- Connect CN3 to internal IO board 7500.01039(J23).

### 5.2.2 P50 Touch Screen Panel to Key panel Cable

P/N: 2275.01223

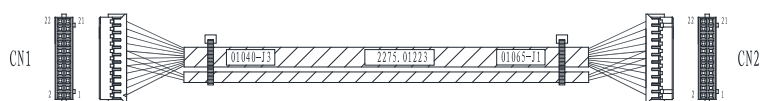


Figure 5-3 P50 Touch Screen Panel to Key panel Cable

Table 5-3 P50 Touch Screen Panel to Key panel Cable Pins

Signal	GND	12V	12V	GND	5V	5V	GND	PWR_ON
Color	Shield	Red	Yellow	Black	Red	Orange	Black	Green
CN1	1	3	5	7	15	17	19	21
CN2	1	3	5	7	15	17	19	21
Remark	Shield separately							

Signal	GND	12V	12V	GND	GND	5V	5V	GND
Color	Black	Yellow	Red	Black	Black	Orange	Red	Shield
CN1	2	4	6	8	14	16	18	20
CN2	2	4	6	8	14	16	18	20
Remark	Shielded separately							

Signal	RX3	TX3	GND
Color	White/Blue twisted pair		Black
CN1	9	11	8
CN2	9	11	8
Remark	Shielded separately		

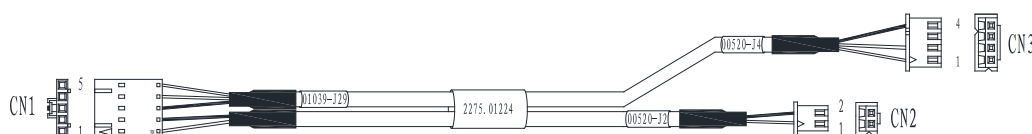
Instructions:

- Connect CN1 to Key panel 7500.01040(J3).
- Connect CN2 to Touch screen panel 7500.01065(J1).

### 5.2.3 P50 Internal IO Board to Battery Monitor Board Cable

P/N: 2275.01224

## 5 Wiring Descriptions



**Figure 5-4 P50 Internal IO Board to Battery Monitor Board Cable**

**Table 5-4 P50 Internal IO Board to Battery Monitor Board Cable Pins**

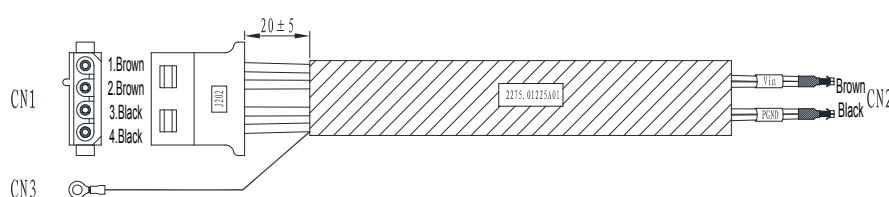
Signal	5V	GND	GND	TXI	RXI
Color	Transparent	Shield	Shield	Orange/Blue twisted pair	
CN1	1	2	3	4	5
CN2	1	2	/	/	/
CN3			4	2	1
Remark	Shielded separately				

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J29)
- Connect CN2 to battery monitor board 7500.00520(J2)
- Connect CN3 to battery monitor board 7500.00520(J4)

### 5.2.4 P50 Charging Monitor Board Power Output Cable

P/N: 2275.01225



**Figure 5-5 P50 Charging Monitor Board Power Output Cable**

Instructions:

- Connect CN1,CN2 to charging monitor board 7500.00546(J202)
- Connect CN3 to ATX350W power supply DC2DC board 500.01044(Vin/PGND).

### 5.2.5 P50 Charging Monitor Board and Battery Supply Connector Cable

P/N: 2275.01226





**Figure 5-6 P50 Charging Monitor Board and Battery Supply Connector Cable**

**Table 5-5 P50 Charging Monitor Board and Battery Supply Connector Cable Pins**

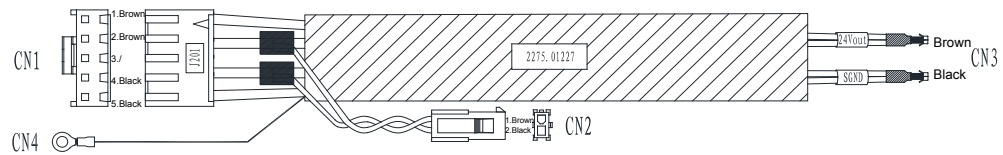
Signal	GND	GND	Bat+	Bat+
Color	Blue	Blue	Brown	Brown
CN1	1	2	3	4
CN2	Board terminal	Board terminal	Board terminal	Board terminal

Instructions:

- Connect CN1 to charging monitor board 7500.00546(J203).
- Connect CN2 to battery supply connection board.

### 5.2.6 P50 Charging Monitor Board Power Input Cable

P/N: 2275.01227



**Figure 5-7 P50 Charging Monitor Board Power Input Cable**

Instructions:

- Connect CN1, CN4 to charging monitor board 7500.00546(J201)
- Connect CN2 to charging monitor board to Charging monitor panel to coupling gel power supply cable.
- Connect CN3 to ATX350W power supply AC2DC board 7500.01272(24Vout/SGND).

### 5.2.7 P50 Internal IO Board to Power on/off Board Cable

P/N: 2275.01228



**Figure 5-8 P50 Internal IO Board to Power on/off Board Cable**

## 5 Wiring Descriptions

**Table 5-6 P50 Internal IO Board to Power on/off Board Cable Pins**

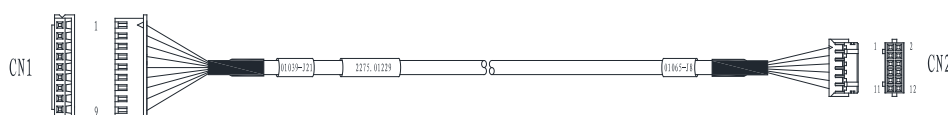
Signal	5VSB	PS_ON	GND	ON/OFF OUT	ON/OFF IN	GND	5V
Color	Red	Green	Shield	White	Blue	Shield	Red
CN1	1	3	2	5	7	6	8
CN2	1	3	2	5	7	6	8

Instructions:

- Connect CN1 to Internal IO board 7500.01039 (J31).
- Connect CN2 to power on/off board 7500.014041 (J1).

### 5.2.8 P50 Internal IO Board to Touch Screen Ethernet Cable

P/N: 2275.01229



**Figure 5-9 P50 Internal IO Board to Touch Screen Ethernet Cable**

**Table 5-7 P50 Internal IO Board to Touch Screen Ethernet Cable Pins**

Signal	M1+	M1-	M2+	M2-	M3+	M3-	M0+	M0-	GND
Color	Orange-white	Orange	Blue-White	Blue	Green-white	Green	Brown-white	Brown	Shield
CN1	6	5	4	3	2	1	8	7	9
CN2	1	3	5	7	9	11	2	4	10
Remark	Twisted pair		Twisted pair		Twisted pair		Twisted pair		/

Instructions:

- Connect CN1 to internal IO board 7500.01039(J21).
- Connect CN2 to touch screen monitor board 7500.01065(J8).

### 5.2.9 P50 Internal IO Board to External IO Board 2 USB Cable

P/N:2275.01230

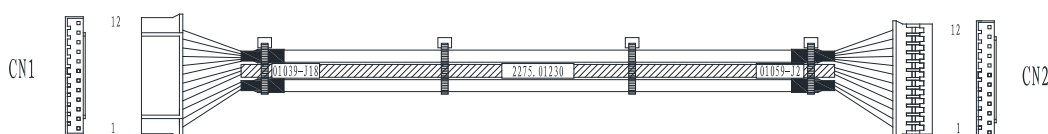


Figure 5-10 P50 Internal IO Board to External IO Board 2 USB Cable

Table 5-8 P50 Internal IO Board to External IO Board 2 USB Cable Pins

Signal	GND	D0-	D0+	GND	D1-	D1+
Color	Shielded	Orange	Blue	Shielded	Orange	Blue
CN1	1	2	3	4	5	6
CN2		2	2	4	5	6
Remark		Twisted pair		/	Twisted pair	
/	Shield separately			Shield separately		

Signal	GND	GND	5V	GND	12V	GND
Color	Shielded	Shield	Red	Shielded	Yellow	Black
CN1	7	8	9	10	11	12
CN2	7	8	9	10	11	12
Remark	/	/	/	/	/	/
	Shielded separately					

Instructions:

- Connect CN1 to Internal IO board.
- Connect CN2 to External IO board.

### 5.2.10 P50 Charging Monitor Board Connector Cable

P/N:2275.01231

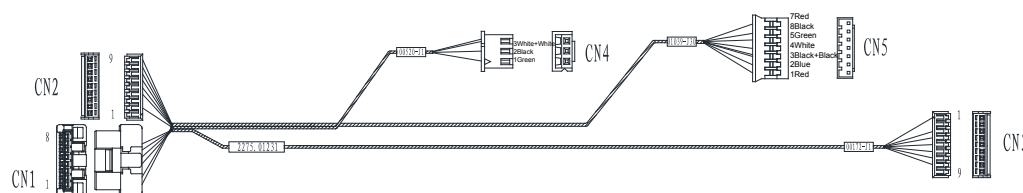


Figure 5-11 P50 Charging Monitor Board Connector Cable

## 5 Wiring Descriptions

**Table 5-9 P50 Charging Monitor Board Connector Cable Pins**

Signal	5VSB	GND	PROG		D2G	D2Y	Light	Convert Light
Color	Red	Black	White		Green	Orange	Blue	White
CN1	/	1	2	/	4	5	6	7
CN2	/	/	/		/	/	/	/
CN3	1	/	/	4	5	6	7	8
CN4	/	2	3		/	/	/	/
CN5	1	/	/	/	/	/	/	/

Signal	BAT+	PS_ON	5V	GND		ON/OFF OUT	ON/OFF IN	GND
Color	Green	Blue	Red	Black		White	Green	Black
CN1	/	/	/	/		/	/	/
CN2	2	4	5	/	6	7	8	9
CN3	/	/	/	3	/	/	/	/
CN4	1	/	/	/	/	/	/	/
CN4	/	2	7	3		4	5	6

Instructions:

- Connect CN1 to charging monitor board 7500.00546(J101).
- Connect CN2 to charging monitor board 7500.00546(J102)
- Connect CN3 to battery indicator board 7500.00172(J1).
- Connect CN4 to battery monitor board 7500.00520(J1).
- Connect CN5 to internal IO board 7500.01039(J30).

### 5.2.11 P50 Internal IO Board to Main Board PS2 Cable

P/N: 2275.01232



**Figure 5-12 P50 Internal IO Board to Main Board PS2 Cable**

**Table 5-10 P50 Internal IO Board to Main Board PS2 Cable Pins**

Signal	TBPS2DAT	GND	TBPS2DAT	GND
Color	Red	Shielded	Black	Shielded
CN1	3	4	5	6
CN2	3	4	6	/

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J8).
- Connect CN2 to main board.

### 5.2.12 P50 Key panel to Knob Board Cable

P/N:2275.01233

**Figure 5-13 P50 Key panel to Knob Board Cable****Table 5-11 P50 Key panel to Knob Board Cable Pins**

Signal	3.3V	3.3V	TOUCHA1	TOUCHA2	TOUCHB1	TOUCHB2
Color	Orange	Orange	White	Green	White	Green
CN1	1	2	3	4	5	6
CN2	1	2	3	4	5	6

Signal	TOUCHB2	TOUCHC1	TOUCHC2	TOUCHD1	TOUCHD2
Color	Green	White	Green	White	Green
CN1	6	7	8	9	10
CN2	6	7	8	9	10

## 5 Wiring Descriptions

Signal	TOUCHE1	TOUCHE2	GND	GND
Color	White	Green	Black	Black
CN1	11	12	13	14
CN2	11	12	13	14

Instructions:

- Connect CN1 to Key panel 7500.01040 (J11).
- Connect CN2 to key panel knob board 7500.01161(J1).

### 5.2.13 P50 Display to Video Card HDMI Cable

P/N:2275.01234

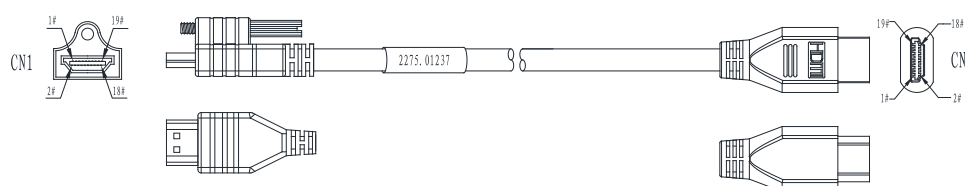


Figure 5-14 P50 Display to Video Card HDMI Cable

Table 5-12 P50 Display to Video Card HDMI Cable Pins

Signal	DATA2+	DATA2-	GND	DATA1+	DATA1-	GND
Color	White-blue twisted pair		White-blue-ground	White-green twisted pair		White-green-ground
CN1	1	3	2	4	6	5
CN2	1	3	2	4	6	5

Signal	DATA0+	DATA0-	GND
Color	White-brown twisted pair		White-brown-ground
CN1	7	9	8
CN2	7	9	8

Signal	CLK+	CLK-	GND	SCL	SDA	CEC	NC
Color	White-red twisted pair		White-red-ground	Red	Purple	Yellow-orange twisted pair	
CN1	10	12	11	13	14	15	16
CN2	10	12	11	13	14	15	16

Signal	DDC	+5V	Detect	GND
Color	White	Green	Blue	Braid
CN1	17	18	19	Shell
CN2	17	18	19	Shell

Instructions:

- Connect CN1 to display HDMI.
- Connect CN2 to video card HDMI cable in the arm.

#### 5.2.14 P50 Display to Internal IO Board Video Power Cable

P/N: 2275.01235



**Figure 5-15 P50 Display to Internal IO Board Video Power Cable**

**Table 5-13 P50 Display to Internal IO Board Video Power Cable Pins**

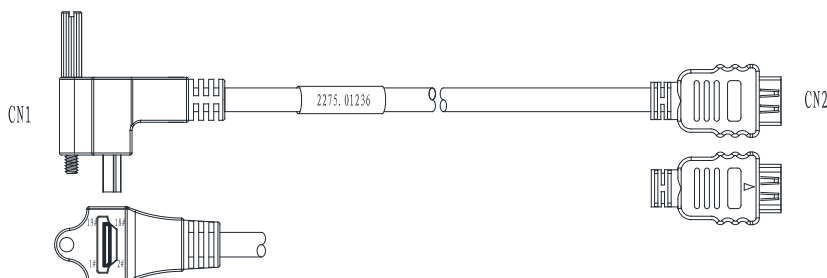
Signal	12V	GND	GND
Color	Red	Black	Shielded
bmP	1	2	3
bmQ	1	2	3

Instructions:

- Connect CN1 to Internal IO board power cable in the arm.
- Connect CN2 to display power 3pin.

### 5.2.15 P50 Video Card to External IO Board HDMI Cable

P/N: 2275.01236



**Figure 5-16 P50 Video Card to External IO Board HDMI Cable**

**Table 5-14 P50 Video Card to External IO Board HDMI Cable Pins**

Signal	DATA2+	DATA2-	GND	DATA1+	DATA1-	GND
Color	White-blue twisted pair		White-blue-ground	White-green twisted pair		White-green-ground
CN1	1	3	2	4	6	5
CN2	1	3	2	4	6	5

Signal	DATA0+	DATA0-	GND
Color	White-brown twisted pair		White-brown-ground
CN1	7	9	8
CN2	7	9	8

Signal	CLK+	CLK-	GND	SCL	SDA	CEC	NC
Color	White-red twisted pair		White-red-ground	Red	Purple	Yellow-orange twisted pair	
CN1	10	12	11	13	14	15	16
CN2	10	12	11	13	14	15	16



Signal	DDC	+5V	Detect	GND
Color	White	Green	Blue	Braid
CN1	17	18	19	Shell
CN2	17	18	19	Shell

Instructions:

- Connect CN1 to video card.
- Connect CN2 to external IO board.

