Service Manual

EDAN

DUS 60

Digital Ultrasonic Diagnostic Imaging System

Version 1.1

CE 0123

About this Manual

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Statement

This manual will help you understand the operation and maintenance of the product better. It is reminded that the product shall be used strictly complying with this manual. User's operation failing to comply with this manual may result in malfunction or accident for which EDAN INSTRUMENTS, INC. (hereinafter called EDAN) can not be held liable.

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The user shall understand that nothing in this manual grants him, expressly or implicitly, any right or license to use any of the intellectual properties of EDAN.

EDAN holds the rights to modify, update, and ultimately explain this manual.

Responsibility of the Manufacturer

EDAN only considers itself responsible for any effect on safety, reliability and performance of the equipment if:

Assembly operations, extensions, re-adjustments, modifications or repairs are carried out by persons authorized by EDAN, and

The electrical installation of the relevant room complies with national standards, and

The instrument is used in accordance with the instructions for use.

Upon request, EDAN may provide, with compensation, necessary circuit diagrams, and other information to help qualified technician to maintain and repair some parts, which EDAN may define as user serviceable.

Terms Used in this Manual

This guide is designed to give key concepts on safety precautions.

WARNING

A **WARNING** label advises against certain actions or situations that could result in personal injury or death.

CAUTION

A **CAUTION** label advises against actions or situations that could damage equipment, produce

inaccurate data, or invalidate a procedure.

NOTE

A **NOTE** provides useful information regarding a function or a procedure.

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Chapter 1 Warranty and Service

Standard Service

EDAN provides a one-year-warranty for the warranted products (accessories are included). The warranty period begins on the date the products are shipped to customers. If a customer promptly notifies EDAN of customer's warranty claim hereunder, EDAN will either repair, adjust or replace (with new or exchange replacement parts) EDAN's products. EDAN warrants that any service it provides to customers will be performed by trained individuals in a workmanlike manner.

Limitation of Warranty

Direct, indirect or final damage and delay caused by the following situations for which EDAN is not responsible may void the warranty:

- ✧ Groupware is dismounted, stretched or redebugged.
- ✧ Unauthorized modification or misuse.
- ✧ Damage caused by operating beyond the environmental specifications for the medical product.
- ✧ Change or remove original serial number label or Manufacturer symbol.
- ✧ Improper use.

Service Procedure

(1) Fill in the **Service Claim Form (SCF)**.

Fill in the SCF with detailed information including: **Model Name**, **Serial Number (SN)** and **Problem Phenomena**.

EDAN should not have any obligation to take over the case without this information. The form can be downloaded at: http://www.edan.com.cn or obtained from EDAN's Service Department.

(2) Send EDAN the SCF and Select a Solution.

Once the service department receives the fully filled SCF, EDAN's engineer will offer a solution in three working days. EDAN will follow out the case based on the two conditions below:

Within Warranty:

There are two options:

i) After receiving the **Return Material Authorization (RMA)** form from EDAN service department, the customer sends EDAN the defective parts and informs about the shipment tracking number. Then we will dispatch new part(s) to your confirmed address with confirmed shipping invoice.

ii) The customer signs the **Declaration Form** and sends it back by email or fax. This form is

legally certificated to make sure the customer or end-user will return the defective parts to EDAN on time. We will, at this option, dispatch the replacement one(s) with confirmed shipping invoice.

NOTE:

1. Both Return Material Authorization Form and Declaration Form are offered by EDAN service department once the SCF is confirmed by service engineer.
2. The customer is responsible for freight & insurance charges when the equipment is shipped to EDAN for service, including custom charges. EDAN is responsible for the freight, insurance & custom charges from EDAN to the customer.

Out of Warranty:

After receiving the RMA form from the service department, the customer sends defective parts to EDAN in advance. We will analyze the problems and discuss with the customer about either repairing or replacing the part(s). Once the maintenance fee is invoiced and paid, we will make sure to dispatch good part(s) to the confirmed address.

NOTE: The customer is responsible for any freight & insurance charge for the returned product.

(3) Obtain the RMA Form.

Before the shipment of the materials, the customer must obtain an RMA form from our service department, in which the RMA number, description of returning parts and shipping instructions are included. The RMA number should be indicated on the outside of the shipping container.

NOTE: EDAN should not have any obligation to the end-user or customer who returns the goods without the notification by EDAN's service department. The sender takes full responsibility for the accounted fee.

(4) Send the Parts to EDAN.

Follow these recommended instructions:

✧ Please disassemble the parts with anti-static facility, do not touch the parts with naked hand.

✧ Please pack the parts safely before return.

✧ Please put the RMA number on the parcel.

✧ Please describe the returned parts as 'sample of *****' and put the total value on the invoice, and note on the invoice as 'sample, no commercial value'.

✧ Please confirm the invoice with Edan before shipment.

✧ Please send back the parts after Edan's confirmation.

Contact Information

If you have any question about maintenance, technical specifications or malfunctions of devices, do not hesitate to contact us.

EDAN Instruments, Inc.

TEL: +86-755-26898321, 26899221

FAX: +86-755-26882223, 26898330

E-mail: support@edan.com.cn

Chapter 2 Introduction

The service provider must read and understand all the information presented in this manual before installing or servicing a unit.

Typical users of the basic service manual:

- Service personnel (installation, maintenance, etc.);
- Hospital service personnel;
- Contractors.

The service provider should fully read and understand the user manual before operating the DUS 60. It should also be kept near the unit for quick reference.

2.1. Safety Considerations

2.1.1. Introduction

WARNING

1. This equipment is not intended for treatment.
2. Do not pull the I / F connector in or out while the module is operating.
3. The startup voltage of backlight is approximately 1000 Volts. It may cause electrical shock while assembling with inverter. Do not disassemble the module or insert anything into the backlight unit.
4. If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

CAUTION

1. The pictures and interfaces in this manual are for reference only.
2. Do not apply rough force such as bending or twisting to the LCD module during assembly.
3. Assembling or installing the LCD module into user's system can only be performed in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.
4. It's not permitted to have pressure or impulse on the module; otherwise, the LCD panel and backlight will be damaged.
5. Do not disassemble the LCD module.

The following safety precautions must be observed during all phases of operation, service and repair of this equipment. Failure to comply with these precautions or with specific warnings elsewhere in this manual, violates the safety standards of the design, manufacture and intended use of the equipment.

The standard three-pin socket should be used for power supply, and its protection terminal should be connected with to the grounding wire. If there is no protection terminal available in the socket or not connected with to the grounding wire of power supply, you are advised to use a spare

grounding wire provided by our company for the connection between the protection grounding column and the earth.

NOTE:

1. This equipment is not intended for home use.
2. Follow the experienced technician's instruction when connecting the earth wire.

2.1.2. Human Safety

Servicing should be performed by authorized personnel only.

Only personnel who have participated in the DUS 60 training are authorized to service the equipment.

2.1.3. Mechanical Safety

WARNING

1. Take care when moving the unit, or when it is raised for repair or moved along any incline, as the trolley may become unstable which could cause the unit to tip over (with trolley).
2. Ultrasound probes are highly sensitive medical instruments that can easily be damaged by improper handling. Take care when handling and protect them from damage when not in use. Do not use a damaged or defective probe. Failure to follow these precautions can result in serious injuries and equipment damage.
3. Never use a probe that has fallen to the floor.

NOTE:

Special care should be taken when transporting the unit in a vehicle:

1. Secure the unit in an upright position.
2. Lock the wheels (brake).
3. Do not use the control panel as an anchor point.
4. Place the probes in their carrying case.

2.1.4. Electrical Safety

To minimize shock hazard, the equipment chassis must be connected to an electrical ground.

The system is equipped with a three-conductor AC power cord. This must be plugged into an approved electrical outlet with safety ground if an extension cord is used with the system. Make sure that the total current rating of the system does not exceed the extension cord rating.

The power outlet used for this device should not be shared with other types of device.

Both the system power cord and the power connector meet international electrical standards.

WARNING

1. **SHOCK HAZARD**-The power receptacle must be a grounded hospital grade outlet. Never try to adapt the three-prong plug to fit a two-slot outlet. Inspect the power cord often for fraying or other damage. Do not operate the apparatus with a damaged power cord or plug. Improper grounding is a safety hazard.
2. **SHOCK HAZARD**-Do not attempt to connect or disconnect a power cord with wet hands. Make certain that your hands are clean and dry before touching a power cord.
3. Do not pour any fluid onto the system surface, as fluid seepage into the electrical circuitry may cause electric shock or system failure.
4. When more than one medical device is connected to the patient, leakage currents of the devices are summed together. Use caution.
5. Only accessories supplied or recommended by EDAN can be used. Or else, the performance and electric shock protection can not be guaranteed.
6. Accessory equipment connected to the analog and digital interfaces must be certified according to the respective IEC/EN standards (e.g. IEC/EN 60950 for data processing equipment and IEC/EN 60601-1 for medical equipment). Furthermore, all configuration shall comply with the valid version of the standard IEC/EN 60601-1-1. Therefore anybody, who connects additional equipment to the signal input connector or output connector to configure a medical system, must make sure that the system complies with the requirements of the valid version of the system standard IEC/EN 60601-1-1. If in doubt, consult our technical service department or your local distributor.
7. A damaged probe can also increase the risk of electric shock if conductive solutions come in contact with internal live parts. Inspect probes often for cracks or openings in the housing and holes in and around the acoustic lens or other damage that could allow liquid entry.

CAUTION

1. Before use, you must make sure that there is no visible evidence of damage on the equipment, cables and probes which may affect patient safety or monitoring capability. The recommended inspection interval is once per week or less. If damage is evident, replacement is recommended before use.
2. It is necessary to take the probe out of the probe bracket during moving and transporting, otherwise, the probe or probe bracket may be broken.
3. The device and accessories are to be disposed of according to local regulations after their useful lives. Alternatively, they can be returned to the dealer or the manufacturer for recycling or proper disposal.

2.1.5. Battery Safety

WARNING

1. Improper operation may cause the internal li-ion battery (hereinafter called battery) to be hot, ignited or exploded, and it may lead to the decrease of the battery capacity. It is necessary to read the user manual carefully and pay more attention to warning messages.
2. Only qualified service engineers authorized by the manufacturer can open the battery compartment and replace the battery, and batteries of the same model and specification should be used.
3. **DANGER OF EXPLOSION** -- Do not reverse the anode and the cathode when installing the battery.
4. Do not heat or splash the battery or throw it into fire or water.
5. Do not destroy the battery; do not pierce battery with a sharp object such as a needle; do not hit with a hammer, step on or throw or drop to cause strong shock; do not disassemble or modify the battery.
6. When leakage or foul smell is found, stop using the battery immediately. If your skin or cloth comes into contact with the leakage liquid, cleanse it with clean water at once. If the leakage liquid splashes into your eyes, do not wipe them. Irrigate them with clean water first and go to see a doctor immediately.
7. Properly dispose of or recycle the depleted battery according to local regulations.
8. Only when the device is off can the battery be installed or removed.
9. Remove the battery from the electrocardiograph when the electrocardiograph is not used for a long time.
10. If the battery is stored alone and not used for a long time, we recommend that the battery should be charged at least once every 6 months to prevent overdischarge.

2.2. Electromagnetic Compatibility (EMC)

Electromagnetic compatibility describes a level of performance of a device within its electromagnetic environment. This environment consists of the device itself and its surroundings including other equipment, power sources and persons with which the device must interface. Inadequate compatibility occurs when a susceptible device fails to perform as expected due to the interference from its environment or when the device produces unacceptable levels of emission to its environment. This interference is often referred to as radio-frequency or electromagnetic interference (RFI/EMI) and can be radiated through space or conducted over interconnecting power of signal cables. In addition to electromagnetic energy, EMC also includes possible effects from electrical fields, magnetic fields, electrostatic discharge and disturbances in the electrical power supply.

2.3. Probe Acoustic Output Parameters List

2.3.1.Test of Probe C321UA

Acoustic Output Reporting Table

Transducer Mode C321UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.8458	0.5959				0.6912
Associated Acoustic Parameters	$P_{r.3}$	MPa	1.506					
	W_0	mW		38.73				38.73
	Min of[$W_{.3}$(z1),$I_{ta.3}$(z1)]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)						
	Z@PII $_{3max}$	(cm)	4.45					
	deq(Z_{sp})	(cm)						
	f_c	(MHz)	3.17	3.17				3.17
	Dim of Aaprt	X(cm)		1.28				1.28
		Y (cm)		1.5				1.5
Other Information	PD	(usec)	0.4958					
	PRF	(Hz)	1872					
	P_r@PII_{max}	(MPa)	2.4931					
	d_{eq}@PII_{max}	(cm)						
	Focal Length	FL_x (cm)		2.186				2.186
		Fl_y (cm)		42.2692				42.2692
	$I_{pa.3}$@MI_{max}	(W/cm^2)	0.1468					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C321UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8458	0.1768		0.0178	0.0639	0.5391
Associated Acoustic Parameters	$P_{r.3}$	MPa	1.506					
	W_0	mW		31.4			2.317	33.717
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)				1.23		
	Z_1	(cm)				3.0		
	Z_{bp}	(cm)				2.3417		
	Z_{sp}	(cm)					4.45	
	$Z@PII_{.3max}$	(cm)	4.45					
	deq(Z_{sp})	(cm)					0.3579	
	f_c	(MHz)	3.17	3.17		3.17	3.17	3.17
	Dim of Aaprt	X(cm)		1.28		1.28	1.28	1.28
		Y (cm)		1.5		1.5	1.5	1.5
Other Information	PD	(usec)	0.4958					
	PRF	(Hz)	1518					
	$P_r@PII_{max}$	(MPa)	2.4931					
	$d_{eq}@PII_{max}$	(cm)					0.3579	
	Focal Length	FL_x (cm)		2.186		2.186		2.186
		Fl_y (cm)		42.2692		42.2692		42.2692
	$I_{pa.3}@MI_{max}$	(W/cm^2)						
Control Conditions	Control1		AP=15; Frequency=3.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C321UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.4616			0.6412	3.0623	1.3986
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.8082					
	W_0	mW					87.47	87.47
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]					50.0		
	Z_1	(cm)				3.0		
	Z_{bp}	(cm)				2.3417		
	Z_{sp}	(cm)					4.95	
	$Z@PII_{.3max}$	(cm)	4.95					
	deq(Z_{sp})	(cm)					0.0075	
	f_c	(MHz)	3.065			3.065	3.065	3.065
	Dim of Aaprt	X(cm)				1.28	1.28	1.28
		Y (cm)				1.5	1.5	1.5
Other Information	PD	(usec)	1.9784					
	PRF	(Hz)	6361					
	$P_r@PII_{max}$	(MPa)	1.2714					
	$d_{eq}@PII_{max}$	(cm)					0.0075	
	Focal Length	FL_x (cm)				2.6236		2.6236
		Fl_y (cm)				54.189		54.189
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.036					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

2.3.2.Test of Probe C613UA

Acoustic Output Reporting Table

Transducer Mode C613UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.8883	0.0725				0.1634
Associated Acoustic Parameters	$P_{r.3}$	MPa	2.155					
	W_0	mW		5.316				5.316
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)						
	$Z@PII_{.3max}$	(cm)	1.3					
	deq(Z_{sp})	(cm)						
	f_c	(MHz)	5.8865	5.8865				5.8865
	Dim of Aaprt	X(cm)		0.896				0.896
		Y (cm)		0.58				0.58
Other Information	PD	(usec)	0.274					
	PRF	(Hz)	2342					
	$P_r@PII_{max}$	(MPa)	2.4022					
	$d_{eq}@PII_{max}$	(cm)						
	Focal Length	FL_x (cm)		0.5431				0.5431
		Fl_y (cm)		4.4323				4.4323
	$I_{pa.3}@MI_{max}(W/cm^2)$		0.2133					
Control Conditions	Control1		AP=15; Frequency=4.5MHz; Depth=29mm; Focus=10mm;					

Acoustic Output Reporting Table

Transducer Mode C613UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.8883	0.0655	0.0082		0.0302	0.1578
Associated Acoustic Parameters	$P_{r.3}$ MPa		2.155					
	W_0 mW			4.799	0.336		0.336	5.135
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						1.3	
	Z@$PII_{.3max}$ (cm)		1.3					
	deq(Z_{sp}) (cm)						0.7584	
	f_c (MHz)		5.8865	5.8865	5.8865		5.8865	5.8865
	Dim of Aaprt	X(cm)		0.896	0.896		0.896	0.896
		Y (cm)		0.58	0.58		0.58	0.58
Other Information	PD (usec)		0.274					
	PRF (Hz)		2114					
	P_r@PII_{max} (MPa)		2.4022					
	d_{eq}@PII_{max} (cm)						0.7584	
	Focal Length	FL_x (cm)		0.5431	0.5431			0.5431
		Fl_y (cm)		4.4323	4.4323			4.4323
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.2133					
Control Conditions	Control1		AP=15; Frequency=4.5MHz; Depth=29mm; Focus=10mm;					

Acoustic Output Reporting Table

Transducer Mode C613UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.4034		0.447		1.5775	0.5415
Associated Acoustic Parameters	$P_{r.3}$ MPa		0.9316					
	W_0 mW				17.62		17.62	17.62
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						1.4	
	Z@$PII_{.3max}$ (cm)		1.4					
	deq(Z_{sp}) (cm)						0.0144	
	f_c (MHz)		5.3316		5.3316		5.3316	5.3316
	Dim of Aaprt	X(cm)			0.896		0.896	0.896
		Y (cm)			0.58		0.58	0.58
Other Information	PD (usec)		1.7398					
	PRF (Hz)		6361					
	P_r@PII_{max} (MPa)		1.3869					
	d_{eq}@PII_{max} (cm)						0.0144	
	Focal Length	FL_x (cm)			0.469			0.469
		Fl_y (cm)			3.8273			3.8273
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.053					
Control Conditions	Control1		AP=15; Frequency=5.5MHz; Depth=29mm; Focus=10mm;					

2.3.3.Test of Probe C343UA

Acoustic Output Reporting Table

Transducer Mode C343UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.9043	0.146				0.5312
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.557					
	W_0 mW			41.69				41.69
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)							
	Z@PII $_{3max}$ (cm)		4.85					
	deq(Z_{sp}) (cm)							
	f_c (MHz)		2.9652	2.9652				2.9652
	Dim of Aaprt	X(cm)		2.061				2.061
		Y (cm)		1.5				1.5
Other Information	PD (usec)		0.5188					
	PRF (Hz)		2159					
	P_r@PII_{max} (MPa)		2.5988					
	d_{eq}@PII_{max} (cm)							
	Focal Length	FL_x (cm)		1.5726				1.5726
		Fl_y (cm)		21.5005				21.5005
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.1552					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C343UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.9043	0.1146		0.0248	0.0961	0.4581
Associated Acoustic Parameters	$P_{r.3}$	MPa	1.557					
	W_0	mW		32.71			3.244	35.954
	Min of[$W_{.3}$(z1),($I_{ta.3}$(z1)]	(mW)				1.75		
	Z_1	(cm)				2.9389		
	Z_{bp}	(cm)				2.9389		
	Z_{sp}	(cm)					4.85	
	Z@PII $_{3max}$	(cm)	4.85					
	deq(Z_{sp})	(cm)					0.236	
	f_c	(MHz)	2.9652	2.9652		2.9652	2.9652	2.9652
	Dim of Aaprt	X(cm)		2.061		2.061	2.061	2.061
		Y (cm)		1.5		1.5	1.5	1.5
Other Information	PD	(usec)	0.5188					
	PRF	(Hz)	1694					
	P_r@PII_{max}	(MPa)	2.5988					
	d_{eq}@PII_{max}	(cm)					0.236	
	Focal Length	FL_x (cm)		1.5726		1.5726		1.5726
		Fl_y (cm)		21.5005		21.5005		21.5005
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.1552					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C343UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.5245			0.6354	3.006	1.2387
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.861					
	W_0	mW					86.45	86.45
	Min of[$W_{.3}$(z1),($I_{ta.3}$(z1)]	(mW)				49.46		
	Z_1	(cm)				2.9389		
	Z_{bp}	(cm)				2.9389		
	Z_{sp}	(cm)					5.0	
	Z@PII $_{3max}$	(cm)	5.0					
	deq(Z_{sp})	(cm)					0.0077	
	f_c	(MHz)	2.7017			2.7017	2.7017	2.7017
	Dim of Aaprt	X(cm)				2.061	2.061	2.061
		Y (cm)				1.5	1.5	1.5
Other Information	PD	(usec)	1.4078					
	PRF	(Hz)	8289					
	P_r@PII_{max}	(MPa)	1.3522					
	d_{eq}@PII_{max}	(cm)					0.0077	
	Focal Length	FL_x (cm)				1.7654		1.7654
		Fl_y (cm)				24.6285		24.6285
	$I_{pa.3}$@MI_{max}	(W/cm^2)	0.042					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

2.3.4.Test of Probe L763UA

Acoustic Output Reporting Table

Transducer Mode L763UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8131	0.0631				0.2158
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.816					
	W_0 mW			10.71				10.71
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)							
	Z@$PII_{.3max}$ (cm)		2.25					
	deq(Z_{sp}) (cm)							
	f_c (MHz)		4.9898	4.9898				4.9898
	Dim of Aaprt	X(cm)		2.016				2.016
		Y (cm)		0.6				0.6
Other Information	PD (usec)		0.3435					
	PRF (Hz)		2218					
	P_r@PII_{max} (MPa)		2.6699					
	d_{eq}@PII_{max} (cm)							
	Focal Length	FL_x (cm)		0.3902				0.3902
		Fl_y (cm)		2.2322				2.2322
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.12					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=80mm; Focus=30mm;					

Acoustic Output Reporting Table

Transducer Mode L763UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8131	0.0653		0.0132	0.0443	0.2448
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.816					
	W_0 mW			11.08			1.072	12.152
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]					0.565		
	Z_1 (cm)					1.8587		
	Z_{bp} (cm)					1.8587		
	Z_{sp} (cm)						2.25	
	Z@PII$_{.3max}$ (cm)		2.25					
	deq(Z_{sp}) (cm)						0.5263	
	f_c (MHz)		4.9898	4.9898		4.9898	4.9898	4.9898
	Dim of Aaprt	X(cm)		2.016		2.016	2.016	2.016
		Y (cm)		0.6		0.6	0.6	0.6
Other Information	PD (usec)		0.3435					
	PRF (Hz)		2295					
	P_r@PII_{max} (MPa)		2.6699					
	d_{eq}@PII_{max} (cm)						0.5263	
	Focal Length	FL_x (cm)		0.3902		0.3902		0.3902
		Fl_y (cm)		2.2322		2.2322		2.2322
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.12					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=80mm; Focus=30mm;					

Acoustic Output Reporting Table

Transducer Mode L763UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.3692			0.5655	1.5	0.6092
Associated Acoustic Parameters	$P_{r.3}$ MPa		0.8751					
	W_0 mW						30.24	30.24
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]					23.12		
	Z_1 (cm)					1.8587		
	Z_{bp} (cm)					1.8587		
	Z_{sp} (cm)						2.55	
	Z@$PII_{.3max}$ (cm)		2.55					
	deq(Z_{sp}) (cm)						0.0152	
	f_c (MHz)		5.6693			5.6693	5.6693	5.6693
	Dim of Aaprt	X(cm)				2.016	2.016	2.016
		Y (cm)				0.6	0.6	0.6
Other Information	PD (usec)		1.4748					
	PRF (Hz)		6361					
	P_r@PII_{max} (MPa)		1.3668					
	d_{eq}@PII_{max} (cm)						0.0152	
	Focal Length	FL_x (cm)				0.3943		0.3943
		Fl_y (cm)				2.5852		2.5852
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.031					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=30mm;					

