SAMSUNG

SAMSUNG MEDISON
DIAGNOSTIC ULTRASOUND SYSTEM

HS70A
Service Manual

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DIAGNOSTIC ULTRASOUND SYSTEM

HS70A

Service Manual

English

SM-HS70A-ENG-02

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Safety Requirements

■ Classifications

- Type of protection against electric shock: Class I
- Degree of protection against electric shock (when the patient is in physical contact): Type BF or CF applied part
- Degree of protection against harmful ingress of water: Ordinary equipment
- Degree of safety of application in the presence of a flammable anesthetic material with air or with oxygen or nitrous oxide: Equipment not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.
- Mode of operation: Continuous operation

■ □Electromechanical safety standards met

- Medical Electrical Equipment, Part 1: General Requirements for Basic Safety and Essential Performance **IEC 60601-1:2005/A1:2012**
- Medical Electrical Equipment, Part 1-2: General Requirements for Basic Safety and Essential Performance - Collateral Standards: Electromagnetic Compatibility - Requirements and Tests **IEC 60601-1-2:2007**
- Medical Electrical Equipment, Part 1-6: General Requirements for Basic Safety and Essential Performance - Collateral Standards: Usability **IEC 60601-1-6:2010**
- Medical Electrical Equipment, Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment **IEC 60601-2-37:2007**
- Medical Electrical Equipment, Part 1: General Requirements for Safety **IEC 60601-1:1988, A1:1991, A2:1995**
- Medical Electrical Equipment, Part 1-1: General Requirements for Safety - Collateral Standards: General Requirements for Medical Electrical Systems **IEC 60601-1-1:2000**
- Medical Electrical Equipment, Part 1-2: General Requirements for Safety - Collateral Standards: Electromagnetic Compatibility - Requirements and Tests **IEC 60601-1-2:2001, A1:2004**
- Medical Electrical Equipment, Part 1-4: General Requirements for Safety - Collateral Standards: Programmable Electrical Medical Systems **IEC 60601-1-4:1996, A1:1999**

- Medical Electrical Equipment, Part 2-37: Particular Requirements for the Basic Safety and Essential Performance of Ultrasonic Medical Diagnostic and Monitoring Equipment **IEC 60601-2-37:2001, A1:2004, A2:2005**
- Medical Devices - Application of Risk Management **ISO 14971:2007**
- Medical Electrical Equipment, Part 1: General Requirements for Safety **UL 60601-1:2003**
- Medical Electrical Equipment - Part 1: General Requirements for Safety **CAN/CSA C22.2 No. 601.1-M90:1990, R2003, R2005**
- Biological Evaluation of Medical Devices – Part 1: Evaluation and Testing **ISO 10993-1: 2009**
- Standard Means for Reporting the Acoustic Output of Medical Diagnostic Ultrasonic Equipment **IEC 61157:2007**

■ □Declarations

CSA mark with the indicators “C” and “US” means that the product is certified for both the U.S. and Canadian markets, to the applicable U.S. and Canadian standards.

CE 0123

This is the manufacturer’s declaration of product compliance with applicable EEC directive (s) and the European notified body.

CE

This is the manufacturer’s declaration of product compliance with applicable EEC directive (s).

GMP

Korea Food & Drug Administration

This is the GMP symbol for Korean Good Manufacturing Practice quality system regulation.

Precautions for Use

Read this service manual to familiarize yourself thoroughly with repair procedures and important safety information before attempting to service the product.

- Refer to this service manual when you are servicing the product. Please familiarize yourself with the safety precautions in 'Chapter 1. Safety' and 'Chapter 4. Maintenance' in particular.
- This product is an ultrasound diagnosis device and cannot be used for other purposes.
- This product may only be serviced by a service engineer of Samsung Medison or an authorized engineer. Samsung Medison is not responsible for any problems caused by an unauthorized person servicing the product.
- The manufacturer is not responsible for any damage to this product caused by user carelessness and/or neglect.
- The content of this service manual is subject to change without prior notice.
- Products that are not manufactured by Samsung Medison are indicated with the trademarks of their respective owners.
- The following terms are used to highlight safety precautions that the user must be aware of:

DANGER	Describes precautions necessary to prevent user hazards of great urgency. Ignoring a DANGER warning will risk life-threatening injury.
WARNING	Used to indicate the presence of a hazard that can cause serious personal injury, or substantial property damage.
CAUTION	Indicates the presence of a hazard that can cause equipment damage.
NOTE	A piece of information useful for installing, operating and maintaining a system. Not related to any hazard.

Revision History

The revision history of this manual is as follows:

VERSION	DATE	REASON FOR CHANGE
v1.00.00	2015.07.07	Initial Release
V2.00.00	2016.09.22	Software upgrade / Parts change

If You Need Assistance

If you need any assistance with the equipment, please contact the Samsung Medison Customer Service Department or your local vendor.

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Chapter 1

Safety

Purpose of Use

Ultrasound diagnostic system and probes were designed for obtaining ultrasound images and analyzing human blood. The clinical applications include:

Fetal/Obstetrics, Abdominal, Gynecology, Pediatric, Small Organ, Neonatal Cephalic, Adult Cephalic, Trans-rectal, Trans-vaginal, Muscular-Skeletal (Conventional, Superficial), Urology, Cardiac Adult, Cardiac Pediatric and Peripheral vessel.

NOTE	For detailed information on applications and presets, please refer to the HS70A User Manual.

Restrictions

This product must not be used for ophthalmological applications, or any other use that involves the ultrasound beam passing through the eye.

CAUTION	For information on the use or clinical application of this product, please refer to the HS70A User Manual.

Safety Information

Please read the following safety information before using this product. This provides explanation about the ultrasound system, the probes, the recording devices, and any of the optional equipment.

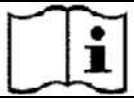
This product is intended for use by, or by the order of, and under the supervision of, a licensed physician who is qualified for direct use of medical devices.

Prolonged use of three-dimensional ultrasound (3D, 4D) by an unqualified individual, such as to produce a commemorative photograph or video of the fetus, may have an adverse effect on the fetus.

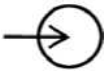
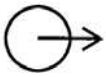
Please use the 3D ultrasound diagnostic imaging system for appropriate purposes only, since using it for non-diagnostic purposes such as recording videos of the fetus may adversely affect the fetus.

Safety Symbols

The International Electro Technical Commission (IEC) has established a set of symbols for medical electronic equipment, which classify a connection or warn of potential hazards. The classifications and symbols are shown below.

Symbols	Description
	Warning: The accompanying information must be followed to prevent serious accidents and/or damage to property.
	Caution: The accompanying information helps to prevent minor accidents and/or damage to property.
	Refer to the user manual.

Symbols	Description
	Follow the user manual.
	Caution: Risk of electric shock
	Type BF applied part (Classification based on degree of protection against electric hazard)
	Defibrillation-proof type CF applied part (Classification based on degree of protection against electric hazard)
	Power on/off
	Power on
	Power off
	Product is partially powered on
	Power off for part of the product
V~	AC (alternating current) voltage source
	Direct current voltage source
	Dangerous voltage (Indicates dangerous voltages over 1000V AC or 1500V DC)
	Protective earth (ground)
	Equipotentiality
	Data output port

Symbols	Description
	Data input port
	Data input/output port
	Input port
	Output port
	Print remote output
	Foot switch port
	ECG port
	USB port
	Network port
	Microphone port
	Probe port
IPX 1	Dripping-proof device: Protected against vertically falling water
IPX 7	Immersion-proof device: Protected against the effects of temporary immersion in water
IPX 8	Submersion-proof device: Protected against the effects of continuous immersion in water

Symbols	Description
	Caution: Electrostatic sensitive devices (ESD)
	Do not sit on the product.
	Do not push the product.
	Do not lean against the product.
	Be mindful of the space. Do not place a finger, and or any part of your body in the space.