### 5.2.16 P50 Video Card to display HDMI Cable

P/N: 2275.01237

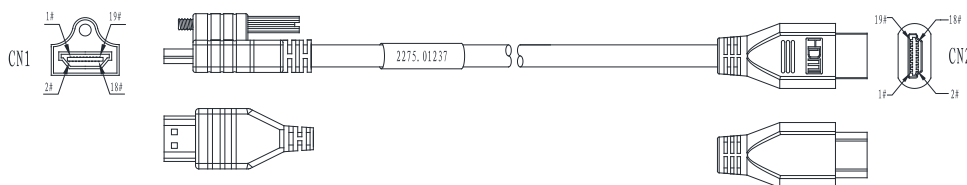


Figure 5-17 P50 Video Card to display HDMI Cable

Table 5-15 P50 Video Card to display HDMI Cable Pins

Signal	DATA2+	DATA2-	GND	DATA1+	DATA1-	GND
Color	White-blue twisted pair		White-blue-ground	White-green twisted pair		White-green-ground
CN1	1	3	2	4	6	5
CN2	1	3	2	4	6	5

Signal	DATA0+	DATA0-	GND
Color	White-brown twisted pair		White-brown-ground
CN1	7	9	8
CN2	7	9	8

## 5 Wiring Descriptions

Signal	CLK+	CLK-	GND	SCL	SDA	CEC	NC
Color	White-red twisted pair		White-red-ground	Red	Purple	Yellow - orange twisted pair	
CN1	10	12	11	13	14	15	16
CN2	10	12	11	13	14	15	16

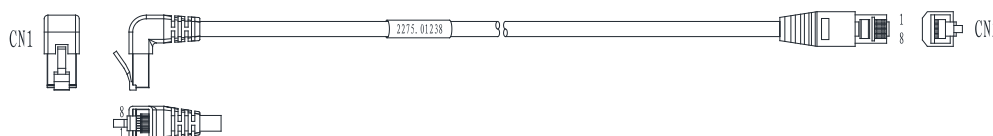
Signal	DDC	+5V	Detect	GND
Color	White	Green	Blue	Braid
CN1	17	18	19	Shell
CN2	17	18	19	Shell

Instructions:

- Connect CN1 to video card.
- Connect CN2 to display HDMI cable in the arm.

### 5.2.17 P50 Main Board to External IO Board 2 Gigabit Ethernet Cable

P/N: 2275.01238



**Figure 5-18 P50 Main Board to External IO Board 2 Gigabit Ethernet Cable**

**Table 5-16 P50 Main Board to External IO Board 2 Gigabit Ethernet Cable Pins**

Signal	MDI0+	MDI0-	MDI1+	MDI1-	MDI2+	MDI2-	MDI3+	MDI3-	GND
Color	Orange-white/ Orange twisted pair		Green-white/ Green twisted pair		Blue-white/Blue twisted pair		Brown-white/ Brown twisted pair		Shielded
CN1	1	2	3	6	4	5	7	8	Shell
CN2	1	2	3	6	4	5	7	8	Shell

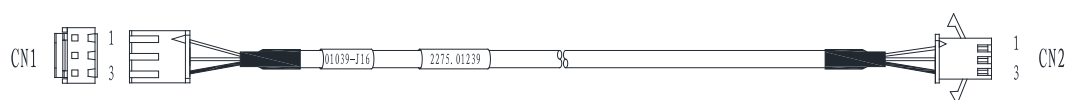
Instructions:

- Connect CN1 to the main board.

- Connect CN2 to external IO board 3 P3.

### 5.2.18 P50 Internal IO Board to Display Video Power Cable

P/N: 2275.01239



**Figure 5-19 P50 Internal IO Board to Display Video Power Cable**

**Table 5-17 P50 Internal IO Board to Display Video Power Cable Pins**

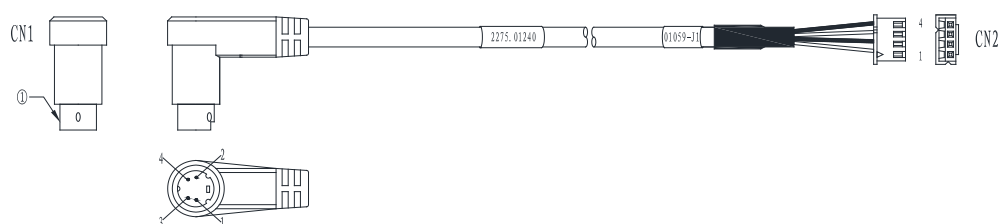
Signal	12V	GND	GND
Color	Red	Black	Shielded
CN1	1	2	3
CN2	1	2	3

Instructions:

- Connect CN1 to internal IO board 7500.01039(J16).
- Connect CN2 to display video power cable in the arm.

### 5.2.19 P50 Main Board to External IO Board 2 S-VIDIO Cable

P/N: 2275.01240



**Figure 5-20 P50 Main Board to External IO Board 2 S-VIDIO Cable**

**Table 5-18 P50 Main Board to External IO Board 2 S-VIDIO Cable Pins**

Signal	Yin	GND	Gin	GND	GND
Color	Shielded(Red)	Shielded(Green)	Red	Green	Shielded
CN1	1	2	3	4	Shell
CN2	2	4	1	3	/

## 5 Wiring Descriptions

Instructions:

- Connect CN1 to the main board.
- Connect CN2 to external IO board 2 7500.01059 (J1).

### 5.2.20 P50 Video Card to External IO Board DVI Cable

P/N: 2275.01241

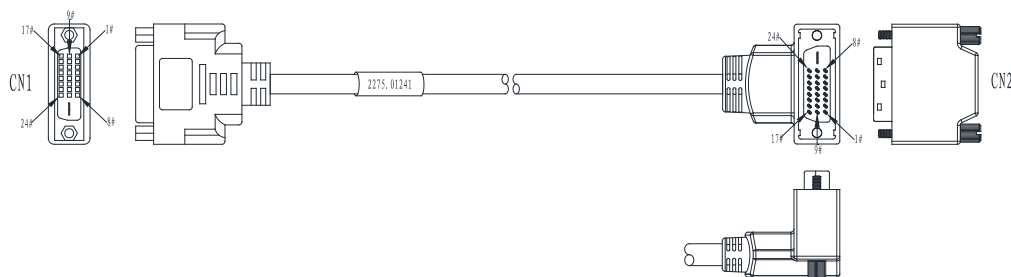


Figure 5-21 P50 Video Card to External IO Board DVI Cable

Table 5-19 P50 Video Card to External IO Board DVI Cable Pins:

Color	Purple - light blue twisted pair		GND	Black - gray twisted pair		Yellow - orange twisted pair		Pink - orange twisted pair		GND	White - brown twisted pair	
CN1	1	2	3	4	5	6	7	9	10	11	12	13
CN2	1	2	3	4	5	6	7	9	10	11	12	13

Color	GND	Purple	Red	White-red twisted pair		GND	White - blue twisted pair		GND	White - green twisted pair		Shielded
CN1	14	15	16	17	18	19	20	21	22	23	24	Shell
CN2	14	15	16	17	18	19	20	21	22	23	24	Shell

Instructions:

- Connect CN1 to External IO board.
- Connect CN2 to video card.

### 5.2.21 P50 Video Card to External IO board 1 VGA Cable

P/N: 2275.01242

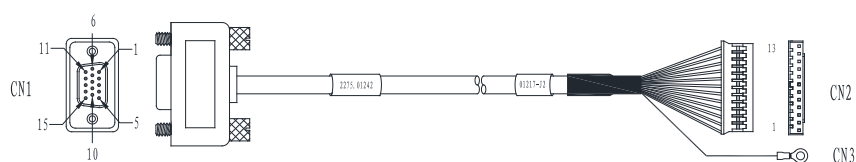


Figure 5-22 P50 Video Card to External IO board 1 VGA Cable

Table 5-20 P50 Video Card to External IO board 1 VGA Cable Pins:

Signal	R	GND	G	GND	B	GND	GND	GND
Color	Pink	Shielded (Pink)	Green	Shielded (Green)	Blue	Shielded (Blue)	Shielded	Shielded
CN1	1	6	2	7	3	8	5	10
CN2	4	3	6	5	8	7	9	12
CN3	/	/	/	/	/	/	/	/

SDA	SCL	H	V	GND
Red	Red-black	White	White-black	Shielded
12	15	13	14	Shell
2	1	10	11	/
/	/	/	/	RV Terminal

Instructions:

- Connect CN1 to video card.
- Connect CN2 to external IO board 1 7500.0121 (J2).

### 5.2.22 P50 Key panel to Internal IO Board Power Cable

P/N: 2275.01243

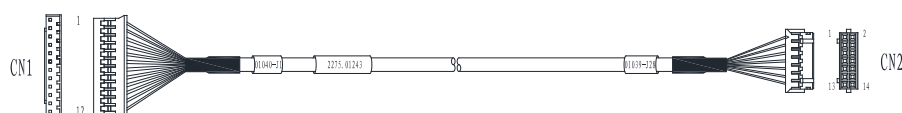


Figure 5-23 Key panel to Internal IO Board Power Cable

## 5 Wiring Descriptions

**Table 5-21 P50 Key panel to Internal IO Board Power Cable Pins:**

Signal	+5V	+5V	+5V	+5V	+12V	+12V	+12V
Color	Red	White	Green	Orange	Yellow	Brown	Grey
CN1	1	2	3	4	10	11	12
CN2	2	4	6	8	10	12	14

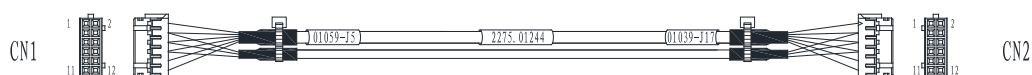
Signal	GND	GND	GND	GND	GND	GND	GND
Color	Shielded	Shielded	Shielded	Shielded	Shielded	Shielded	Shielded
CN1	5	6	7	8	9	NC	NC
CN2	1	3	5	7	9	11	13

Instructions:

- Connect CN1 to key panel 7500.01040 (J1).
- Connect CN2 to internal IO board 7500.01039 (J28)

### 5.2.23 P50 Internal IO Board to External IO Board 2 Print Cable

P/N: 2275.01244



**Figure 5-24 P50 Internal IO Board to External IO Board 2 Print Cable**

**Table 5-22 P50 Internal IO Board to External IO Board 2 Print Cable Pins**

Signal	GND	GND	PRT_CTRL	PRT_BUSY	GND	+5V	Check_ID
Color	Shielded	Shielded	Green	Black	Shielded	Red	White
CN1	1	2	3	5	7	9	10
CN2	1	2	3	5	7	9	10

Signal	CMPout1	AUDIO_L	AUDIO_R	GND
Color	Blue	Black	Red	Shielded
CN1	12	4	6	8
CN2	12	4	6	8

Instructions:

- Connect CN1 to external IO board 2 7500.01059 (J5).
- Connect CN2 to internal IO board 7500.01039 (J17).

#### 5.2.24 P50 Video Card to External IO Board 3 CVBS Signal Cable

P/N: 2275.01021

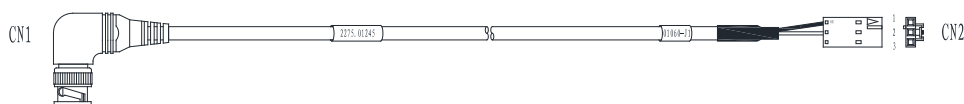


Figure 5-25 P50 Video Card to External IO Board 3 CVBS Signal Cable

Table 5-23 P50 Video Card to External IO Board 3 CVBS Signal Cable Pins

Signal	GND	CMPPin
Color	Shielded	Core wire
CN1	Shell	PIN
CN2	1	2

Instructions:

- Connect CN1 to video card.
- Connect CN2 to external IO board 3 7500.01060(J1).

#### 5.2.25 P50 Internal IO Board to External Printer Cable

P/N: 2275.01246

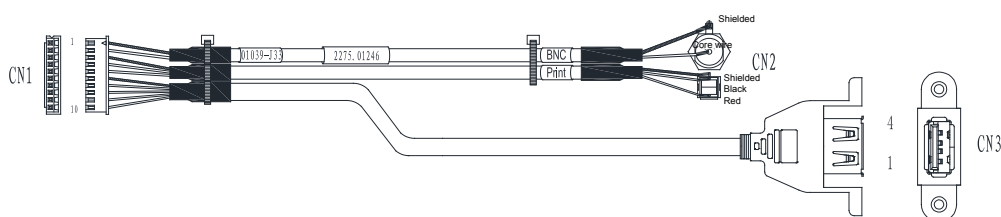


Figure 5-26 P50 Internal IO Board to Main Board USB2.0 Cable

## 5 Wiring Descriptions

**Table 5-24 P50 Internal IO Board to External Printer Cable Pins**

Signal	GND	CMPout1	GND	P R T _ CTRL	P R T _ BUSY	GND
Color	Shielded	Core wire	Shielded	Red	Black	Shielded
CN1	1	2	3	4	5	6
CN2	BNC plug shell		Audio plug shell			/
CN3						Shell

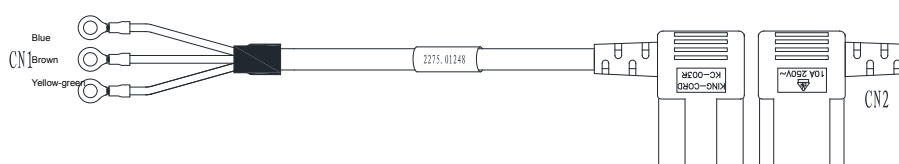
Signal	5V	D-	D+	GND
Color	Red	White-green twisted pair		Black
CN1	7	8	9	10
CN2	/	/	/	/
CN3	1	2	3	4

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J33).
- Connect CN2, CN3 to the printer.

### 5.2.26 P50 Isolation Transformer to ATX Power Input Cable

P/N: 2275.01248



**Figure 5-27 P50 Isolation Transformer to ATX Power Input Cable**

Instructions:

- Connect CN1 to isolation transformer.
- Connect CN2 to ATX power source.

### 5.2.27 P50 Internal Footswitch Cable

P/N: 2275.01249



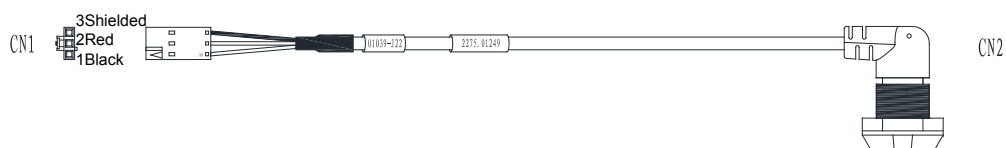


Figure 5-28 P50 Internal Footswitch Cable

Table 5-25 P50 Internal Footswitch Cable Pins

Signal	FSW1	FSW2	GND
Color	Black	Red	Shielded
CN1	1	2	3
CN2	3	2	1, 4

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J22).
- Connect CN2 to the rack.

### 5.2.28 P50 Internal IO Board to VBF Board Serial Cable

P/N: 2275.01250



Figure 5-29 P50 Internal IO Board to VBF Board Serial Cable

Table 5-26 P50 Internal IO Board to VBF Board Serial Cable Pins

Signal	RX_RS232	GND	TX_RS232
Color	Red	Shielded	Black
CN1	1	2	3
CN2	3	1	2

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J26).
- Connect CN2 to VBF board P3.