2.3.5. Test of Probe C362UA

Acoustic Output Reporting Table

Transducer Mode C362UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8549	0.1619				0.769
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.528					
	W_0 mW			53.67				53.67
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)							
	$Z@PII_{.3max}$ (cm)		4.45					
	deq(Z_{sp}) (cm)							
	f_c (MHz)		3.2169	3.2169				3.2169
	Dim of Aaprt	X(cm)		1.5936				1.5936
		Y (cm)		1.5				1.5
Other Information	PD (usec)		0.4834					
	PRF (Hz)		3223					
	$P_r@PII_{max}$ (MPa)		2.3303					
	$d_{eq}@PII_{max}$ (cm)							
	Focal Length	FL_x (cm)		1.7369				1.7369
		Fl_y (cm)		26.6692				26.6692
	$I_{pa.3}@MI_{max}$(W/cm^2)		0.1409					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C362UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8549	0.0922		0.0146	0.0582	0.4652
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.528					
	W_0 mW			30.57			1.898	32.468
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]					1.01		
	Z_1 (cm)					30.0		
	Z_{bp} (cm)					2.6132		
	Z_{sp} (cm)						4.45	
	$Z@PII_{.3max}$ (cm)		4.45					
	deq(Z_{sp}) (cm)						0.3908	
	f_c (MHz)		3.2169	3.2169		3.2169	3.2169	3.2169
	Dim of Aaprt	X(cm)		1.5936		1.5936	1.5936	1.5936
		Y (cm)		1.5		1.5	1.5	1.5
Other Information	PD (usec)		0.4834					
	PRF (Hz)		1836					
	$P_r@PII_{max}$ (MPa)		2.3303					
	$d_{eq}@PII_{max}$ (cm)						0.0243	
	Focal Length	FL_x (cm)		1.7369		1.7369		1.7369
		Fl_y (cm)		26.6692		26.6692		26.6692
	$I_{pa.3}@MI_{max}(W/cm^2)$		0.1409					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C362UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.4772			0.5209	2.1213	0.9647
Associated Acoustic Parameters	$P_{r.3}$ MPa		0.7812					
	W_0 mW						67.33	67.33
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]					35.5		
	Z_1 (cm)					30.0		
	Z_{bp} (cm)					2.6132		
	Z_{sp} (cm)						4.45	
	Z@$PII_{.3max}$ (cm)		4.45					
	deq(Z_{sp}) (cm)						0.0108	
	f_c (MHz)		2.6875			2.6875	2.6875	2.6875
	Dim of Aaprt	X(cm)				1.5936	1.5936	1.5936
		Y (cm)				1.5	1.5	1.5
Other Information	PD (usec)		1.4124					
	PRF (Hz)		8186					
	P_r@PII_{max} (MPa)		1.3549					
	d_{eq}@PII_{max} (cm)						0.0108	
	Focal Length	FL_x (cm)				1.9452		1.9452
		Fl_y (cm)				33.9865		33.9865
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.0338					
Control Conditions	Control1		AP=15; Frequency=3.0MHz; Depth=98mm; Focus=60mm;					

2.3.6.Test of Probe L742UA

Acoustic Output Reporting Table

Transducer Mode L742UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.9257	0.1136				0.4053
Associated Acoustic Parameters	$P_{r.3}$	MPa	2.017					
	W_0	mW		13.65				13.65
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)						
	$Z@PII_{3max}$	(cm)	1.7					
	deq(Z_{sp})	(cm)						
	f_c	(MHz)	5.0334	5.0334				5.0334
	Dim of Aaprt	X(cm)		0.96				0.96
		Y (cm)		0.58				0.58
Other Information	PD	(usec)	0.4574					
	PRF	(Hz)	2687					
	$P_r@PII_{max}$	(MPa)	2.7789					
	$d_{eq}@PII_{max}$	(cm)						
	Focal Length	FL_x (cm)						0.6584
		Fl_y (cm)						6.3649
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.1291					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=50mm;					

Acoustic Output Reporting Table

Transducer Mode L742UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.9257	0.1148	0.0205		0.0455	0.4348
Associated Acoustic Parameters	$P_{r.3}$ MPa		2.017					
	W_0 mW			13.79	0.8535		0.8535	14.6435
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						1.7	
	Z@PII $_{.3max}$ (cm)		1.7					
	deq(Z_{sp}) (cm)						0.4978	
	f_c (MHz)		5.0334	5.0334	5.0334		5.0334	5.0334
	Dim of Aaprt	X(cm)		0.96	0.96		0.96	0.96
		Y (cm)		0.58	0.58		0.58	0.58
Other Information	PD (usec)		0.4574					
	PRF (Hz)		2715					
	P_r@PII_{max} (MPa)		2.7789					
	d_{eq}@PII_{max} (cm)						0.4978	
	Focal Length	FL_x (cm)		0.6584	0.6584			0.6584
		Fl_y (cm)		6.3649	6.3649			6.3649
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.1291					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=50mm;					

Acoustic Output Reporting Table

Transducer Mode L742UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.2692		0.7442		0.6186	0.7842
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.6542					
	W_0	mW			26.41		26.41	26.41
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)					3.35	
	$Z@PII_{.3max}$	(cm)	3.35					
	deq(Z_{sp})	(cm)					0.0406	
	f_c	(MHz)	5.9179		5.9179		5.9179	5.9179
	Dim of Aaprt	X(cm)			0.96		0.96	0.96
		Y (cm)			0.58		0.58	0.58
Other Information	PD	(usec)	0.8333					
	PRF	(Hz)	8503					
	$P_r@PII_{max}$	(MPa)	1.2953					
	$d_{eq}@PII_{max}$	(cm)					0.0406	
	Focal Length	FL_x (cm)			0.8462			0.8462
		Fl_y (cm)			12.3959			12.3959
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.0158					
Control Conditions	Control1		AP=15; Frequency=7.0MHz; Depth=78mm; Focus=50mm;					

2.3.7.Test of Probe E613UA

Acoustic Output Reporting Table

Transducer Mode E613UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.7349	0.0841				0.1426
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.677					
	W_0 mW			6.094				6.094
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)							
	$Z@PII_{.3max}$ (cm)		1.75					
	deq(Z_{sp}) (cm)							
	f_c (MHz)		5.1924	5.1924				5.1924
	Dim of Aaprt	X(cm)		0.896				0.896
		Y (cm)		0.6				0.6
Other Information	PD (usec)		0.3274					
	PRF (Hz)		2323					
	$P_r@PII_{max}$ (MPa)		2.3518					
	$d_{eq}@PII_{max}$ (cm)							
	Focal Length	FL_x (cm)		0.702				0.702
		Fl_y (cm)		7.4919				7.4919
	$I_{pa.3}@MI_{max}(W/cm^2)$		0.1489					
Control Conditions	Control1		AP=15; Frequency=4.5MHz; Depth=39mm; Focus=25mm;					

Acoustic Output Reporting Table

Transducer Mode E613UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.7349	0.0765	0.0096		0.0264	0.1389
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.677					
	W_0 mW			5.545	0.3882		0.3882	5.9332
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						1.75	
	Z@$PII_{.3max}$ (cm)		1.75					
	deq(Z_{sp}) (cm)						0.9021	
	f_c (MHz)		5.1924	5.1924	5.1924		5.1924	5.1924
	Dim of Aaprt	X(cm)		0.896	0.896		0.896	0.896
		Y (cm)		0.6	0.6		0.6	0.6
Other Information	PD (usec)		0.3274					
	PRF (Hz)		2114					
	P_r@PII_{max} (MPa)		2.3518					
	d_{eq}@PII_{max} (cm)						0.9021	
	Focal Length	FL_x (cm)		0.702	0.702			0.702
		Fl_y (cm)		7.4919	7.4919			7.4919
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.1541					
Control Conditions	Control1		AP=15; Frequency=4.5MHz; Depth=39mm; Focus=25mm;					

Acoustic Output Reporting Table

Transducer Mode E613UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.3292		0.3405		1.0256	0.3745
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.696					
	W_0	mW			16		16	16
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)					1.8	
	$Z@PII_{.3max}$	(cm)	1.8					
	deq(Z_{sp})	(cm)					0.0229	
	f_c	(MHz)	4.4688		4.4688		4.4688	4.4688
	Dim of Aaprt	X(cm)			0.896		0.896	0.896
		Y (cm)			0.6		0.6	0.6
Other Information	PD	(usec)	1.9666					
	PRF	(Hz)	6361					
	$P_r@PII_{max}$	(MPa)	0.919					
	$d_{eq}@PII_{max}$	(cm)					0.0229	
	Focal Length	FL_x (cm)			0.9829			0.9829
		Fl_y (cm)			12.649			12.649
	$I_{pa.3}@MI_{max}$	(W/cm^2)						
Control Conditions	Control1		AP=15; Frequency=4.5MHz; Depth=39mm; Focus=25mm;					

2.3.8.Test of Probe C363UA

Acoustic Output Reporting Table

Transducer Mode C363UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.8507	0.1496				0.5623
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.493					
	W_0 mW			45.17				45.17
	Min of[$W_{.3}$(z1),(mW) $I_{ta.3}$(z1)]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)							
	Z@PII $_{3max}$ (cm)		4.5					
	deq(Z_{sp}) (cm)							
	f_c (MHz)		3.083	3.083				3.083
	Dim of Aaprt	X(cm)		2.112				2.112
		Y (cm)		1.5				1.5
Other Information	PD (usec)		0.504					
	PRF (Hz)		2097					
	P_r@PII_{max} (MPa)		2.3798					
	d_{eq}@PII_{max} (cm)							
	Focal Length	FL_x (cm)		1.5429				1.5429
		Fl_y (cm)		20.3404				20.3404
	$I_{pa.3}$@MI_{max}(W/cm^2)		0.1041					
Control Conditions	Control1		AP=15; Frequency=3.0MHz; Depth=98mm; Focus=60mm;					

Acoustic Output Reporting Table

Transducer Mode C363UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8507	0.1166		0.0182	0.0598	0.4682
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.493					
	W_0 mW			35.2			2.413	37.613
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]					1.3		
	Z_1 (cm)					3.008		
	Z_{bp} (cm)					3.008		
	Z_{sp} (cm)						5.45	
	$Z@PII_{.3max}$ (cm)		4.5					
	deq(Z_{sp}) (cm)						0.3944	
	f_c (MHz)		3.083	3.083		3.083	3.083	3.083
	Dim of Aaprt	X(cm)		2.112		2.112	2.112	2.112
		Y (cm)		1.5		1.5	1.5	1.5
Other Information	PD (usec)		0.504					
	PRF (Hz)		1634					
	$P_r@PII_{max}$ (MPa)		2.3798					
	$d_{eq}@PII_{max}$ (cm)						0.3944	
	Focal Length	FL_x (cm)		1.5429		1.5429		1.5429
		Fl_y (cm)		20.3404		20.3404		20.3404
	$I_{pa.3}@MI_{max}$(W/cm^2)		0.1041					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=70mm;					

Acoustic Output Reporting Table

Transducer Mode C363UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.5314			0.5852	2.75	1.1357
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.8781					
	W_0	mW					79.26	79.26
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)				45.01		
	Z_1	(cm)				3.0		
	Z_{bp}	(cm)				2.6132		
	Z_{sp}	(cm)					5.0	
	$Z@PII_{.3max}$	(cm)	5.0					
	deq(Z_{sp})	(cm)					0.0083	
	f_c	(MHz)	2.7296			2.7296	2.7296	2.7296
	Dim of Aaprt	X(cm)				2.112	2.112	2.112
		Y (cm)				1.5	1.5	1.5
Other Information	PD	(usec)	1.4049					
	PRF	(Hz)	6361					
	$P_r@PII_{max}$	(MPa)	1.4072					
	$d_{eq}@PII_{max}$	(cm)					0.0083	
	Focal Length	FL_x (cm)				1.6648		1.6648
		Fl_y (cm)				22.1698		22.1698
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.0441					
Control Conditions	Control1		AP=15; Frequency=2.0MHz; Depth=98mm; Focus=70mm;					

2.3.9.Test of Probe L743UA

Acoustic Output Reporting Table

Transducer Mode L743UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.7874	0.0863				0.2326
Associated Acoustic Parameters	$P_{r.3}$	MPa	1.985					
	W_0	mW		8.067				8.067
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)						
	$Z@PII_{.3max}$	(cm)	2.6					
	deq(Z_{sp})	(cm)						
	f_c	(MHz)	5.2224	5.2224				5.2224
	Dim of Aaprt	X(cm)		1.344				1.344
		Y (cm)		0.6				0.6
Other Information	PD	(usec)	0.3289					
	PRF	(Hz)	2287					
	$P_r@PII_{max}$	(MPa)	3.0623					
	$d_{eq}@PII_{max}$	(cm)						
	Focal Length	FL_x (cm)		0.7188				0.7188
		Fl_y (cm)		7.8222				7.8222
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.1536					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

Acoustic Output Reporting Table

Transducer Mode L743UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.7874	0.0866	0.0183		0.0368	0.2517
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.985					
	W_0 mW			8.0099	0.72		0.72	8.2799
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						2.6	
	$Z@PII_{.3max}$ (cm)		2.6					
	deq(Z_{sp}) (cm)						0.6139	
	f_c (MHz)		5.2224	5.2224	5.2224		5.2224	5.2224
	Dim of Aaprt	X(cm)		1.344	1.344		1.344	1.344
		Y (cm)		0.6	0.6		0.6	0.6
Other Information	PD (usec)		0.3289					
	PRF (Hz)		2295					
	$P_r@PII_{max}$ (MPa)		3.0623					
	$d_{eq}@PII_{max}$ (cm)						0.6139	
	Focal Length	FL_x (cm)		0.7188	0.7188			0.7188
		Fl_y (cm)		7.8222	7.8222			7.8222
	$I_{pa.3}@MI_{max}$(W/cm^2)		0.1536					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

Acoustic Output Reporting Table

Transducer Mode L743UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.4043		0.9339		3.0125	0.8505
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.9634					
	W_0	mW			35.2		35.2	35.2
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)					2.15	
	$Z@PII_{.3max}$	(cm)	2.15					
	deq(Z_{sp})	(cm)					0.0076	
	f_c	(MHz)	5.6782		5.6782		5.6782	5.6782
	Dim of Aaprt	X(cm)			1.344		1.344	1.344
		Y (cm)			0.6		0.6	0.6
Other Information	PD	(usec)	1.5134					
	PRF	(Hz)	6361					
	$P_r@PII_{max}$	(MPa)	2.35					
	$d_{eq}@PII_{max}$	(cm)					0.0076	
	Focal Length	FL_x (cm)			0.5274			0.5274
		Fl_y (cm)			4.635			4.635
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.1433					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

2.3.10. Test of Probe E743UA

Acoustic Output Reporting Table

Transducer Mode E743UA Operation Mode B Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt}\leq 1$	$A_{aprt}>1$		
Global Maximum Index Value			0.8577	0.1067				0.2815
Associated Acoustic Parameters	$P_{r.3}$	MPa	1.967					
	W_0	mW		8.36				8.36
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)						
	$Z@PII_{3max}$	(cm)	2.9					
	deq(Z_{sp})	(cm)						
	f_c	(MHz)	5.262	5.262				5.262
	Dim of Aaprt	X(cm)		1.344				1.344
		Y (cm)		0.6				0.6
Other Information	PD	(usec)	0.3378					
	PRF	(Hz)	2287					
	$P_r@PII_{max}$	(MPa)	3.005					
	$d_{eq}@PII_{max}$	(cm)						
	Focal Length	FL_x (cm)		0.7188				0.7188
		Fl_y (cm)		7.8222				7.8222
	$I_{pa.3}@MI_{max}$	(W/cm^2)	0.11907					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

Acoustic Output Reporting Table

Transducer Mode E743UA Operation Mode B+M Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.8577	0.0881	0.0183		0.0371	0.2521
Associated Acoustic Parameters	$P_{r.3}$ MPa		1.967					
	W_0 mW			8.2969	0.75		0.75	9.0469
	Min of[$W_{.3}(z1)$,(mW) $I_{ta.3}(z1)$]							
	Z_1 (cm)							
	Z_{bp} (cm)							
	Z_{sp} (cm)						2.9	
	$Z@PII_{.3max}$ (cm)		2.9					
	deq(Z_{sp}) (cm)						0.6139	
	f_c (MHz)		5.262	5.262	5.262		5.262	5.262
	Dim of Aaprt	X(cm)		1.344	1.344		1.344	1.344
		Y (cm)		0.6	0.6		0.6	0.6
Other Information	PD (usec)		0.3378					
	PRF (Hz)		2287					
	$P_r@PII_{max}$ (MPa)		3.005					
	$d_{eq}@PII_{max}$ (cm)						0.6132	
	Focal Length	FL_x (cm)		0.7188	0.7188			0.7188
		Fl_y (cm)		7.8222	7.8222			7.8222
	$I_{pa.3}@MI_{max}$(W/cm^2)		0.11907					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

Acoustic Output Reporting Table

Transducer Mode E743UA Operation Mode PW Mode

Index Label			MI	TIS			TIB	TIC
				Scan	Non-Scan		Non-scan	
					$A_{aprt} \leq 1$	$A_{aprt} > 1$		
Global Maximum Index Value			0.4087		0.9333		1.6167	0.8497
Associated Acoustic Parameters	$P_{r.3}$	MPa	0.9729					
	W_0	mW			39.88		39.88	39.88
	Min of[$W_{.3}(z1)$,$I_{ta.3}(z1)$]	(mW)						
	Z_1	(cm)						
	Z_{bp}	(cm)						
	Z_{sp}	(cm)					2.7	
	Z@PII$_{.3max}$	(cm)	2.7					
	deq(Z_{sp})	(cm)					0.0073	
	f_c	(MHz)	5.6718		5.6718		5.6718	5.6718
	Dim of Aaprt	X(cm)			1.344		1.344	1.344
		Y (cm)			0.6		0.6	0.6
Other Information	PD	(usec)	1.5072					
	PRF	(Hz)	6361					
	P_r@PII_{max}	(MPa)	2.7					
	d_{eq}@PII_{max}	(cm)					0.014	
	Focal Length	FL_x (cm)			0.5274			0.5274
		Fl_y (cm)			4.635			4.635
	$I_{pa.3}$@MI_{max}	(W/cm^2)	0.1431					
Control Conditions	Control1		AP=15; Frequency=6.0MHz; Depth=78mm; Focus=35mm;					

Chapter 3 Installation

WARNING

To prevent shock, do not remove any cover or panel. Should problems or malfunctions occur, unplug the power cord. Only qualified service personnel should carry out servicing and troubleshooting.

3.1. General Console Requirements

3.1.1. Console Environmental Requirements

Operating temperature	Operating humidity	Storage temperature	Operating humidity
+5 °C ~ +40 °C	25% RH ~ 80% RH non-condensing	-20 °C ~ +55 °C	25% RH ~ 93% RH non-condensing

Table 3-1 Environmental Requirements

3.1.2. Power Requirements

Voltage	Tolerances	Current	Frequency
100 V-240 V~	±10%	150 VA	50 Hz/60 Hz

Table 3-2 Power Requirements

WARNING

Connecting a DUS 60 system to the wrong voltage level may destroy the system.

3.2. Unpacking

Carefully remove foam packing material and plastic bag from the ultrasound unit.

3.3. Preparing for Installation

Compare the items received from the customer to those listed on the delivery order. Report any items that are missing, back ordered or damaged.

EMI Limitations

Ultrasound machines are susceptible to Electromagnetic Interference (EMI) from radio frequencies, magnetic fields, and transients in the air of wiring. Ultrasound machines also generate EMI. The DUS 60 complies with limits as stated on the EMC label. However, there is no guarantee that interference will not occur in a particular installation.

Possible EMI sources should be identified before the unit is installed.

EMI Rule	Prevention Tips
Be aware of RF sources	Keep the unit at least 5 meters or 15 feet away from other EMI sources. Special shielding may be required to eliminate interference problems caused by high frequency, high powered radio or video broadcast signals.
Ground the unit	Poor grounding is the most likely reason why a unit will have noisy images. Check grounding of the power cord and power outlet.
Replace all screws, RF gaskets, covers, cores	After you finish repairing or updating the system, replace all covers and tighten all screws. Any cable with an external connection requires a magnet wrap at each end. Install the shield over the front of card cage. Losing covers or RF gaskets will cause radio frequency interference with the ultrasound signals.
Do not place labels	Never place a label where RF gaskets meet the unit. Otherwise, the gap

where RF gaskets touch metal	created will permit RF leakage. Or, if a label has been found in such a position, move the label.
Use EDAN specified harnesses and peripherals	The interconnecting cables are grounded and require ferrite beads and other shielding. Also, cable length, material, and routing are all important; do not change from what is specified.
Take care with cellular phones	Cellular phones may transmit a 5V/m signal; that could cause image artifacts.
Properly dress peripheral cables	Do not allow cables hang out of the peripheral bays. Loop the excess length for peripheral cables inside the peripheral bays. Attach the monitor cables to the frame.

Table 3-3 EMI Prevention/Abatement

3.4. Connection of Auxiliary Devices

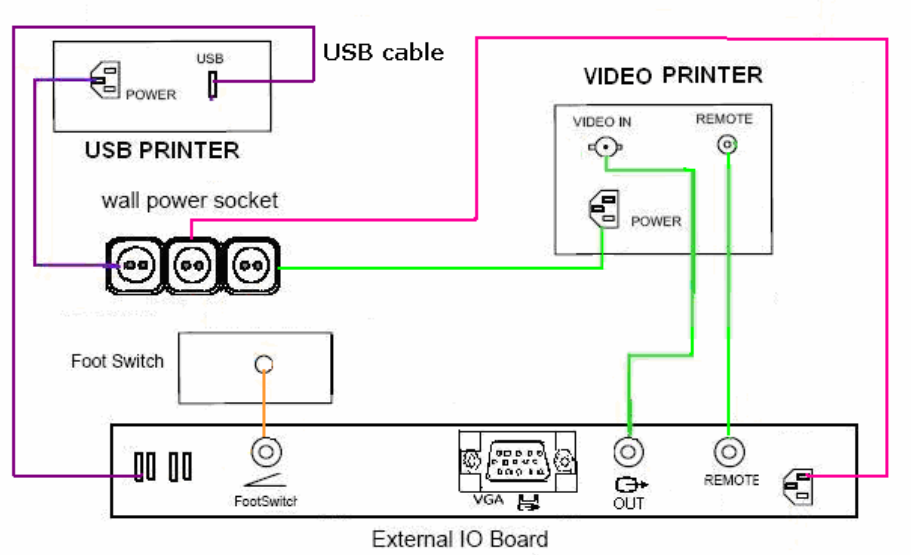


Figure 3-1 Connection of Peripherals

Device	Manufacturer	Model	Video Signal
Video printer	SONY	UP-895MD	PAL/NTSC
Video printer	SONY	UP-897MD	PAL/NTSC
Video printer	MITSUBISHI	P93W	PAL/NTSC
USB printer	HP	DeskJet D2368	USB-Port
USB printer	HP	DeskJet D2568	USB-Port
USB printer	HP	DeskJet D4368	USB-Port
USB printer	HP	LaserJet P2015	USB-Port
USB printer	HP	LaserJet P2035	USB-Port
USB printer	HP	DeskJet D5568	USB-Port
USB printer	HP	DeskJet D2668	USB-Port

Table 3-4 Approved Peripherals

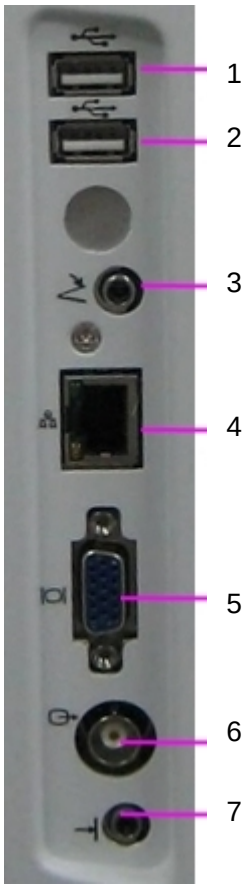


Figure 3-2 Peripheral Ports

1	USB port
2	USB port
3	Footswitch port
4	Network port
5	VGA output port
6	Video output port
7	Video print control--remote

3.5. Equipotential Bonding

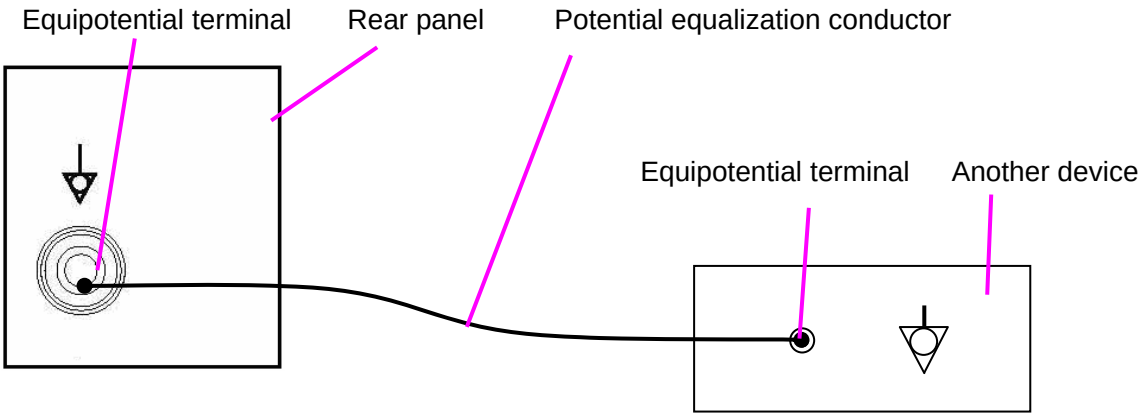


Figure 3-3 Equipotential Bonding

WARNING

1. Equipotential bonding: when the device is running with other instruments jointly, consideration should be given to equipotentiality.
2. Doctors and patients might be exposed to the hazardous and uncontrollable effects of compensating current caused by unbalanced equipotentiality between indoor medical device and touchable conducting parts. The safest solution is to build a unified equipotential network, to which the medical device is connected, using an angular plug.

3.6. Monitor Connection

The monitor comes already installed with the system. And the system can connect with peripheral monitor via the VGA port, shown in figure 3-4.