LABEL

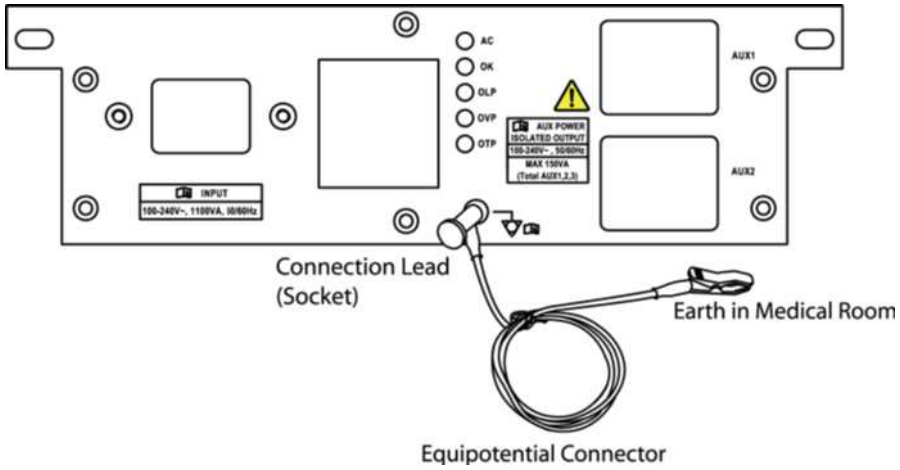
Phrases containing the words ‘warning’ and/or ‘caution’ are displayed on the product’s surface in order to protect it.

Electrical Safety

This equipment is categorized as a Class I device with Type BF or Type CF (ECG) applied parts.

Prevention of Electric Shock

In a hospital environment, dangerous electric current may occur as a result of the potential difference between a contactable conductive part and connected equipment in treatment rooms. The solution to the problem is consistent equipotential bonding. Medical equipment is connected with connecting leads made up of sockets which are angled to the equipotential bonding network in medical rooms.



[Figure 1.1 Equipotential Bonding]

Additional equipment connected to medical electrical equipment must comply with the pertinent IEC standards (e.g. IEC 60950/EN 60950 for data processing equipment, IEC 60601-1/EN 60601-1 for medical devices). Furthermore, all components of the product shall comply with the requirements for medical electrical systems IEC 60601-1-1/EN 60601-1-1. Any person connecting additional equipment to the signal input and output ports of medical electrical equipment must verify that the equipment complies with IEC 60601-1-1/EN 60601-1-1.

WARNING	■ Electric shocks may result if this system, including all of its externally mounted recording and monitoring devices, is not properly grounded. ■ Never open the cover of the product. Hazardously high voltage flows through the product. All internal adjustments and replacements must be made by a qualified Samsung Medison Customer Service Department. ■ Always check the product's casing, cables, cords, and plugs for damage before using the product. Disconnect and do not use the power source if the face is cracked, chipped, torn, the housing is damaged, or if the cable is abraded. ■ Always disconnect the system from the wall outlet prior to cleaning it. ■ All patient contact devices, such as probes and ECG leads, must be removed from the patient prior to the application of a high voltage defibrillation pulse. ■ The use of flammable anesthetic gas or oxidizing gases (N2O) should be avoided. Doing so may cause an explosion. ■ Avoid placing the system where it is likely to be difficult to operate, or disconnect. ■ Do not use HF surgical equipment with the system. Any malfunctions in the HF surgical equipment may result in burns to the patient. ■ The system must only be connected to a supply mains with protective earth to avoid risk of electric shock.

CAUTION	■ The system has been designed for 100-240VAC; you should select the input voltage of any connected printer and VCR. Prior to connecting a peripheral power cord, verify that the voltage indicated on the power cord matches the voltage rating of the peripheral device. ■ An isolation transformer protects the system from power surges. This continues to operate when the system is on standby. ■ Do not immerse the cable in liquids. Cables are not waterproof. ■ Make sure that the inside of the system is not exposed to or flooded with liquids. In such cases, fire, electric shock, injury, or damage to the product may occur. ■ The auxiliary socket outlets installed on this system are rated 100-240VAC, with a maximum total load of 150VA. Only use these outlets for supplying power to equipment that is intended to be part of the ultrasound system. Do not connect additional multiple-socket outlets or extension cords to the system. ■ Do not connect any peripheral devices not listed in this manual to the auxiliary socket outlets of the system. It may cause an electrical hazard. ■ Do not touch SIP/SOP and the patient simultaneously. There is a risk of electric shock from current leakage.

ECG-Related Information

WARNING	■ This product does not support ECG monitoring. Therefore, it will not recognize incompatible ECG signals. ■ Do not use the ECG electrodes of HF surgical equipment. Any malfunctions in the HF surgical equipment may result in burns to the patient. ■ Do not use ECG electrodes during cardiac pacemaker procedures or other electrical stimulators. ■ Do not use ECG leads and electrodes in an operating room.

ESD

Electrostatic discharge (ESD), commonly referred to as a static shock, is a naturally occurring phenomenon. ESD is most prevalent during conditions of low humidity, which can be caused by heating or air conditioning. The static shock, or ESD, is a discharge of the electrical energy buildup from a charged individual to a lesser or uncharged individual or object. An ESD occurs when an individual with an electrical energy build-up comes in to contact with conductive objects such as metal doorknobs, file cabinets, computer equipment, and even other individuals.

CAUTION	■ The level of electrical energy discharged from a system user or a patient to an ultrasound system can be significant enough to cause damage to the system or probes. ■ Always perform the pre-ESD preventive procedures before using connectors marked with the ESD warning label. - Apply anti-static spray to carpets or linoleum. - Use anti-static mats. - Ground the product to the patient table or bed. ■ It is highly recommended that the user be given training on ESD-related warning symbols and preventive procedures.

EMI

This product complies with EMI (Electromagnetic Interference) standards. However, using the system inside an electromagnetic field can lower the quality of ultrasound images and even damage the product.

If this occurs often, Samsung Medison suggests a review of the environment in which the system is being used, to identify possible sources of radiated emissions. These emissions could be from other electrical devices used within the same room or an adjacent room. Communication devices, such as cellular phones and pagers, can cause these emissions. The existence of radios, TVs, or microwave transmission equipment nearby can also cause interference.

CAUTION	In cases where EMI is causing disturbances, it may be necessary to relocate the system.

EMC

Testing of the EMC (Electromagnetic Compatibility) of this system has been performed according to the international standard for EMC with medical devices (IEC 60601-1-2). This IEC standard was adopted in Europe as the European norm (EN 60601-1-2).

Guidance and Manufacturer's Declaration – Electromagnetic Emissions

This product is intended for use in the electromagnetic environment specified below. The customer or the user of this product should assure that it is used in such an environment.

Emission Test	Compliance	Electromagnetic environment guidance
RF Emission CISPR 11	Group 1	The Ultrasound System uses RF energy only for its internal function. Therefore, its RF emissions are very low and are not likely to cause any interference in nearby electronic equipment.
RF Emission CISPR 11	Class A	The Ultrasound System is suitable for use in all establishments other than domestic and those directly connected to the public low-voltage power supply network that supplies buildings used for domestic purposes.
Harmonic Emission IEC 61000-3-2	Class A	
Flicker Emission IEC 61000-3-3	Complies	

Approved Cables, Probes and Peripherals for EMC

■ Cable

Cables connected to this product may affect its emissions.

Refer to the table below for recommended cable types and lengths:

Cable	Type	Length
VGA	Shielded	Normal
RS232C	Shielded	Normal
USB	Shielded	Normal
LAN(RJ45)	Twisted pair	Any
S-Video	Shielded	Normal
Foot Switch	Shielded	2.99m
B/W printer	Unshielded Coaxial	Normal
MIC	Unshielded	Any
Printer Remote	Unshielded	Any
Audio R.L	Shielded	Normal
VHS	Shielded	Normal
ECG AUX input	Shielded	< 3m
Parallel	Shielded	Normal

■ Probe

The image probe used with this product may affect its emission. The probe listed in 'Chapter 5. Probes' when used with this product, have been tested to comply with the group1 Class A emission as required by International Standard CISPR 11.

■ □Peripherals

Peripherals used with this product may affect its emissions.

CAUTION	When connecting other customer-supplied accessories to the system, it is the user's responsibility to ensure the electromagnetic compatibility of the system.
WARNING	The use of cables, probes, and peripherals other than those specified, may result in increased emissions or decreased immunity of the Ultrasound System.