### 5.2.29 P50 ATX Power Cable

P/N: 2275.01251

## 5 Wiring Descriptions

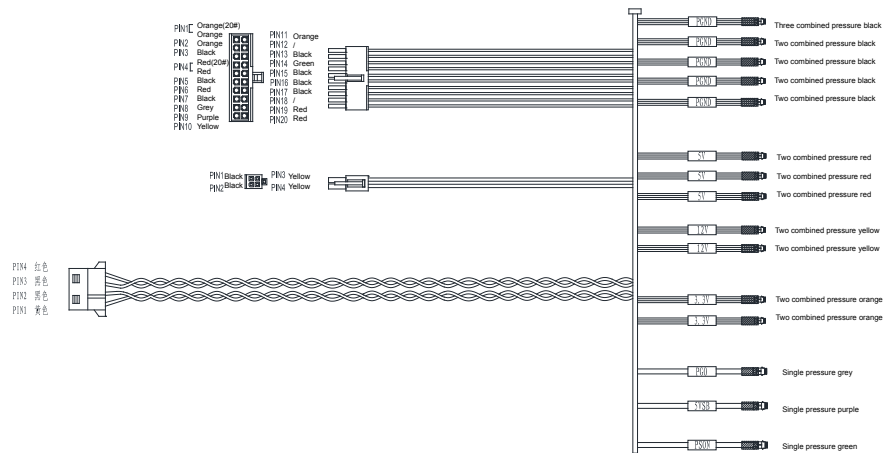


Figure 5-30 P50 ATX Power Cable

### 5.2.30 P50 Slide Switch Cable

P/N: 2275.01252

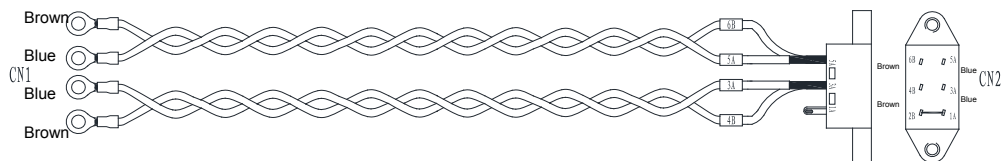


Figure 5-31 P50 Slide Switch Cable

Instructions:

Connect CN1 to isolation transformer.

### 5.2.31 P50 EMC Subjugation Board to Isolation Power Supply Board Cable

P/N: 2275.01253

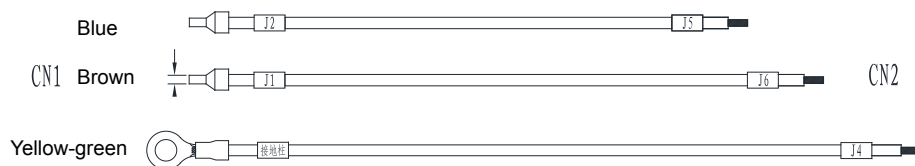


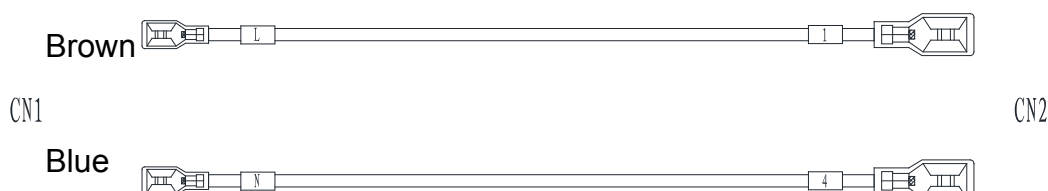
Figure 5-32 P50 EMC Subjugation Board to Isolation Power Supply Board Cable

Instructions:

- Connect CN1 isolation power board 7500.00078 (J1,J2) to ground post.
- Connect CN2 to EMC subjugation board 7500.00847(J4, J5, J6).

**5.2.32 P50 AC Filter to Power Switch Cable**

P/N: 2275.01254

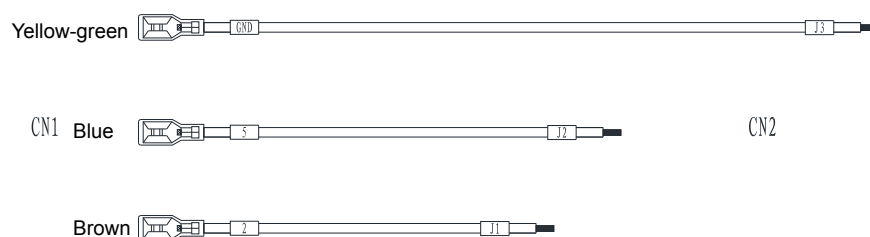
**Figure 5-33 P50 AC Filter to Power Switch Cable**

Instructions:

- Connect CN1 to filter plug L, N.
- Connect CN2 to power switch 1, 4.

**5.2.33 P50 EMC Subjugation Board to Power Switch Cable**

P/N: 2275.01255

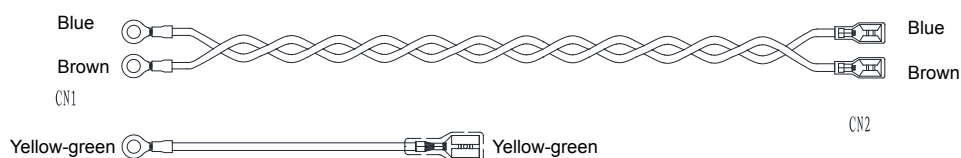
**Figure 5-34 P50 EMC Subjugation Board to Power Switch Cable**

Instructions:

- Connect CN1 to power plug 2, 5 and filter plug GND.
- Connect CN2 to EMC subjugation board 7500.00847(J1, J2, J3).

**5.2.34 P50 Isolation Transformer to External Printer Power Supply Cable**

P/N: 2275.01256

**Figure 5-35 P50 Isolation Transformer to External Printer Power Supply Cable**

Instructions:

## 5 Wiring Descriptions

- Connect CN1 to isolation transformer ground post.
- Connect CN2 to printer.

### 5.2.35 P50 Isolation Transformer to Ground Post Earth Wire

P/N: 2275.01257



**Figure 5-36 P50 Isolation Transformer to Ground Post Earth Wire**

Instructions:

- Connect CN1 to ground post.
- Connect CN2 to isolation transformer ground post.

### 5.2.36 P50 SATA Hard Dick Signal Cable

P/N: 2275.01260



**Figure 5-37 P50 SATA Hard Dick Signal Cable**

**Table 5-27 P50 SATA Hard Dick Signal Cable Pins**

CN1	2	2	3	4	5	6	7
CN2	1	2	3	4	5	6	7

Instructions:

- Connect CN1 to hard dick
- Connect CN2 to main board.

### 5.2.37 P50 SATA Hard Disk Power Cable

P/N: 2275.01261



**Figure 5-38 P50 SATA Hard Disk Power Cable**

Table 5-28 P50 SATA Hard Disk Power Cable Pins

Signal	3.3V			GND			5V			GND			12V		
Color	/			Black			Red			Black			Yellow		
CN1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CN2	NC			2			1			3			4		
Remark	/			Twisted pair						Twisted pair					

Instruction:

- Connect CN1 to hard disk
- Connect CN2 to main board.

### 5.2.38 P50 DVD Drive Power & SATA Signal Cable

P/N: 2275.01262

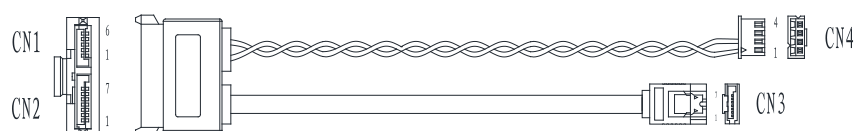


Figure 5-39 P50 DVD Drive Power &amp; SATA Signal Cable

Table 5-29 P50 DVD Drive Power &amp; SATA Signal Cable Pins

Signal	VCC	GND	GND	TX0+	TX0-	GND	TR0+	TR0-	GND
Color	Red	Black	Flat cable						
CN1	2, 3	5, 6	/	/	/	/	/	/	/
CN2	/	/	1	2	3	4	5	6	7
CN3	/	/	1	2	3	4	5	6	7
CN4	1	2	/	/	/	/	/	/	/

Instruction:

- Connect CN1 to DVD drive
- Connect CN2 to main board.

### 5.2.39 P50 Case USB3.0 Cable

P/N: 2275.01263

## 5 Wiring Descriptions



Figure 5-40 P50 Case USB3.0 Cable

Table 5-30 P50 Case USB3.0 Cable Pins

Color	Red	White	Green	Black	Blue	Yellow	GND	Purple	Orange	Shielded
CN1	1	2	3	4	5	6	7	8	9	Shell
CN2	1	2	3	4	5	6	7	8	9	Shell
Remark	/	Twisted pair		/	Twisted pair		/	Twisted pair		/

Instruction:

- Connect CN1 to case.
- Connect CN2 to main board USB3.0 cable.

### 5.2.40 P50 ECG Signal Cable

P/N:2275.01264



Figure 5-41 P50 ECG Signal Cable

Table 5-31 P50 ECG Signal Cable Pins

Signal	RA	LA	LL	/	/	GND
Color	Shielded	Green	Brown	Red	Black	Yellow
CN1	1	2	3	4	5	6
CN2	6	4	5	3	1	2

Instruction:

- Connect CN1 to SBF board 7500.00152(J5).

### 5.2.41 P50 Pencil Probe Signal Cable

P/N:2275.01265

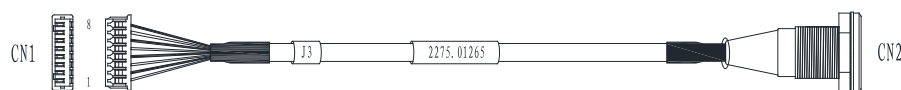


Figure 5-42 P50 Pencil Probe Signal Cable

Table 5-32 P50 Pencil Probe Signal Cable Pins

Signal	TX	GND	ID0E	GND	RX	GND	Reserved	GND
Color	White	Shielded	Black	Shielded	Red	Shielded	Green	Shielded
CN1	1	2	3	4	5	6	7	8
CN2	1	2	3	4	5	6	7	8

Instruction:

- Connect CN1 to probe board 7500.00163(J3).

#### 5.2.42 P50 Touch Panel to Touch Screen EDP Cable

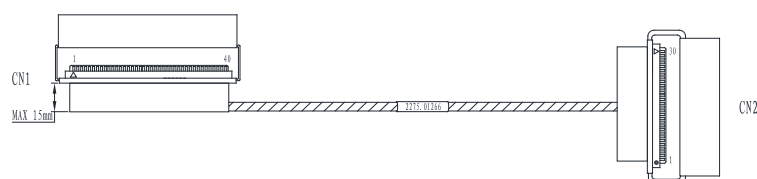


Figure 5-43 P50 Touch Panel to Touch Screen EDP Cable

Table 5-33 P50 Touch Panel to Touch Screen EDP Cable Pins

Signal	EN	12V	12V	12V	12V	PWM	ON/OFF	GND	GND	GND
Color	Blue	Red	Red	Red	Red	Blue	Blue	Blue	Blue	Blue
CN1	11	12	13	14	15	18	19	20	21	22
CN2	30	29	28	27	26	23	22	21	20	19

Signal	GND	HPD	GND	GND	3.3V	3.3V	GND	TX0+	TX0_	GND
Color	Blue	Blue	Blue	Blue	Red	Red	Blue	Blue	Blue	Blue
CN1	23	24	25	26	28	29	30	31	32	33
CN2	18	17	16	15	13	12	11	7	6	8

## 5 Wiring Descriptions

Signal	TX1+	TX1_	GND	AUX+	AUX_	GND
Color	Blue	Blue	Blue	Blue	Blue	Blue
CN1	34	35	36	37	38	39
CN2	4	3	5	9	10	2

Instruction:

- Connect CN1 to touch screen.
- Connect CN2 to touch-screen control panel.7500.01065(J12).

### 5.2.43 P50 Touch Panel to Touch Screen USB+KEY Cable

P/N:2275.01283

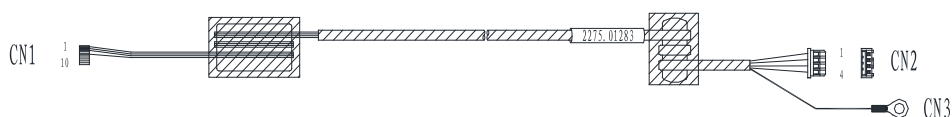


Figure 5-44 P50 Touch Panel to Touch Screen USB+KEY Cable

Table 5-34 P50 Touch Panel to Touch Screen USB+KEY Cable Pins

Signal	VBUS	D-	D+	GND	GND
Color	Red	White-green twisted pair		Black	Shielded
CN1	1	2	3	5	/
CN2	4	3	2	1	/
CN3	/	/	/	/	OT terminal

Instruction:

- Connect CN1 to touch screen.
- Connect CN2 to touch-screen control panel.
- Connect CN3 to touch-screen control panel ground.

### 5.2.44 P50 Touch Panel to USB Updating Board Cable

P/N:2275.01284



Figure 5-45 P50 Touch Panel to USB Updating Board Cable



**Table 5-35 P50 Touch Panel to USB Updating Board Cable Pins**

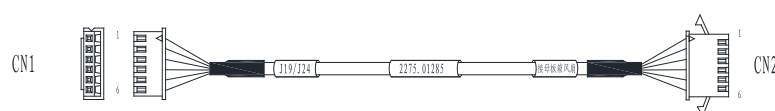
Signal	OTG_DN	OTG_DP	GND	KEY	GND	VBUS
Color	Orange	Blue	Shielded	White	Shielded	Red
CN1	1	3	2	4	6	8
CN2	1	3	2	4	6	8

Instructions:

- Connect CN1 to USB board J1.
- Connect CN2 to Touch-screen control board 7500.01065 (J4)

#### 5.2.45 P50 Internal IO board to Ultrasound Unit Casing Fan Connector Cable

P/N:2275.01285

**Figure 5-46 P50 Internal IO board to Ultrasound Unit Casing Fan Connector Cable****Table 5-36 P50 Internal IO board to Ultrasound Unit Casing Fan Connector Cable Pins**

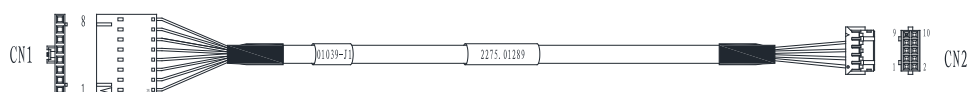
Signal	GND	+12V	+12V	+12V	GND	CND
Color	Shielded	Green	Brown	Red	Black	Yellow
CN1	1	2	3	4	5	6
CN2	1	2	3	4	5	6

Instructions:

- Connect CN1 to Internal IO board 7500.01039(J19/J24).
- Connect CN2 to Ultrasound Unit Casing Fan.

#### 5.2.46 P50 Internal IO Board to Main Board Gigabit Ethernet Cable

P/N:2275.01289

**Figure 5-47 P50 Internal IO Board to Main Board Gigabit Ethernet Cable**

**Table 5-37 P50 Internal IO Board to Main Board Gigabit Ethernet Cable Pins**

Signal	L A N _ MDI0+	L A N _ MDI0-	L A N _ MDI1+	L A N _ MDI1-	L A N _ MDI2+	L A N _ MDI2-	L A N _ MDI3+	L A N _ MDI3-
Color	W h i t e / O r a n g e twisted pair		W h i t e / G r e e n twisted pair		White/Blue twisted pair		W h i t e / B r o w n twisted pair	
CN1	1	2	3	4	5	6	7	8
CN2	2	1	4	3	6	5	8	7

Instructions:

- Connect CN1 to internal IO board 7500.00729 (J1).
- Connect CN2 to main board.

#### 5.2.47 P50 Internal IO Board to Main Board 12V Power Supply Cable

P/N:2275.01290


**Figure 5-48 P50 Internal IO Board to Main Board 12V Power Supply Cable**
**Table 5-38 P50 Internal IO Board to Main Board 12V Power Supply Cable Pins**

Signal	GND	12V	GND	12V
Color	Black	Yellow	Black	Yellow
CN1	1	3	2	4
CN2	1	3	2	4

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J3).
- Connect CN2 to main board.

#### 5.2.48 P50 PS-ON/5VSB Signal Cable

P/N:2275.01291


**Figure 5-49 P50 PS-ON/5VSB Signal Cable**

**Table 5-39 P50 PS-ON/5VSB Signal Cable Pins**

Signal	5VSB	PS-ON	GND
Color	Red	Black	Shielded
CN1	1	2	3
CN2	1	2	3

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J13).
- Connect CN2 to main board.

#### 5.2.49 P50 Internal IO Board to Main Board Power Switch Cable

P/N:2275.01292

**Figure 5-50 P50 Internal IO Board to Main Board Power Switch Cable****Table 5-40 P50 Internal IO Board to Main Board Power Switch Cable Pins**

Signal	PWR_SWL	PWR_SWL
Color	Red	Black
CN1	1	2
CN2	1	2

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J12).
- Connect CN2 to main board.