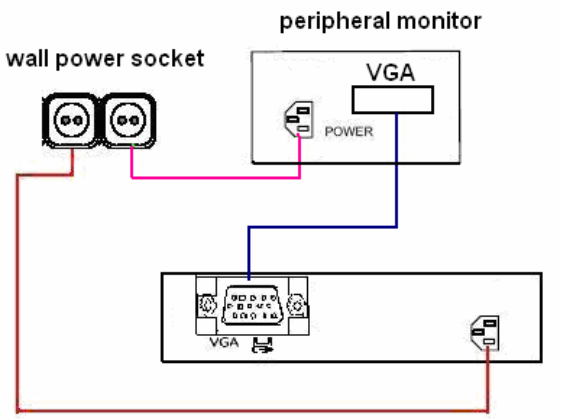


Figure 3-4 Connection of Peripheral Monitor

3.7. External USB-Devices

Connection:

When an external USB-storage device (such as a USB disk or an external hard disk) is connected to the DUS 60 system, the system detects the device and automatically installs a driver.

Disconnection:

Unplug or eject devices directly.

3.8. Transducer Connection

NOTE:

Ensure that the system is shut down or it is frozen before connecting and disconnecting transducers.

Flip images horizontally to change the scan direction or vertically to change the image orientation. The scan direction mark located at the side of probe indicates the beginning direction of scanning. The scan direction mark is shown in figure 3-5.

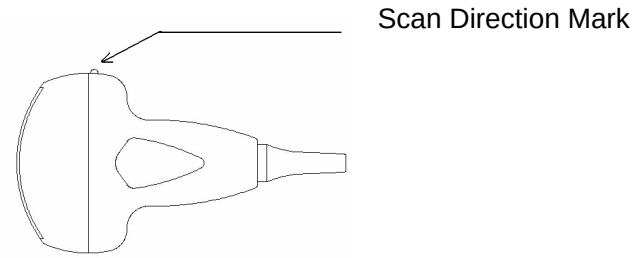


Figure 3-5 Probe Scan Direction Mark Schematic Diagram

There is information about Model and SN on the probe.

To connect a transducer:

1. Place the transducer's carrying case on a stable surface and open the case.
2. Carefully remove the transducer and unwrap the probe cable.
3. DO NOT allow the transducer head to hang free. Impact to the transducer head could result in irreparable damage.
4. Turn the connector locking handle counterclockwise to the horizontal position.
5. Align the connector with the transducer port and carefully push into place.
6. Turn the locking handle on the transducer connector clockwise to the vertical position. This ensures the connector in position and ensures the best possible contact.
7. Place the transducer in the transducer holder.

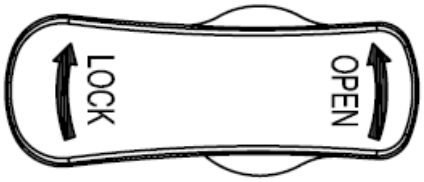


Figure 3-6 Lock and Open Marks on Probe Connectors

3.9. Configuration

3.9.1. Available Probes

See Chapter 7.3.5 Probes, for part numbers to be used when ordering new or replacement service probes.

3.9.2. Monitor Specifications

LCD: 12.1 inches

Pixel number: 1024*768

Power supply voltage: 3.3 V

	Ambient Temperature	Relative Humidity	Atmospheric Pressure
Operation	+5 °C ~ +40 °C	25%~80%	860 hPa-1060 hPa
Transportation	-20 °C ~ +55 °C	25%~93%	700 hPa-1060 hPa
Storage	-20 °C ~ +55 °C	25%~93%	700 hPa-1060 hPa

Table 3-5 Ambient Conditions

Inverter specifications:

Input voltage: DC12 V

Output voltage: AC1500 V

On control voltage: 5 V

Off control voltage: 0.3 V

WARNING

Dangerous voltage, do not touch the inverter when it's running.

3.9.3. Software/Option Configuration

Refer to the DUS 60 User Manual, Chapter 5.7.3 General Presetting, for information on configuring items like hospital name, language, date, time, date format, time format, etc.

For information on configuring user settings, refer to the DUS 60 User Manual, Chapter 5.7.4 – 5.7.8, for presetting information.

3.9.4. User Manual

Check that the correct user manual for the system and software revision is included with the installation. Specific language versions of the user manual may also be available.

Chapter 4 Components and Functions (Theory)

4.1. Description of the DUS 60 Operating Modes

B Mode

B mode is a two-dimensional image of the amplitude of the echo signal. It is used for location and measurement of anatomical structure and for spatial orientation during operation in other modes. Ultrasound echoes of different intensities are mapped to different gray scales on the screen.

M Mode

In M-mode, soft tissue structure is presented as scrolling display, with depth on the Y-axis and time on the X-axis. It is used primarily for cardiac measurements such as value timing on septal wall thickness when accurate timing information is required. M-mode is also known as T-M mode or time-motion mode. M-mode displays time notion information of the ultrasound data derived from a stationary beam. Depth is arranged along the vertical axis with time along the horizontal axis. M-mode is normally used in conjunction with a 2D image for spatial reference. The 2D image has a graphical line (M-line) superimposed on the 2D image indicating where the M-mode beam is located.

PW Mode

A pulsed-wave Doppler (PW) scan produces a series of pulsed used to study the motion of blood flow in a small region along a desired scan line, called the sample volume.

The X-axis of the graph represents time, and the Y-axis represents Doppler frequency shift. The shift in frequency between successive ultrasound pulses, caused mainly by moving red blood cells, can be converted into velocity and flow if an appropriate angle between the insonating beam and blood flow is known.

Shades of gray in the spectral display represent the strength of the signal. The thickness of the spectral signal is indicative of laminar or turbulent flow (laminar flow typically shows a narrow band of blood flow information).

4.2. Principle Block Diagram

The DUS 60 is composed of probe, front end, ultrasound echo signal processing, video overlay, CPU system control, power, peripheral equipment, etc., which is shown in figure 4-1.

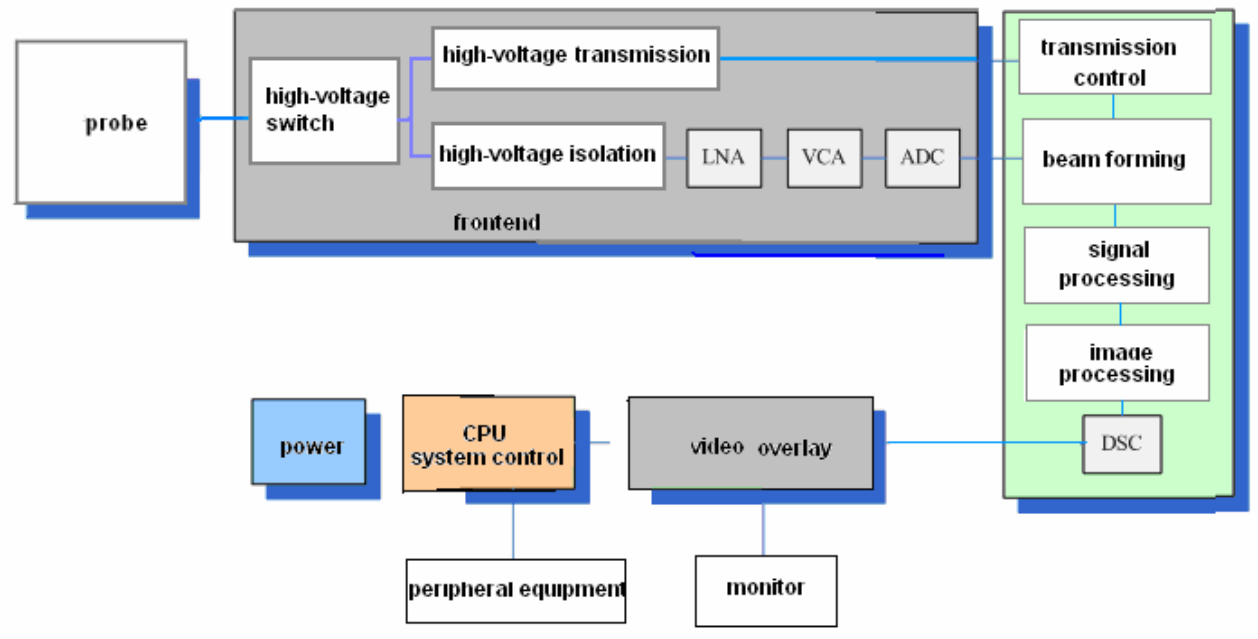


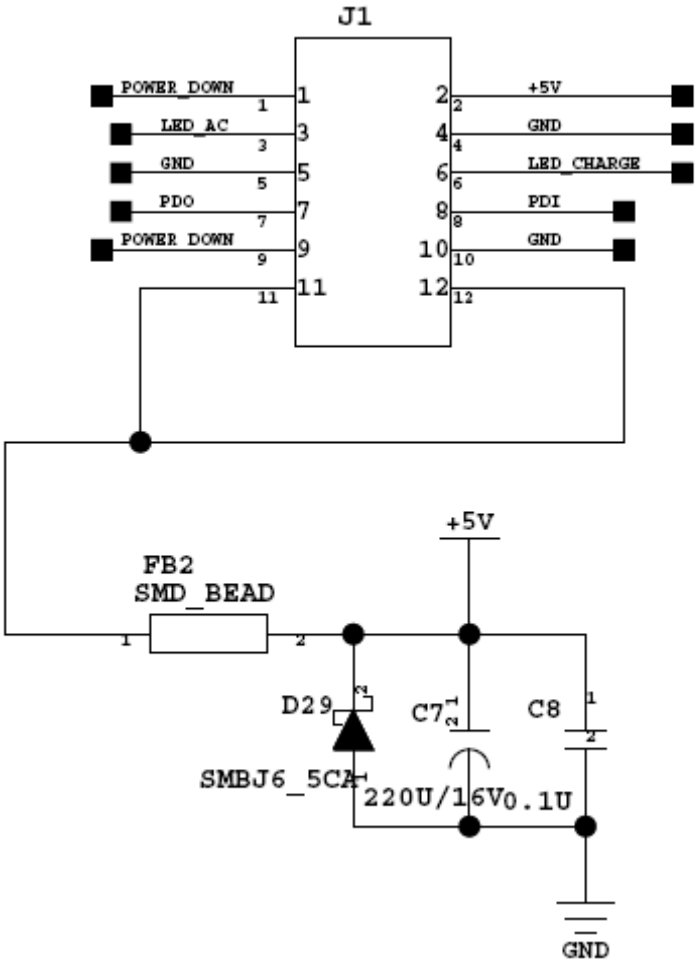
Figure 4-1 Principle Block Diagram

- The following technologies were adopted in this equipment, which achieves wider focus area and richer information in image:
  - This device adopts 4-sector dynamic focusing which can be combined conveniently and provides higher resolving power.
  - Pretreatments to echoes are implemented, such as dynamic low-noise preamplifier, dynamic logarithm compressing, TGC control, filtering and so on.
  - Some digital related processing is adopted, such as gamma correction curves, pretreatment, frame correlation, line correlation, Digital Scanning Conversion, post-processing (sharpening and data insertion) and so on.
  - Many functions are adopted, for example, the system can flip images up and down, and flip left and right, the depth can be adjusted, and it can also CINE Review. High frequency generator ensures the best resolution of the image.
- Probe of high density and wide frequency bandwidth improves the image quality greatly.
- Alternating current is adopted, which brings the power with good applicability.
- Keyboard is well-designed according with man-machine principle, which fits user's requirement much better.

4.2.1. Keyboard Board

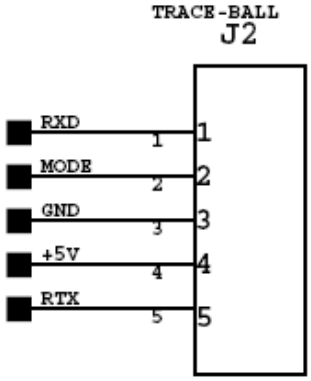
Definitions of Keyboard board

Interface connected to the main board –J1



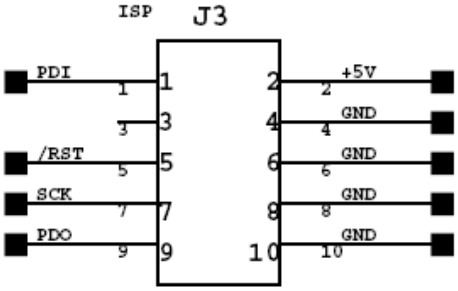
Pin No.	**1**	**2**	**3**
Symbol	**POWER DOWN**	**+5V**	**LED AC**
Pin No.	**4**	**5**	**6**
Symbol	**GND**	**GND**	**LED CHARGE**
Pin No.	**7**	**8**	**9**
Symbol	**PDO**	**PDI**	**POWER DOWN**
Pin No.	**10**	**11**	**12**
Symbol	**GND**	**+5V**	**+5V**

Interface connected to the trackball –J2



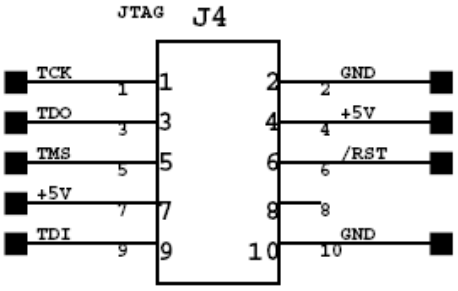
Pin No.	Symbol
1	**RXD**
2	**MODE**
3	**GND**
4	**+5V**
5	**RTX**

Interface connected to the main board –J3 (to download program)



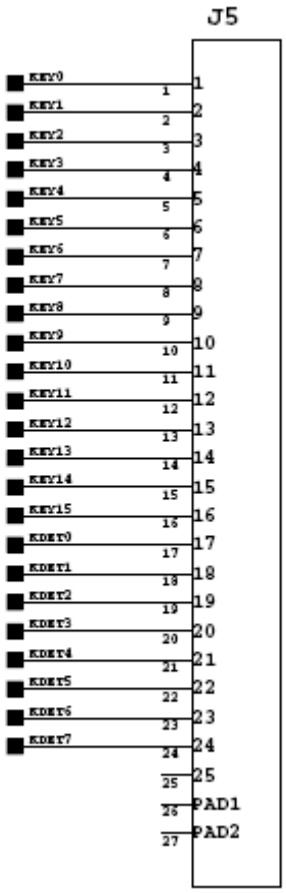
Pin No.	Symbol	Pin No.	Symbol
1	**PDI**	**2**	**+5V**
3	**reserved**	**4**	**GND**
5	**/RST**	**6**	**GND**
7	**SCK**	**8**	**GND**
9	**PDO**	**10**	**GND**

Interface connected to the main board –J4 (to download program)



Pin No.	Symbol	Pin No.	Symbol
1	**TCK**	**2**	**GND**
3	**TDO**	**4**	**+5V**
5	**TMS**	**6**	**/RST**
7	**+5V**	**8**	**reserved**
9	**TDI**	**10**	**GND**

Interface connected to the standard PC board –J5

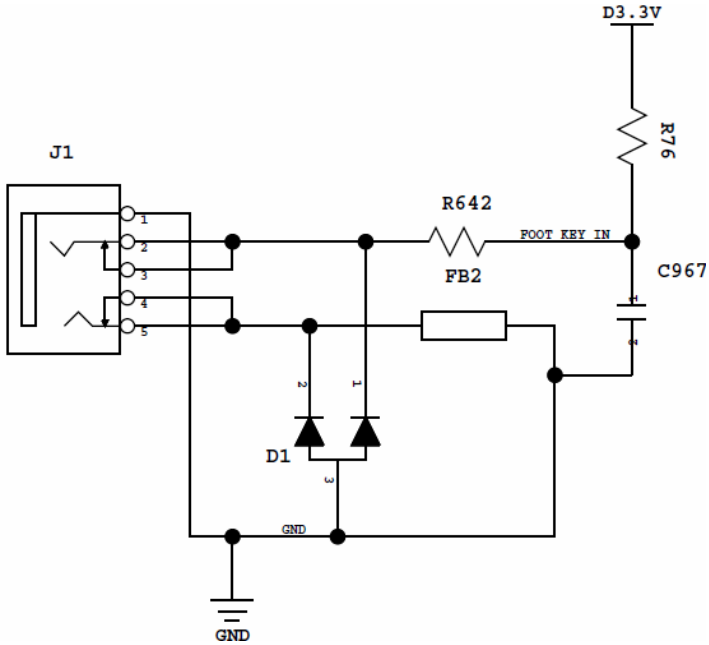


Pin No.	Symbol	Pin No.	Symbol
1	**KEY0**	**2**	**KEY1**
3	**KEY2**	**4**	**KEY3**
5	**KEY4**	**6**	**KEY5**
7	**KEY6**	**8**	**KEY7**
9	**KEY8**	**10**	**KEY9**
11	**KEY10**	**12**	**KEY11**
13	**KEY12**	**14**	**KEY13**
15	**KEY14**	**16**	**KEY15**
17	**KDET0**	**18**	**KDET1**
19	**KDET2**	**20**	**KDET3**
21	**KDET4**	**22**	**KDET5**
23	**KDET6**	**24**	**KDET7**
25	**reserved**	**PAD1**	
PAD2		**/**	**/**

4.2.2. Main Board

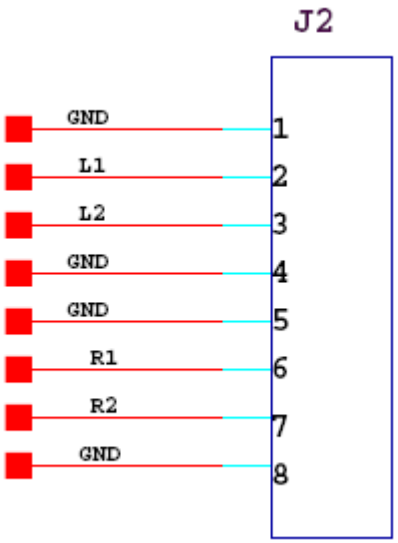
Definitions of Mainboard (V0.002)

Interface connected to the foot switch –J1



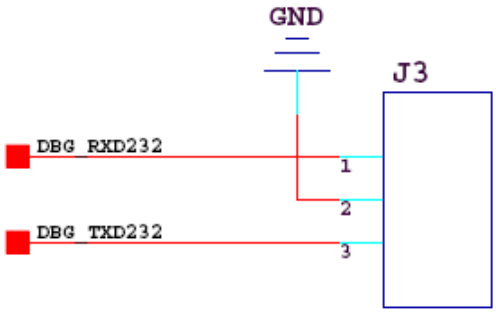
Pin No.	Symbol	Pin No.	Symbol
1	**GND**	**2**	**D3.3V**
3	**D3.3V**	**4**	**GND**
5	**GND**	/	/

Interface connected to the loudspeaker –J2



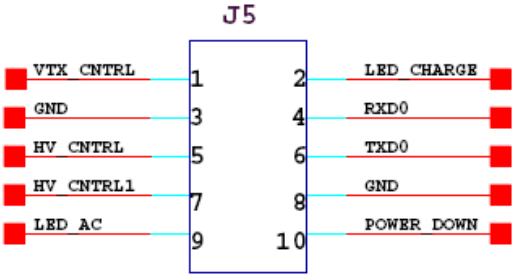
Pin No.	Symbol	Pin No.	Symbol
1	**GND**	**2**	**L1**
3	**L2**	**4**	**GND**
5	**GND**	**6**	**R1**
7	**R2**	**8**	**GND**

Connector for debugging programming –J3



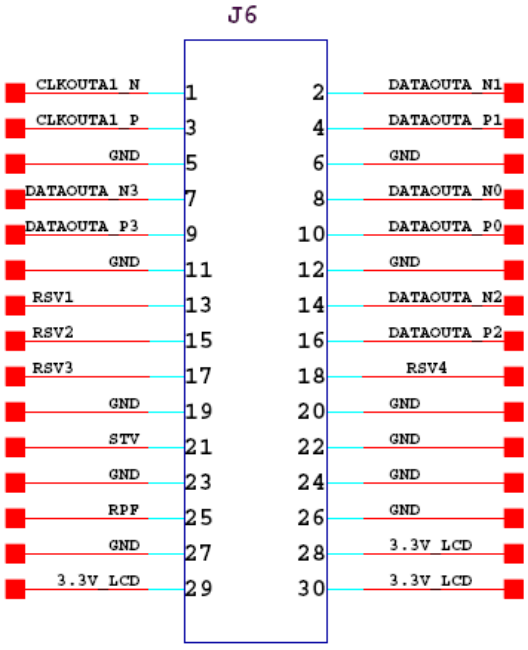
Pin No.	Symbol
1	**DBG_RXD232**
2	**GND**
3	**DBG_TXD232**

Power control -J5



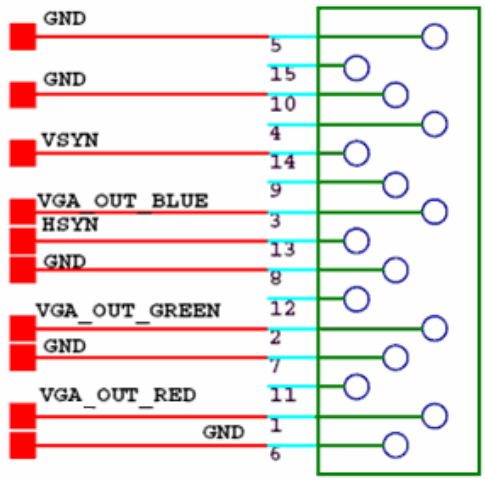
Pin No.	Symbol	Pin No.	Symbol
1	**VTX_CNTRL**	**2**	**LED_CHARGE**
3	**GND**	**4**	**RXD0**
5	**HV_CNTRL**	**6**	**TXD0**
7	**HV_CNTRL1**	**8**	**GND**
9	**LED_AC**	**10**	**POWER_DOWN**

Interface connected to the LCD –J6 (LCD data port)



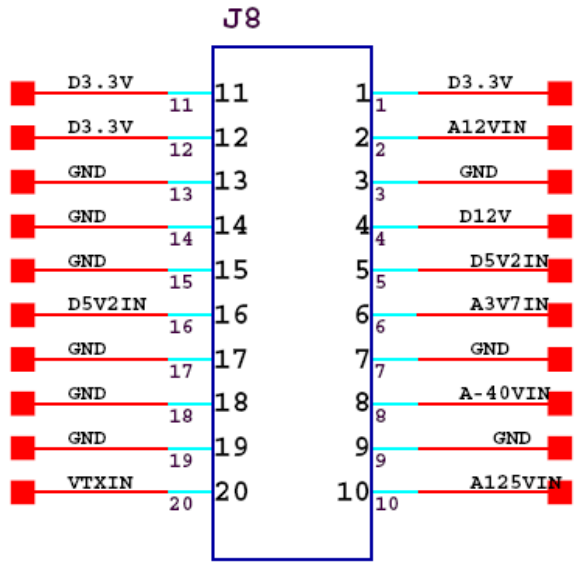
Pin No.	Symbol	Pin No.	Symbol
1	**CLKOUTA1_N**	**2**	**CLKOUTA_N1**
3	**CLKOUTA1_P**	**4**	**CLKOUTA_P1**
5	**GND**	**6**	**GND**
7	**CLKOUTA_N3**	**8**	**CLKOUTA_N0**
9	**CLKOUTA_P3**	**10**	**CLKOUTA_P0**
11	**GND**	**12**	**GND**
13	**RSV1**	**14**	**CLKOUTA_N2**
15	**RSV2**	**16**	**CLKOUTA_P2**
17	**RSV3**	**18**	**RSV4**
19	**GND**	**20**	**GND**
21	**STV**	**22**	**GND**
23	**GND**	**24**	**GND**
25	**RPF**	**26**	**GND**
27	**GND**	**28**	**3.3V_LCD**
29	**3.3V_LCD**	**30**	**3.3V_LCD**

Interface connected to the VGA –J7



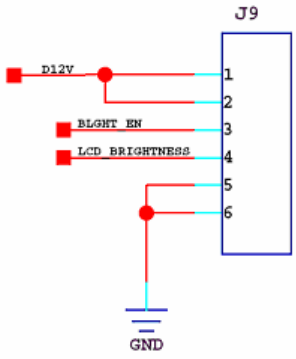
Pin No.	Symbol	Pin No.	Symbol
1	**VGA_OUT_RED**	**2**	**VGA_OUT_GREEN**
3	**VGA_OUT_BLUE**	**4**	**reserved**
5	**GND**	**6**	**GND**
7	**GND**	**8**	**GND**
9	**reserved**	**10**	**GND**
11	**reserved**	**12**	**reserved**
13	**HSYN**	**14**	**VSYN**
15	**reserved**	**/**	**/**