Immunity Test	IEC 60601 Test Level	Compliance level	Electromagnetic environment guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6KV contact ±8KV air	±6KV contact ±8KV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2KV for power supply lines ±1KV for input/output lines	±2KV for power supply lines ±1KV for input/output lines	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1KV differential mode ±2KV common mode	±1KV differential mode ±2KV common mode	Mains power quality should be that of a typical commercial or hospital environment.
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5% U_T for 0.5 cycles (>95% dip in U_T) 40% U_T for 5 cycles (60% dip in U_T) 70% U_T for 25 cycles (30% dip in U_T) <5% U_T for 5 s (<95% dip in U_T)	<5%U_T for 0.5 cycles (>95% dip in U_T) 40% U_T for 5 cycles (60% dip in U_T) 70% U_T for 25 cycles (30% dip in U_T) <5%U_T for 5 s (<95% dip in U_T)	Mains power quality should be that of a typical commercial or hospital environment. If the user of this product requires continued operation during power mains interruptions, it is recommended that this product be powered from an uninterruptible power supply or a battery.
Power frequency magnetic field (50/60Hz) IEC 61000-4-8	3A/m	3A/m	Power frequency magnetic fields should be at levels characteristic of a typical commercial or hospital environment.
Note: U_T is the AC mains voltage, prior to application of the test level.			

Immunity Test	**IEC 60601 Test Level**	**Compliance level**	**Electromagnetic environment guidance**
Conducted RF IEC 61000-4-6	3Vrms 150kHz ~ 80MHz	3V	Portable and mobile RF communications equipment should be used no closer to any part of the Ultrasound System, including cables, than the recommended separation distance. This is calculated using the equation applicable to the frequency of the transmitter. **Recommended separation distance** $d = 1.2\sqrt{P}$ $d = 1.2\sqrt{P}$ 80MHz to 800MHz $d = 2.3\sqrt{P}$ 800MHz to 2.5GHz
Radiated RF IEC 61000-4-3	3V/m 80MHz ~ 2.5GHz	3V/m	Where *P* is the transmitter's maximum output power rating in watts (W) according to the transmitter's manufacturer, and *d* is the recommended separation distance in meters (m). Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, [a]should be less than the compliance level in each frequency range.[b] Interference may occur in the vicinity of equipment marked with the following symbol: 

Note 1) At 80MHz and 800MHz, the higher frequency range applies.
Note 2) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio, (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcasts and TV broadcasts cannot be predicted with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength, in the location in which the Ultrasound System is used, exceeds the applicable RF compliance level above, the Ultrasound System should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the Ultrasound System or using a shielded location with a higher RF shielding effectiveness and filter attenuation.
[b] IOver the frequency range 150kHz to 80MHz, field strengths should be less than 3 V/m.

▌Recommended Separation Distances between This Product and RF Communications Equipment

This product is intended for use in an electromagnetic environment in which radiated RF disturbances are controlled. The customer or the user of this product can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and this product. These distances are recommended below, according to the maximum output power of the communications equipment.

Rated maximum output power of transmitter W	**Separation distance, according to frequency of transmitter m**		
	150kHz ~ 80MHz $d = 1.2\sqrt{P}$	**80MHz ~ 800MHz** $d = 1.2\sqrt{P}$	**800MHz ~ 2.5GHz** $d = 2.3\sqrt{P}$
0.01	0.12	0.12	0.23
0.1	0.38	0.38	0.73
1	1.2	1.2	2.3
10	3.8	3.8	7.3
100	12	12	23

For transmitters rated at a maximum output power not listed above, the recommended separation distance *d* in meters (m) can be estimated using the equation applicable to the frequency of the transmitter, where *p* is the maximum output power rating of the transmitter in watts (W), according to the transmitter's manufacturer.

NOTE 1) At 80MHz and 800MHz, the separation distance for the higher frequency range applies.
NOTE 2) These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

Electromagnetic Environment – Guidance

It is recommended to use ultrasound systems in shielded locations offering RF shielding effectiveness, with shielded cables. Field strengths outside the location shielded from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3V/m.

It is essential that the actual shielding effectiveness and filter attenuation of the shielded location be verified to assure that they meet the minimum specification.

CAUTION	If the system is connected to other customer-supplied equipment, such as a local area network (LAN) or a remote printer, Samsung Medison cannot guarantee that the remote equipment will work correctly in the presence of electromagnetic phenomena.

Avoiding Electromagnetic Interference

Typical interference on ultrasound imaging systems varies depending on electromagnetic phenomena. Please refer to the following table:

Imaging Mode	ESD[1]	RF[2]	Power Line[3]
2D	Change of operating mode, system settings, or system reset. Brief flashes in the displayed or recorded image.	For sector imaging probes, white radial bands or flashes in the centerlines of the image. For linear imaging probes, white vertical bands, sometimes more pronounced on the sides of the image.	White dots, dashes, diagonal lines, or diagonal lines near the center of the image.
M		Increase in the image background noise or white M mode lines.	White dots, dashes, diagonal lines, or increase in image background noise.
Color		Color flashes, radial or vertical bands, increase in background noise, or changes in color image.	Color flashes, dots, dashes, or changes in the color noise level.
Doppler		Horizontal lines in the spectral display or tones, abnormal noise in the audio, or both.	Vertical lines in the spectral display, popping type noises in the audio, or both.

1. ESD caused by discharging of electric charge build-up on insulated surfaces or persons.
2. RF energy from RF transmitting equipment such as portable phones, hand-held radios, wireless devices, commercial radio and TV, and so on.
3. Conducted interference on power lines or connected cables caused by other equipment, such as switching power supplies, electrical controls, and natural phenomena such as lightning.

A medical device can either generate or receive electromagnetic interference. The EMC standards describe tests for both emitted and received interference.

Samsung Medison ultrasound systems do not generate interference in excess of the referenced standards.

The Ultrasound System is designed to receive signals at radio frequency and is therefore

susceptible to interference generated by RF energy sources. Examples of other sources of interference are medical devices, information technology products, and radio and television transmission towers. Tracing the source of radiated interference can be a difficult task. Customers should consider the following in an attempt to locate the source:

- Is the interference intermittent or constant?
- Does the interference show up only with one transducer operating at the same frequency or with several transducers?
- Do two different transducers operating at the same frequency have the same problem?
- Is the interference present if the system is moved to a different location in the facility?

The answers to these questions will help to determine if the problem resides with the system or the scanning environment. After you answer this question, contact your local Samsung Medison customer service representative.

Mechanical Safety

Moving the Equipment

WARNING	The product weighs more than 100kg. Be extra careful when transporting it. Careless transportation of the product may result in product damage or personal injury.

- Before transporting the product, check that the wheel brakes are unlocked. Also, make sure to retract the monitor arm completely, so that it is secured in a stationary position.
- Always use the handles at the back of the console and move the product slowly.

This product is designed to resist shocks. However, excessive shock, for example – if the product falls over, may cause serious damage.

If the product does not work properly after transfer, please contact the Samsung Medison Service Department.

The Brakes

You can use the brakes to control the movement of the product. The brakes are mounted on each wheel of the main body with interlinked on/off buttons. This is how you engage or release the brakes:

- Engaged: To engage the brakes, press the On button with your foot. The Off button will rise.
- Released: To release the brakes, press the Off button with your foot. The On button will rise.

We recommend that you lock the brakes when using the product.

Precautions on Ramps

Always make sure that the control panel is facing the direction of movement.

WARNING	Be aware of the castors, especially when moving the system. Samsung Medison recommends that you exercise caution when moving the product up or down ramps.

When moving the product down a ramp or resting it temporarily on a ramp, the product may tilt over even with the brakes on depending on the direction the product is facing. Do not leave the product on ramps.

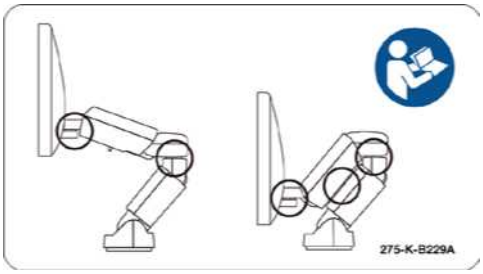
Safety Notes

CAUTION	■ Do not press the control panel excessively. ■ Never attempt to modify the product in any way. ■ Check the operational safety when using the product after a prolonged break in service. ■ Make sure that other objects, such as pieces of metal, do not enter the system. ■ Do not block the ventilation slots. ■ Do not pull on the power cord to unplug it. Doing so can damage the cord and cause short-circuiting and cord snapping. Always unplug by pulling on the plug itself. ■ Excessive bending or twisting of cables, or parts that are applied to the patient, may cause failure or intermittent operation of the system. ■ Improper cleaning or sterilization of parts that are applied to the patient may cause permanent damage. ■ Servicing the product, including repairs and the replacement of parts, must be done by qualified Samsung Medison service personnel. Assuming that the product is used in accordance with the guidelines contained in this manual and maintained by qualified service personnel, the expected service life of the product is approximately 7 years.