#### 5.2.50 P50 Internal IO Board to Main Board Audio Cable

P/N:2275.01293

**Figure 5-51 P50 Internal IO Board to Main Board Audio Cable**

## 5 Wiring Descriptions

**Table 5-41 P50 Internal IO Board to Main Board Audio Cable Pins**

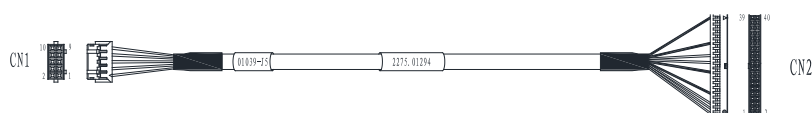
Signal	GND	AUDIO_L0	AUDIO_R0	GND	Check_ID
Color	Shielded	Red	Black	Shielded	Core wire
CN1	1	2	3	4	5
CN2	2	9	5	4	10

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J12).
- Connect CN2 to main board.

### 5.2.51 P50 Internal IO Board to Main Board Serial Cable

P/N:2275.01294



**Figure 5-52 P50 Internal IO Board to Main Board Serial Cable**

**Table 5-42 P50 Internal IO Board to Main Board Serial Cable Pins**

Signal	SCLK	TX	SDA	RX	GND
Color	Red	Orange	White	Green	Shielded
CN1	1	2	3	4	5
CN2	1	5	2	3	19

Signal	GND	GND	TX2	GND	RX2
Color	Shielded	Shielded	Brown	Shielded	Black
CN1	6	7	8	9	10
CN2	29	39	25	9	23

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J12).
- Connect CN2 to main board.

### 5.2.52 P50 Charging Monitor Panel to Coupling Gel Power Supply Cable

P/N:2275.01470



Figure 5-53 P50 Charging Monitor Panel to Coupling Gel Power Supply Cable

Table 5-43 P50 Charging Monitor Panel to Coupling Gel Power Supply Cable Pins

Signal	12V	GND	GND
Color	Red	Black	Shielded
CN1	1	2	/
CN2	1	2	/
CN3	/	/	RV terminal

Instructions:

- Connect CN1 to power supply cable 2275.01227.
- Connect CN2 to coupling gel transfer board J4.

### 5.2.53 P50 Back Casing Fan Conversion Cable

P/N:2275.01296

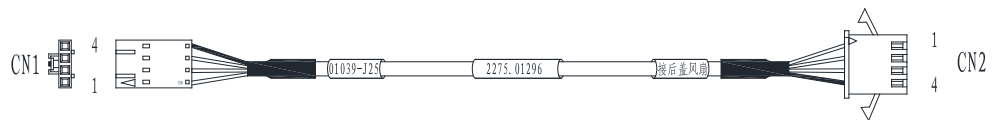


Figure 5-54 P50 Back Casing Fan Conversion Cable

Table 5-44 P50 Back Casing Fan Conversion Cable Pins

Signal	GND	+12V	+12V	GND
Color	Black	White	Red	Shielded
CN1	1	2	3	4
CN2	1	2	3	4

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J25).
- Connect CN2 to back casing fan.

### 5.2.54 P50 Main Board USB3.0 Cable

P/N:2275.01297



**Figure 5-55 P50 Main Board USB3.0 Cable**

**Table 5-45 P50 Main Board USB3.0 Cable Pins**

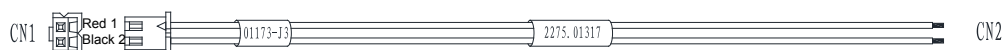
Color	Red	White	Green	Black	Blue	Yellow	GND	Purple	Orange	Shielded
CN1	1	2	3	4	5	6	7	8	9	Shell
CN2	1	2	3	4	5	6	7	8	9	Shell

Instructions:

- Connect CN1 to main board.
- Connect CN2 to case USB3.0 cable.

### 5.2.55 P50 Coupling Gel Heating Temperature Measurement Cable

P/N:2275.01317



**Figure 5-56 P50 Coupling Gel Heating Temperature Measurement Cable**

**Table 5-46 P50 Coupling Gel Heating Temperature Measurement Cable Pins**

Color	Red	Black
CN1	1	2
CN2	TIN	TIN

Instructions:

- Connect CN1 to coupling gel heater PCBA7500.01173(J3).
- Welding CN2 to coupling gel heater band.

### 5.2.56 P50 Coupling Gel Heating Power Input Cable

P/N:2275.01318



**Figure 5-57 P50 Coupling Gel Heating Power Input Cable**

**Table 5-47 P50 Coupling Gel Heating Power Input Cable Pins**

Color	Black	Red
CN1	1	2
CN2	2	1

Instructions:

- Connect CN1 to coupling gel heater PCBA7500.01173(J1).
- Welding CN2 to coupling gel heater transfer board 7500.01228(J1).

### 5.2.57 P50 Internal IO Board to Main Board USB2.0 Cable

P/N:2275.01319

**Figure 5-58 P50 Internal IO Board to Main Board USB2.0 Cable****Table 5-48 P50 Internal IO Board to Main Board USB2.0 Cable Pins**

Signal	GND	USB_D0-	USB_D0+	GND	USB_D1-	USB_D1+
Color	Shielded	Orange	Blue	Shielded	Brown	Blue
CN1	1	2	3	4	5	6
CN2	7	3	5	8	4	6

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J11).
- Connect CN2 to main board.

### 5.2.58 P50 Internal IO Board to Video Card 12V Power Supply Cable

P/N:2275.01320

**Figure 5-59 P50 Internal IO Board to Video Card 12V Power Supply Cable****Table 5-49 P50 Internal IO Board to Video Card 12V Power Supply Cable Pins**

Signal	GND	12V	GND	12V
--------	-----	-----	-----	-----

## 5 Wiring Descriptions

Color	Black	Yellow	Black		Yellow	
CN1	1	3	2		4	
CN2	6	3	4	5	1	2

Instructions:

- Connect CN1 to internal IO board 7500.01039 (J20).
- Connect CN2 to video card.

### 5.2.59 P50 Key panel to Side USB Board Cable

P/N:2750.01321

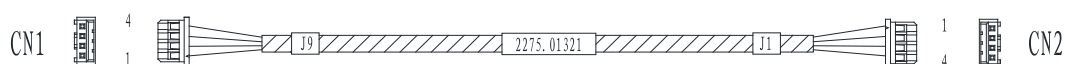


Figure 5-60 P50 Key panel to Side USB Board Cable

Table 5-50 P50 Key panel to Side USB Board Cable Pins

Signal	5V	D-	D+	GND
Color	Red	White-green twisted pair		Shielded
CN1	1	2	3	4
CN2	4	3	2	1

Instructions:

- Connect CN1 to key panel 7500.01040 (J9).
- Connect CN2 to key panel side USB board (J1).

### 5.2.60 P50 External IO Board 2 to External IO board 1 and External IO board 3 Cable

P/N:2275.01322

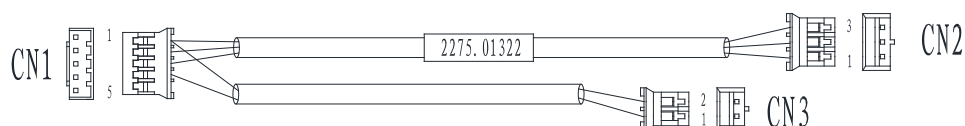


Figure 5-61 P50 External IO Board 2 to External IO board 1 and External IO board 3 Cable

Table 5-51 P50 External IO Board 2 to External IO board 1 and External IO board 3



Cable Pins

Signal	5V		GND	GND	CM
Color	Red		White	Black	Green
CN1	Pressing 1		Pressing 2	Pressing3	Pressing 4
CN2	1	/	2	3	/
CN3	/		/	/	/

Instructions:

- Connect CN1 to external IO board 2 7500.01059 (J4).
- Connect CN2 to external IO board 1 7500.01217 (J1).
- Connect CN3 to external IO board 3 7500.01060 (J2).

### 5.2.61 P50 Main Board Case to Key panel Audio Conversion Cable

P/N:2275.01427

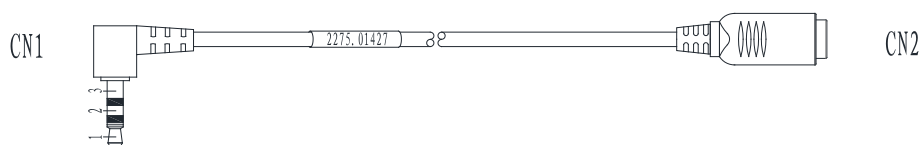


Figure 5-62 P50 Main Board Case to Key panel Audio Conversion Cable

Table 5-52 P50 Main Board Case to Key panel Audio Conversion Cable Pins

Signal	L	R	GND
Color	Red	White	Shielded
CN1	1	2	3
CN2	1	2	3

Instructions:

- Connect CN1 to main board case audio cable.
- Connect CN2 to key panel audio cable.

### 5.2.62 P50 Touch Screen Ground Cable

P/N:2275.01428



**Figure 5-63 P50 Touch Screen Ground Cable**

Instructions:

- Connect CN1 to touch screen ground cable.
- Connect CN2 to key panel aluminum plate.

### 5.2.63 P50 Case to Key panel Aluminum Plate Ground Cable

P/N:2275.01429



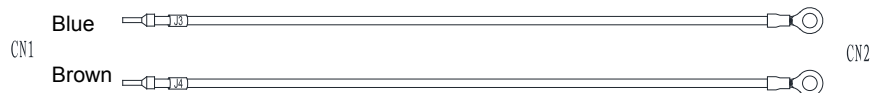
**Figure 5-64 P50 Case to Key panel Aluminum Plate Ground Cable**

Instructions:

- Connect CN1 to case ground cable.
- Connect CN2 to key panel aluminum plate.

### 5.2.64 S40 Isolation Transformer to Isolation Power Supply Board Connector Cable

P/N:2275.00198



**Figure 5-65 S40 Isolation Transformer to Isolation Power Supply Board Connector Cable**

Instructions:

- Connect CN1 to isolation power supply board 7500.00078 (J3, J4).
- Connect CN2 to transformer 2601.010002.

### 5.2.65 P50 Trackball Cable

P/N:2275.01011



**Figure 5-66 Trackball Cable**

Table 5-53 P50 Trackball Cable Pins

Signal	+5V	Update	SET	GND	TBPS2CLK	TBPS2DAT
Color	Red	Orange	White	Black	Green	Brown
CN1	1	3	2	5	6	7
CN2	1	6	5	2	4	3

Instructions:

- Connect CN1 to key panel 7500.00737 (J2).
- Connect CN2 to trackball.

### 5.2.66 P50 Main Board to SBF Board USB3.0 Cable

P/N:2275.01036



Figure 5-67 P50 Main Board to SBF Board USB3.0 Cable

Table 5-54 P50 Main Board to SBF Board USB3.0 Cable Pins

Color	Red	White	Green	Black	Blue	Yellow	GND	Purple	Orange	Shielded
CN1	1	2	3	4	5	6	7	8	9	Shell
CN2	1	2	3	4	8	9	7	5	6	Shell

Instructions:

- Connect CN1 to main board.
- Connect CN2 to SBF.

### 5.2.67 P50 USB Board Ground Cable

P/N: 2275.01652

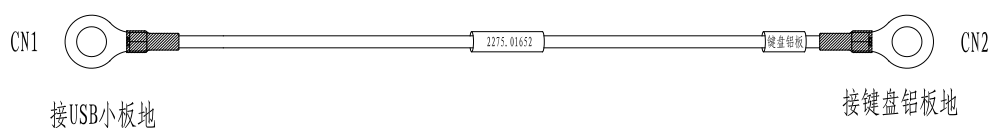


Figure 5-68 P50 USB Board Ground Cable

Instructions:

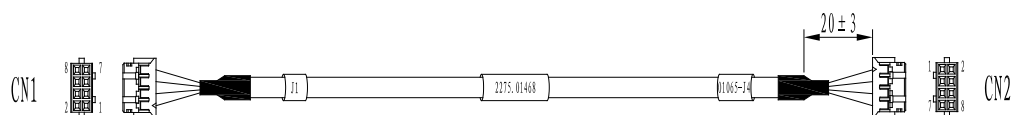
- Connect CN1 to USB board ground cable

## 5 Wiring Descriptions

- Connect CN2 to keyboard panel aluminum plate

### 5.2.68 P20 Touch Panel to Updating Board Cable

P/N: 2275.01468



**Figure 5-69 P20 Touch Panel to Updating Board Cable**

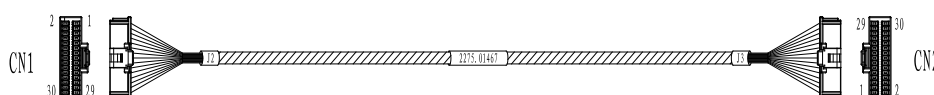
Color	White/Green		Shielded	Black	Shielded	Red
CN1	1	3	2	4	6	8
CN2	1	3	2	4	6	8

Instructions:

- Connect CN1 to USB updating board J1
- Connect CN2 to touch panel J4

### 5.2.69 P20 Pull Keyboard Cable

P/N: 2275.01467



**Figure 5-70 P20 Pull Keyboard Cable**

Color	Red	White	Red	Green	White	White	Green	Green	White	White
CN1	1	2	3	4	5	6	7	8	9	10
CN2	1	2	3	4	5	6	7	8	9	10
Color	Green	Green	White	White	Green	Green	White	White	Green	Green
CN1	11	12	13	14	15	16	17	18	19	20
CN2	11	12	13	14	15	16	17	18	19	20
Color	White	White	Green	Green	White	White	Green	Green	White	White
CN1	21	22	23	24	25	26	27	28	29	30
CN2	21	22	23	24	25	26	27	28	29	30

Instructions:

- Connect CN1 to the pull keyboard.
- Connect CN2 to the matrix conversion plate.

### 5.2.70 P20 Pull Keyboard Conversion Cable

P/N: 2275.01701

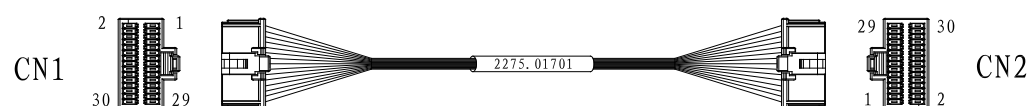


Figure 5-71 P20 Pull Keyboard Conversion Cable

Color	Red	White	Red	Green	White	White	Green	Green	White	White
CN1	1	2	3	4	5	6	7	8	9	10
CN2	1	2	3	4	5	6	7	8	9	10
Color	Green	Green	White	White	Green	Green	White	White	Green	Green
CN1	11	12	13	14	15	16	17	18	19	20
CN2	11	12	13	14	15	16	17	18	19	20
Color	White	White	Green	Green	White	White	Green	Green	White	White
CN1	21	22	23	24	25	26	27	28	29	30
CN2	21	22	23	24	25	26	27	28	29	30

Instructions:

- Connect CN1 to the keyboard plate J4.
- Connect CN2 to the matrix conversion plate.

### 5.2.71 Main Board Casing Fan

P/N:2100.00970

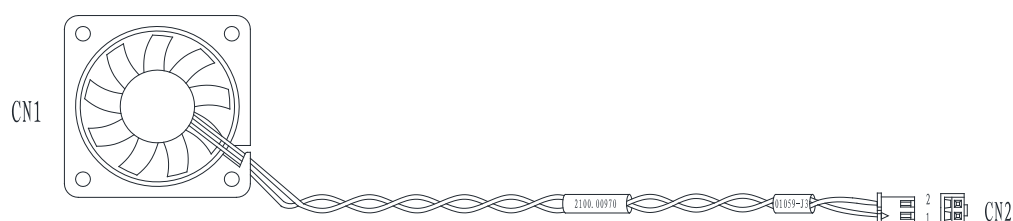


Figure 5-72 Main Board Casing Fan

## 5 Wiring Descriptions

**Table 5-55 Main Board Casing Fan Pins**

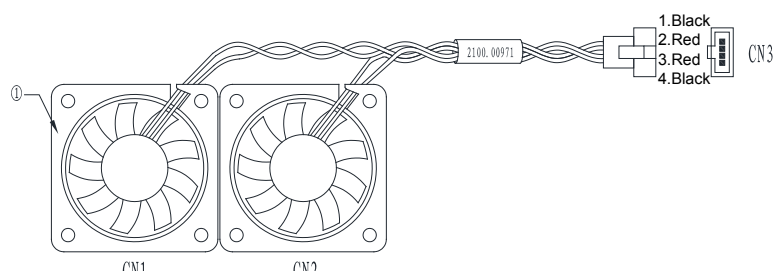
Signal	+12V	GND
Color	Red	Black
CN1	+	-
CN2	1	-

Instructions:

Connect CN2 to external IO board 7500.01059 (J3).