Interface connected to the power board –J8



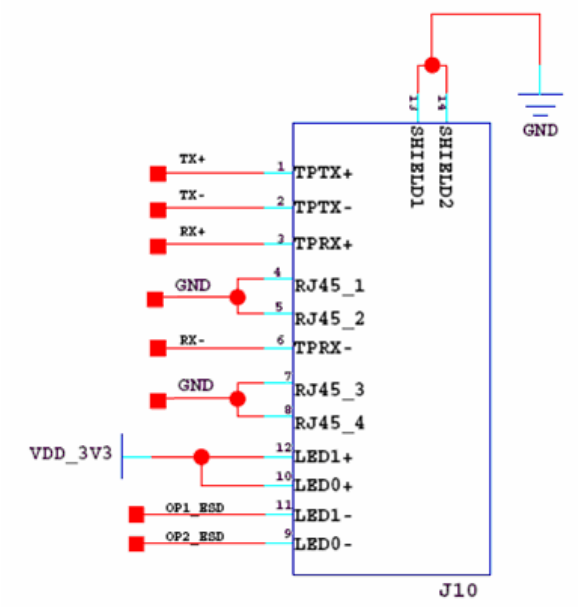
Pin No.	Symbol	Pin No.	Symbol
1	**D3.3V**	**2**	**A12VIN**
3	**GND**	**4**	**D12V**
5	**D5V2IN**	**6**	**A3V7IN**
7	**GND**	**8**	**A-40VIN**
9	**GND**	**10**	**A125VIN**
11	**D3.3V**	**12**	**D3.3V**
13	**GND**	**14**	**GND**
15	**GND**	**16**	**D5V2IN**
17	**GND**	**18**	**GND**
19	**GND**	**20**	**VTXIN**

Interface connected to the inverter (to control the LCD backlight) –J9



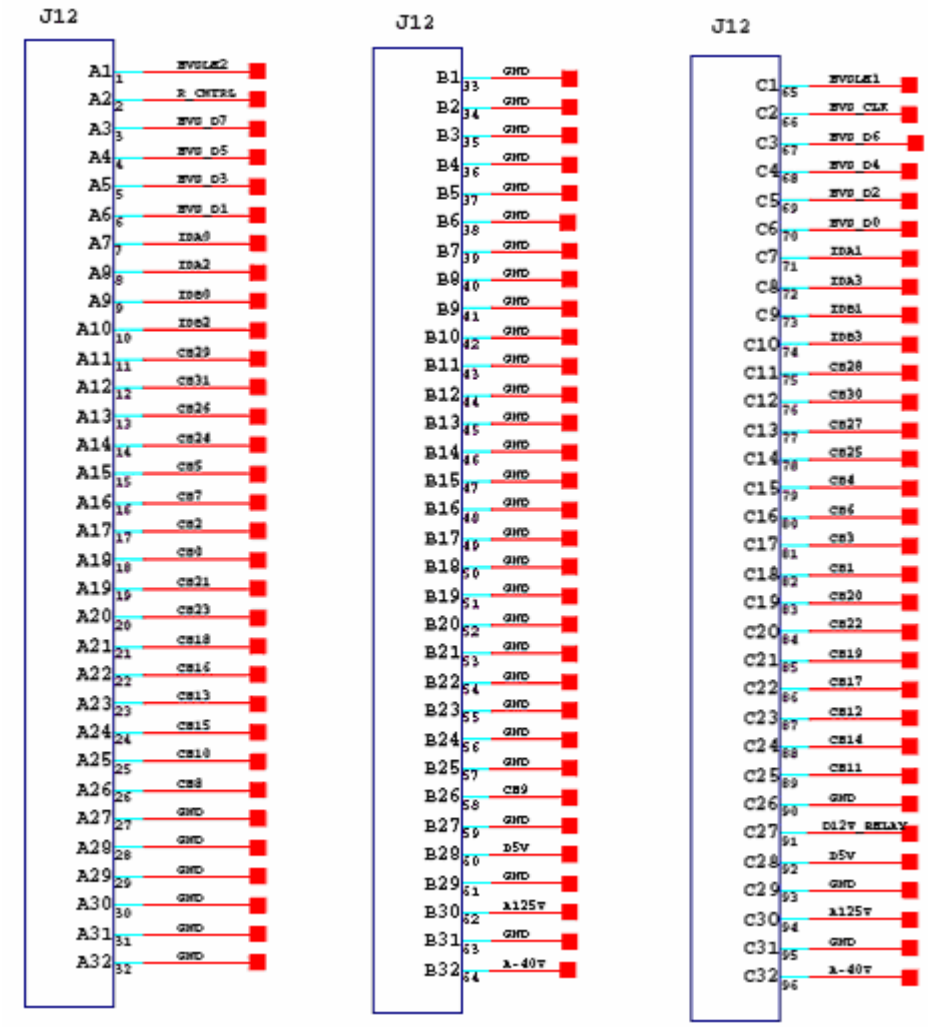
Pin No.	Symbol
1	**D12V**
2	**D12V**
3	**BLGHT_EN**
4	**LCD_BRIGHTNESS**
5	**GND**
6	**GND**

Network port -J10



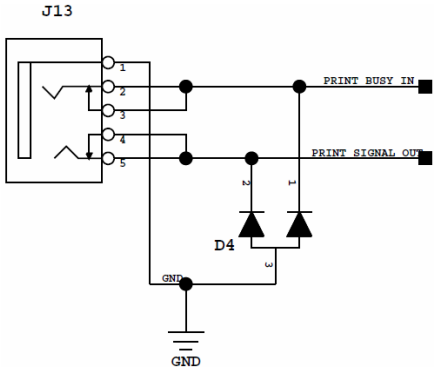
Pin No.	Symbol	Pin No.	Symbol
1	**TX+**	**2**	**TX-**
3	**RX+**	**4**	**GND (through capacitance)**
5	**GND (through capacitance)**	**6**	**RX-**
7	**GND (through capacitance)**	**8**	**GND (through capacitance)**
9	**OP2 ESD**	**10**	**VDD_3V3**
11	**OP1 ESD**	**12**	**VDD_3V3**
13	**GND**	**14**	**GND**

Interface connected to the mother board –J12



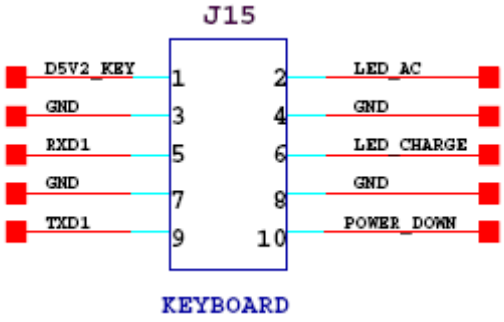
Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
A1	HVSLE2	B1	GND	C1	HVSLE1
A2	R_CNTRL	B2	GND	C2	HVS_CLK
A3	HVS_D7	B3	GND	C3	HVS_D6
A4	HVS_D5	B4	GND	C4	HVS_D4
A5	HVS_D3	B5	GND	C5	HVS_D2
A6	HVS_D1	B6	GND	C6	HVS_D0
A7	IDA0	B7	GND	C7	IDA1
A8	IDA2	B8	GND	C8	IDA3
A9	IDB0	B9	GND	C9	IDB1
A10	IDB2	B10	GND	C10	IDB3
A11	CH29	B11	GND	C11	CH28
A12	CH31	B12	GND	C12	CH30
A13	CH26	B13	GND	C13	CH27
A14	CH24	B14	GND	C14	CH25
A15	CH5	B15	GND	C15	CH4
A16	CH7	B16	GND	C16	CH6
A17	CH2	B17	GND	C17	CH3
A18	CH0	B18	GND	C18	CH1
A19	CH21	B19	GND	C19	CH20
A20	CH23	B20	GND	C20	CH22
A21	CH18	B21	GND	C21	CH19
A22	CH16	B22	GND	C22	CH17
A23	CH13	B23	GND	C23	CH12
A24	CH15	B24	GND	C24	CH14
A25	CH10	B25	GND	C25	CH11
A26	CH8	B26	CH9	C26	GND
A27	GND	B27	GND	C27	C12V_RELAY
A28	GND	B28	D5V	C28	D5V
A29	GND	B29	GND	C29	GND
A30	GND	B30	A125V	C30	A125V
A31	GND	B31	GND	C31	GND
A32	GND	B32	A-40V	C32	A-40V

Print remote port –J13



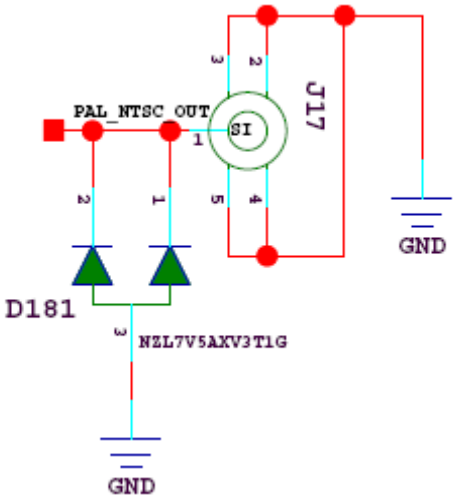
Pin No.	Symbol
1	**GND**
2	**PRINT_BUSY_IN**
3	**PRINT_BUSY_IN**
4	**PRINT_SIGNAL_OUT**
5	**PRINT_SIGNAL_OUT**

Interface connected to the keyboard board –J15



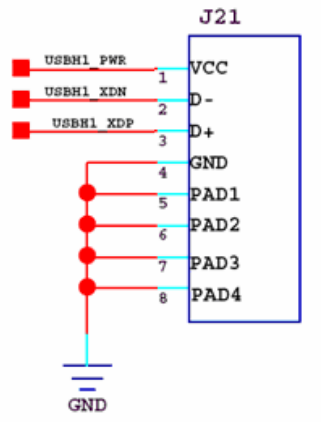
Pin No.	Symbol	Pin No.	Symbol
1	**D5V2_KEY**	**2**	**LED_AC**
3	**GND**	**4**	**GND**
5	**RXD1**	**6**	**LED_CHARGE**
7	**GND**	**8**	**GND**
9	**TXD1**	**10**	**POWER_DOWN**

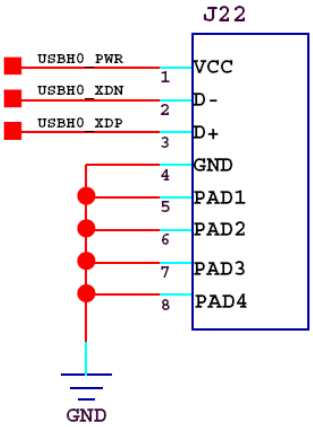
Video out port –J17



Pin No.	Symbol
1	**PAL_NTSC_OUT**
2	**GND**
3	**GND**
4	**GND**
5	**GND**

USB ports –J21, J22





Pin No.	Symbol	Pin No.	Symbol
1	**USBH1_PWR**	**5**	**GND**
2	**USBH1_XDN**	**6**	**GND**
3	**USBH1_XDP**	**7**	**GND**
4	**GND**	**8**	**GND**

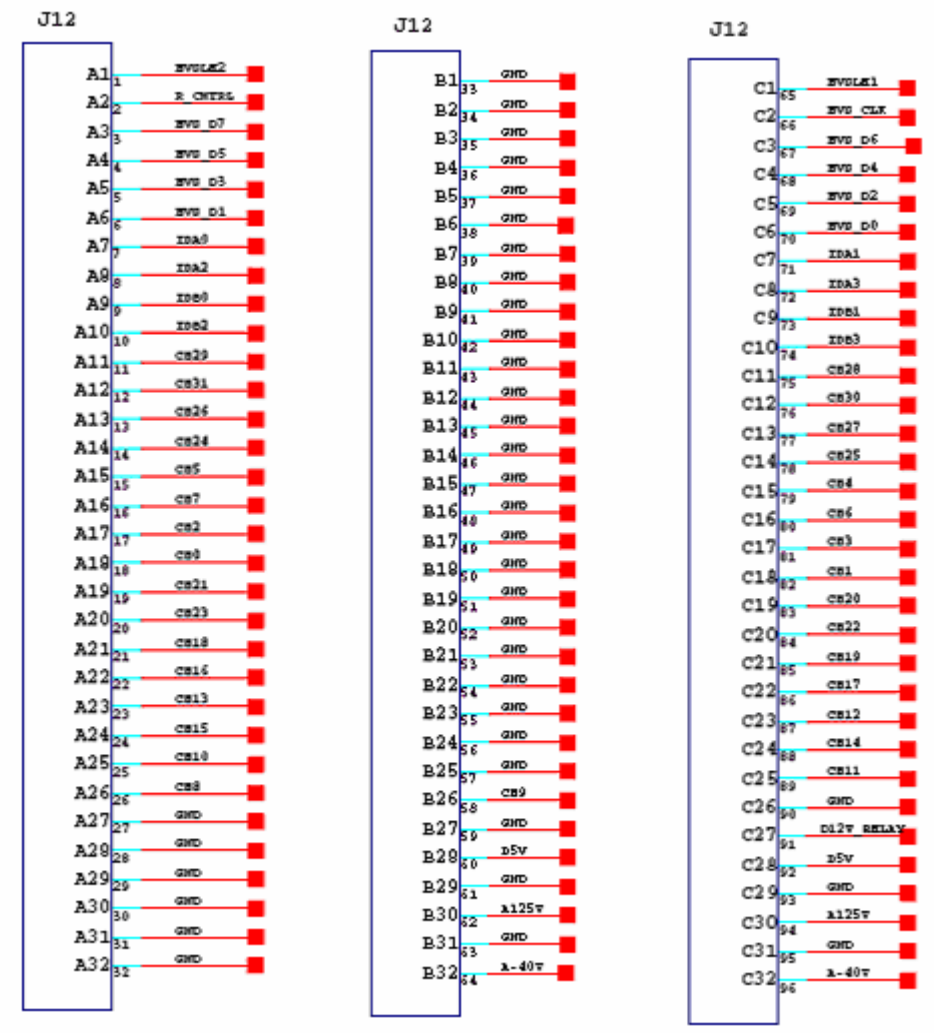
Pin No.	Symbol	Pin No.	Symbol
1	**USBH0_PWR**	**5**	**GND**
2	**USBH0_XDN**	**6**	**GND**
3	**USBH0_XDP**	**7**	**GND**
4	**GND**	**8**	**GND**

4.2.4. Mother Board

Definitions of mother board interfaces

Interface connected to the main board –J1

The definitions of the J1 are same as those of J12 on the main board.



Pin No.	Symbol	Pin No.	Symbol	Pin No.	Symbol
A1	HVSLE2	B1	GND	C1	HVSLE1
A2	R_CNTRL	B2	GND	C2	HVS_CLK
A3	HVS_D7	B3	GND	C3	HVS_D6
A4	HVS_D5	B4	GND	C4	HVS_D4
A5	HVS_D3	B5	GND	C5	HVS_D2
A6	HVS_D1	B6	GND	C6	HVS_D0
A7	IDA0	B7	GND	C7	IDA1
A8	IDA2	B8	GND	C8	IDA3
A9	IDB0	B9	GND	C9	IDB1
A10	IDB2	B10	GND	C10	IDB3
A11	CH29	B11	GND	C11	CH28
A12	CH31	B12	GND	C12	CH30
A13	CH26	B13	GND	C13	CH27
A14	CH24	B14	GND	C14	CH25
A15	CH5	B15	GND	C15	CH4
A16	CH7	B16	GND	C16	CH6

A17	CH2	B17	GND	C17	CH3
A18	CH0	B18	GND	C18	CH1
A19	CH21	B19	GND	C19	CH20
A20	CH23	B20	GND	C20	CH22
A21	CH18	B21	GND	C21	CH19
A22	CH16	B22	GND	C22	CH17
A23	CH13	B23	GND	C23	CH12
A24	CH15	B24	GND	C24	CH14
A25	CH10	B25	GND	C25	CH11
A26	CH8	B26	CH9	C26	GND
A27	GND	B27	GND	C27	C12V_RELAY
A28	GND	B28	D5V	C28	D5V
A29	GND	B29	GND	C29	GND
A30	GND	B30	A125V	C30	A125V
A31	GND	B31	GND	C31	GND
A32	GND	B32	A-40V	C32	A-40V

Interface connected to the probe socket board --J2

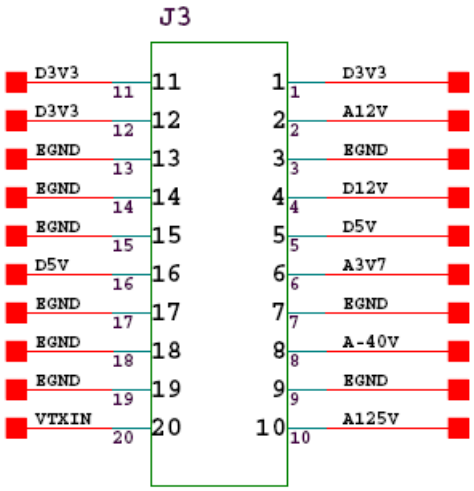
4.2.4. Power Board

Definitions of power board interfaces

NOTE:

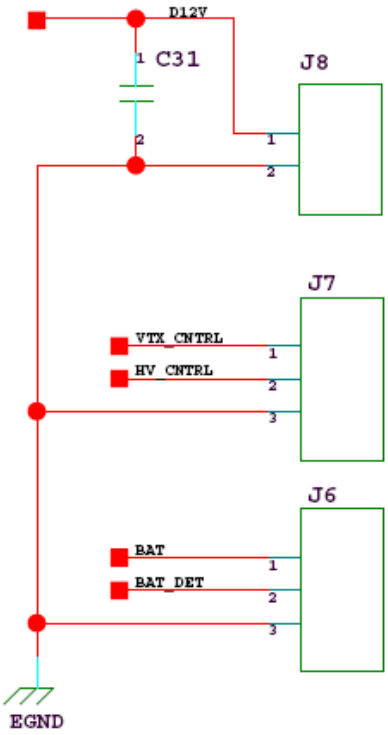
Please refer to section *6.6.4 Inspection and Maintenance on PCB* for more information.

Interface connected to the main board –J3



PIN NO.	1	2	3	4	5
Symbol	D3V3	A12V	EGND	D12V	D5V
PIN NO.	6	7	8	9	10
Symbol	A3V7	EGND	A-40V	EGND	A125V
PIN NO.	11	12	13	14	15
Symbol	D3V3	D3V3	EGND	EGND	EGND
PIN NO.	16	17	18	19	20
Symbol	D5V	EGND	EGND	EGND	VTXIN

J6, J7, J8



J8			J7			J6		
PIN NO.	1	2	1	2	3	1	2	3
Symbol	D12V	EGND	VTX_CNTRL	HV_CNTRL	EGND	BAT	BAT_DET	EGND

4.3. Connection Block Diagram

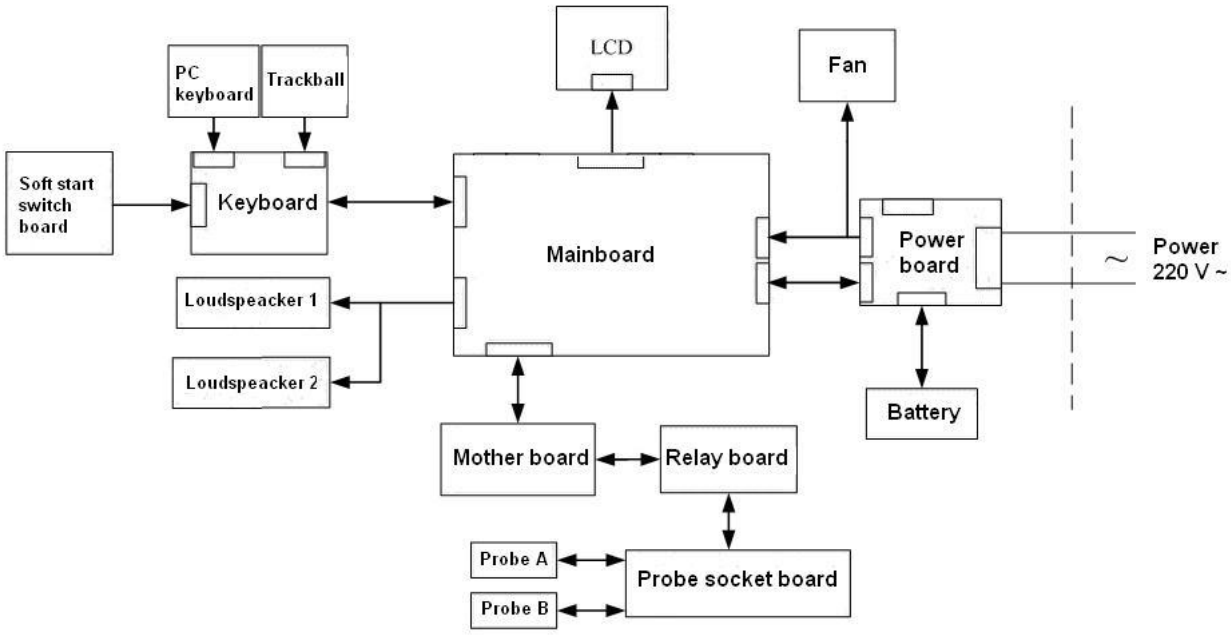


Figure 4-2 Connection Block Diagram

4.4. Functional Checks

CAUTION

System requires all covers. Operate this unit only when all board covers and frame panels are securely in place. Then covers are required for safe operation, good system performance and cooling purposes.

4.4.1. System Features

- Measurement and calculation in abdomen, gynecology, urology, cardiology, hypothyroid, galactophore, and other apparatus.
- In addition to the measurement of such parameters as distance, circumference, area, volume, angle, heart rate, slope, movement speed, time etc., and the measurement of fetus parameters such as weight, gestation week and expected date of childbirth is included.
- Can equip the equipment with wide frequency band or frequency alterable electronic convex array probe, electronic linear probe and cavity probe.
- 4 focuses can be set at will to get a vivid and well-proportioned image.
- In B mode, you can select the expected area, and zoom in the area using the **zoom** function.
- The CINE review function gives doctors more operation freedom, which can play the dynamic images forward and backward or frame-by-frame.
- Display language can be switched among Chinese, English, French, Spanish, etc. (The language options varies with language software installed.) freely. Prompt function facilitates doctors to operate this equipment. Character note can be inserted at any position in the image.
- Puncture leading line is possessed.
- External video printer and ultrasound station can be connected to this equipment.

4.4.2. Function Checks

- **B mode checks**

Step	Task	Expected Results
1	Contrast	Rotate the contrast Knob to adjust the contrast of the entire image.
2	Brightness	Rotate the brightness Knob to adjust the brightness of the entire image.
3	Gain	Rotate the Gain Knob to adjust the sensitivity (brightness) of the entire image.
4	Acoustic Power	Optimizes image quality and allows user to reduce beam intensity.
5	Depth	Use this control to adjust the depth to form the tissue image.
6	Image Orientation	Use the left / right and the up / down keys on the control panel to alternate the image orientation.
7	Frequency	To adjust the range of the receive frequency. High resolution / lower penetration, mid resolution / mid penetration, low resolution / high penetration.
8	TSI	TSI allows to “fine tune” the system for scanning different kinds of tissue.

9	Zoom	The displayed zoom box can be placed over the entire B image area, also the size and the position of the zoom box can be changed.
10	THI	Press this key on the control panel to switch on / off the Tissue Harmonic Image function in B mode provided the active probe allows this function.
11	Focus Number	Increase the number of transmit focal zone, so that you can tighten up the beam for a specific area.
12	Focus Position	To select the depth position of the actual focus zone(s). Arrows at the left edge of the B image mark the active focal zone(s) by their depth position.
13	Angle	Use this control to select a part of interest of the B image. The advantage of the decreased field-of-view is an increased B frame rate due to the smaller sector width.
14	Scan mode	Use this control to select the scan mode, high density or high frequency.
15	Screen Format 	Press these keys to change the display mode from single B to dual, or quad display mode.
16	Dynamic Range	Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.
17	Edge Enhance	This brings out subtle tissue differences and boundaries by enhancing the gray scale differences corresponding to the edges of structures. Adjustments to B mode's edge enhancement affects the B mode only.
18	Smooth	This has the effect of presenting a smoother image.
19	Persist	This is a temporal filter that averages frames together. This has the effect of presenting a smoother, softer image.
20	Line Average	This is a temporal filter that averages lines together.
21	Rejection	Selects a level below which echoes will not be amplified (an echo must have a certain minimum amplitude before it will be processed.)
22	Gray Map	Selects a level.

Table 4-1 B mode checks

◆ B/M mode and M mode checks

Step	Task	Expected Results
1	M mark	To make the fixed M mark turn to be adjustable in the B image.
2	Gain	Rotate the Gain Knob to adjust the sensitivity (brightness) of the entire image.
3	Acoustic Power	Optimizes image quality and allows user to reduce beam intensity.
4	Depth	Common with B mode Depth.
5	M Sweep	By adjusting up or down, four different sweep speeds can be selected.
6	Frequency	To adjust the range of the receive frequency. High resolution / lower penetration, mid resolution / mid penetration, low resolution / high penetration.
7	Scan Mode	Use this control to select the scan mode, high density or high frequency.

8	Screen format	Press these keys to change the display mode from B/M, or M display mode.
9	Dynamic Range	Dynamic Range controls how echo intensities are converted to shades of gray, thereby increasing the adjustable range of contrast.
10	Edge Enhance	Due to this function a finer, sharper impression of the image is produced.
11	Rejection	It determines the amplitude-level below which echoes are suppressed (rejected).
12	Gray Map	Selects a level.

Table 4-2 M mode checks

4.4.3. Calculations and Worksheet Pages

The DUS 60 supports calculation packages and applications-oriented patient reports for following applications: abdominal, obstetrical, small parts, gynecological, orthopedic, cardiac, and urological calculations.

NOTE:

Confirm that the patient information is correct and the probe and application are selected properly.