For detailed information on cleaning and disinfecting the product, refer to ‘Chapter 4. Maintenance‘.

Monitor Safety Caution

When adjusting the height or position of the monitor, be careful of the space in the middle of the monitor arm. Having your fingers, or other body parts, caught in it may result in injury.

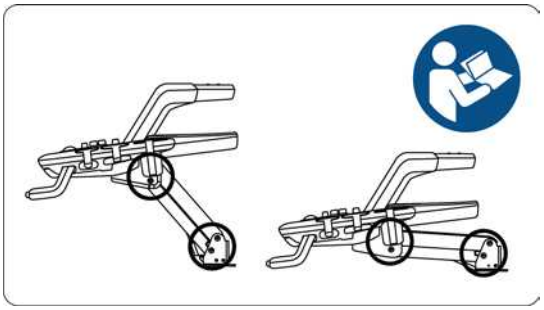


[Figure 1.2 Monitor Safety Caution]

Control Panel Caution

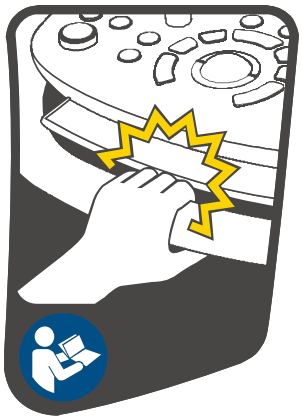
CAUTION	■ Do not press on the control panel with excessive force or lean against it. ■ Do not sit on the control panel or apply too much pressure to it.

When adjusting the control panel's height or position, be mindful of the space between the panel and the lift. Having your fingers, or other body parts, caught in it may result in injury.



[Figure 1.3 Control Panel Caution]

When using the handle of the control panel, be mindful of the space between the handle and the keyboard. The keyboard may pop up and hit your hand.



[Figure 1.4 Handle Caution]

Biological Safety

For safety instructions concerning probes and biopsies, refer to HS70A User Manual.

WARNING	■ Ultrasound waves may have damaging effects on cells and, therefore, may be harmful to the patient. If there is no medical benefit, minimize the exposure time and maintain the ultrasound wave output level at low. Please refer to the ALARA principle. ■ Do not use the system if an error message appears on the video display indicating that a hazardous condition exists. Note the error code, turn off the power to the system, and call Samsung Medison customer service department. ■ Do not use a system that exhibits erratic or inconsistent functioning. Discontinuities in the scanning sequence are indicative of a hardware failure that should be corrected before use. ■ The system limits the maximum contact temperature to 43 degrees Celsius, and the ultrasonic wave output observes American FDA regulations.

ALARA Principle

Guidance for the use of diagnostic ultrasound is defined by the ”(**A**s **L**ow **A**s **R**easonably **A**chievable) (ALARA) principle. The decision as to what is reasonable has been left to the judgment and insight of qualified personnel. No set of rules can be formulated that would be sufficiently complete to dictate the correct response to every circumstance. By keeping ultrasound exposure as low as possible, while obtaining diagnostic images, users can minimize ultrasonic bioeffects.

Since the threshold for diagnostic ultrasound bioeffects is undetermined, it is the sonographer’s responsibility to control the total energy transmitted into the patient. The sonographer must reconcile exposure time with diagnostic image quality. To ensure diagnostic image quality and limit exposure time, the Ultrasound System provides controls that can be manipulated during the exam to optimize the results.

The ability of the user to abide by the ALARA principle is important. Advances in diagnostic ultrasound, not only in the technology but also in its applications, have resulted in the need for increased and improved information to guide the user. The output indices are designed to provide that important information.

There are a number of variables, which affect the way in which the output display indices can be used to implement the ALARA principle. These variables include mass, body size, location of the bone relative to the focal point, attenuation in the body, and ultrasound exposure time. Exposure time is an especially useful variable, because the user controls it. The ability to limit the index values over time supports the ALARA principle.

Applying ALARA

The system imaging mode used depends upon the information needed. 2D-mode and M-mode imaging provide anatomical information, while Doppler, Power, and Color imaging provide information about blood flow. Scanned modes, like 2D-mode, Power, or Color, disperse or scatter the ultrasonic energy over an area, while an unscanned mode, like M-mode or Doppler, concentrate the ultrasonic energy. Understanding the nature of the imaging mode being used allows the sonographer to apply the ALARA principle with informed judgment. The probe frequency, system set-up values, scanning techniques, and operator experience aid the sonographer in meeting the ALARA principle. The decision as to the amount of acoustic output is, in the final analysis, up to the system operator. This decision must be based on the following factors: type of patient, type of exam, patient history, ease or difficulty of obtaining diagnostically useful information, and the potential localized heating of the patient due to probe surface temperatures. Prudent use of the system occurs when patient exposure is limited to the lowest index reading for the shortest amount of time necessary to achieve acceptable diagnostic results.

Although a high index reading does not mean that a biological effect is actually occurring, it should be taken seriously. Every effort should be made to reduce the possible effects of a high index reading. Limiting exposure time is an effective way to accomplish this goal.

There are several system controls that the operator can use to adjust the image quality and limit the acoustic intensity. These controls are related to the techniques that an operator might use to implement ALARA and can be divided into three categories: direct, indirect, and receiver control.

Direct Controls

Application selection and the output intensity control directly affect acoustic intensity. There are different ranges of allowable intensity or output depending on your selection. Selecting the correct range of acoustic intensity for the application is one of the first things required during any exam. For example, peripheral vascular intensity levels are not recommended for fetal exams. Some systems automatically select the proper range for a particular procedure, while others require manual selection. Ultimately, the user bears the responsibility for proper clinical use. Samsung Medison systems provide both automatic and user-definable settings.

Output has direct impact on acoustic intensity. Once the application has been established, the output control can be used to increase or decrease the output intensity. The output control allows you to select intensity levels less than the defined maximum. Prudent use dictates that you select the lowest output intensity consistent with good image quality.

Indirect Controls

The indirect controls are those that have an indirect effect on acoustic intensity. These controls affect

imaging mode, pulse repetition frequency, focus depth, pulse length, and probe selection.

The choice of imaging mode determines the nature of the ultrasound beam. 2D-mode is a scanning mode, Doppler is a stationary or unscanned mode. A stationary ultrasound beam concentrates energy on a single location. A moving or scanned ultrasound beam disperses the energy over a wide area and the beam is only concentrated on a given area for a fraction of the time that is necessary in unscanned mode.

Pulse repetition frequency or rate refers to the number of ultrasound bursts of energy over a specific period of time. The higher the pulse repetition frequency, the more pulses of energy in a given period of time. Several controls affect pulse repetition frequency: focal depth, display depth, sample volume depth, color sensitivity, number of focal zones, and sector width controls.

The focus of the ultrasound beam affects the image resolution. To maintain or increase resolution at a different focus requires a variation of output over the focal zone. This variation of output is a function of system optimization. Different exams require different focal depths. Setting the focus to the proper depth improves the resolution of the structure of interest.

Pulse length is the time during which the ultrasonic burst is turned on. The longer the pulse, the greater the time-average intensity value. The greater the time-average intensity, the greater the likelihood of temperature increase and cavitations. Pulse length, burst length or pulse duration is the output pulse duration in pulsed Doppler. Increasing the Doppler sample volume, increases the pulse length.

Probe selection affects intensity indirectly. Tissue attenuation changes with frequency. The higher the probe operating frequency, the greater the attenuation of the ultrasonic energy. Higher probe operating frequencies require higher output intensity to scan at an increased depth. To scan deeper at the same output intensity, a lower probe frequency is required. Using more gain and output beyond a point, without corresponding increases in image quality, can mean that a lower frequency probe is needed.