### 5.2.72 Back Casing Fan

P/N:2100.00971



**Figure 5-73 Back Casing Fan**

**Table 5-56 Back Casing Fan Pins**

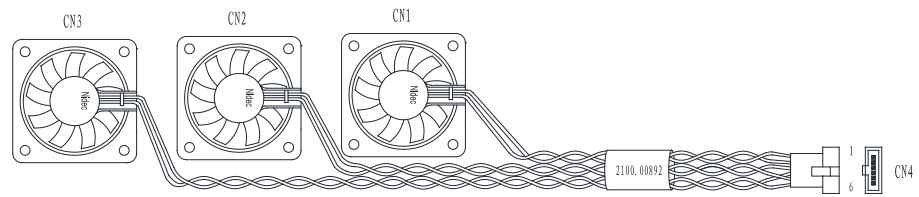
Signal	GND	+12V	+12V	GND
Color	Black	Red	Red	Black
CN1	-	+	/	-
CN2	/	/	+	/
CN3	1	2	3	4

Instructions:

Connect CN2 to back casing fan cable.

### 5.2.73 Ultrasound Unit Casing Fan

P/N:2100.00891

**Figure 5-74 Ultrasound Unit Casing Fan****Table 5-57 Ultrasound Unit Casing Fan Pins**

Signal	GND	+12V	+12V	+12V	GND	GND
Color	Black	Red	Red	Red	Black	Black
CN1	-	+	/	/	/	/
CN2	/	/	/	+	/	-
CN3	1	2	3	4	5	6

**Instructions:**

Connect CN2 to internal IO board fan cable.

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## **6 Software Installation and Update**

The service department or local distributor can obtain the upgraded software package from the manufacturer by the CD disk or Email. You can copy the package into the USB2.0 drive to update the system with a reference to this chapter.

## 6.1 Installing aconfig File

### 6.1.1 Tool Preparation

Tool	Specification	Remark
USB drive	Kingston Data Traveler 4G	4G Capacity, FAT32 format, aconfig file under the root directory
PC	Windows XP operating system or above	USB port available
aconfig document	aconfigxxxxxxx	Acquire the same control number as the updated system from the aconfig file application website

### 6.1.2 Acquiring Control Number

1. Start up the system, enter the **Application Mode**.
2. Press **Setup** key to enter the **System Settings** menu.
3. Click **About** to view the control number on the screen.

**Control number** field information is the control number of the system

**NOTE:**

The control number is consistent with serial number of the SBF board. If the system cannot work normally, check the serial number of the SBF board by removing the case.

### 6.1.3 Operations

**NOTE:**

- Ensure the aconfig file is consistent with control number of the system.
- Ensure the aconfig file is saved in the root directory of USB drive.

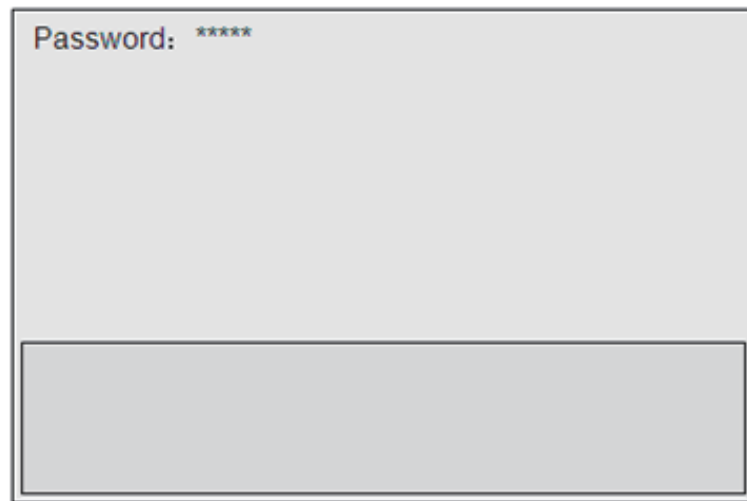
#### ■ Performing an Active Import

1. Copy the aconfig file corresponding to the control number of the system to the root directory of the USB drive. Power on the system and insert the USB drive to the USB port of the system after entering the **Application** mode screen

**NOTE:**

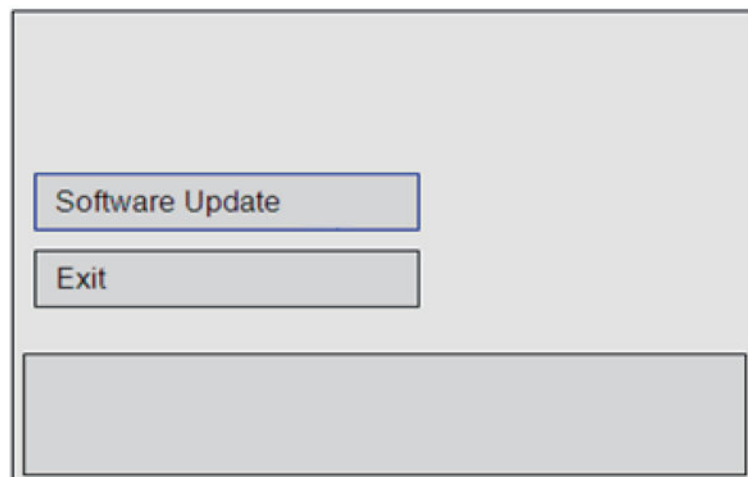
The digits in the aconfig file name is the control number of the system. For example, in a file name of aconfig101106, "101106" corresponds to the control number of the system.

2. Press **shift > E > Setup**. A dialog box is displayed on the screen, as shown in Figure 6-1.



**Figure 6-1 aconfig Password Input Screen**

3. Input the year password and click the **Enter**.
4. A dialog box is displayed on the screen. Click **Software Update**.



**Figure 6-2 Software Update Screen**

5. **Config update** pops up when updating successfully. Click **Exit**.

**NOTE:**

If aconfig update failed, press the confirm key again to re-update the system. If still not successful, check if the aconfig file control number is correct or aconfig file is in the root directory of USB drive.

#### **6.1.4 Result Verification**

Check **License Valid Days** on the **system information**.

## 6.2 Activating the Dongle (Update Keypass File)

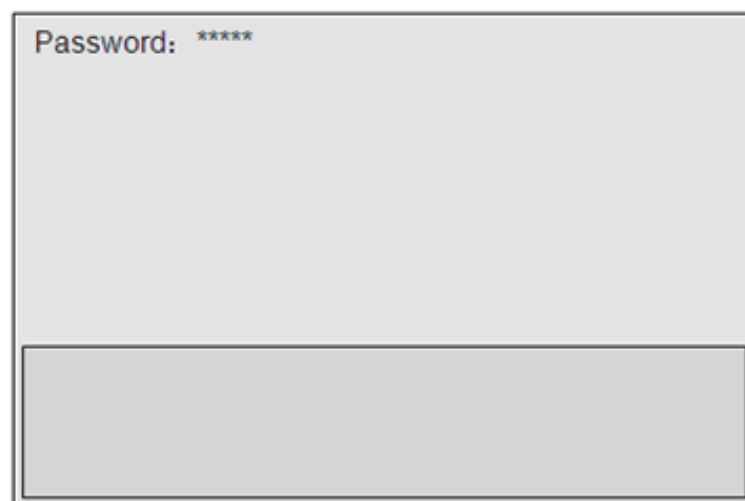
### 6.2.1 Tool preparation

Tool	Specification	Remark
USB drive	Kingston Data Traveler 4G	4G Capacity, FAT32 format, aconfig file under the root directory
PC	Windows XP operating system or above	USB port available
Keypass file	\	Acquire the corresponding number to hardware dongle from the aconfig file application website

### 6.2.2 Operations

**NOTE:**

- Apply the corresponding Keypass according to the number label on the hardware dongle nameplate.
  - Ensure the Keypass file is saved in the root directory of the USB drive.
1. Power on the system and enter the diagnostic screen.
  2. Insert the USB drive with keypass file.
  3. Press **Shift > E > Setup**. A dialog box is displayed on the screen, as shown in Figure 6-3.



**Figure 6-3 Keypass Password Input Screen**

4. Input the month password, and click **Enter** key to enter the keypass output screen.

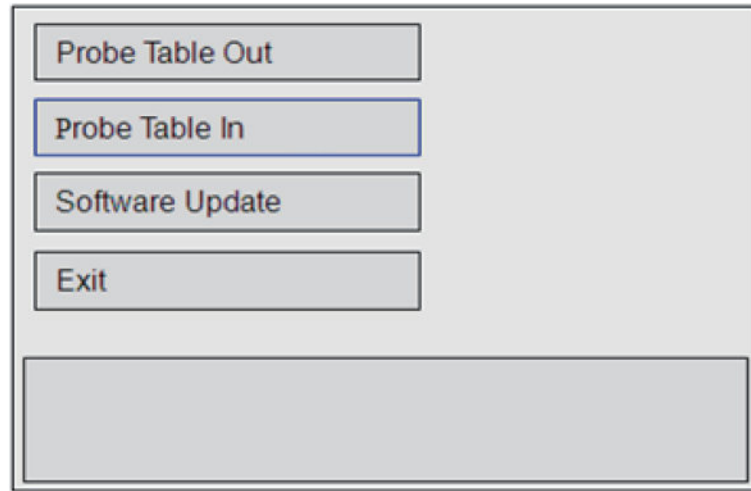


Figure 6-4 Keypass Output Screen

5. Move the trackball or press the Left/Right arrow key on the key panel, and click **Probe Table In** to import keypass file.
6. Click **Exit** when files successfully copied.
7. Press **Setup** to display the system menu, click **About** to enter the system information menu.
8. Press **[F10]** key, input the month password, and press **Enter** key to enter the engineering mode.

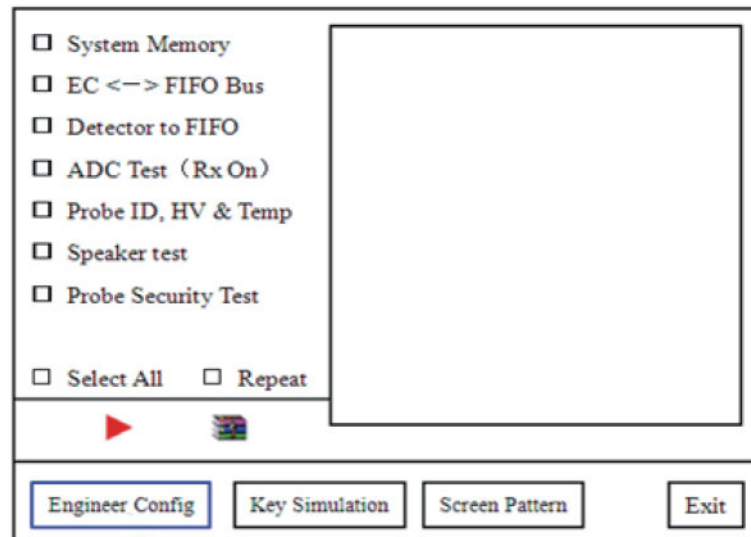


Figure 6-5 Engineer Config Screen

9. Click **Engineer Config** to u-scan activation interface, and press **I** key on the key panel, and wait for the activation of keypass. After all items are activated, a dialog box is displayed on the screen, as shown in Figure 6-6

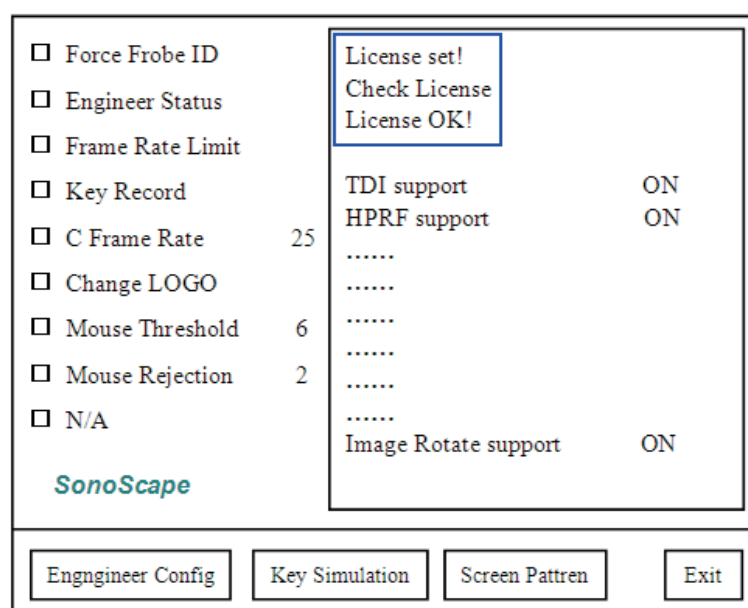


Figure 6-6 U-scan Activated Screen

### 6.2.3 Result verification

Restart the system, check if the u-Scan Dev Rev is 4.2.

## 6.3 Updating the Application Update

### 6.3.1 Tool Preparation

Tool	Specification	Remark
USB drive	Kingston Data Traveler 4G	4G Capacity, FAT32 format, application updating package under the root directory
PC computer	Windows XP or above	USB port
Application updating package	adata_*.*.*.tgz asecure_*.*.*.tgz	apply from the website, “*.*.*.” refers to the software version

### 6.3.2 Operations

**NOTE:**

- Ensure that the prepared USB drive works normally on the desired ultrasound system. You can confirm the USB drive works normally by storing the system image successfully into the USB drive.

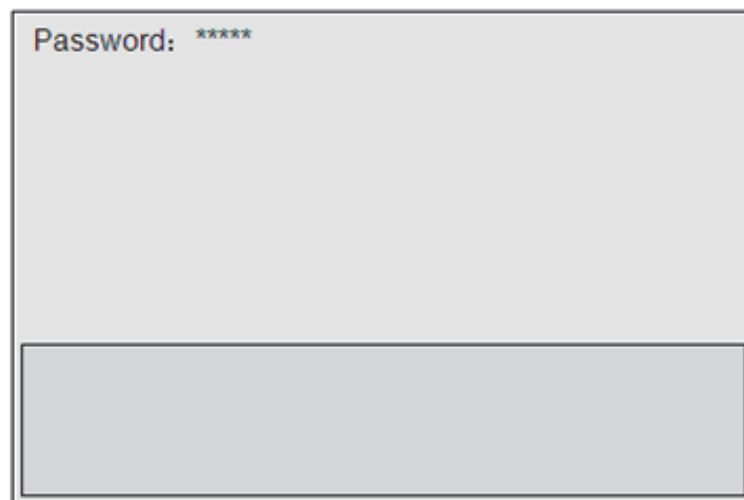
- Ensure only one update file is saved in the USB drive while keeping other files in the USB drive do not affect updating.
- Do not alter the format and file name of the update file in the USB drive. Otherwise, the ultrasound system may result in a failure update.
- Ensure that the screen of the system displays the current date. Otherwise, the incorrect date may result in a failure update of the software.
- Ensure that the upgraded system can be started without any other hardware failure.
- Expectations may happen if the update file is sent through E-mail. In such case, you can correct its name manually. For example, you can correct asecurexxxxxx.tar.gz(1) to asecurexxxxxx.tar.gz.
- The stored images or patient information will not be damaged or lost if you update software by the USB drive.

Perform the following steps.

1. After starting the system, insert the USB drive with the upgrade file into the USB port.

**NOTE:**

- Do not insert the USB drive during the process of startup. Otherwise, the normal startup of the system affected.
  - After starting the system, insert the USB drive to the USB port. Re-insert the USB drive or use another USB port if **check the USB** pops up.
2. Press **Shift > E > Setup** in the diagnostic screen. A prompt box is displayed on the screen, as shown in Figure 6-7.