For further details refer to the DUS 60 user manual, Chapter 7 to Chapter 12.

4.4.4. Probe/Connectors Usage

◆ Activating the probe

While multiple transducers can be connected to the ultrasound system, only one can be activated at a time.

Press **Probe** repeatedly to cycle through the transducers currently connected to the system. The type of the activated transducer is displayed in the top corner of the screen.

◆ Deactivating the probe

When deactivating the probe, the probe is automatically placed in standby mode.

1. Press **Freeze**.
2. Gently wipe the excess gel from the face of the probe. (Refer to the DUS 60 user manual，13.3.2 for complete cleaning instructions.)
3. Carefully slide the probe around the right side of the keyboard, toward the probe holder. Ensure that the probe is placed gently in the probe holder.

◆ Disconnecting the probe

Prior to disconnect a probe switch the unit off.

CAUTION

If a probe is disconnected while running, a software error may occur. In this case switch the unit off (perform a restart).

1. Turn the locking handle on the connector housing counterclockwise to the horizontal position.
2. Firmly grasp the transducer connector and carefully remove it from the system port.
3. Store each transducer in its protective carrying case.

4.5. File Management

Perform the file management as described in section 6.8 of the DUS 60 user manual.

4.6. Software Configuration Checks

Press **File** and select **Preset**, and then enter the **General Preset** to display the general preset dialog box, this offers different items to check:

Item	Task	Expected Result(s)
1	General: Check Date and Time setting	Date and Time are correct
2	General: Check the Hospital Name is correct.	Hospital Name is correct
3	General: Check Language settings	desired Language is displayed
4	General: Check assignment of Printer	desired printer is correct

Press **Patient Info** to display the patient information dialog box, this offers different items to check:

Item	Task	Expected Result(s)
1	User Settings: Check settings of Name	Patient name is correct
2	User Settings: Check settings of ID	Patient ID is correct
3	User Settings: Check all the User Settings	Settings assigned as desired by the customer

Press **File** and select **Preset**, and then enter the every exam preset to display the corresponding preset dialog box, this offers different items to check:

Item	Task	Expected Result(s)
1	Application Parameters: Check all settings for all applications	setting assigned as desired by the customer

Press **File** and select **Preset**, and then enter formula preset to display the formula preset dialog box, this offers different items to check:

Item	Task	Expected Result(s)
1	Global Parameters: Check all settings	Settings assigned as desired by the customer

4.7. Peripheral Checks

Check that peripherals work as described below:

Item	Task	Expected Result(s)
1	Press **Print** on the report page	The report is printed on printer.
2	Press **Print** on the control panel	The image displayed on the screen is printed on printer.
3	Check the VGA monitor	The monitor displays the layout in normal.
4	Check the video monitor	The monitor displays the image in normal.

Chapter 5 Disassembly

5.1. Main Structure

Figure 5-1 DUS 60 Main Structure

1. Switch of the keyboard 2. Main unit
3. Coupling gel 4. Probe

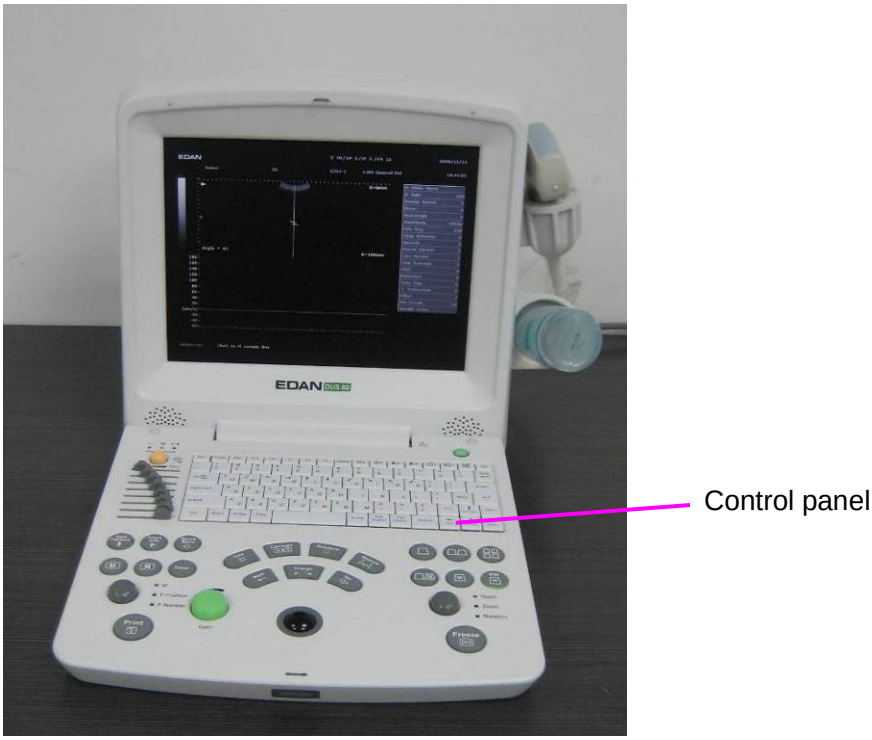


Figure 5-2 DUS 60 Appearance

Figure 5-3 DUS 60 Left View

Figure 5-4 DUS 60 Right View

Figure 5-5 DUS 60 Rear View

The DUS 60 is consisted with power board, mainboard, mother board, relay board, probe socket board, and battery socket board, etc.

5.2. Disassembly

Before disassembling the unit, please make sure that:

- Make sure there is an engineer or technician approved by EDAN;
- The power supply has been cut off;
- Probes and any external components have be taken down.

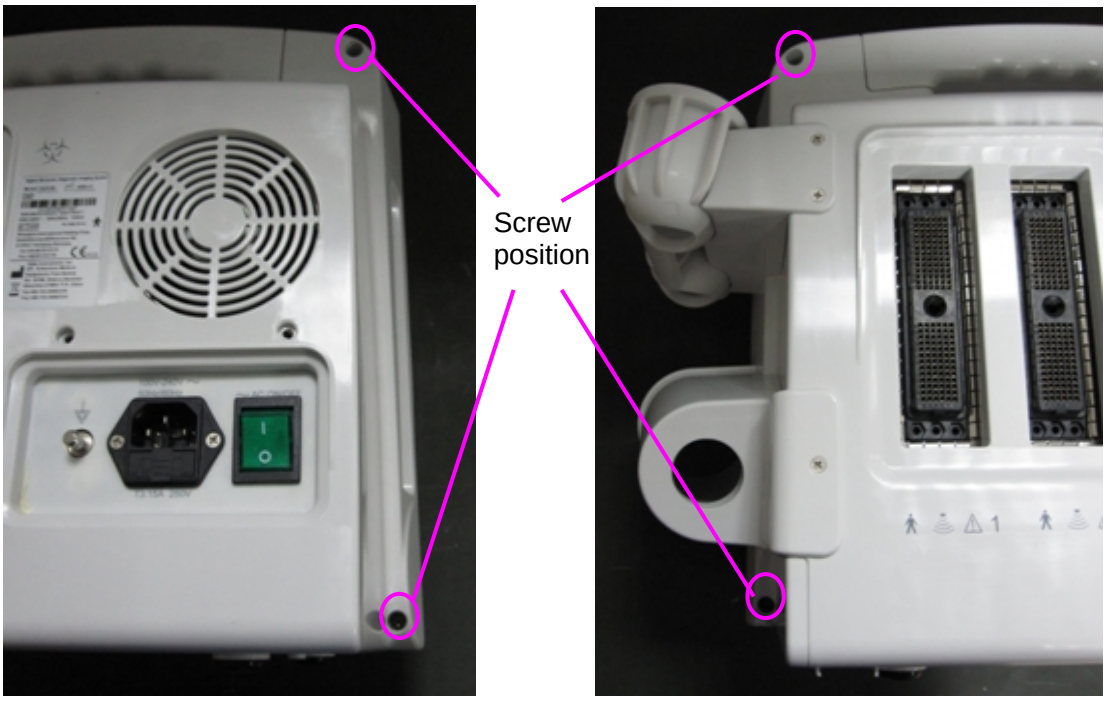
Tools: screw driver, tweezers, and pincers

5.2.1. Keyboard Module

Step 1. Put the system on a flat table;

Step 1

Step 2. Overturn the system to make the rear side up, and unscrew the four screws on the rear panel of the system;

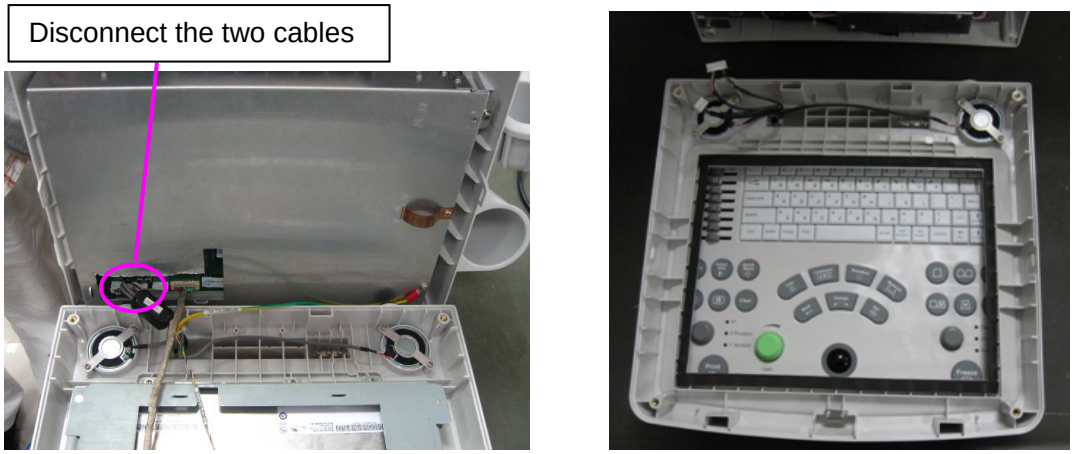


Step 2

Step 3. Overturn the system to make the right panel up, and open the coping;

Step 3 Press the right part marked on the photo above and push the left part leftwards

Step 4. Overturn the system to the normal position, disconnect the two cables to separate the two pars;



Step 4

Step 5. Press the keyboard switch;

Step 5

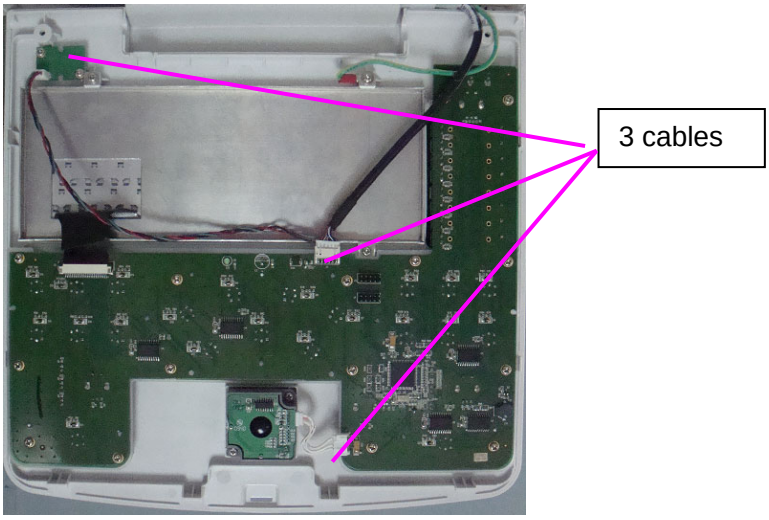
Step 6. Take down the TGC caps (with hand), knob caps (with pincers), and two screws;

Step 6

Step 7. Open the keyboard cover through the gap between the keyboard and the cover;

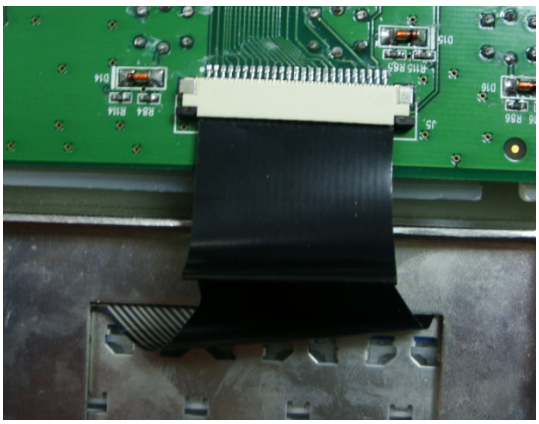
Step 7

Step 8. Disconnect the three cables;

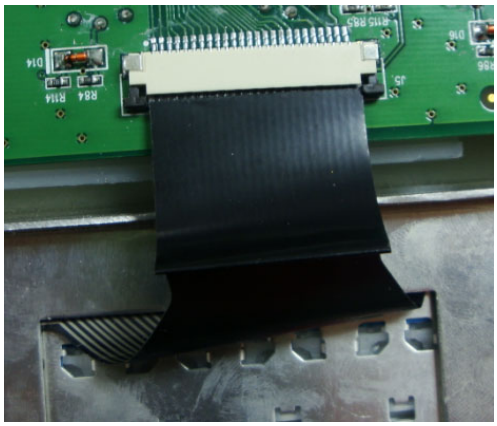


Step 8

Step 9. Open the lock of the connector for the standard PC keyboard with your fingers or tweezers gently, and then disconnect the cable.



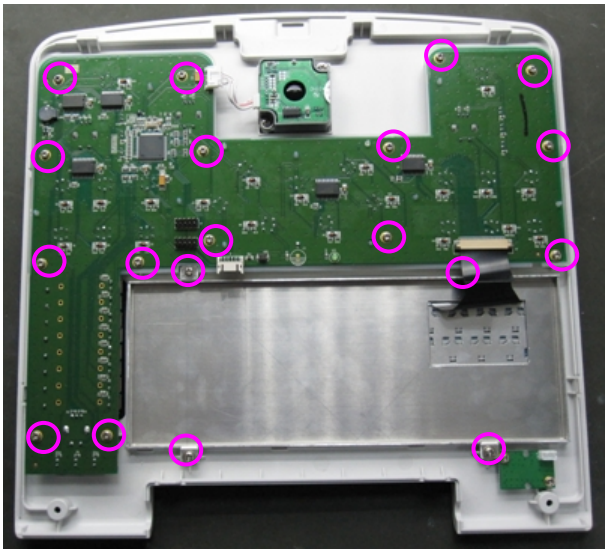
Locked



Opened

Step 9

Step 10. Unbolt the screws on the keyboard board;



Step 10

Step 11. Take down the caps of the knobs and TGC sliders, covers of the LED, and silicone keyboard to get the separate standard PC board and keyboard board.

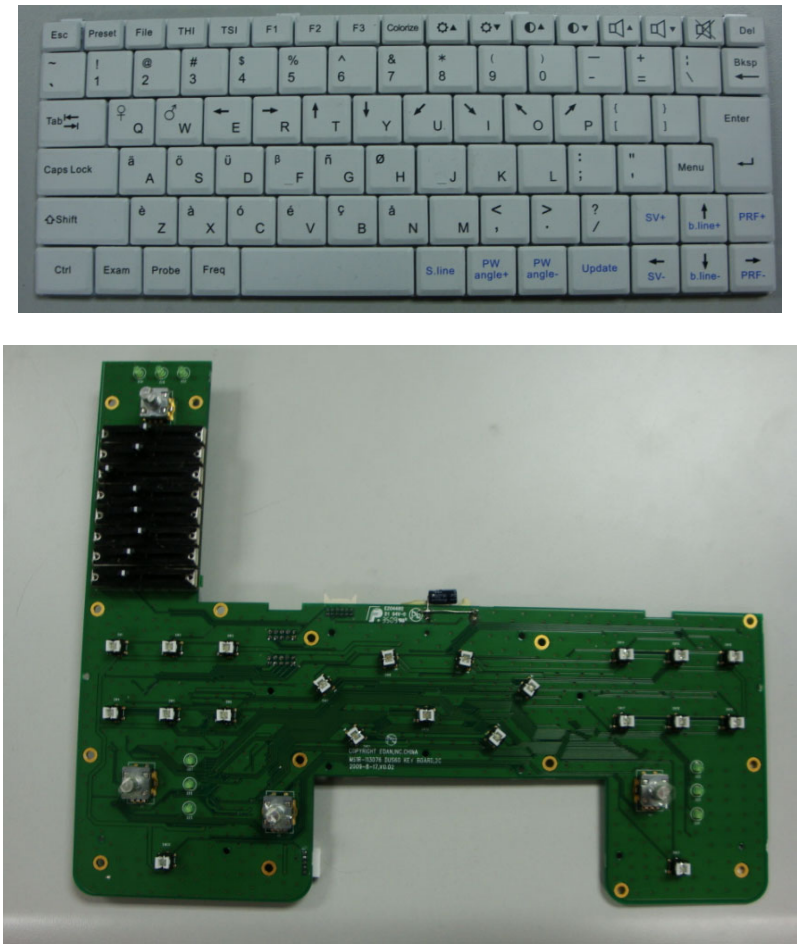


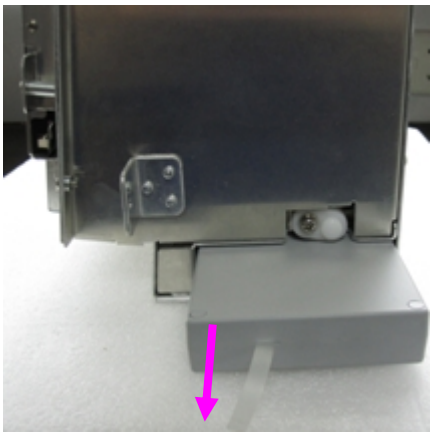
Figure 5-6 Keyboard Board

5.2.2. Battery

Step 1. Turn the flicker counterclockwise;

Step 2. Pull the battery out.

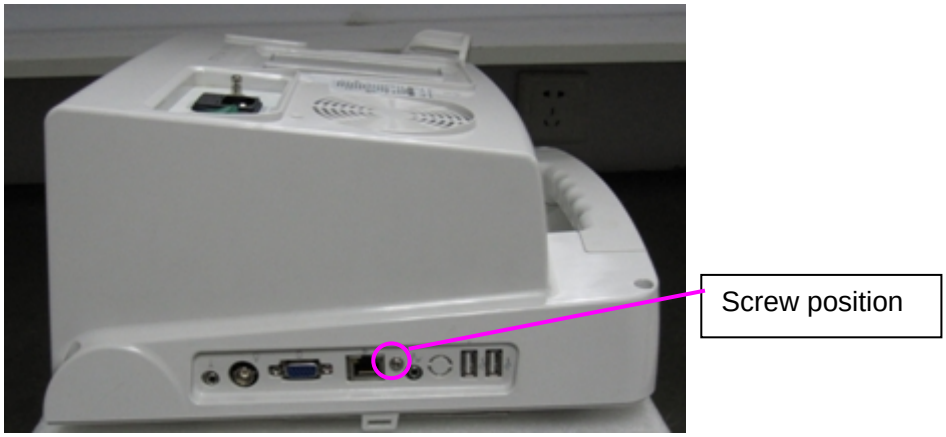
Step 1



Step 2

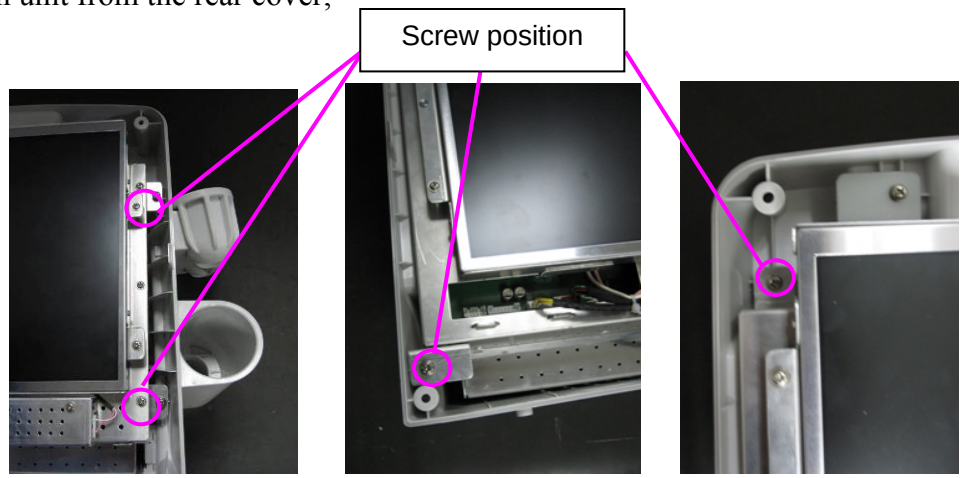
5.2.3. Power Board

Step 1. Put the system rear side up on a foam to avoid scraping the LCD, and unbolt the screw on the left side of the system;



Step 1

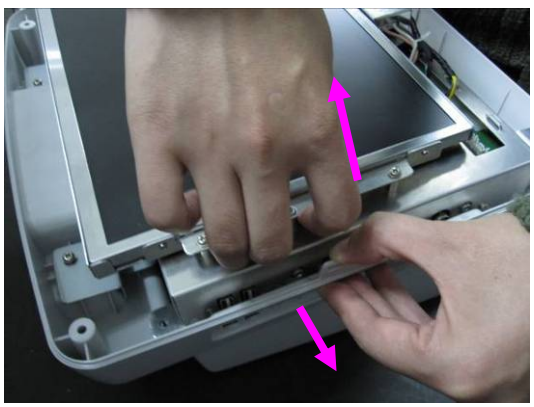
Step 2. Overturn the system to make the front side up and unbolt the four screws to separate the main unit from the rear cover;



Step 2

Step 3. Pull the rear cover outwards on the left panel side with one hand, and lift the main unit with the other;

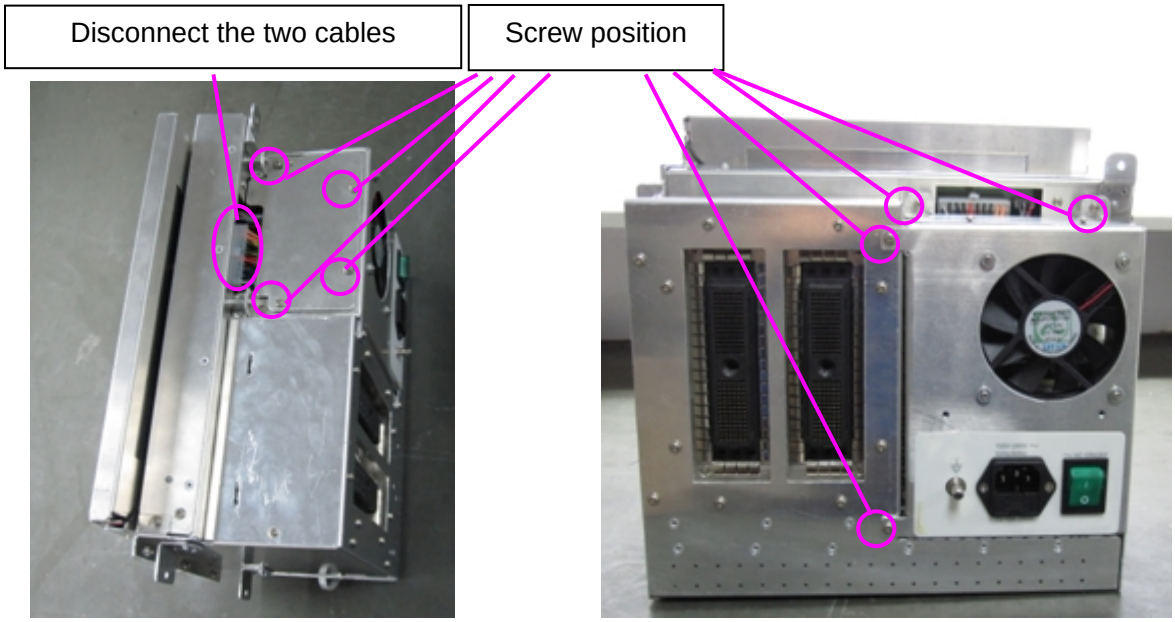
Step 4. Lift the separate main unit with both hands;



Step 3

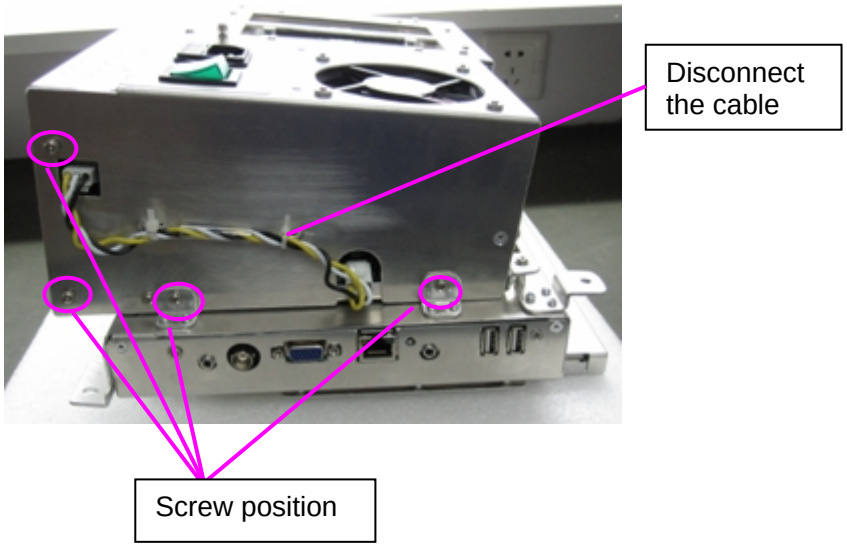
Step 4

Step 5. Unbolt the screws on the power module cover and disconnect the two cables connected with the main board;