- **Receiver Controls**

  Receiver controls are used by the operator to improve image quality. These controls have no effect on output. Receiver controls only affect how the ultrasound echo is received. These controls include gain, TGC, dynamic range, and image processing. The important thing to remember, relative to output, is that receiver controls should be optimized before increasing output. For example; before increasing output, optimize gain to improve image quality.

Additional Considerations

Ensure that scanning time is kept to a minimum, and ensure that only medically required scanning is performed. Never compromise quality by rushing through an exam. A poor exam will require a follow-

up, which ultimately increases the time. Diagnostic ultrasound is an important tool in medicine, and, like any tool, should be used efficiently and effectively.

Output Display Features

The system output display comprises two basic indices: a mechanical index and a thermal index. The thermal index consists of the following indices: soft tissue (TIs), bone (TIb) and cranial bone (TIc). One of these three thermal indices will be displayed at all times. Which one depends upon the system's default setting or user choice, depending upon the application at hand.

The mechanical index is continuously displayed over the range of 0.0 to 1.9, in increments of 0.1. The thermal index consists of the three indices, and only one of these is displayed at any one time. Each probe application has a default selection that is appropriate for that combination. The TIb or TIs is continuously displayed over the range of 0.0 to the maximum output, based on the probe and application, in increments of 0.1.

The application-specific nature of the default setting is also an important factor of index behavior. The default setting is a system control state, which is preset by the manufacturer or the operator. The system has default index settings for the probe application. The default settings are invoked automatically by the Ultrasound System when power is turned on, new patient data is entered into the system database, or a change in application takes place. The decision as to which of the three thermal indices to display should be based on the following criteria:

Appropriate index for the application: TIs is used for imaging soft tissue; and TIb for a focus at or near bone.Some factors might create artificially high or low thermal index readings, e.g. the presence of fluid or bone, or the flow of blood. A highly attenuating tissue path, for example, will cause the potential for local zone heating to be less than the thermal index displays.

Scanned modes versus unscanned modes of operation affect the thermal index. For scanned modes, heating tends to be near the surface; for unscanned modes, the potential for heating tends to be deeper in the focal zone.

Always limit ultrasound exposure time but do not rush the exam. Ensure that the indices are kept to a minimum and that exposure time is limited without compromising diagnostic sensitivity.

■ Mechanical Index (MI) Display

Mechanical bioeffects are threshold phenomena that occur when a certain level of output is exceeded. The threshold level varies, however, with the type of tissue. The potential for mechanical biological effects varies with peak pressure and ultrasound frequency. The MI

accounts for these two factors. The higher the MI value, the greater the likelihood of mechanical bioeffects occurring. However, there is no specific MI value that means that a mechanical bioeffect will actually occur. The MI should be used as a guide for implementing the ALARA principle.

■ Thermal Index (TI) Display

The TI informs the user about the potential for temperature increase occurring at the body surface, within body tissue, or at the point of focus of the ultrasound beam on bone. The TI is an estimate of the temperature increase in specific body tissues. The actual amount of any temperature rise is influenced by factors such as tissue type, vascularity, mode of operation, etc. The TI should be used as a guide for implementing the ALARA principle.

The bone thermal index (TIb) informs the user about potential heating at or near the focus, after the ultrasound beam has passed through soft tissue or fluid, for example, at or near second or third trimester fetal bone. The cranial bone thermal index (TIc) informs the user about the potential heating of bone at or near the surface of, for example, cranial bone. The soft tissue thermal index (TIs) informs the user about the potential for heating within soft homogeneous tissue. TIc is displayed when you select a trans-cranial application.

You can select TI Display in Utility > Setup > Display > Display.

■ Precision and Accuracy of Mechanical and Thermal Indices Displays

The mechanical and thermal indices on the system are precise to 0.1 units.
The MI and TI display accuracy estimates for the system are given in the Acoustic Output Tables manual. These accuracy estimates are based on the various range of probes and systems, inherent acoustic output modeling errors, and measurement variation, as described below.

The displayed values should be interpreted as relative information to help the system operator achieve the ALARA principle through prudent use of the system. The values should not be interpreted as actual physical values from investigated tissue or organs. The initial data that is used to support the output display is derived from laboratory measurements based on the AIUM measurement standard. The measurements are then put into algorithms for calculating the displayed output values.

Many of the assumptions used in the process of measurement and calculation are conservative in nature. Over-estimation of actual *in situ* exposure, for the vast majority of tissue paths, is built into

the measurement and calculation process. For example, the measured water tank values are derated using a conservative, industry standard, attenuation coefficient of 0.3dB/cm-MHz.

Conservative values for tissue characteristics were selected for use in the TI models. Conservative values for tissue or bone absorption rates, blood perfusion rates, blood heat capacity, and tissue thermal conductivity were selected.

A steady state temperature rise is assumed in the industry standard TI models, and the assumption is made that the ultrasound probe is held steady in one position long enough for a steady state to be reached.

A number of factors are considered when estimating the accuracy of display values: hardware variations, algorithm accuracy estimation and measurement variation. Variation among probes and systems is a significant factor. Probe variability results from piezoelectric crystal efficiencies, process-related impedance differences, and sensitive lens focusing parameter variations. Differences in the system pulse voltage control and efficiencies are also a contributor to variability. There are inherent uncertainties in the algorithms used for estimating acoustic output values over the range of possible system operating conditions and pulse voltages. Inaccuracies in laboratory measurements are related to differences in hydrophone calibration and performance, positioning, alignment and digitization tolerances, as well as variation among test operators.

The conservative assumptions of the output estimation algorithms of linear propagation, at all depths, through a 0.3dB/cm-MHz attenuated medium are not taken into account in calculation of the accuracy estimate displayed. Neither linear propagation, nor uniform attenuation at the 0.3dB/cm-MHz rate, occur in water tank measurements or in most tissue paths in the body. In the body, different tissues and organs have dissimilar attenuation characteristics. In water, there is almost no attenuation. In the body, and particularly in water tank measurements, non-linear propagation and saturation losses occur as pulse voltages increase.

The display accuracy estimates take into account the varying ranges of probes and systems, inherent acoustic output modeling errors, and measurement variations. Display accuracy estimates are not based on errors in, or caused by measuring according to, the AIUM measurement standards. They are also independent of the effects of non-linear loss on the measured values.

Control Effect - Control Affecting the indices

As various system controls are adjusted, the TI and MI values may change. This will be most apparent as the POWER control is adjusted; however, other system controls will affect the on-screen output

values.

- **Power**

  Power controls the system acoustic output. Two real-time output values are on the screen: a TI and an MI. They change as the system responds to POWER adjustments.
  In combined modes, such as simultaneous Color, 2D-mode and pulsed Doppler, the individual modes each add to the total TI. One mode will be the dominant contributor to this total. The displayed MI will be from the mode with the largest peak pressure.

2D-mode Controls

- **2D-Mode Size**

  Narrowing the sector angle may increase the frame rate. This action will increase the TI. Pulse voltage may be automatically adjusted down via software controls to keep the TI below the system maximums. A decrease in pulse voltage will decrease the MI.

- **Zoom**

  Increasing the zoom magnification may increase the frame rate. This action will increase the TI. The number of focal zones may also increase automatically to improve resolution. This action may change the MI, since the peak intensity can occur at a different depth.

- **Persistence**

  A lower persistence will decrease the TI. Pulse voltage may be automatically increased. An increase in pulse voltage will increase the MI.

- **Focal no.**

  More focal zones may change both the TI and MI by changing the frame rate or focal depth automatically. Lower frame rates decrease the TI. The MI displayed will correspond to the zone with the largest peak intensity.

- **Focus**

  Changing the focal depth will change the MI. Generally, higher MI values will occur when the focal depth is near the natural focus of the transducer.

Color and Power Controls

- **Color Sensitivity**

  Increasing the color sensitivity may increase the TI. More time is spent scanning for color images. Color pulses are the dominant pulse type in this mode.

- **Color Sector Width**

  Narrower color sector width will increase color frame rate and the TI will increase. The system may automatically decrease pulse voltage to stay below the system maximum. A decrease in pulse voltage will decrease the MI. If pulsed Doppler is also enabled, then pulsed Doppler will remain as the primary mode and the TI change will be small.