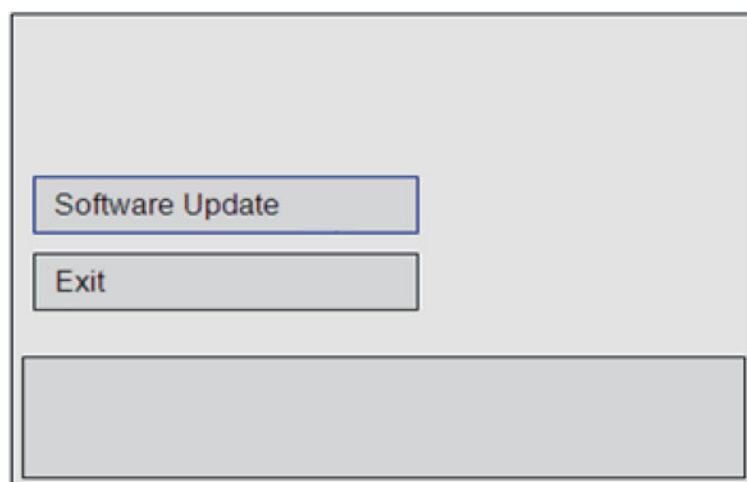


**Figure 6-7 Password Updating Screen**

3. Input the year password, and press the Enter key, a prompt box is displayed on the screen, as shown in Figure 6-9, click **Software Update**.

**NOTE:**

The password is not case sensitive. If the password is wrong, “invalid password” is displayed to remind you for password retry.



**Figure 6-8 Updating Screen**

4. **Please wait...** appears on the screen, wait and click **Exit** back to the Application mode when **Files successfully copied. Please exit and reboots system to complete update** pops up.
5. Unplug the USB drive and reboot the system.

### 6.3.3 Result verification

View **Software Build On**, **Software Version**, **Application Version** on the **System Information** screen.

## 6.4 Installing the Operating System (Kernel update)

### 6.4.1 Tool Preparation

Tool	Specification	Remarks
Kernel USB drive	13.7.2	Confirm the version
Application updating package	adata_*.*.*.tgz asecure_*.*.*.tgz	Apply from the website, “*.*.*.” refers to the software version
PC computer	Windows XP or above	USB port



### 6.4.2 Operations

#### NOTE:

- System data on the hard disk will be erased during software updating. Ensure you back up all data before the updating.
- Place the master file (adata file) and the control code file (asecure file) into the updated directory of the USB drive. Ensure only one asecure file is in the Update directory.
- Unload the USB drive before you remove it
- When configuring BIOS, use the arrow keys on the number/letter key panel to highlight an item, and press the **Enter** key to confirm. Or, press the **⏮** key to back to the previous screen.

#### ■ BIOS Settings

1. To Enter BIOS
  - a. Connect the USB drive written with kernel and updated files, and the USB key panel to the system.
  - b. Press and hold the **Delete** key on the USB key panel till enter the **BIOS Settings** screen.
2. To Set BIOS
  - a. Enter the **Boot** menu and check the **Boot Option1**. Press the up and down keys to select a USB drive as the **Boot Option1** as shown in Figure 6-9.

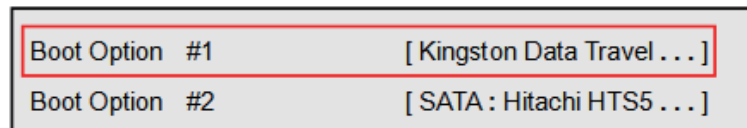


Figure 6-9 Setting USB Startup Screen

- b. Check and ensure that **Boot Option1** is set as the desired USB drive in the **Boot Option Priorities** menu as shown in Figure 6-10.

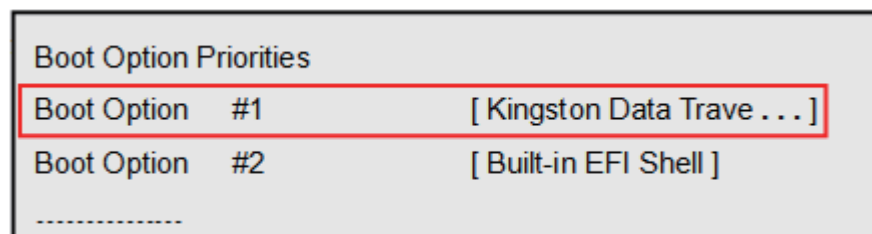


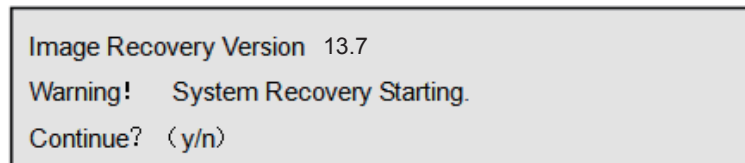
Figure 6-10 USB Startup Confirmation Screen

- c. Set **System Date** and **System Time** in the **Main menu** to the current time and date.

- d. Highlight **Save Changes and Exit**, and press the confirm key to save settings, then the system restarts automatically.

### ■ Installing Software

1. Unplug the USB key panel before the system reboot, wait for Linux self-test until the following message appears.



```
Image Recovery Version 13.7
Warning! System Recovery Starting.
Continue? (y/n)
```

2. Connect the USB key panel to the specific USB port, input **forcekill**, and then press the **Enter** key on the USB key panel to install the software. Installation processes automatically, and the process needs 7-10 minutes.

#### NOTE:

If **FAIL** pops up during the installation process, check that kernel files in the USB drive is complete, UPDATE folder is decompressed and the hardware parts are connected well. Type **y** or **forcekill** in the dialogue box after the above troubles are cleared, and press the **Enter** key on the USB key panel to re-install the software. If the software still cannot be installed, check the USB drive or hard disk, and then re-install the software.

3. Press the **Enter** key when **Press Enter key to shutdown** appears, and the ultrasound system automatically shuts down after exiting the USB drive system.
4. Unplug the USB drive, restart the system.

The system will install the software automatically during the startup, the system will restart automatically after software installation completed.

#### NOTE:

If the startup process prompts wrong, check the `asecureXXXXXXXXX.tar.gz` to consistent with the control number of the system.

### ■ Importing of aconfig file

For details, refers to 6.1 Installing aconfig File.

### ■ Activating the Dongle.

Activate u-scan, for details, refers to 6.2 Activating the Dongle (Update Keypass File).

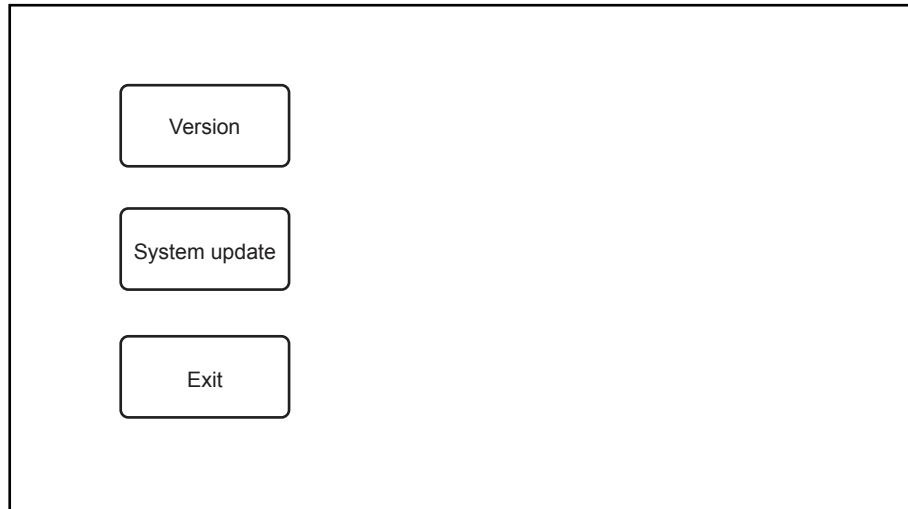
### 6.4.3 Result Verification

After starting the system, check each field in the system information


## 6.5 Updating the Touch-Screen Software

1. Back up the touch-screen software to the USB drive.


2. Hold the touch-screen **Reset** button on the bottom right of the control panel to display the following screen.



**Figure 6-11 Touch Screen Updating Screen**

3. Connect the USB drive written with kernel files to the system.
4.  appears if the USB drive is detected.
5. Select **System Update** on the touch screen to upgrade the system with a prompt **Updating Standby**.
6. The upgrade needs several minutes, and it completes when **Update Finished, Restart!** pops up. You can remove the USB drive and reboot the system for future use.

If **Illegal Update File** pops up, select **OK** to back to the above screen.

If the touch screen software cannot be upgraded normally, press and hold the  (freeze) key on the control panel to enter safe mode to upgrade the touch screen software when the system starts up.



During the system update, messages or icons are displayed to indicate that the system is busy. You should wait and not to shut down the system until the system update completes. Otherwise, the system cannot be started up.

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## 7 Settings Import/Export

This chapter describes how to import/export the settings, which is closely related to system settings, customized application mode or presets and engineering probe table.

Settings export is mainly used to back up system settings, and settings import mainly used to restore or replace system settings.

## 7.1 Versions of System Settings and Probe Table

Press the **Setup** key on the key panel, and click **About** to display the **System Information** menu.

## 7.2 System Settings

The system settings file is in a format of userdataX.X.X.X-oo.tar.gz, X.X.X.X stands for the current software version, oo stands for the system settings version. X.X.X.X is only for reference, but oo must be consistent with the system settings version. Otherwise, the system settings can not be imported.

### 7.2.1 System Settings Export

You can back up system settings, including general settings, printer settings, customized obstetrics and measurement settings, to the USB drive.

Perform the steps as follows,

1. Connect the USB drive to the system.
2. Press the **Setup** key on the key panel, then click **Load Default > Export/Import** to display the following menu.

The screenshot shows a 'System Setting' window. On the left is a vertical list of menu items: General, Peripheral, Comment, Bodymark, Measure, Touch Screen, Report, DICOM, Load Default (highlighted), and About. At the top right of the main area are three buttons: Load, New, and Export/Import (highlighted). Below these buttons is a text prompt 'Make sure USB drive in the USB slot' followed by a dropdown menu. Underneath are four buttons: 'Copy user setting to USB', 'Copy user preset to USB', 'Load USB user setting to system', and 'Load USB user preset to system'. At the bottom of this section is an 'Export Log' button. A caution message reads: 'Caution: Copy USB to hard drive will replace all user setting in the system including patient database, Please use it wisely'. At the very bottom of the window are two buttons: 'Save&Exit' and 'Exit'.

Figure 7-1 Export/Import System Setting

3. Click **Copy user setting to USB**, and then press **Y** in the following prompt box to export settings to the USB drive.

!Make sure USB driver ready!

Copy setting?

Continue? [Y/N]

### 7.2.2 System Settings Import

1. Copy the system settings file into the root directory of the USB drive, and ensure the version is consistent with that of the system. Otherwise, a failure prompt **Version is not match** is displayed. Power on the system, and connect the USB drive to the system when the **Exam** screen is displayed.
2. Press the **Setup** key on the key panel to enter **System Setting** menu, then click **Load Default > Export/Import > Copy user setting to USB > Y** to confirm.
3. Remove the USB drive from the system when **Load userdata successful** pops up.

**NOTE:**

Ensure only one **userdataX.X.X.X-oo.tar.gz** file is in the USB drive. Otherwise, a failure import may result or the imported file cannot be recognized.

## 7.3 Application Presets

The application preset file is in a format of **userpreset\_X.X.X.X-oo.tar.gz**, **X.X.X.X** stands for the current software version, **oo** stands for the system settings version. **X.X.X.X** is only for reference, but **oo** must be consistent with the system settings version. Otherwise, the application presets could not be imported.

### 7.3.1 Customizing Application Presets

Perform the steps as follows,

1. Select the desired probe and application part.
2. Select an imaging mode, and then make settings of imaging parameters.

**Note:**

Imaging parameters setting only affect certain mode.

3. Press the **S** key on the key panel to display the following prompt box.
4. Press the **Y** key on the key panel to enter the application mode as shown in **Figure 7-2**.

The screenshot shows a software interface for customizing a preset. On the left is a sidebar with two buttons: 'Create preset' (highlighted) and 'Presets display'. Below these is an 'Exit' button. The main area contains the following fields and controls:

- Probe:** A text field containing 'XXX'.
- Exam Name:** An empty text input field.
- Exam Type:** A dropdown menu showing 'Vascular', flanked by left and right arrow buttons.
- Exam Icon:** A dropdown menu showing 'C-Vascular', flanked by left and right arrow buttons.
- Icon Preview:** A small square image showing a blue vascular tree icon on a dark background.
- Action Buttons:** 'Create Exam' and 'Replace Exam' buttons at the bottom right.

**Figure 7-2 Customizing Preset Mode**

5. Enter the name of the application preset in the **Input new exam name** textbox.
  - Click  or  beside **ExamType** to select the template for the application preset.
  - Click  or  beside **ExamIcon** to select the icon for the application preset.
6. Click **Create Exam** to create an application preset
7. Click **Exit**, and the application preset you customized are displayed.

### 7.3.2 Exporting Application Presets

Perform the steps as follows,

1. Connect the USB drive to the ultrasound system.
2. Choose **Menu > System Settings > Load Default > Store > Copy user setting to USB**.

### 7.3.3 Importing Application Presets

Perform the steps as follows,

1. Connect the USB drive to the ultrasound system.
2. Choose **Menu > System Settings > Load Default > Store > Copy user setting to USB**.

#### **NOTE:**

- Ensure only one **userdataX.X.X.X.-oo.tar.gz** file is in the USB drive. Otherwise, a failure import may result or the imported file cannot be recognized.
- The default system icons would not be replaced or deleted when you import application presets to the ultrasound system.



## 8 System Software Tests

You should perform system software tests with a reference to this chapter after software installation or update. In case of any test fails, you should solve it and perform the system software test again until the system works normally.

**NOTE:**


- Only service engineers / representatives trained or qualified by the manufacturer could perform the system functional tests on the ultrasound system.
- To maintain the safety and functionality of the ultrasound system, do not remove or replace any circuit boards when the system is powered on.
- Due to the potential hazardous voltage in the system, do not remove the insulation unit of the system.

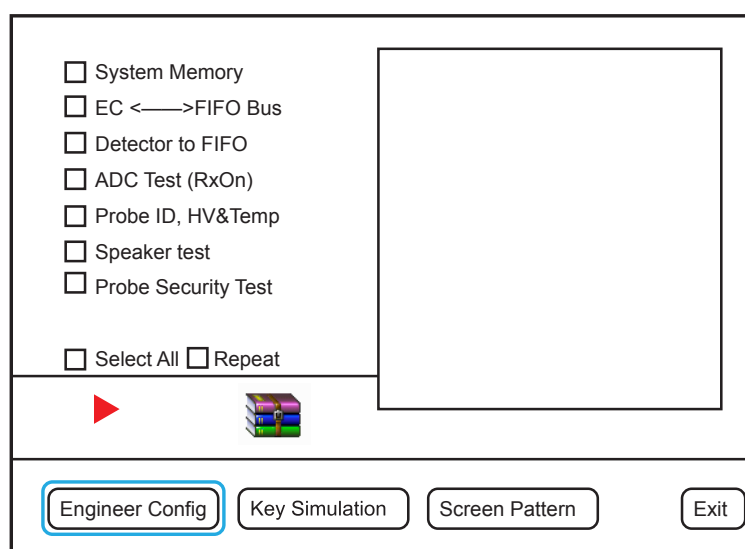
### 8.1 Testing System Software

The system has a built-in testing software which can be utilized to test the performance and functionality of the system hardware. The software supports both in-factory and field tests. After the system passed all the necessary functional tests, service personal should reset and restart the system before delivering it for normal usage.

The testing software can be used to test storage function, FIFO function, FIFO wave-detector, analogue-to-digital conversion, probe code, HV and temperature. During the test, the green identifier on the screen indicates that the testing item works normally and passes the test. While, the red identifier indicates that the tested item results in malfunction, and you should re-test it after servicing it.

#### 8.1.1 Testing Software Activation



1. Press the **Setup** key on the key panel, and select **About** to display the **System Information** menu.
2. Press the  (freeze) key on the control panel, enter a correct password to enter the engineering mode screen.



**Figure 8-1 Engineering Mode Screen**

### 8.1.2 Storage Test

You can use the testing software to test all available registers and memories in the scanning module.