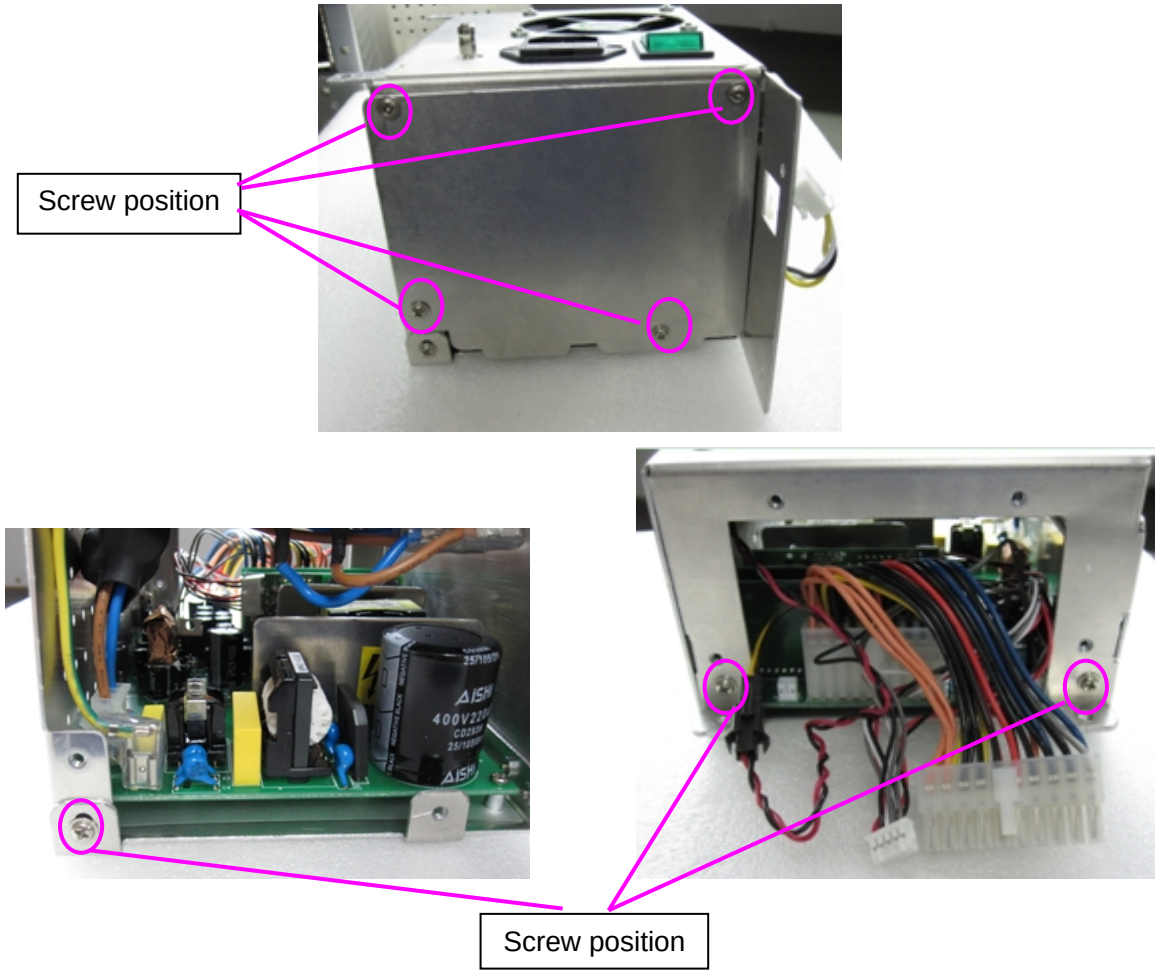
Step 5

Step 6. Overturn the system to make the rear side up, disconnect the cable and unbolt the four screws to get the separate power module;

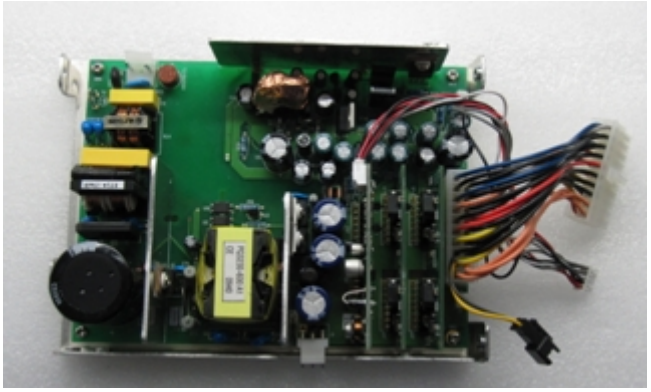


Step 6

Step 7. Unbolt the seven screws of the separate power module and disconnect the two cables to get the power board.



Step 7



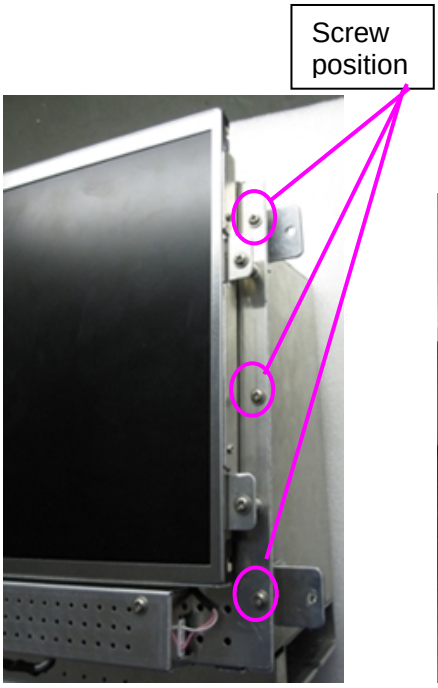
power board

5.2.4. Mother Board, Relay Board and Probe Socket Board

Step 1. Unbolt the three screws on the right of the LCD to take down the metal cover;

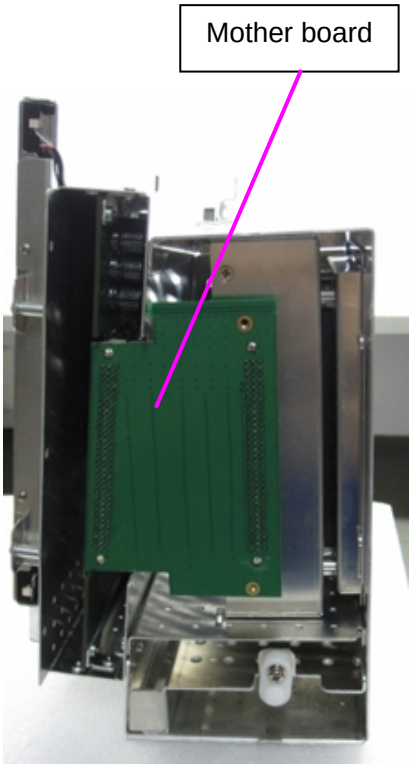
Step 2. Remove the baffle

Step 3. Disconnect the mother board;



Step 1

Step 2



Step 3

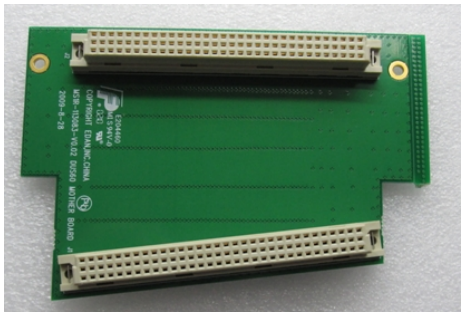
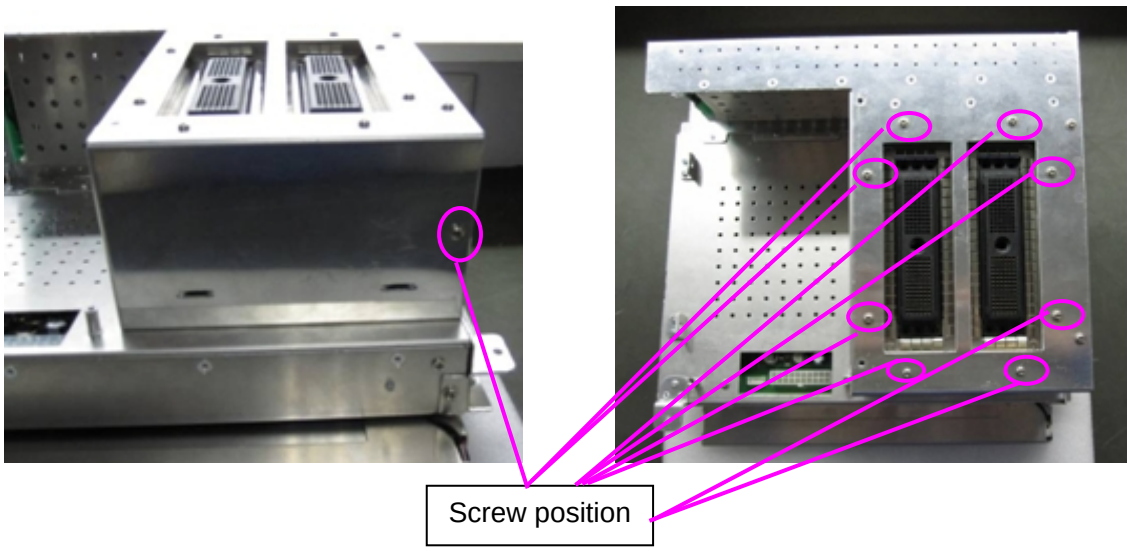


Figure 5-7 Mother Board

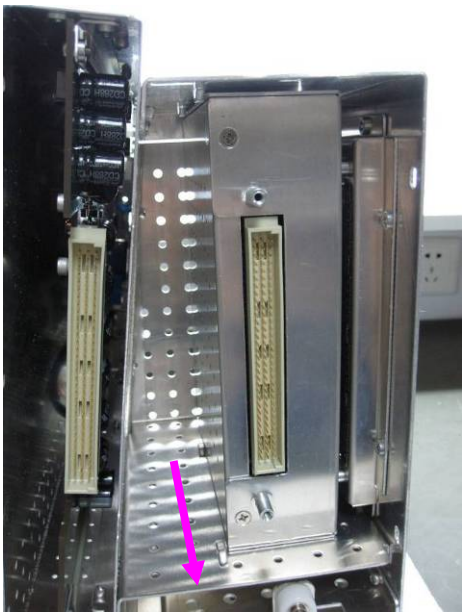
Figure 5-8 Main Unit Without Mother Board

Step 4. Unbolt the nine screws of the probe module;



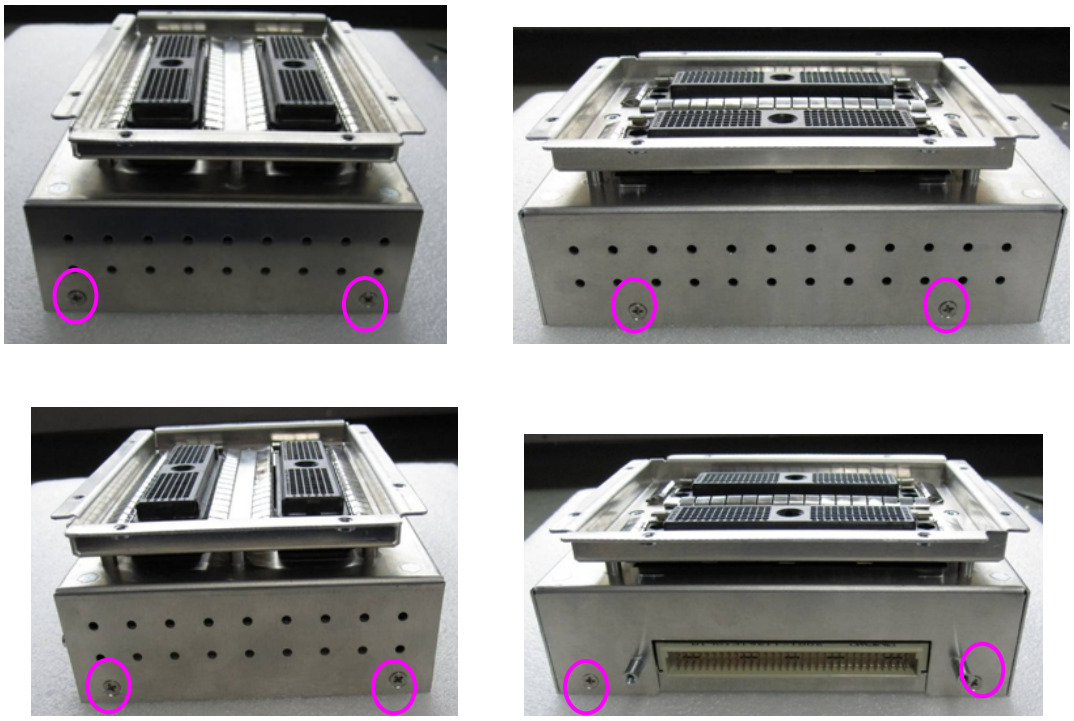
Step 4

Step 5. Pull out the probe module along the localization groove;



Step 5

Step 6. Unbolt the eight screws around the separate probe module to remove the metal cover;



Step 6

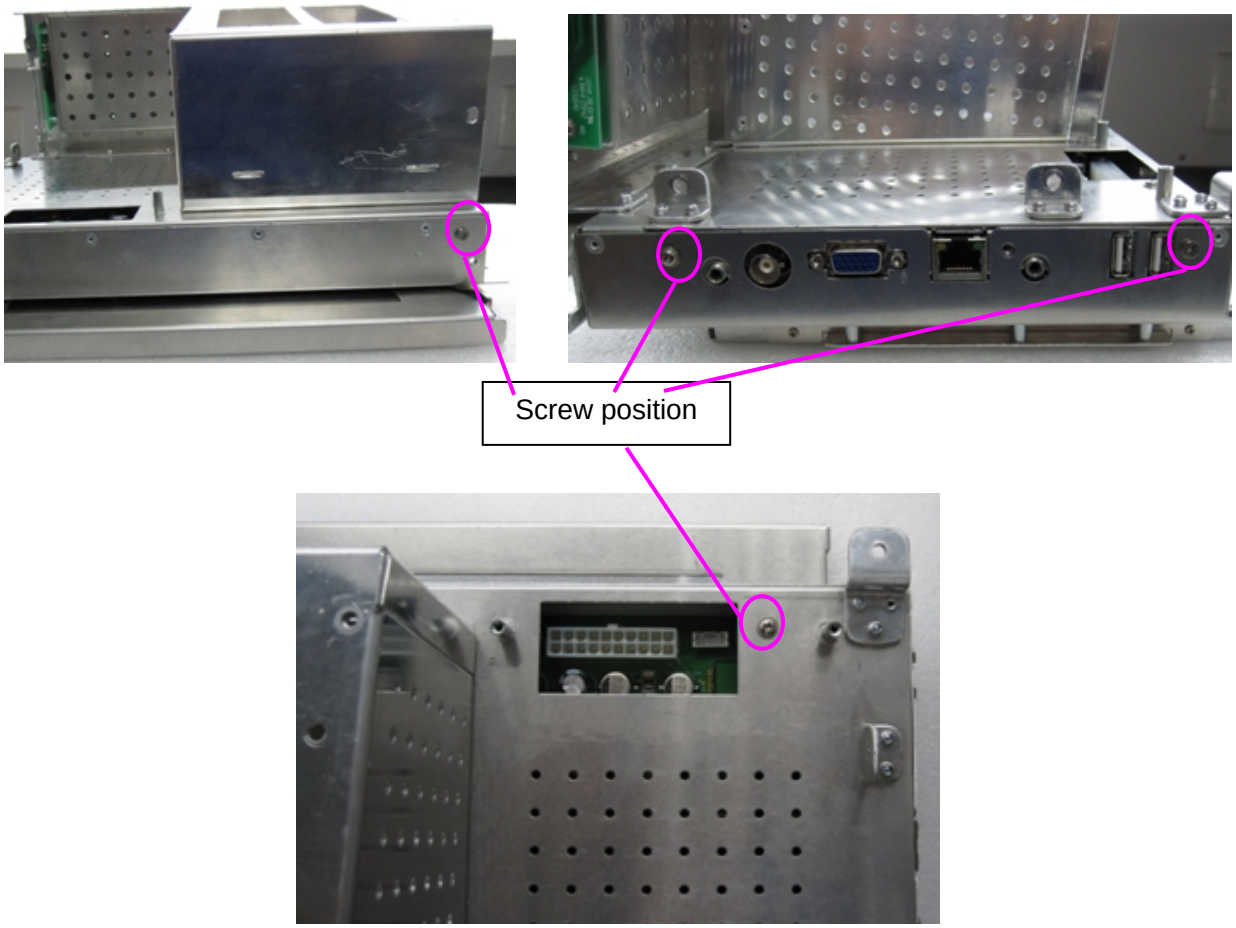
Step 7. Separate the relay board from the probe socket board with hand.

Figure 5-9 Probe Socket Board and Relay Board

Figure 5-10 Separate Relay Board

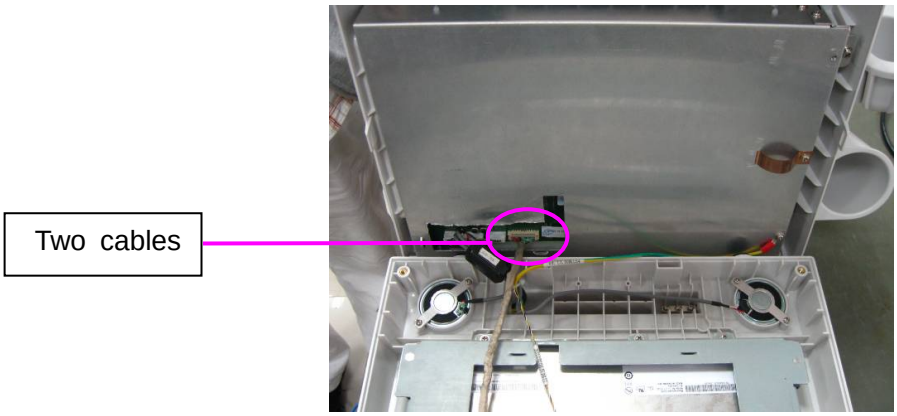
5.2.5. Mainboard

Step 1. Unbolt the four screws of the main board module;



Step 1

Step 2. Disconnect the two cable to get the separate main board.



Step 2

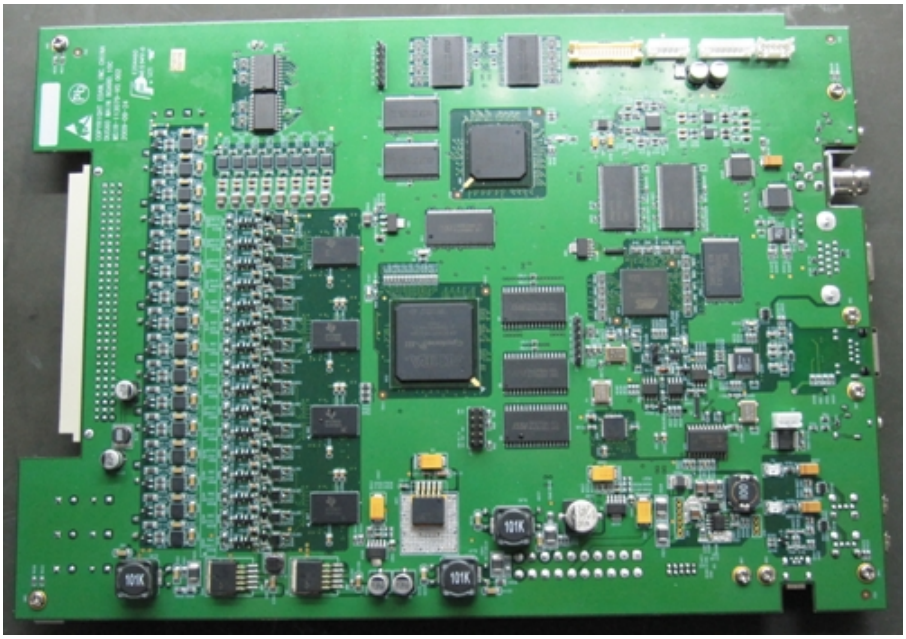


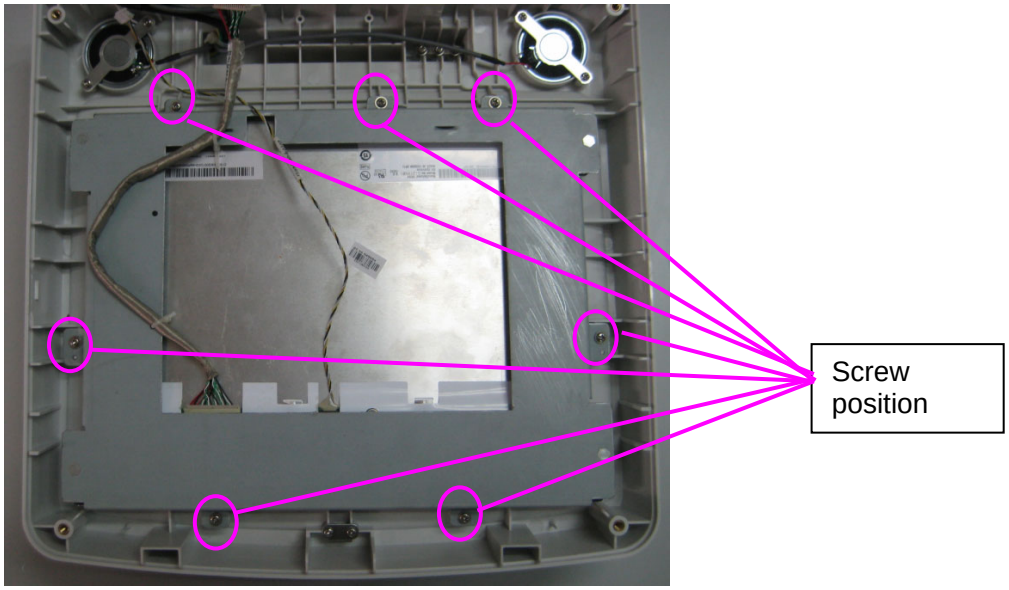
Figure 5-11 Mainboard (front view)

Figure 5-12 Mainboard (rear view)

5.2.6. LCD

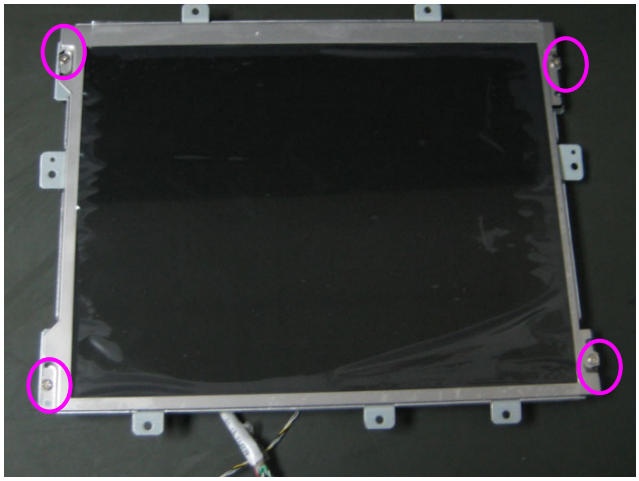
Step 1. Unbolt the seven screws that fix the LCD;

Step 2. Disconnect all the cables on the LCD;



Step 1

Step 3. Overturn the LCD, unbolt the four screws that fix the LCD and take out the LCD.



Step 3

5.2.7. Other Boards

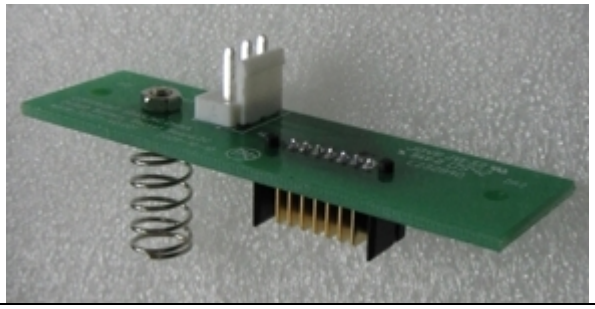
Item	Photo
Battery Socket board	

Table 5-1 Other Boards

Chapter 6 Troubleshooting

6.1. Attention and Prevention

Before operating the device, you have to read this section thoroughly.

WARNING

There are several places on the backplane, the AC distribution, and DC distribution that are dangerous. Be sure to disconnect the system power plug and switch off the power switch before you remove any parts. Take care whenever power is still on and covers are removed.