- **Color Sector Depth**

  Deeper color sector depth may automatically decrease color frame rate or change color focal zone or color pulse length. The TI will change due to the combination of these effects. Generally, the TI will decrease with increased color sector depth. MI will correspond to the peak intensity of the dominant pulse type, which is a color pulse. However, if pulsed Doppler is also enabled then pulsed Doppler will remain the dominant mode and the TI change will be small.

- **Scale**

  Using the SCALE control to increase the color velocity range may increase the TI. The system will automatically adjust pulse voltage to stay below the system maximums. A decrease in pulse voltage will also decrease MI.

- **Sec Width**

  A narrower 2D-mode sector width in Color imaging will increase color frame rate. The TI will increase and the MI will not change. If pulsed Doppler is also enabled, then pulsed Doppler will remain as the primary mode and the TI change will be small.

M Mode and Doppler Controls

- **Speed**

  M-Mode and Doppler sweep speed adjustments will not affect the MI. When M-Mode sweep speed changes, TI changes.

- **Simultaneous and Update Methods**

  Use of combination modes affects both the TI and MI through the combination of pulse types. During simultaneous mode, the TI is additive. During auto-update and duplex, the TI will display the dominant pulse type. The displayed MI will be from the mode with the largest peak pressure.

- **Sample Volume Depth**

  When Doppler sample volume depth is increased, the Doppler PRF may automatically decrease. A decrease in PRF will decrease the TI. The system may also automatically decrease the pulse voltage to remain below the system maximum. A decrease in pulse voltage will decrease the MI.

Doppler, CW, M-Mode, and Color Imaging Controls

When a new imaging mode is selected, both the TI and the MI will change to default settings. Each mode has a corresponding pulse repetition frequency and maximum intensity point. In combined or simultaneous modes, the TI is the sum of the contribution from the modes enabled and the MI is for the focal zone and mode with the largest derated intensity. If a mode is turned off and then reselected, the system will return to the previously selected settings.

- **Probes**

  Each probe model available has unique specifications for contact area, beam shape, and center frequency. Defaults are initialized when you select a probe. Factory defaults vary with probe, application, and selected mode. Defaults have been chosen below the FDA limits for intended use.

  - **Depth**

    An increase in 2D-mode depth will automatically decrease the 2D-mode frame rate. This would decrease the TI. The system may also automatically choose a deeper 2D-mode focal depth. A change of focal depth may change the MI. The MI displayed is that of the zone with the largest peak intensity.

- **Application**

  Acoustic output defaults are set when you select an application. Factory defaults vary with probe, application, and mode. Defaults have been chosen below the FDA limits for intended

use.

Related Guidance Documents

For more information about ultrasonic bioeffects and related topics refer to the following:

- AIUM Report, January 28, 1993, “Bioeffects and Safety of Diagnostic Ultrasound”
- Bioeffects Considerations for the Safety of Diagnostic Ultrasound, *J Ultrasound Med*., Sept. 1998: Vol. 7, No. 9 Supplement
- Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment. (AIUM, NEMA. 1998)
- Acoustic Output Labeling Standard for Diagnostic Ultrasound Equipment (AIUM, 1998)
- Second Edition of the AIUM Output Display Standard Brochure, Dated March 10, 1994. (A copy of this document is shipped with each system.)
- Information for Manufacturer Seeking Marketing Clearance of Diagnostic Ultrasound Systems and Transducers. FDA. September 1997. FDA.
- Standard for Real-Time Display of Thermal and Mechanical Acoustic Output Indices on Diagnostic Ultrasound Equipment. (Revision 1, AIUM, NEMA. 1998)
- WFUMB. Symposium on Safety of Ultrasound in Medicine: Conclusions and Recommendations on Thermal and Non-Thermal Mechanisms for Biological Effects of Ultrasound, *Ultrasound in Medicine and Biology*, 1998: Vol. 24, Supplement1.

Acoustic Output and Measurement

Since the first usage of diagnostic ultrasound, the possible human biological effects (bioeffects) of ultrasound exposure have been studied by various scientific and medical institutions. In October 1987, the American Institute of Ultrasound in Medicine (AIUM) ratified a report prepared by its Bioeffects Committee (Bioeffect Considerations for the Safety of Diagnostic Ultrasound, J Ultrasound Med., Sept. 1988: Vol.7, No.9 Supplement), sometimes referred to as the Stowe Report, which reviewed available data on possible effects of ultrasound exposure. Another report, “Bioeffects and Safety of Diagnostic Ultrasound,” dated 28th January, 1993, provides more up to date information.

The acoustic output for this system has been measured and calculated in accordance with the December 1985 “510 (K) Guide for Measuring and Reporting Acoustic Output of Diagnostic Ultrasound Medical Devices,” except that the hydrophone meets the requirements of “Acoustic Output Measurement Standard for Diagnostic Ultrasound Equipment” (NEMA UD 2-1992).

In Situ, De-rated, and Water Value Intensities

All intensity parameters are measured in water. Since water does not absorb acoustic energy, these water measurements represent a worst case value. Biological tissue does absorb acoustic energy. The true value of the intensity at any point depends on the amount and type of tissue and the frequency of the ultrasound that passes through the tissue. The intensity value in the tissue, *In Situ* has been estimated using the following formula:

In Situ = Water $e^{-(0.23alf)}$

where: *In Situ* = *In Situ* Intensity Value

Water = Water Value Intensity

e = 2.7183

a = Attenuation Factor

Tissue	a(dB/cm-MHz)
Brain	.53
Heart	.66
Kidney	.79
Liver	.43
Muscle	.55

l = skin line to measurement depth (cm)

f = Center frequency of the transducer/system/mode combination (MHz)

Since the ultrasonic path during an examination is likely to pass through varying lengths and types of tissue, it is difficult to estimate the true *In Situ* intensity. An attenuation factor of 0.3 is used for general reporting purposes. Therefore, the *In Situ*value which is commonly reported uses the formula:

In Situ (*derated*) = Water $e^{-(0.069lf)}$

Since this value is not the true *in situ* intensity, the term “de-rated” is used.

The maximum derated and the maximum water values do not always occur at the same operating condition. Therefore, the reported maximum water and derated values may not be related to the *In Situ* (derated) formula. For example, a multi-zone array transducer that has maximum water value intensities in its deepest zone: The same transducer may have its largest derated intensity in one of its shallowest focal zones.

Acoustic Output and Measurement

The terms and symbols used in the acoustic output tables are defined in the following paragraphs.

ISPTA.3 The **derated spatial-peak temporal-average intensity** (Milliwatts per square centimeter).

ISPPA.3 The **derated spatial-peak pulse-average intensity**(watts per square centimeter). The value of IPA.3 at the position of global maximum MI (IPA.3@MI) may be reported instead of ISPPA.3 if the global maximum MI is reported.

MI The **Mechanical Index**. The value of MI at the position of ISPPA.3, (MI@ISPPA.3) may be reported instead of MI (global maximum value) if ISPPA.3 is 190W/cm^2.

Pr.3 The **derated peak rarefactional pressure** (megapascals) associated with the transmit pattern giving rise to the reported MI value.

WO **Ultrasonic power** (milliwatts). For the operating condition giving rise to ISPTA.3, WO is the total time-average power; For operating conditions subject to reporting under ISPPA.3, WO is the **ultrasonic power** associated with the transmit pattern, giving rise to the value reported under ISPPA.3.

Fc **Center frequency** (MHz). For MI and ISPPA.3, Fc is the **center frequency** associated with the transmit pattern, giving rise to the global maximum value of the respective parameter. For ISPTA.3, for combined modes involving beam types of unequal **center frequency**, Fc is defined as the overall ranges of center frequencies of the respective transmit patterns.

ZSP The axial distance at which the reported parameter is measured (centimeters).

x-6,y-6 These are respectively the in-plane (azimuth) and out-of-plane (elevation) -6 dimensions in the x-y plane where ZSP is found (centimeters).

PD The **pulse duration** (microseconds) associated with the transmit pattern, giving rise to the reported value of the respective parameter.

PRF The **pulse repetition frequency** (Hz) associated with the transmit pattern, giving rise to the reported value of the respective parameter.

EBD The **entrance beam dimensions** for the azimuth and elevation planes (centimeters).