1. Move the cursor on the check box before **System memory** by using the trackball, and then press the **Set** key to select it.
2. Click  to start the test, the testing status is displayed in the right information box. A green icon appears if the test passes, but a red icon appears if the test fails.
3. If necessary, select **Repeat** to re-test the item.
4. All testing status reports are saved to the system hard disk. You can click , tap the up or down arrow on the touch screen to view the reports.
5. Move the cursor on the check box before **System memory** by using the trackball, and then press the **Set** key to cancel the test.

### 8.1.3 FIFO Test

You can check FIFO function on the SBF board by testing **EC<->FIFO**. For details, refer to Section 8.1.2 Storage Test.

### 8.1.4 FIFO Wave-Detector Test

You can check FIFO circuits inter-function on the SBF board by testing **Detector to FIFO**. For details, refer to Section 8.1.2 Storage Test.

### 8.1.5 Analogue-to-Digital Conversion Test

The analogue-to-digital converter is located on the SBF board, used to test amplitude and phase. Its working is closely related to storage and reception bus.

You can check this function by testing **ADC Test (Rx on)**. For details, refer to Section 8.1.2 Storage Test.

### 8.1.6 Speaker Test

You can check speaker test function by testing **Speaker Test**. For details, refer to Section 8.1.2 Storage Test.

### 8.1.7 Probe, HV and Temperature Test

If the probe is connected to the ultrasound system, ID information is displayed on the screen. If no probe is connected to the ultrasound system, **255** is displayed on the screen. You can use the testing software to test the high-voltage generator and regulator, or test the temperature of the high-voltage regulator board on the basis of VHV test.

You can check this function by testing **Probe ID, HV and Temp**. For details, refer to Section 8.1.2 Storage Test.

### 8.1.8 Monitor Test

Move the cursor on **Screen pattern** by using the trackball, press the **Set** key to enter the monitor test screen. You can check the function by viewing images, display color or display information.

## 8.2 System Simulation Test

Select **Dealer Config** on the engineering mode screen to enter the following screen. You can test about virtual probe settings, virtual functions and power.

The image shows a software interface for system simulation. On the left, there is a list of seven items, each with an unchecked checkbox:

- ☐ Force ProbeID
- ☐ Key Record
- ☐ Power Measurement
- ☐ TV PAL
- ☐ N/A
- ☐ N/A
- ☐ CWHWDevice ON

To the right of this list is a large, empty rectangular box. At the bottom of the screen is a horizontal bar containing four buttons: "Dealer Config", "Key Simulation", "Screen Pattern", and "Exit". The "Dealer Config" button is highlighted with a blue border.

Figure 8-2 System Simulation Screen

### 8.2.1 Virtual Probe

**NOTE:**

The virtual probe is only a demo, and do not use it when performing an exam.

The virtual probe allows you to test the system function without probes.

1. Move the cursor on the check box before **Force probe ID** by using the trackball, and press the **Set** key to select it with a × mark.

2. Press the left/right arrow key on the key panel to select the desired virtual probe.
3. Select **Exit**, and the touch screen displays the desired virtual probe.

### 8.2.2 System Simulation Operation

You can apply system simulation operation to check the system operating or perform the aging test.

1. Move the cursor on the check box before **Key record** by using the trackball, and press the **Set** key to select it with a × mark.
2. Select **Exit** to back to the main screen.
3. Press the **Pointer** key on the control panel to activate system simulation operation with **PLAY BACK** identifier

### 8.2.3 Probe Power Test

You can perform probe power test to check probe working.

1. Connect 6V3 to the ultrasound system, enter the configuration screen, and select **Power Measurement**.
2. Select **Exit** to back to the main screen.
3. Select Neck as exam type, and enter the B mode.
4. Adjust the gain to the maximum, and adjust the depth to the minimum. To enhance the brightness of the initial waveform, you can immerse the acoustic window of the probe into water.
5. Press the **Print** key to display the Power Test menu.
6. Press the up/down arrow key on the key panel to select **S.Elm**, and then press the **Enter** key to confirm.
7. Press the left/right arrow key on the key panel to set **S.Elm** to **All**, the initial waveform image is smooth without obvious dark strips. If there are dark strips, you should promptly find in the malfunction array on the imaging area.
8. Press the left/right arrow key on the key panel to locate the malfunction array, and record the number of the malfunction array.
9. Ensure there are no disturbances or separating images in the B/THI/CFM/B+THI+CFM/M/PW/CW mode.

Special Concern: There are no regular color bars or abnormal color disturbances when the gain is adjusted to the maximum and D gain is set to 50 or above in the CFM/PW/CW mode.

#### **NOTE:**

If the channel is damaged, you can check probe, MPC board, SBF board or connection among the three parts to find the problem before the delivery.

### 8.3 Touch-Screen Testing Software

The system has a built-in testing software which can be utilized to test the performance and functionality of the system hardware. The software supports both in-factory and field tests. After the system passes all the necessary functional tests, service personal should reset and restart the system before delivering it for normal usage.

Touch-screen testing software is used to calibrate the touch screen, test the key panel, import, export, display, USB, HV or temperature of the touch screen.

#### 8.3.1 Testing Software Enable

1. Press and hold the reset button under the bottom right of the control panel to display the key panel of the touch screen.
2. Tap **Enable**, type **ts.test** in the textbox, tap **OK** to enter the touch-screen test screen.

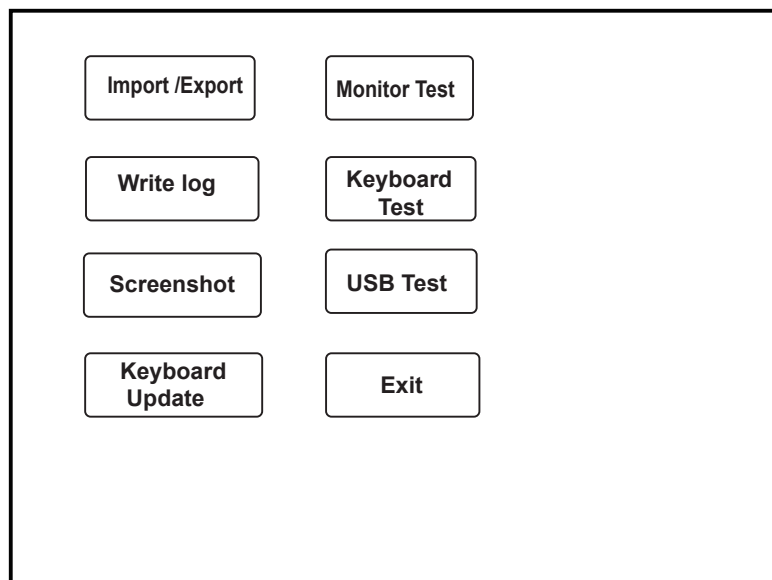



Figure 8-3 Touch-Screen Test Screen

- Tap the test item to display corresponding options. Touch screen may result in malfunction if there are no relevant options, and you should immediately contact the service personnel.
- If the key does not respond, you should immediately contact the service personnel.
- Select **Exit** after the test.

#### 8.3.2 USB Port Test

You can test USB port of the touch screen by inserting the USB drive.

Perform the following steps:

1. Connect the USB drive written with files to the port located on the right side of the control panel after entering the touch screen test software screen, and  appears on the left side.
2. Select **USB Test**, USB works normally if the USB drive is read by the software. However, USB port works abnormally if the USB drive cannot be read by the software.

### 8.3.3 Display Test

You can check the display by viewing images.

1. Tap **Monitor Test** after entering the touch screen test software screen, images are played in turns.  
If the USB drive written with pictures is connected, the pictures are played in turns.
2. Rotate the **Depth** knob to exit the test screen.

### 8.3.4 Key panel Update

1. Insert the USB drive to the USB port on the right side of the touch screen.
2. Tap **Keyboard Update** after entering the touch screen to upgrade the key panel firmware.

### 8.3.5 Key panel Emulations Test

You can test keys, knobs, TGC by viewing the corresponding display information. They are verified to work normally with correct display information.

#### **NOTE:**

Power on/off button, trackball, **Update**, **Set** and **Video print** keys cannot be tested.

Perform the steps as follows,

1. Tap **Keyboard Test** to enter the key panel test screen.
2. Test keys, knobs, TGC or the corresponding keys on the touch screen.
3. Tap **Exit** to exit the screen.

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## 9 System Troubleshooting

This chapter contains important information for system troubleshooting. You can make fault diagnostics and resolute it with a reference to this chapter.



- Potentially hazardous voltage exists inside the ultrasound system. Remove personal jewelry that contains metallic substances when you operate the system.
- Do not disassembly or remove any circuit boards when the ultrasound system is powered on.
- Identify whether the system malfunction is caused by incorrect operations or system hardware/software failures to make a fault diagnostics.
- Propose all possible factors, including system running time and external interferences, that affect system functions.
- Identify whether the system malfunction is a common fault. Fault caused by power supply socket, (extension) power cord or fuse can be attributed to a common fault.
- If the system malfunction is identified as a unusual fault, you can make the fault recurrence in a similar test environment.
- You can identify the system malfunction and solve it with your knowledge, experience or a reference to Section 3 Principle Descriptions, Section 8.1 Testing System Software and Section 9.1 Fault Diagnostics.
- Do not replace a component if you are unsure if it is the cause.
- If certain component is identified to be the fault cause, you should replace it only, but not replace the whole circuit board that holds it. For example, a faulty capacitor is identified to be fault cause, you should replace it only, but not the PCB board that holds it.
- Only the fault cause is identified, you should solve it and perform necessary tests described in this chapter to ensure the system performance.

### 9.1 Fault Diagnostics

The common faults are listed as follows, you can take them as reference.

**NOTE:**

The following sections are for reference only, you should make a on-site fault diagnostics with care.

## 9.1.1 Startup Faults

Fault	Description	Solution
Unable to start up the system	The system cannot be started up by pressing the Power On/Off button, and the key panel indicator does not illuminate.	<ol style="list-style-type: none"> <li>1. Ensure the ultrasound system is connected to the mains supply and powered on, the input voltage meets the requirement.</li> <li>2. Ensure the fuse is not a blown one.</li> <li>3. Ensure the cable of switchboard is plugged in.</li> <li>4. If the fault cannot be solved, replace the power supply.</li> </ol>
No Display	No display on the monitor or the monitor indicator illuminates in red or orange after the system startup.	<p>Change VGA display screen, and connect the new VGA display screen to the VGA port of the system, check if there is a output signal.</p> <p>If there is a output signal, ensure the cable is connected to the display screen.</p> <p>If there is no output signal, replug the memory, then restart the system to see the signal.</p>
Prompt for Password	A password prompt appears after the system self-test screen is displayed.	Ensure that there are no stuck keys, and clean the key panel.
Black Screen	The system stops at a black screen after startup.	<p>Update the touch screen software if the touch screen cannot be started up.</p> <p>If the touch screen can be started up, check the cables that are connected to the touch screen. Power off the system and reboot it.</p> <p>If the fault cannot be solved, replace RAM or re-install the system software.</p>

Fault	Description	Solution
Unable to start up normally	The system runs out startup bar but cannot enter the diagnostic system.	Ensure the cable is connected to the touch screen.

### 9.1.2 Operating Faults

Fault	Description	Solution
Flashing Probe Icons	Probe icons appear after the system enters the Exam screen, but they are constantly flashing.	<ol style="list-style-type: none"> <li>1. Replace the probes.</li> <li>2. Ensure the probe and SBF boards are connected well or there are no dry joints.</li> </ol>
Unable to select probe	Probe cannot be selected or in partial display.	<p>Ensure the probe board works well</p> <p>Ensure no sound produced when selecting a probe.</p> <p>Ensure the probe and SBF boards are connected well.</p>
Touch screen unable to respond	No respond by pressing the items on the touch screen	<ol style="list-style-type: none"> <li>1. Ensure the cable is connected to control panel, re-insert the cable.</li> <li>2. If the bug cannot be solved, replace the touch screen.</li> </ol>
No initial echo on the image	No initial echo displayed on the image.	<p>Ensure voltages on the high-voltage board are normal.</p> <p>Ensure there are high voltage output.</p> <p>Ensure the SBF board works well.</p>
Trackball Malfunction	<p>The confirm key has no respond.</p> <p>The Update key has no respond.</p> <p>The cursor cannot be moved by using the trackball.</p>	<p>Reboot the system.</p> <p>Clean the trackball.</p> <p>If the fault cannot be solved, replace the trackball.</p>

Fault	Description	Solution
Auto Shutdown	The ultrasound system automatically shuts down when you perform general system operations, such as performing measurements, connecting the USB drive or freezing an image.	Identify the operation causing the auto shutdown, and inform the malfunction frequency to the manufacturer. Update the system software.
Monitor Color Deviation	The monitor displays non-homogeneous with spots.	Swivel the monitor, and its degaussing circuit could eliminate color deviation. If the fault cannot be solved, replace the monitor.

## 9.2 System Troubleshooting

Ensure you are similar to the internal system structure, software installation, parts assembly, corresponding principles and you can make a correct fault diagnostics before you attempt to service the system.

### NOTE:

- If the ultrasound system requires a password to continue during startup, type the password (consist of case-sensitive letters and numbers, tapping **Shift** to change letter case), tap **Enter**, and reboot the system. You can get the password from the manufacturer.
- If the ultrasound system cannot work normally or abnormal startup screen is display, you can ignore serial port or key panel failure as follows. Firstly, ensure the serial port of the main board is connected well, touch screen communicates well with the ultrasound system. Secondly, ensure there are no failure keys and knobs. Lastly, press all keys and knobs to ensure their performance.

### 9.2.1 On-Site Inspection

Get detailed information from the user before the on-site inspection, including system working environment, fault description, fault frequency and frequency of system being moved.

1. Check power supply and operating environment of the ultrasound system, also get a knowledge of local weather.
2. Make a detailed record of the system malfunction, including malfunction duration and fault cause proposed by the user, and then make an initial solution plan with a reference to Section 3 Principle Descriptions or your experiences.

### 9.2.2 Fault Identification

1. If there is burn smell from the ultrasound system, identify the burned board by checking power supply, VHV board, SBF board and main board.
2. Ensure all connection cables, especially hard disk cables, USB cable between the main board and the SBF board, power supply cable, are complete and connected well before servicing the ultrasound system.

### 9.2.3 Fault Resolution

#### ■ Disassembly Parts

Observe and record the location and connection direction of parts when you replace them. The parts in incorrect location or connection direction may result in system startup failure, system malfunction, board burning, or even serious damages.

#### ■ Replace Parts

Replace failure parts one by one and test it after each replacement until the fault is solved. You are not recommended to replace failure parts before system test. Meanwhile, make a detailed record of the replacement sequence.

#### ■ Assembly Parts

Install all replaced parts in the ultrasound system by fastening all necessary screws. Meanwhile, ensure there are no screws left and the ultrasound system is in the original cable routing. Otherwise, interferences may result.

#### ■ Take a Simple Test

Take a simple test with a reference to Chapter 8 after you replace all failure parts. If the ultrasound system is connect to a server, ensure all images can be backed up to the server. Ensure all images can be displayed normal and available in all working modes, such PW/CW/4D. Moreover, adjust contrast and brightness of the monitor or other imaging parameters, such as dynamic range, grayscale or gain, based on the user's needs.

### 9.2.4 Post Maintenance

#### ■ Inspection after Critical Parts Replacement

The ultrasound system mainly consists of key panel, touch screen, power supply, computer system and ultrasound module. It is very important to ensure the full connections among these parts. Therefore, you should check the connections both before and after servicing the equipment.

- **Key panel**

Ensure all keys, knobs, switches and trackball work normally after you re-install the key panel.
- **Touch Screen**

Ensure the touch screen is not squeezed by any frames and frames are installed without any deviations. Ensure all probes, all imaging modes or keys are available after the replacement.
- **Probe Board**

The probe board serves as the important transmission channel between the probe and the front end, it is connected to the SBF board by J1. The probe board transmits ultrasound signals and probe codes, connects the power supply by J2 and provides power for relay and other parts. Connection failure between J1 and SBF board may result in stripes on the diagnostic image or even probe detection failure. J2 connection failure may result in probe detection failure.
- **Main Board**

The main board is the control center of the ultrasound system, any failure part or connection may result in system malfunction. Ensure power supply socket, RAM and hard disk SATA are connected well. Any failure of the above parts, especially serial between the ultrasound system and touch screen, may result in system startup failure, auto shutdown, no video output, and/or other system malfunctions.