NOTE:

1. Keep the device in dry, clean and dustproof conditions, free of any corrosive gas and strong magnetic field interference. Avoid using and restoring around the pressure, humidity and temperature out of standard or something flammability, explosive and strong corrosive objects aside.
2. The light of the work room should be dim. Avoid direct strong sunshine and keep airiness, anti-dirt for better observation of medical images.
3. The device should be put in horizontal direction worktable. Avoid shaking and striking during operating the device.
4. Use corresponding AC power frequency and voltage complying with the requirements in instruction manual. Do not use the device exceeding the voltage range.
5. The perfect electrical system and grounding are supplied to the device which should be connected to earth reliably, otherwise, the patient is likely to be electrically shocked.
6. The outside grounding equipment is good for magnetic interference.
7. Do not restart the device immediately after being shut down, please wait for 5 seconds to protect the device avoiding damage the device.
8. Cut off the power and then contact our company or client server section professional maintenance people to do the trouble shooting, do not disassemble the device privately, otherwise ,we have rights to not to maintain that device any more.
9. Do not drawn or insert the probe when power is on.
10. Do not drop the probe onto the floor or collide with hard objects, or it will be damaged easily.
11. Do not take off the probe by the cable but the plug, otherwise the probe and the device will be damaged.
12. Do not use the damaged probe; otherwise it may bring to electrical shock. Ensure that the probe, probe cable and the connector is in normal (without cracks, casts, etc.) before connecting probe. Check carefully after the probe felling down. If necessarily, contact us.
13. If it is necessary to exchange the fuse, use the defined specification.
14. Those who debug, install, update, check or maintain the unit should be our company authorization.

15. Prior to operation, the operators should read the user manual carefully to be familiar with the performance and functions of the device.
16. Remove the power plug for a long time not to use the device.

Prevention

1. Probe should be cleaned with the soft cloth after operation at once.
2. Do not bend the probe cable to a circle diameter less than 9 cm.
3. Far away form strong electrical or magnetic conditions as to protect the monitor.
4. Do not use the machine close to the high frequency equipment, such as medical test equipments, unwired telephones, etc., which may affect the device or others.
5. Avoid installing or operating the device in direct strong sunshine or high temperature.
6. Check carefully if the probe falls broken. If damaged seriously, who contact it is likely to be electrically shocked.

6.2. Notice Before Switching On the Unit

1. Make sure that the power is OFF, and the input voltage complies with the requirements in user manual.
2. Ensure that other electric equipment will not interfere to ultrasound diagnosis when used with together.

6.3. Notice When Operating the Device

1. Observe whether the device and the patient are normal or not at any time.
2. Considering the safety, if there is something abnormal with the device and the patient, the operator should switch off the device.
3. It is not necessary to power off the device while it is not operated in a short duration, but only to lower the brightness to protect the monitor. It will be helpful to extend the service life if power off the device for 10-15 minutes after 4 hours' operation. If the ambient temperature is low, the operation hour could be duly extended, whereas, it should be shortened in the hot summer, and the air conditioner or fan is necessary to lower the temperature.

6.4. Notice after Operation

1. Do not take off the probe by the cable but the plug, otherwise the probe and the device will be damaged.
2. Device and attachment should be cleaned up for next examination with a soft cloth.
3. Cover the device with the anti-dirt cover.

6.5. Basic Step of Checking Malfunction

General speaking, there are three factors for the malfunction:

- Natural wastage of device. Each component has its service life, when surpassing the period, the caducity, degeneration, low insulation and technical abrasion will be existed, further more, the device will completely invalidate or cause leakage or circuit malfunction.
- Bad conditions and environment, e.g.: the temperature and humidity is too high or there is corrosive gas and too much dirt in the air; the device is librated, e.g.: the voltage fluctuate

is too obvious (≥10%), when seriously, it can cause instantaneous malfunction.

- Factitious malfunction caused by low responsibility of not maintaining in time or properly. The device should be checked or maintained by the technicians to settle the malfunction, and the followings are the brief introduction of basal step and method of maintenance.

There are four steps to check the malfunctions: observation, reason analysis, isolating malfunction and eliminating malfunction.

6.5.1. Observation

The observation is to observe phenomena and to get to know the case. There must be something abnormal when malfunction exists. Observing all kinds of normal and abnormal phenomenon to offer proof for analyzing and judging malfunction. The overall and accurate knowledge for the malfunction phenomenon will directly influence eliminating malfunction and the speed. Only know the malfunction phenomenon accurately can you verdict the reason of the malfunction correctly. It is not allowed to switch on repeatedly under some conditions. Even if the repeated switching on is allowed, it is necessary to know the course of malfunction and the malfunction phenomenon from the operator, because it is helpful to judge the malfunction part and reason, it can reduce many unnecessary course for checking and examination.

If you are not familiar with the machine to be repaired, the scope for knowing should be wider, such as the using period, the malfunction happened suddenly or accumulatively, the malfunction is usual or occasional, whether it ever be checked, what parts have been changed, whether the adjustable components of circuit has been changed etc.

If the device is new, then the malfunction is always occasional, such as the vibrating during the shipment lead to the failure of plug-in package, or the malfunction because of the weak welding of some single components. This type of malfunction can be eliminated through careful adjustment or fixing the loose plug-in package. If the device has been used for many years, always happen wasting malfunction. This mainly means that the deter operation of the circuit components such as the capacity of the capacitance especially the electrolytic capacitance go to decline, leakage even invalidation, the change of impedance, all kinds of transformer and loops are affected with damp and went moldy, the damage of transistors and semiconductor integrated circuit etc. This kind of malfunction must be analyzed carefully to be found.

6.5.2. Reason Analysis

Reason analysis is to analyze and define the reason of malfunction to offer theory instruction for further isolating and finding the concrete parts existing malfunction. It is dangerous to start working without analysis, especially for the complicated device. The same malfunction maybe caused by different reasons, though PCB of B-mode ultrasound are soldered carefully, it is difficult to disassemble the components, repeated soldering will lead to the injury of circuit and components, even worsen the malfunction. Reason analysis should be based on observation, analysis and abundant technical knowledge. The correct conclusion can only be got from comprehensive consideration according to the operating principles of circuit, structure features and the rule of malfunction. Firstly, all the possible reasons should be analyzed to confirm which are the most possible and which are the less possible to cause the malfunction. After that the most possible reasons will be checked to find the exact malfunction parts.

6.5.3. Isolating Malfunction

Isolating malfunction is to find the exact malfunction circuit and components through a certain checking and examination. There are many ways to isolate malfunction, and will be introduced in details. Isolating malfunction is base on the comprehension to the conditions and operating

principles, so, it is very important to prepare and conserve device information (Circuit drawing, Service manual, etc.).

6.5.4. Eliminating malfunction

The method of eliminating malfunction should be selected according to the malfunction. The usual way is changing the defective and damaged components. Some malfunctions are caused because of the maladjustment of some components, well then, the components should be checked and debugged via instrument or meter to eliminate malfunction. The circuit B-mode ultrasound has been highly integrated, and it is a high specification requirements for the welding of the chip, so some specific purpose tools are used, such as solder sucker and extractor for IC chips. Weld the IC carefully, otherwise, the circuit board will be damaged.

6.6. Basic Method of Checking Malfunction

The most important key of checking malfunction is isolating malfunction, to check malfunction is to isolate malfunction and find out the malfunction components and parts.

6.6.1. Confirming the Malfunction Part

You can use the knob and button on panel to confirm the malfunction part. After finding out the malfunction phenomena, the malfunction parts could be estimated according to the operating principles of circuit. However, the veracity of estimation should be proved by many means, such as measuring the circuit voltage and wave shape. For some malfunction, you can use the knob and control button to define the malfunction scope directly. It is easier than measuring inside the device. When checking the malfunction of low sensitivity of the knob or buttons, it is available to watch whether the enlarging circuit is running normally through adjusting the gain knob or not. Under the normal condition, it always produces certain noise to display on the screen to receive the circuit, When adjust the gain control knob, there are obvious power changes in the noise, this can generally prove that the receiving circuit is running normally. The reason for low sensitivity may probably be caused by the transmission circuit or probe. There are also some adjusting knobs, they can't make the trouble disappear after adjusting, but can lead to the change of the malfunction phenomenon. This can contribute to the judgment for the malfunction too.

6.6.2. General Checking After Opening the Cover of the Unit

If the malfunction is happened inside the unit, it needs to open the cover of the unit for a further checking. After opening the machine cover, every components and parts are exposed to us. The first step is to check all the components and parts by the eyes, ears, and nose, but not by hands, because some components, especially the transistor, IC have many terminals, which are very fragile and can be damaged easily. Check whether the component of resistance is burned or changed color, whether the capacitance is broken, whether the pin of the transistor is rusted and broken, whether there is dirt on the pin of the IC, whether the plug-in chip is falloff and whether there is short circuit and weak welding for the pins of the components, etc. Then electrify the device to observe carefully whether the indicator light is on, whether there is jumping fire, flashing fire or smoking between the components of the circuit board. Listen whether there is “pa-pa” sound inside the components and whether there is “weng-weng” sound from transformer; smell whether there is burn paint flavor from the transformer, resistance, ozone flavor that the high pressure discharges, etc. Switch off the device immediately if meet something abnormal and touch the doubtful components such as transistor, integrated circuit, transformer to feel whether it is too hot. At this moment, you must be careful not to move the terminal of the components to avoid damage. For the safety of the high voltage part, should firstly discharge the high voltage capacitance. If there is no abnormal phenomenon after switching on the device, you can try some

careful methods such as pressing and knocking the malfunction parts and components, these methods can effectively isolate malfunction caused because of poor contact of components and plug-in board. Do not press and knock the parts so hard to avoid damage. Meanwhile, you should observe the malfunction phenomenon carefully when pressing and knocking, if the several boards are connected together, you can press and knock one by one to reduce the malfunction scope.

The above checking ways are simple and intuitionistic; they can help us to find the malfunction without any instrument sometimes. For example, under the help of the circuit principle you can find the reason why the impedance is burnt through observing the burnt impedance. It is always the reason to cause the malfunction, and then the malfunction could be eliminated quickly.

6.6.3. Replacement Isolating the Malfunction

If nothing abnormal or no damaged components has been found through careful observation, you can use the replacement way to isolate the malfunction if you have spare circuit plug-in board (or the same type B-mode ultrasound device). The inside circuits consists of many plug-in boards. Replace the doubtful circuit plug-in board at first. If the instrument works normally after the replacement, it can be confirmed that the trouble is between the components and parts of this circuit plug-in board. Then combine the circuit diagram of the principle to analyze the possible reason causing this trouble in details. This way can save you a lot of time than analyzing in the system range.

Plug-in board replacement can help you confirm the general scope of the malfunction. If you are sure about malfunction is in the plug-inboard, you can replace the components if necessary. In case the integrated circuit adopted the chip socket, you think that one circuit chip is damaged, and you just have chip socket of the same type, then you can replace it to confirm your analysis. If the malfunction is eliminated after the replacement, it can prove that there is something wrong with the circuit chip, you could change it. It is better to change the components for the same type. If there is no chip socket of the same type, you must assure that the chip socket of different type is replaceable. Otherwise, the new problem will be caused.

If the malfunction is at the inconvenient location for replacement, reduction to absurdity is helpful for you. For example, malfunction is confirmed to be at the main board if all the plug-inboards are checked to be normal.

The replacement method has some localization that your replacement parts should be the same type of one in device, especially the circuit plug-in board. Otherwise, this method is not applicable.

6.6.4. Inspection and Maintenance on PCB

◆ Power Inspection

Eyeballing:

Switch on the device firstly. In case the bigger fan doesn’t work, the power board may break down, or the fan breaks down. Now you need a multimeter to check.

Basic inspection:

Apparatus: Multimeter

Multimeter is used to measure output voltages. If the output voltages are natural value, then enter into next inspection. Please refer natural voltages value to the table 6-1 and table 6-2, otherwise, adjustment is needed. If the natural value cannot be reached, that is to say the trouble is on the power board.

Trouble fixation and correction:

Switch down the system before checking the PCB. Check mutual inductance filter by multimeter to make sure there is no open circuit. Check the bridge rectification circuit in the four bridge channels to examine if shortness or open circuit exists in each channel, by diode function on multimeter. Check short circuit in every output current by multimeter. Do not use the oscillograph to check.

● Fuse burn out as the device is switched on

A、Check anti-jamming capacitance and thermal resistance.

B、Check short circuit in commutating current, and check filter capacitance 220UF/400V.

C、Check switching transistor NCP1337.

D、Check short circuit in switch transformer.

● No output voltage

A、Check the voltage of collecting anode in switching transistor NCP1337. If the voltage is 0, that is to say the AC input current or commutating current is open circuit

B、If the voltage of collecting anode in switching transistor NCP1337 is around 300V，the reason may be the switch oscillating circuit stop oscillating caused for the reason that the start up circuit is open, interior switching transistor is open circuit or positive feedback circuit is open.

C、Rectification output load is short (Schottky arcing)

● Output voltage is low or high

A、Stabilivolt element in switch power supply is not qualified.

B、5V voltage is low or high.

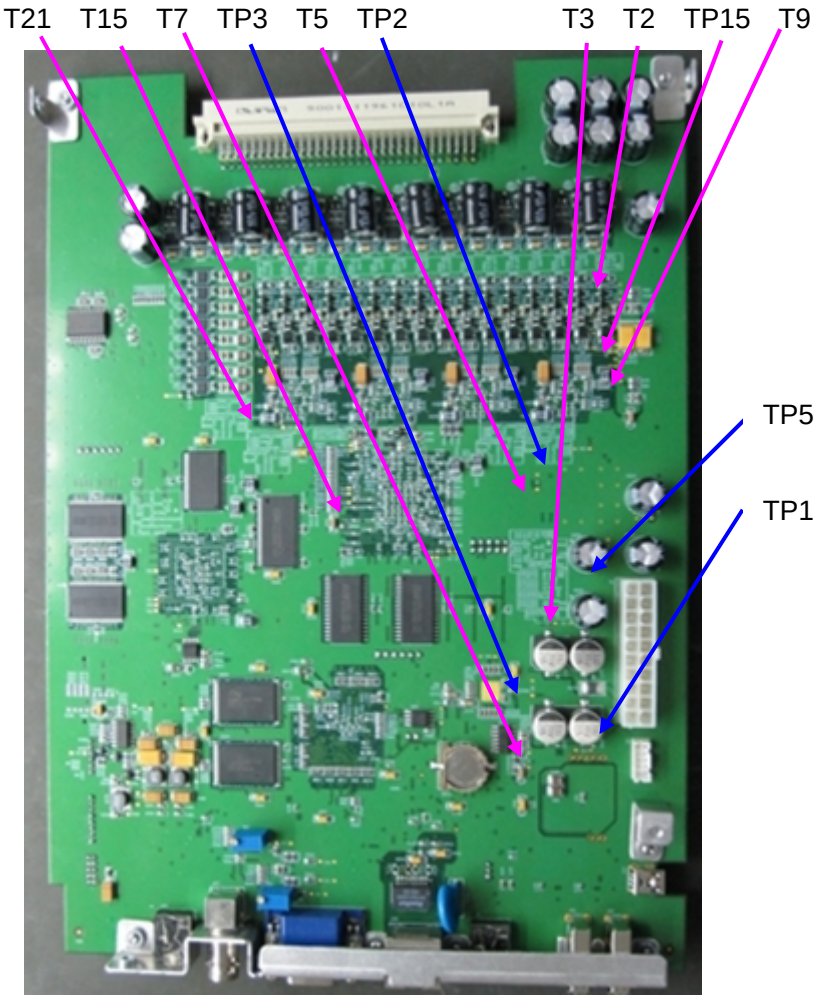
C、Output stage has short circuit，and load current is too large.

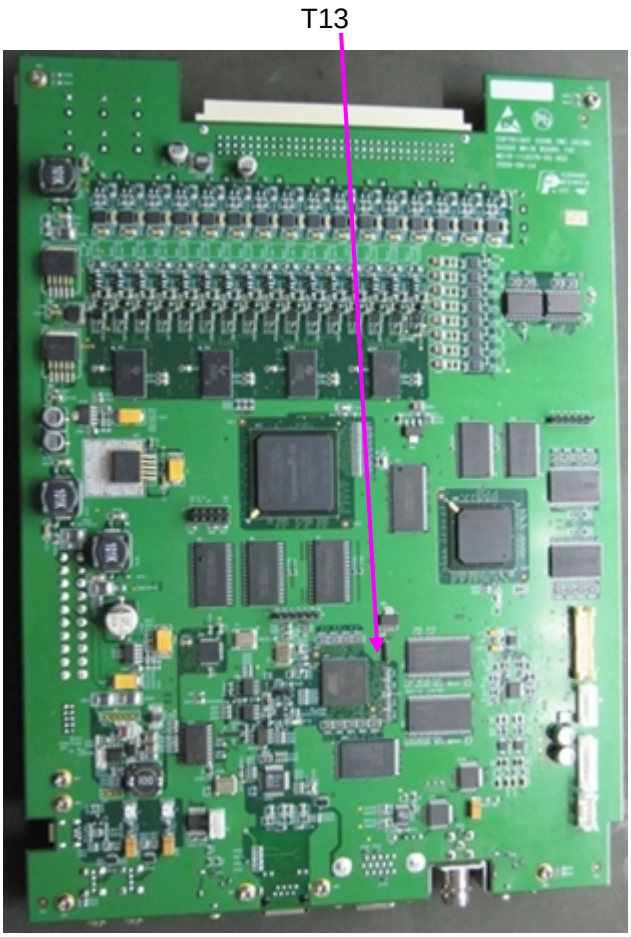
◆ Mainboard

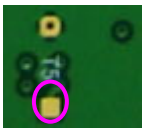
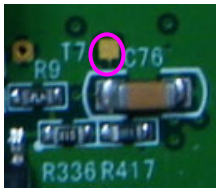
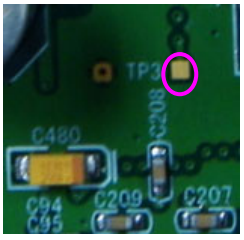
To verify the mainboard,

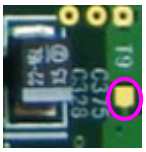
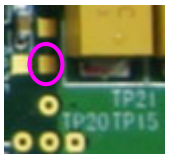
1. Open the main unit using the procedures described in section 5.3.
2. Switch on the monitor.
3. Use a multimeter to measure the voltage to earth of the pins list below.

Test point	Reference result	Test point	Reference result
T2	A3V3 HV	T21	D1.8V
T3	D2.5V	TP1	D2.5V_DCDC
T5	D1.2V	TP2	A5V
T7	TGC: 963 mV ~ 3550 mV	TP3	D5V
T9	A3V3_VCA	TP5	A-40V
T13	VDDMCU_1V2	TP15	A3V3_HV


T21
T15
T7
TP3
T5
TP2
T3
T2
TP15
T9
TP5
TP1



Test point	Photo	Test point	Photo
T2		T21	
T3		TP1	
T5		TP2	
T7		TP3	

Test point	Photo	Test point	Photo
T9		TP5	
T13		TP15	

4. Compare the measurement results with the reference results in the list. If anyone of the results exceeds the reference range, the mainboard defection is confirmed. Replacement of the mainboard is recommended.

6.7. Troubleshooting

6.7.1. System Does Not Boot Up

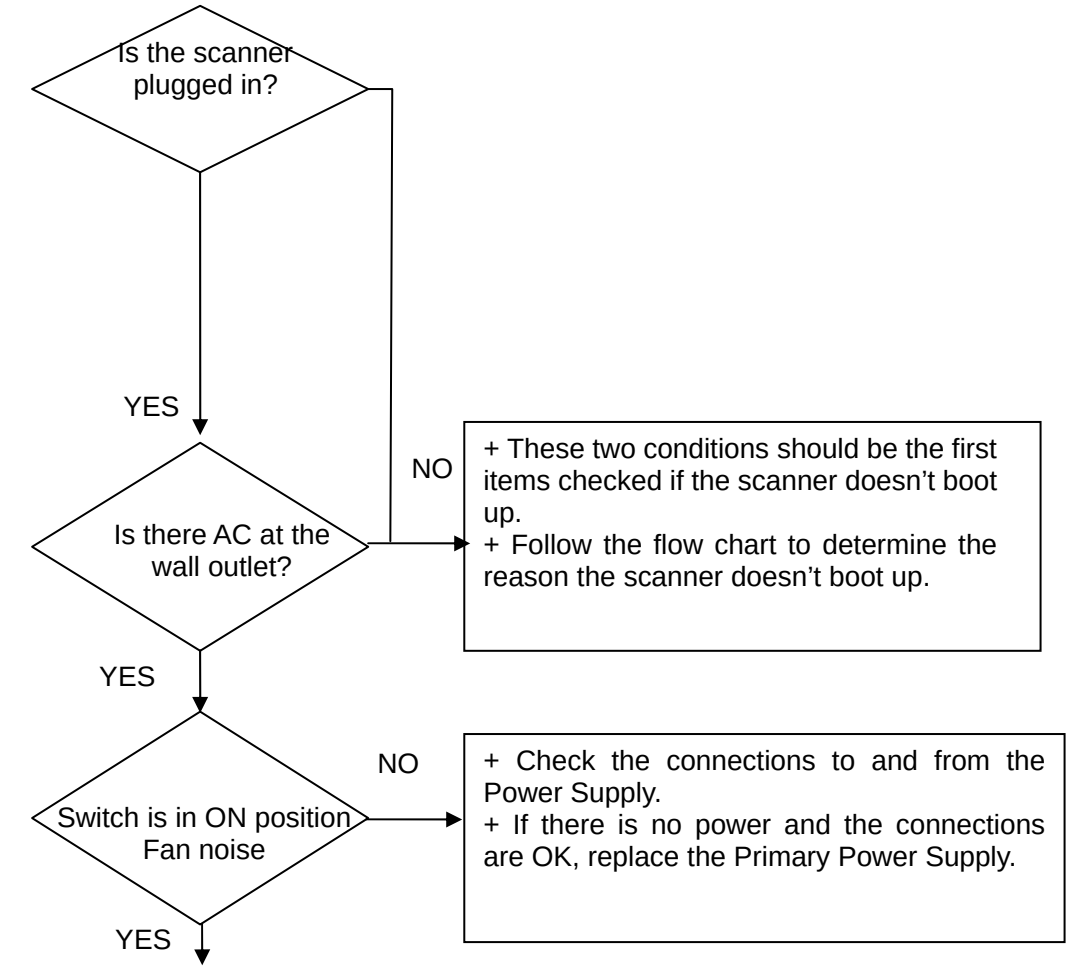


Figure 6-4 System does not boot up

6.7.2. Noise Disturbs the Image

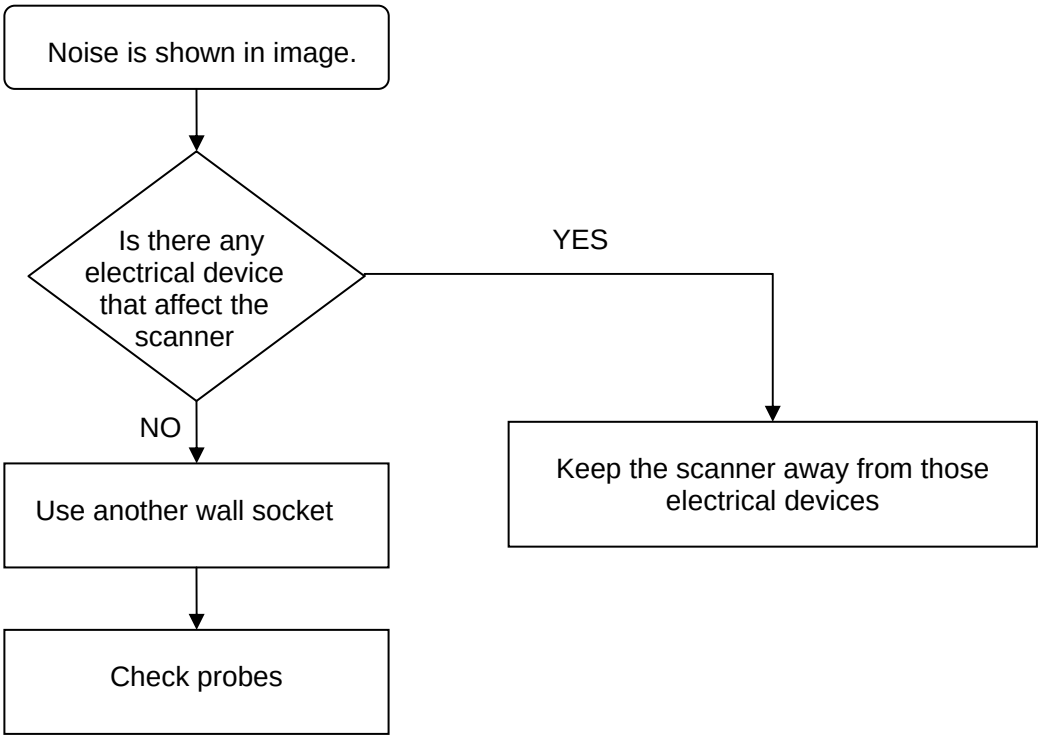


Figure 6-5 Noise disturbs the image - Troubleshooting

6.7.3. Trackball

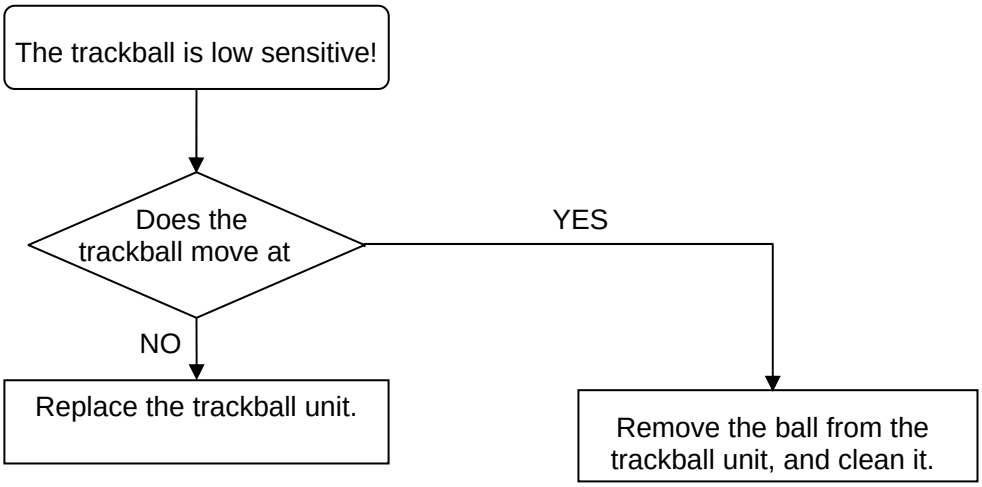


Figure 6-6 Trackball - Troubleshooting

6.7.4. Monitor Troubleshooting

Fault symptom		Check these items
The screen is dark		Check the power cord is properly connected.
		Check the power switch on left of system is set to the “ON” position.
		Check the monitor board power.
		Check the monitor.
The screen is gray		Check the video cable on the J6 socket of mainboard is properly connected.
		Check no pins of the video cable are bent.
		Check the mainboard.
No sector image, the whole sector image is white		Check the probe connection and the probe model.
		Check the probe socket board.
		Check the mainboard.
There is dark channel when unit is switched on	There are three dark channels in the B image area	Check the 32 pin (from A17 to A32 and from C17 to C32) on the J1 socket of the mother board. If any of the pin does not have signal, the mainboard is broken down; if all of them have signals, the probe or the probe socket may be broken down.
	Not there dark channels	Check probe (transducer) is not broken down. Check probe socket board is not broken down.
Image is not clear in far field		Check there is no interference.
		Check the probe is not broken.
		Check parameters in the field are adjusted well.
Image in near field is too dark		Check there is no air bubble on the lens of probe.
Fuse burn out as the device is switched on		Check short circuit on the power board.
Probe does not work		Check the socket to connect the probe loosens.
No effect when adjusting gain		Check the IC is not broken.
Picture is fuzzy		Adjust the contrast and brightness.
Video test patterns are not clear, bright, parallel or square		Replace the monitor.