EDS The **entrance dimensions of the scan** for the azimuth and elevation planes (centimeters).

Acoustic Measurement Precision and Uncertainty

The Acoustic Measurement Precision and Acoustic Measurement Uncertainty are described below.

Quantity	Precision	Total Uncertainty
PII.3 (derated pulse intensity integral)	3.2 %	+21 % to - 24 %
Wo (acoustic power)	6.2 %	+/- 19 %
Pr.3 (derated rarefaction pressure)	5.4 %	+/- 15 %
Fc (center frequency)	< 1 %	+/- 4.5 %

■ Systematic Uncertainties

For the pulse intensity integral, derated rarefaction pressure, Pr.3, Center frequency and pulse duration, the analysis includes considerations of the effects on accuracy of:

Hydrophone calibration drift or errors.

Hydrophone / Amp frequency response.

Spatial averaging.

Alignment errors.

Voltage measurement accuracy, including.

- Oscilloscope vertical accuracy.
- Oscilloscope offset accuracy.
- Oscilloscope clock accuracy.
- Oscilloscope Digitization rates.
- Noise.

The systematic uncertainties of acoustic power measurements using a radiation force are measured through the use of calibrated NIST acoustic power sources.

We also refer to a September 1993 analysis done by a working group of the IEC technical committee 87 and prepared by K. Beissner, as a first supplement to IEC publication 1161.

The document includes analysis and discussion of the sources of error/measurement effects due to:

Balance system calibration.

Absorbing (or reflecting) target suspension mechanisms.

Linearity of the balance system.

Extrapolation to the moment of switching the ultrasonic transducer (compensation for ringing and thermal drift).

Target imperfections.

Absorbing (reflecting) target geometry and finite target size.

Target misalignment.

Ultrasonic transducer misalignment.

Water temperature.

Ultrasonic attenuation and acoustic streaming.

Coupling or shielding foil properties.

Plane-wave assumption.

Environmental influences.

Excitation voltage measurement.

Ultrasonic transducer temperature.

Effects due to nonlinear propagation and saturation loss.

The overall findings of the analysis give a rough Acoustic Power accuracy figure of ±10% for the frequency range of 1 – 10 MHz.

Training

The users of this ultrasound system must familiarize themselves with the ultrasound system to optimize the performance of the device and to detect possible malfunctions. It is recommended that all users receive proper training before using the device. You can receive training on the use of the product from the Samsung Medison service department, or any of the customer support centers worldwide.

Environmental Protection

CAUTION	■ For disposing of the system or accessories that have come to the end of their service life, contact the vendor or follow appropriate disposal procedures. ■ You are responsible for complying with the relevant regulations for disposing of wastes. ■ The lithium ion battery used in the product must be replaced by a Samsung Medison service engineer or an authorized dealer.

Chapter 2

Introduction

Specifications

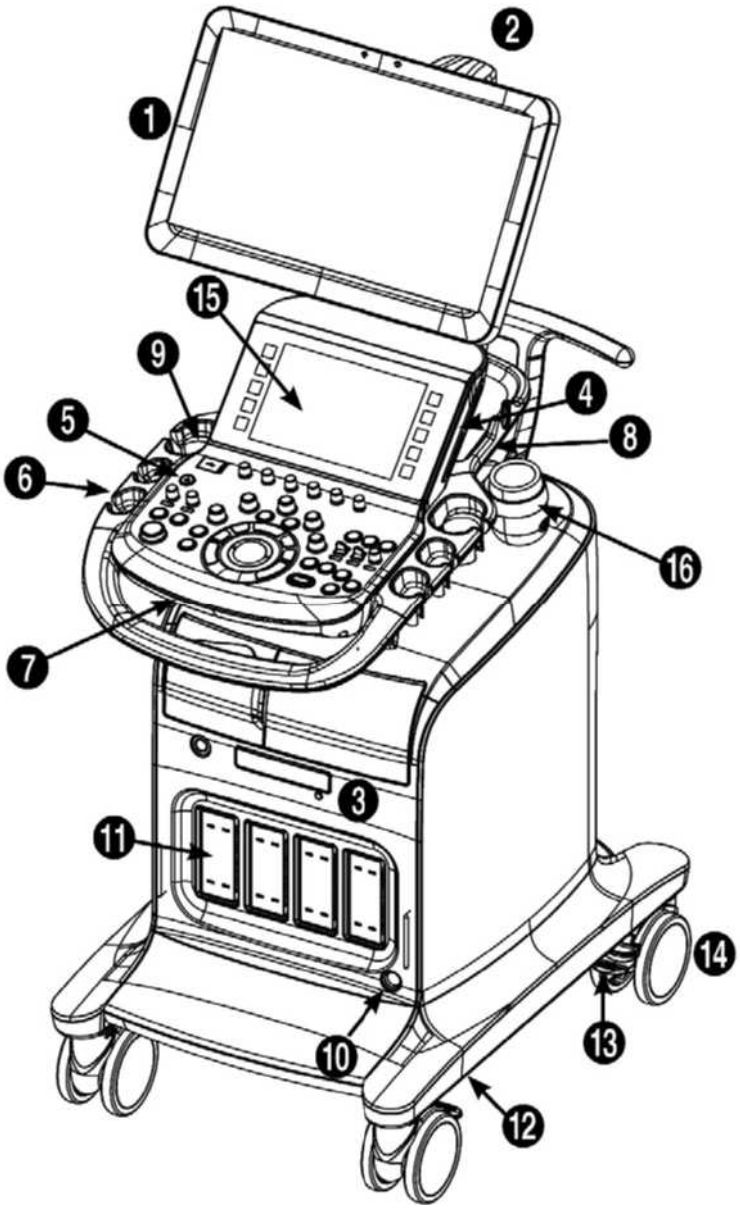
Physical Dimensions	Height: 1,430 – 1,710mm (with monitor) Width: 557mm Depth: 791 – 860mm Weight: 99.4kg (with monitor) Weight: Approx. 124kg (with Safe Working Load)
Imaging Modes	2D Mode M Mode Color Doppler Pulsed Wave (PW) Spectral Doppler Continuous Wave (CW) Spectral Doppler Tissue Doppler Imaging (TDI) Tissue Doppler Wave (TDW) Power Doppler (PD) Directional Power Doppler (S-Flow) Color M Mode Anatomical M Mode 3D imaging Mode 4D imaging Mode ElastoScan Mode
Gray Scale	256 (8 bits)
Focusing	Transmit focusing, maximum of eight points (four points simultaneously selectable) Digital dynamic receive focusing (continuous)
Probes (Type BF/IPX7)	**Linear Array** L3-12A, LA3-16A, LA3-16AI, LA2-9A, LA4-18B **Convex** CA1-7A, CA2-8A, CF4-9, CA3-10A, CA2-9A **Endocavity** E3-12A, VR5-9, EA2-11B **Phased Array** PA3-8B, PE2-4, PA4-12B, PA1-5A **3D** CV1-8A, LV3-14A, V5-9 **CW** CW4.0, CW6.0, DP2B, DP8B **TEE** MMPT3-7
Probe Connections	Four Active Probe Ports (include one CW probe port) Five Active Probe Ports for option (include one CW probe port)

Monitor	**Main Monitor** 23 inch Full HD LCD monitor (LED Backlight unit, hereafter referred to as “LCD monitor”) **Touch Screen Monitor** 10.1 inch LCD monitor (LED Backlight unit, hereafter referred to as “LCD monitor”)
ECG	USB Type (Type CF)
Rear Panel Input/Output Connections	Audio out Microphone in External Trigger out External monitor DVI-I Network USB S-VHS Video out Composite Video out
Image Storage	Maximum 12,700 frames for Cine memory Maximum 8,192 lines for Loop memory Image filing system
Application	Obstetrics, Gynecology, Urology, Abdomen, Vascular, Small Part, MSK, Pediatric, Cardiac, TCD, Intraoperative
Electrical Parameters	100-240V~, 1100VA, 50/60Hz
Measurement Packages	OB, Gynecology, Cardiac, Vascular, Fetal Heart, Urology, Abdomen, Small Parts, MSK, TCD, Pediatric Hips * Refer to ‘Chapter 9. Measurements and Calculations’ for additional information
Signal Processing (Pre-Processing)	TGC Control (Digital/Slider) Mode-independent gain control Acoustic power control (adjustable) Dynamic aperture Dynamic apodization Dynamic range control (adjustable) Image view area control M-mode sweep speed control
Signal Processing (Post-Processing)	Frame average Edge enhancement/blurring Gamma-scale windowing Image orientation (left/right, up/down, and rotation) White on black/black on white Zoom