CPU fan is an easily worn out part, ensure it can work well when the ultrasound system is running.
- **Ultrasound Unit**

The ultrasound unit consists of SBF, VHV and probe boards, processes most signals and time sequence. Ensure all boards in it are connected well, especially the following items.
- **USB3.0 Cable**

The ultrasound unit is connected to the main board through USB3.0 port on the SBF board. Ensure USB3.0 cable is connected well, or else system crash or auto shutdown may result.
- **Power Supply**

All the power consumed by the ultrasound unit is transferred through P3 and P4 (or P1 and P2 on some models), the current flowing through power supply socket is rather large. Failure connection of power supply may result in great resistance, low voltage inputted to components, overheat socket, or even system damage. Ensure P3 and P4 (or P1 and P2 on some models) are in good contacts, hold the plug not the cable when unplug the power supply socket.

### ■ Maintenance Items

- Start up or shut down the ultrasound system for several times to ensure no malfunction occurs.
- Clean the ultrasound system if it has been used for a long period. For details, refer to Section 10 System Maintenance.
- Record or solve problems proposed by the user.
- Make a detailed service record for future maintenance or service. The fault cause, replaced parts and their corresponding part numbers, repairing procedures should be detailed in this record. Moreover, a signature from the hospital on this record is required.



# **10 System Maintenance**

To maintain the safety and functionality of the ultrasound system, you should periodically perform the maintenance for the ultrasound system and accessories.



- To avoid electrical shock and damage to the ultrasound system, power off and unplug the system from the AC power outlet before cleaning.
- To maintain the safety and functionality of the ultrasound system, maintenance must be performed at least every 1 year. Electrical safety tests must also be performed at regular intervals as specified by local safety regulations.

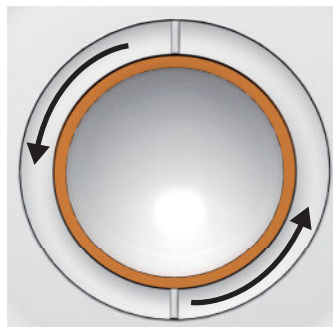
### 10.1 Cleaning the System

#### ■ To Clean the System Surface

1. Power off and unplug the ultrasound system from the AC power outlet.
2. Dampen a lint-free soft cloth with 75% ethanol.
3. Use this lint-free soft cloth to clean the surfaces of the monitor screen, the touch screen, the control panel, the key panel and the main unit. Take special care and avoid to scratch the screens.
4. Use a cotton swab to remove solids from between keys and controls.

#### ■ To Clean the Trackball

1. Power off and unplug the ultrasound system from the AC power outlet.
2. Press the bulges in the fixing ring by both hands.
3. Turn the fixing ring anticlockwise until the ring lifts.



4. Take out the dust ring, the fixing ring and the ball (careful not to drop the ball) from the control panel.
5. Use a lint-free soft cloth dampened with 75% ethanol to clean the dust ring, the fixing ring and the ball.
6. Use a cotton swab dampened with 75% ethanol to remove stains from the surrounding area and edge.
7. Place the ball, the fixing ring and the dust ring back to the control panel, and turn the fixing ring clockwise to install the trackball.

### ■ To Clean the Dust Filter

The dust filter must be clean at least every 3 months for ventilation.

1. Power off and unplug the ultrasound system from the AC power outlet.
2. Pinch the dust filter with fingers as the figure shown above.



3. Rinse the taken out sponge with refresh running water, and use a brush to rinse the dust filter with refresh running water.
4. Place the sponge and dust filter back to the ultrasound system after a thorough airing.

## 10.2 Probe Maintenance

### 10.2.1 Cleaning the Probe



- **WARNING** To avoid the electrical shock, disconnect the probe from the ultrasound system before cleaning.
- To avoid potential disease transmission, you should wear sterile medical gloves and protective goggles while cleaning.



- **CAUTION** Do not use the cleaner that contains the sodium sulfate and sodium hypochlorite to clean the probe. Otherwise, the probe may be damaged.
- To avoid probe damages, do not bump the probe on hard surfaces.
- Use only the cleaner recommended by the manufacturer to clean a probe. Otherwise, the probe may be damaged.

You should clean the probe before and after each use. Probe cleaning is an essential step of the disinfection and sterilization.

Perform the following steps to clean the probe.

1. Remove the coupling gel from the probe surface after exam.
2. Disconnect the probe from the ultrasound system and remove the probe sheath and biopsy bracket from the probe.

3. Use a lint-free soft cloth dampened with mild soapy water or the recommended cleaner listed in the basic user manual to wipe the probe.  
If there are dried stains on the surface or in the grooves of the probe, remove them by a brush dampened with an enzymatic clearer.
4. Rinse the surfaces of the probe with the fresh running water to completely remove any residual cleaner.
5. Dry the probe with a lint-free soft dry cloth.

### 10.2.2 Disinfecting and Sterilizing the Probe



- There is a cleared list of sterilants and high-level disinfectants for use in processing reusable medical and dental devices on the FDA website. That list can be consulted to find agents that may be useful for probe disinfection. Please refer to the following URL for FDA-Cleared Sterilants and High Level Disinfectants: <http://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/ReprocessingofSingle-UseDevices/ucm133514.htm>.
- Use the liquid disinfectant/sterilant that meets the local laws and regulations or the recommended disinfectant/sterilant.
- The probe sheath may be damaged during exam and contamination risk level caused by the damaged sheath is difficult to estimate. Therefore, probe sheath cannot change the level of disinfection for a probe. Please clean and sterilize (or high level disinfect) the intracavitary probe and clean and sterilize the probe for biopsy and coming into contact blood after exam.
- Do not use an expired disinfectant/sterilant.
- Store the probe in a sterile environment, and review its expiration date before use.



- If you use the recommended disinfectant/sterilant, ensure the requirements for the disinfection level and probe soak period are met. Otherwise, the probe could be damaged and your warranty might be void. If you have further use or needs for the probe, ensure the level of the make-up disinfectant/sterilant and the probe soak period are suitable for the intended clinical application.
- Do not use the following methods to sterilize the probe.
  - Autoclave
  - Ultraviolet sterilizer
  - Gamma ray sterilizer
  - Ethylene oxide gas
  - Ethylene oxide
  - Thermal disinfection/sterilization. Temperature higher than 66°C (150°F) will damage the probe.
- Do not allow any disinfectant/sterilant to be air-dried on the probe.

#### ■ Disinfection Levels

To choose an appropriate disinfectant, you first must determine the required level of disinfection, based on the probe applications.

Classification	Definition	Level of Disinfection	Application
Critical	A device that enters normally sterile tissue or the vascular system.	Sterilization	Intraoperative, biopsy use or blood contacting probe
Semi-critical	A device that comes into contact with intact mucous membranes and does not ordinarily penetrate sterile tissue.	High	Endocavitary probe
Noncritical	Devices that do not ordinarily touch the patient or touch only intact skin.	Medium or low	Body surface probe

#### ■ Soaking Requirements

Do not immerse the probe beyond its junction line.

#### ■ To Disinfect the Body Surface Probe

You should disinfect the body surface probe after each use.

Perform the following steps.

1. Clean the probe.  
For details, refer to Section 10.2.1 Cleaning the Probe.
2. Perform the medium-level disinfection to the probe as shown in Table 10-1.  
Or select the recommended disinfectant listed in the basic user manual to disinfect the probe by following the instruction provided by disinfectant's manufacturer.
3. Rinse the probe with fresh running water to completely remove any residual disinfectant.
4. Dry the probe with a lint-free soft dry cloth.

**Table 10-1 Recommended Method for Medium-level Disinfection**

Disinfectant	Manufacturer	Active Ingredients	Level for Active Ingredient	Contact Type	Contact Period
70% Isopropyl alcohol	All	70% Isopropyl alcohol	70%	Spray / Wipe	<10 minutes
T-spray II	Pharm. Inc.	Quat.Ammonia	/	Spray / Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat.Ammonia	/	Spray / Wipe	<10 minutes

■ **To Disinfect the Endocavitary Probe**

You should disinfect the endocavitary probe before and after each use.

Perform the following steps.

1. Clean the probe.  
For details, refer to Section 10.2.1 Cleaning the Probe.
2. Perform the high-level disinfection to the probe as shown in Table 10-2.  
Or select the recommended disinfectant listed in the basic user manual to disinfect the probe by following the instruction provided by disinfectant's manufacturer.
3. Rinse the probe with running sterile water to completely remove the residual disinfectant.
4. Dry the probe with a lint-free soft dry cloth.

**Table 10-2 Recommended Method for High-level Disinfection**

Disinfectant	Manufacturer	Active Ingredients	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	45-50 minutes
Resert XL HLD	STERIS	H2O2	2.0%	Soak	8 minutes

**10.2.3 To Sterilize the Probe**

You should sterilize the intraoperative, biopsy use probe or any probe that comes into contact with blood after each use.

Perform the following steps.

1. Clean the probe.  
For details, refer to Section 10.2.1 Cleaning the Probe.
2. Sterilize the intraoperative probe as shown in Table 10-3.  
Or select the recommended disinfectant listed in the basic user manual to sterilize the probe by following the instruction provided by disinfectant's manufacturer.
3. Rinse the probe with running sterile water to completely remove the residual sterilant.
4. Dry the probe with a lint-free soft dry cloth.

**Table 10-3 Recommended Method for Sterilization**

Sterilant	Manufacturer	Active Ingredients	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

**10.2.4 Disinfecting and Sterilizing the Probe Cable**

**WARNING** To avoid potential disease transmission, you should wear sterile medical gloves and protective goggles during disinfection or serialization.



Do not immerse the probe cable in alcohol or isopropyl alcohol at any concentration for a long period of time. Avoid any contact with an iodine or phenols. Otherwise, it will accelerate the aging of the cable and decrease the service time of the probe, or even cause cable damages.

#### ■ Disinfection

Perform the following steps to disinfect the probe cable.

1. Use a lint-free soft cloth dampened with mild soapy water to wipe the probe cable.
2. Rinse the cable with fresh running water to completely remove the residual cleaner.
3. Perform the medium-level disinfection to the probe cable as shown in Table 10-4
4. Rinse the surfaces of the probe cable with fresh running water to completely remove the residual disinfectant.
5. Dry the probe cable with a lint-free soft dry cloth.

**Table 10-4 Recommended Method for Medium-level Disinfection**

Disinfectant	Manufacturer	Active Ingredients	Level for Active Ingredient	Contact Type	Contact Period
T-spray II	Pharm. Inc.	Quat.Ammonia	/	S p r a y / Wipe	<10 minutes
T-spray	Pharm. Inc.	Quat.Ammonia	/	S p r a y / Wipe	<10 minutes

#### ■ Sterilization

If the probe cable comes into contact with any blood or body fluids, you should sterilize it. For details, refer to the information about probe sterilization.

### 10.2.5 Storage and Transportation

#### ■ To store the probe

Follow the following items to store the probe.

- Store the probe in a probe holder or specific package when not in use.
- Ensure the probe holder is clean before storage.
- To avoid contaminating the package, disinfect or sterilize the probe before storage or store it in a disposable probe package.
- Do not expose it to direct sunlight or sudden environmental temperature changes.



- Store the probe alone to avoid any impact on the probe head.
- Carefully wind the probe cable.
- Dry the probe before storage.

■ **To transport the probe**

Perform the following steps to transport the probe.

1. Clean and disinfect the probe before transportation.
2. Place the probe fully into the carrying case and carefully wind the cable.
3. Close the cover of the carrying case.
4. Pack the carrying case with sponge and place it in a carton.

## **10.3 Biopsy Bracket Maintenance**

### **10.3.1 Cleaning the Biopsy Bracket**



- Clean and disinfect the biopsy bracket after each use.
- Wear sterile medical gloves and protective goggles during cleaning.

Perform the following steps.

1. Disconnect the probe from the ultrasound system, and remove the biopsy bracket and biopsy guide tube from the probe.
2. Brush and rinse the bracket with an enzymatic cleaner to remove any residue.
3. Dry the bracket with a lint-free soft dry cloth.

### **10.3.2 Sterilizing the Biopsy Bracket**



- Disinfect the biopsy bracket after each use.
- Use the liquid sterilant that meets with the local laws and regulations.
- If you use the recommended sterilant, ensure the requirements for the sterilant level and probe soak period are met. Otherwise, the biopsy bracket could be damaged and your warranty might be void. If you have further use or needs for the probe, ensure the level of the make-up sterilant and the biopsy bracket soak period are suitable for the intended clinical application.
- Store the biopsy bracket in a sterile environment and review its expiration date before use.
- Do not sterilize the biopsy bracket with any ethylene oxide.
- Do not allow any sterilant to be air-dried on the biopsy bracket.

Perform the following steps.

1. Clean the biopsy bracket.  
For details, refer to Section 10.3.1 Cleaning the Biopsy Bracket
2. Sterilize the biopsy bracket as shown in Table 10-5 for the entire recommended soak period.
3. Rinse the bracket with running sterile water to completely remove any sterilant residue.
4. Dry the bracket with a lint-free soft dry cloth.

**Table 10-5 Recommended Method for Sterilization**

Sterilant	Manufacturer	Active Ingredients	Level for Active Ingredient	Contact Type	Contact Period
Cidex™ Activated Dialdehyde Solution	J&J	Glutaraldehyde	2.4%	Soak	10 hours

### 10.3.3 Storage

Ensure the biopsy bracket is cleaned, sterilized and completely dried before storage. Store the biopsy bracket in a sterile environment and keep it away from the environment of sudden temperature changes or direct sunlight.

## 10.4 Equipment Disposal

You should dispose of the main unit, the probe, the biopsy bracket or other accessories in accordance with the local laws or regulations.

For the detailed disposal information, consult the manufacturer or the local distribution. The manufacturer is not responsible for any system content or accessories that have been discarded improperly.

## 10.5 Customer Service

Only the service personnel of or authorized by the manufacturer can service the ultrasound system. Any feedbacks or inquires concerning our product or service should be directed to the following address.

4/F, 5/F, 8/F, 9/F & 10/F, Yizhe Building, Yuquan Road, Nanshan, Shenzhen, 518051, Guangdong, China

Tel: +86-755-26722890

Fax: +86-755-26722850

Email: [service@sonoscape.net](mailto:service@sonoscape.net)

## Appendix Renewal Parts

Parts		P/N	Quantity
U l t r a s o u n d System Board	VHV Board	7500.00445	1
	MPC Board	7500.01119	1
	SBF Board	7500.00716	1
Circuit Board	Key panel	7500.01309	1
	Key panel Knob Board	7500.01161	1
	Touch-Screen Control Board	7500.01065	1
	External IO Board 1	7500.01217	1
	External IO Board 2	7500.01059	1
	External IO Board 3	7500.01060	
	Charging Monitor Board	7500.01227	1
	Battery Monitor Board	7500.00520	1
	Coupling Gel Heating Conversion Board	7500.01228	1
Display	21.5” LCD	3900.00120	1
	13.3" LCD	3900.00127	1
Power Supply	Power Switch	3600.02333	1
	Transformer	2601.010002	1
	P50 EMC Filter	7500.01443	1
	Isolation Power Board	7500.00078	1

## Appendix Renewal Parts

Parts		P/N	Quantity
PC System	PC Main Board	2100.00702	1
	Video Card	2100.00703	1
	Hard Disk	2100.00455	1
	Internal IO Board	7500.01039	1
	PC Key panel	2100.00826	1
	USB Dongle	2100.00944	1
	Trackball	2100.00913	1
	DVD/CD-RW	2100.00185	1
Accessories	Speaker	2100.00764	2
	Fan of Ultrasound Unit Casing	2100.0892	2
	Fan of Back Casing	2100.00971	1
	Fan of Main Board Casing	2100.00970	1
	Footswitch	2100.00007	1
	Probe Left Holder 1	1063.03313	2
	Probe Left Holder 2	1063.03314	1
	Probe Right Holder 1	1063.03315	2
	Probe Right Holder 2	1063.03316	1
	Left Rubber Mat 1	1063.03415	1
	Left Rubber Mat 2	1063.03416	2
	Right Rubber Mat 1	1063.03417	1
	Right Rubber Mat 2	1063.03418	2
	Caster	2208.01892	2