Table 6-3 Monitor Troubleshooting

The causes of troubles are simply analyzed only for reference; the troubles are not absolutely caused by above analyzed reasons.

6.7.5. Printer Troubleshooting

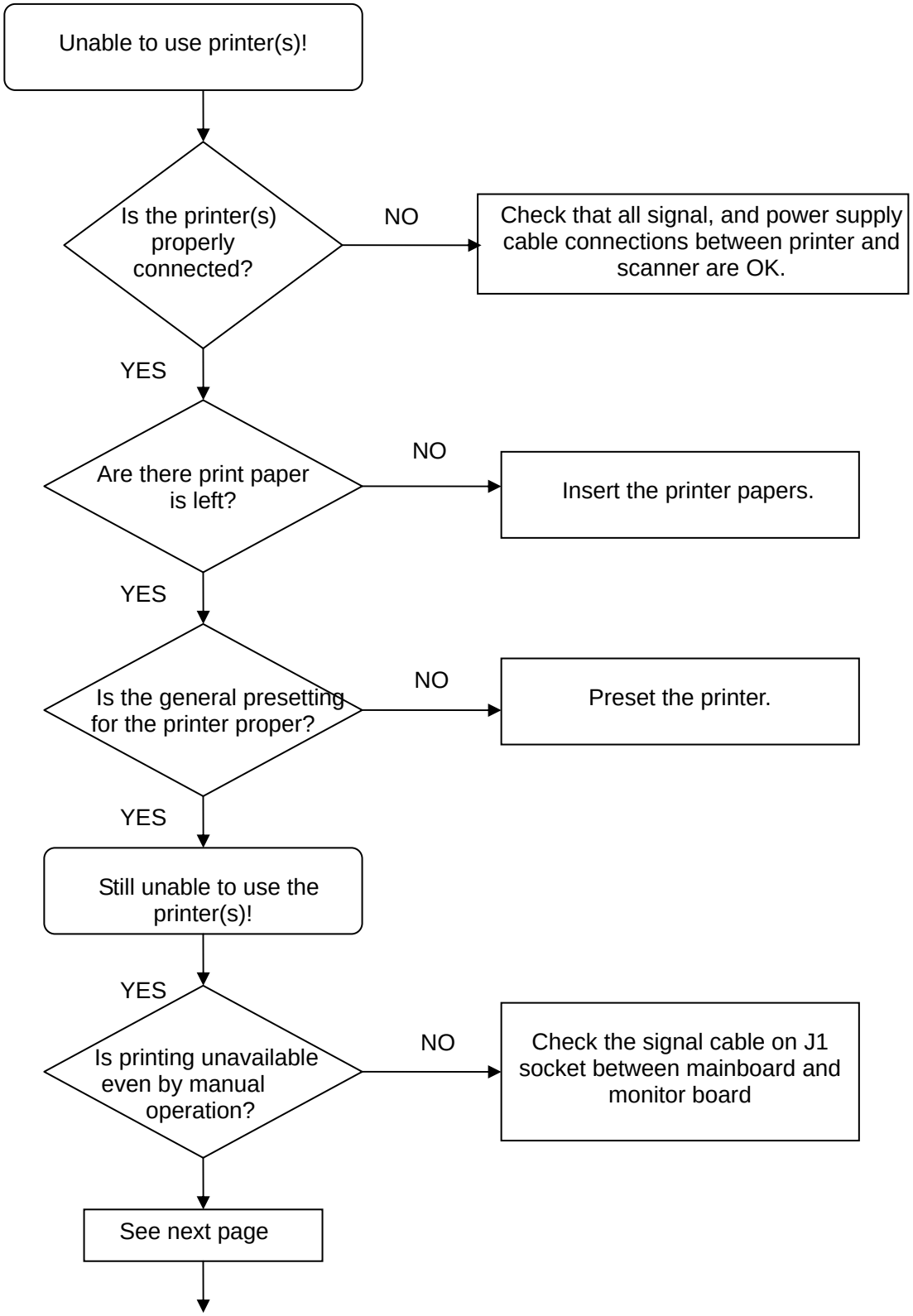


Figure 6-7 Printer - Troubleshooting

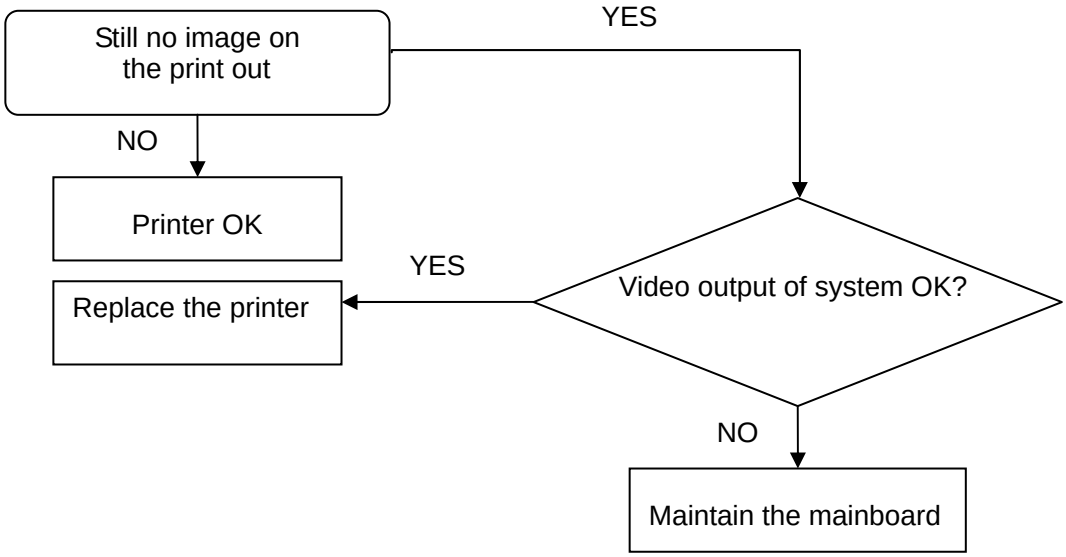


Figure 6-7 Printer - Troubleshooting (con')

6.7.6. Removable Disk Troubleshooting

1. Connect an empty removable disk to the USB port.
2. Enter file management by pressing **File** on the control panel.
3. Click drive and select files to backup them to removable disk.
4. Choose **USB disk** drive.
5. The files, which you have chosen during backup should be visible.

6.7.7. Error Messages

NOTE:

If the problem (error massage) still exists after performing the prompt information or restarting the system, call technical support.

6.7.8. Servicing Experience

The causes of troubles are simply analyzed only for reference because the circuit is complex, so the troubles are not necessarily caused by following reasons. Our repair and maintenance are not limited to follow the trouble analysis.

1. Trouble description: The indicator is still off and no display on the screen after the unit is switched on.

Analysis: Maybe power supply or the power cord and plug is in trouble or the fuse breaks down, or **BRIGHT** and **CONTRAST** need to be adjusted. If necessary, pull the fuse box out, replace the old fuses, and then reposition the fuse box.

2. Trouble description: The signal of echo is abnormal.

Analysis: The probe may be broken, and then change it for another try. And if that doesn't work, the probe socket or mainboard may be broken down.

3. Trouble description: Interrupted Stripe and snow-shaped interference on the screen

Analysis: Maybe the power supply is interfered by other electrical equipment or operation

condition is free from any electrical or magnetic interference, and perhaps power supply, probe and plugs are not connected well; it's necessary to check each one.

4. Trouble description: Image isn't clear enough.

Analysis: Maybe the gain, or the brightness and contrast need to be adjusted.

5. Trouble description: Image isn't clear in near, medium or far distance

Analysis: Maybe the gain, near, medium or far field need to be adjusted

6. Trouble description: Good image but the fan doesn't work when the unit is on

Analysis: Maybe the inside of the fan is too dirty and it needs to be cleaned, or change a new one if broken.

7. Trouble description: Good image but the trackball doesn't work well

Analysis: Maybe the inside of the trackball is dirty, clean the trackball, and refer to the above.

8. Trouble description: Image is not clear in far field

Analysis: Maybe there is electronic interference or probe is broken or parameters are abnormal.

9. Trouble description: Trackball doesn't work well

Analysis: Maybe the cord of trackball or the crystal of trackball is broken. In case the trackball can only move in horizontal direction, please check the optical couplers.

10. Trouble description: Image in near field is not clear

Analysis: Maybe there is air bubble on the lens of probe.

11. Trouble description: Fuse burns out as the device is switched on

Analysis: Maybe some capacitances on power board burn out or the voltage is not complied with this machine.

12. Trouble description: Probe does not work

Analysis: Maybe the socket connecting with the probe loosens.

13. Trouble description: No sector and the whole area is white.

Analysis: Maybe the monitor, signal cable or the mainboard may be broken down.

Chapter 7 Replacement Procedures

WARNING

Service and repairs must only be performed by authorized personnel.

Equipment being returned must be clean and free of blood and other infectious substances.

EDAN maintenance service (EDANMS) state that body fluids must be properly removed from any part or equipment prior to shipment. EDANMS employees, as well as customers, are responsible for ensuring that parts/equipment have been properly decontaminated prior to shipment. Under no circumstance should a part or equipment with visible body fluids be taken or shipped from a clinic or site (for example, body coils or and ultrasound probe).

The purpose of the regulation is to protect employees in the transportation industry, as well as the people who will receive or open this package.

NOTE:

The US Department of Transportation (DOT) has ruled that “items what were saturated and/or dripping with human blood that are now caked with dried blood; or which were used or intended for use in patient care” are “regulated medical waste” for transportation purpose and must be transported as hazardous material.

7.1. Ultrasound Application Software Installation Procedure

NOTE: It is possible to update the Ultrasound Application Software via the UPDATE function.

Tools: U-disk.

Preparations

Before performing the software update/upgrade:

1. Make sure that all system functions are working correct.
2. Check the current software version and installed options.

Software – Installation Procedure (via Maintenance Page):

- Connect the U-disk with updating program to the main unit.
- Press **File** and select **Preset**, and then enter **Maintains** to display the password window.

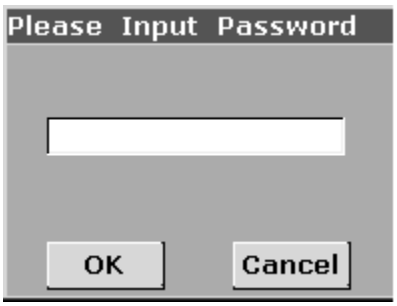


Figure 7-1 Password Dialog Box

- Enter the password **DUS602903G** and click **OK** to display the update window, shown as below:

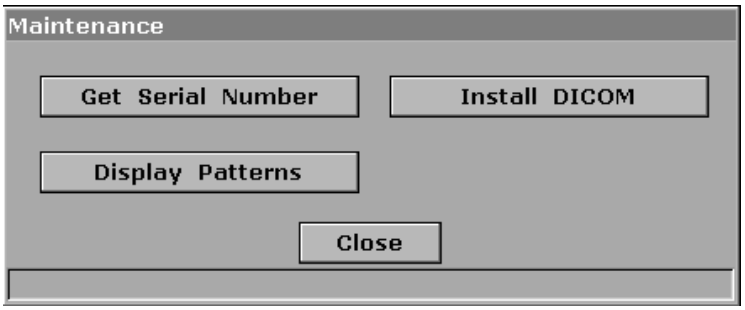
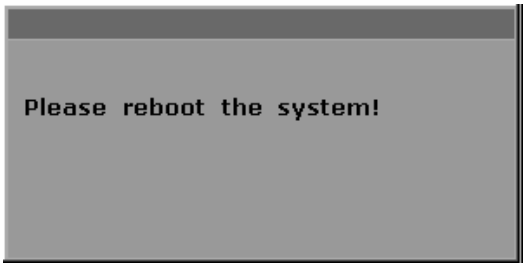


Figure 7-2 Maintenance Options

- EXCEPT the DICOM Installation, you can select the desired updating option and press **Set** to do the updating automatically.
- DICOM Install:

You should press **Get Serial Number** to get the serial number, and then press **DICOM Install** to upgrade DICOM.

- After installation, press **Close** and the system pops up prompt information of rebooting the system.



7.2. Software and Functional Check after the Upgrade

1. Press **File** on the control panel once to display the file menu.
2. Select **Preset**, and then select **General** item to pop up the general preset dialog box.
3. Select **System information** to see which software/hardware version is installed in the unit.

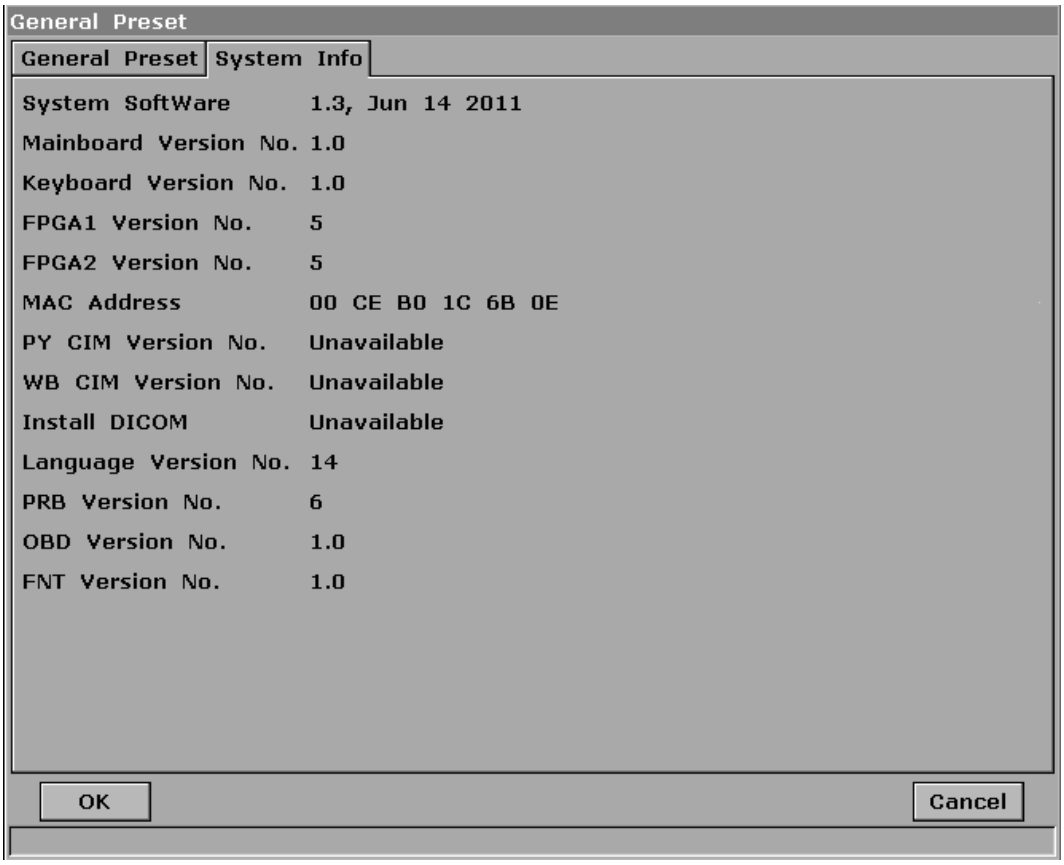


Figure 7-3 System Information

4. Restart the system and perform basic functional checks to ensure system is functioning normally.

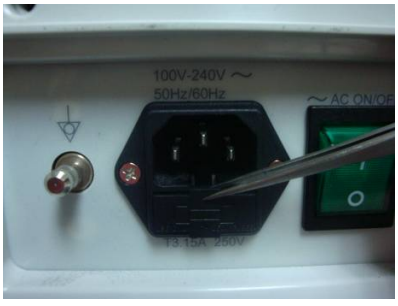
7.3. Replacing Fuses

You can replace the fuses if necessary.

Step 1. Pull out the fuse-box using tweezers;

Step 2. Use the tweezers to pull the fuses out through the small hole on the bottom of the box;

Step 3. Put new fuses (φ5×20, T3.15AH250V) provided by EDAN in position, and reposition the fuse-box.



Step 1

Step 2

Step 3

7.4. Renewal Parts

7.4.1. Description of the Boards

No.	Renewal Part	Part Number
1	DUS 60 mainboard	02.03.113080
2	DUS 60 probe socket board, including relay board	02.04.240044
3	DUS 60 mother board	02.02.113084
4	DUS 60 keyboard board	02.03.113077
5	DUS 60 soft start switch board	02.03.113170
6	DUS 60 power module board, including: DUS 60 power DC board DUS 60 power mainboard DUS 60 power control board	02.03.113189
7	DUS 60 battery socket board	02.02.113172

Table 7-1 Renewal parts of the boards

7.4.2. User Interface

No.	Renewal Part	Part Number
1	Power Cable (EUR standard)	11.13.36014
2	Power Cable (USA standard)	11.13.36015
3	Potential equalization conductor	11.13.114214

4	Fan	11.58.047347
5	PC keyboard	01.18.052218
6	Loudspeaker	11.14.038019
7	12.1’ LCD	01.16.045054
8	JS-608R Switch	11.10.27019
9	Fuse	21.21.064172
10	Trackball	11.17.047342
11	DUS 60 cable holder	01.52.113229
12	TWSLB-001 Rechargeable Lithium-Ion battery	01.21.064135

Table 7-2 Renewal parts of the user interface

7.4.3. Renewable Cables

No.	Renewal Part	Part Number
1	Cable that connects power board with mainboard	01.13.113087-10
2	Cable that connects LCD with mainboard	01.13.113239-11
3	Backlight control cable that connects mainboard with LCD	01.13.113240-10
4	Cable that connects keyboard with mainboard	01.13.113091-10
5	Power control cable that connects power board with main board	01.13.133092-10
6	Cable that connects power board with boat-shape switch	01.13.113094-10
7	Cable that connects battery socket board with power board	01.13.113173-10
8	Power socket cable	01.13.036157-10
9	Protective grounding that connects enclosure of DUS 60 and base plate of keyboard.	01.13.036154

Table 7-3 Renewal Cables

7.4.4. Optional Peripherals and Accessories

Figure 7-4 Video Printer

Item	Part Name	Part Number	Description
1	SONY B/W Video Printer UP-895MD (CE)	/	PAL
2	PPP55 Connection Set	/	Connection Set UP-895MD

Table 7-4 Printers

7.4.5. Probes

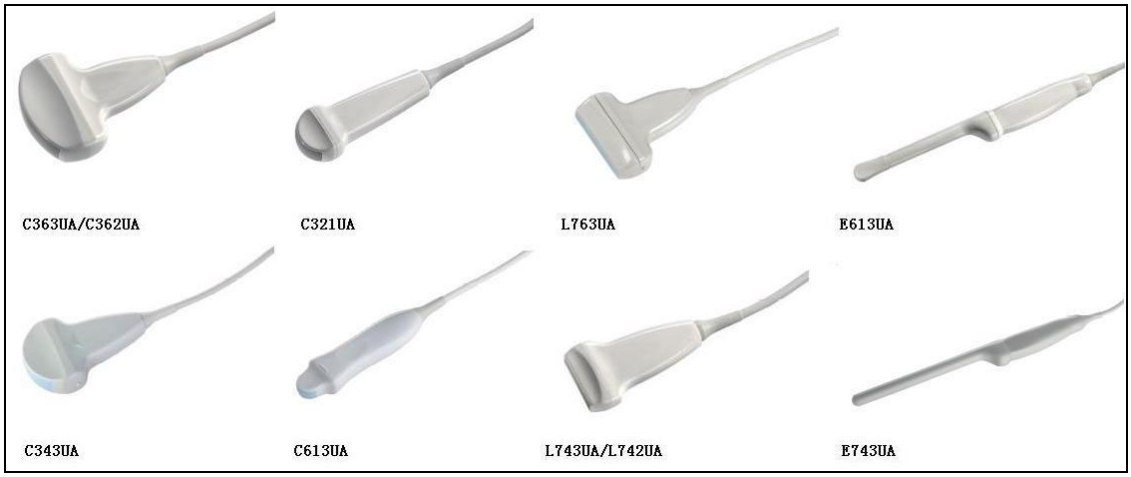


Figure 7-5 Probes

Item	Part Number	Description
C363UA	12.01.116212	Abdomen, Gynecology, Fetal / Obstetrics, and Pediatrics
C362UA	12.01.116217	Abdomen, Gynecology, Fetal / Obstetrics, and Pediatrics
C343UA	12.01.116213	Abdomen, Gynecology, Fetal / Obstetrics, and Pediatrics
C321UA	12.01.116221	Abdomen, Gynecology, Fetal / Obstetrics, Pediatrics and Cardiology
C613UA	12.01.116215	Abdomen, Gynecology, Fetal / Obstetrics, Pediatrics and Cardiology
E613UA	12.01.116216	(Transvaginal / Transrectal): Gynecology, Fetal / Obstetrics, and Urology
E743UA	12.01.116223	(Transrectal): Rectum and the surrounding viscera, uterus, ovary and prostate
L743UA	12.01.116214	Small parts (galactophore, thyroid gland, prostate), Neonatal Cephalic, Peripheral Vascular, Musculo-skeletal (both Conventional and Superficial)
L742UA	12.01.116220	Small parts (galactophore, thyroid gland, prostate), Neonatal Cephalic, Peripheral Vascular, Musculo-skeletal (both Conventional and Superficial)
L763UA	12.01.116222	Small parts (galactophore, thyroid gland, prostate), Neonatal Cephalic, Peripheral Vascular, Musculo-skeletal (both Conventional and Superficial)

Table 7-5 Probes

7.4.6. Needle Guide Bracket Kit

The needle guide bracket kits for the DUS 60 are listed in table 7-6.

Item	Part Number	Description
BGK-CR60	12.01.102338	For the R60 probe, 4 vessels: 14G, 18G, 20G, 22G
BGK-LA43	12.01.102355	For the R40 probe, 4 vessels: 14G, 18G, 20G, 22G

Table 7-6 Needle guide bracket kits

Figure 7-6 BGK-CR60 Needle Guide Bracket kit

Figure 7-7 BGK-LA43 Needle Guide Bracket kit

P/N: 01.54.113187-11

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