Measurement	Trackball operation of multiple cursors 2D mode: Linear measurements and area measurements using elliptical approximation or trace M mode: Continuous readout of distance, time, and slope rate Doppler mode: Velocity and trace
Auxiliary	USB Video Printer USB to RS-232 Serial Cable Foot Switch (IPX8) USB HDD Monitor
User Interface	English, German, French, Spanish, Italian, Russian, Chinese
Pressure Limits	Operating: 700 – 1,060hPa Storage: 700 – 1,060hPa
Humidity Limits	Operating: 30 – 75% Storage & Shipping: 20 – 90%
Temperature Limits	Operating: 10 – 35°C Storage & Shipping: -25 – 60°C

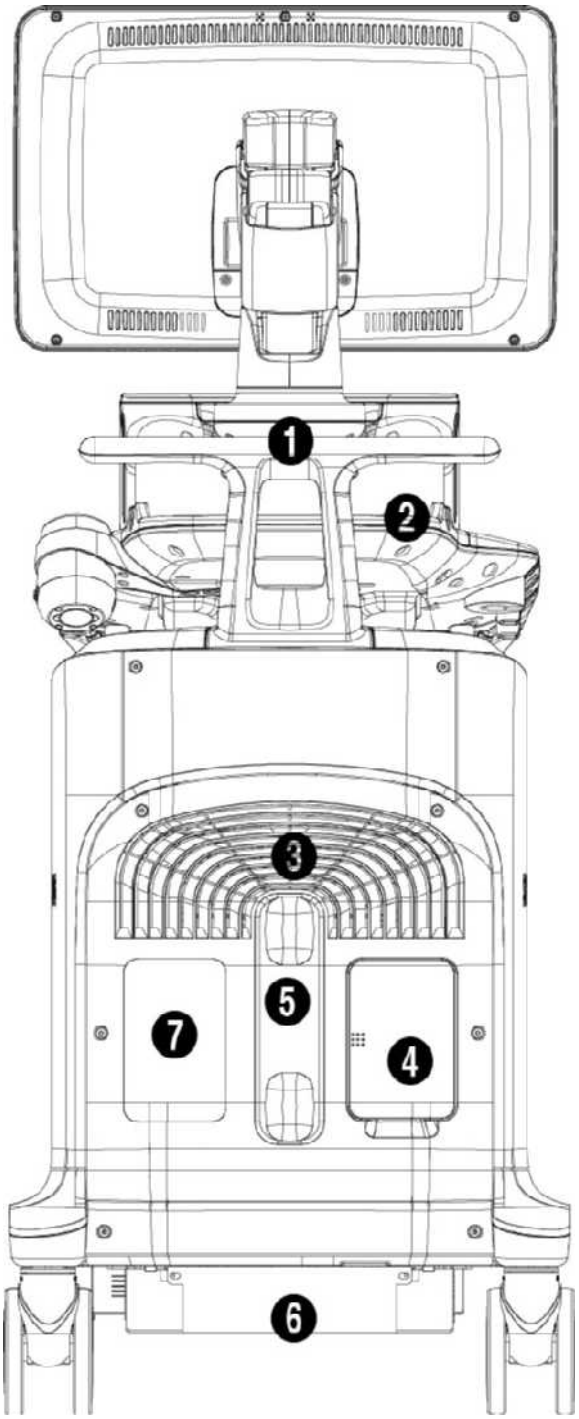
Product Configuration

This product consists of the monitor, the control panel, the console, the peripheral devices, and the probes.



[Figure 2.1 Front of the HS70A]

① Monitor
② Monitor arm
③ DVD drive
④ Speaker
⑤ Control panel
⑥ Probe holder
⑦ Keyboard
⑧ Lift
⑨ USB port
⑩ CW probe port
⑪ Probe port
⑫ Air filter
⑬ Brake
⑭ Wheels
⑮ Touch panel
⑯ Gel Warmer (Option)



① Handle
② Storage compartments
③ Ventilation
④ Rear panel
⑤ Cable holder
⑥ Power connection part
⑦ ID Label

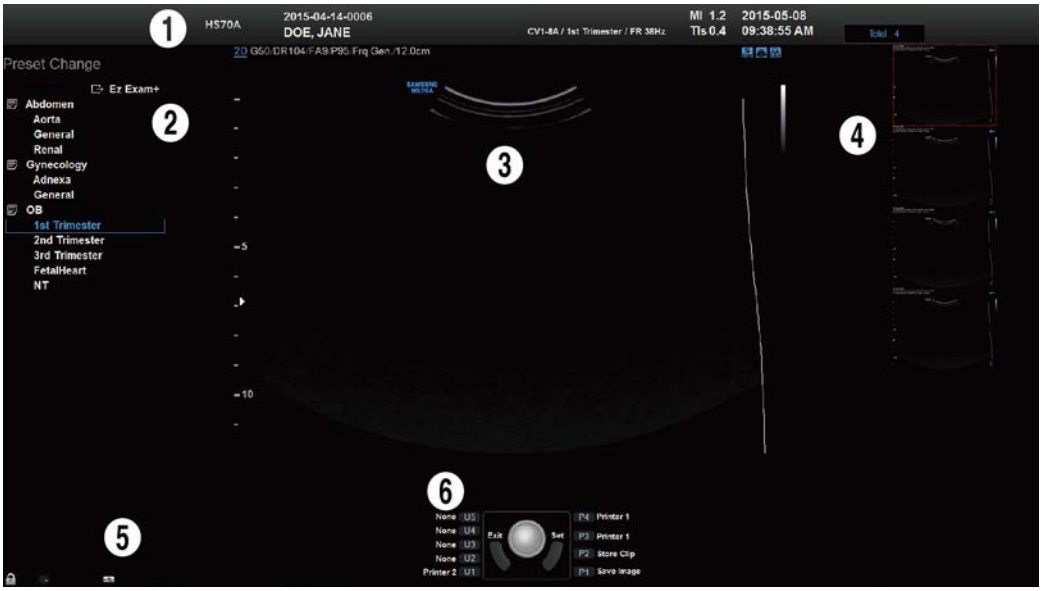
[Figure 2.2 Back of the HS70A]

Monitor

Ultrasound images and other information are displayed on the color LCD monitor.

Screen Layout

The monitor displays ultrasound images, operation menus and a variety of other information. As shown in the image below, the screen consists of ① Title Area, ② Preset Change and Ez Exam+ Area ③ Image Area, ④ Thumbnail Area, ⑤ User Information Area, and ⑥ User Defined Key Area.



[Figure 2.3 Monitor Display]

① Title Area

Displays patient name, hospital name, application, frame rate and depth, probe information, acoustic output information, and date and time.

② Preset Change and Ez Exam+ Area

Displays Preset Change. You can quickly change the preset of a probe. If you are using Ez Exam+, the Ez Exam+ menu will be displayed.

NOTE

The Ez Exam+ menu can be set up in Ez Exam+ Setup. For details about Ez Exam+ Setup, please refer to ‘Chapter 3. Utilities’.

③ Image Area

Displays ultrasound images, TGC, image information, annotation, and measurement information are also displayed.

④ Thumbnail Area

Up to five saved images are displayed. (Save by pressing the **Save** button.) When you save Single screens, up to 5 images are shown in a list; for Quad screens, up to 16 images are shown. Clicking with the pointer will enlarge the selected thumbnail in the Image area. At the top of the Thumbnail area, you can see the total number of images saved.

⑤ User Information Area

Information that is useful to the user, such as current system status, image information, selectable items, etc., is displayed.

⑥ User Defined Key Area

Settings for User Defined Keys, including the positions of **Set** and **Exit**, are displayed. You can change the setting of each button in Setup > User Defined Key.

NOTE

For information on User Key Setup, please refer to ‘Chapter 3. Utilities’.

TIP **Principles of Operation of the Diagnostic Ultrasound System**

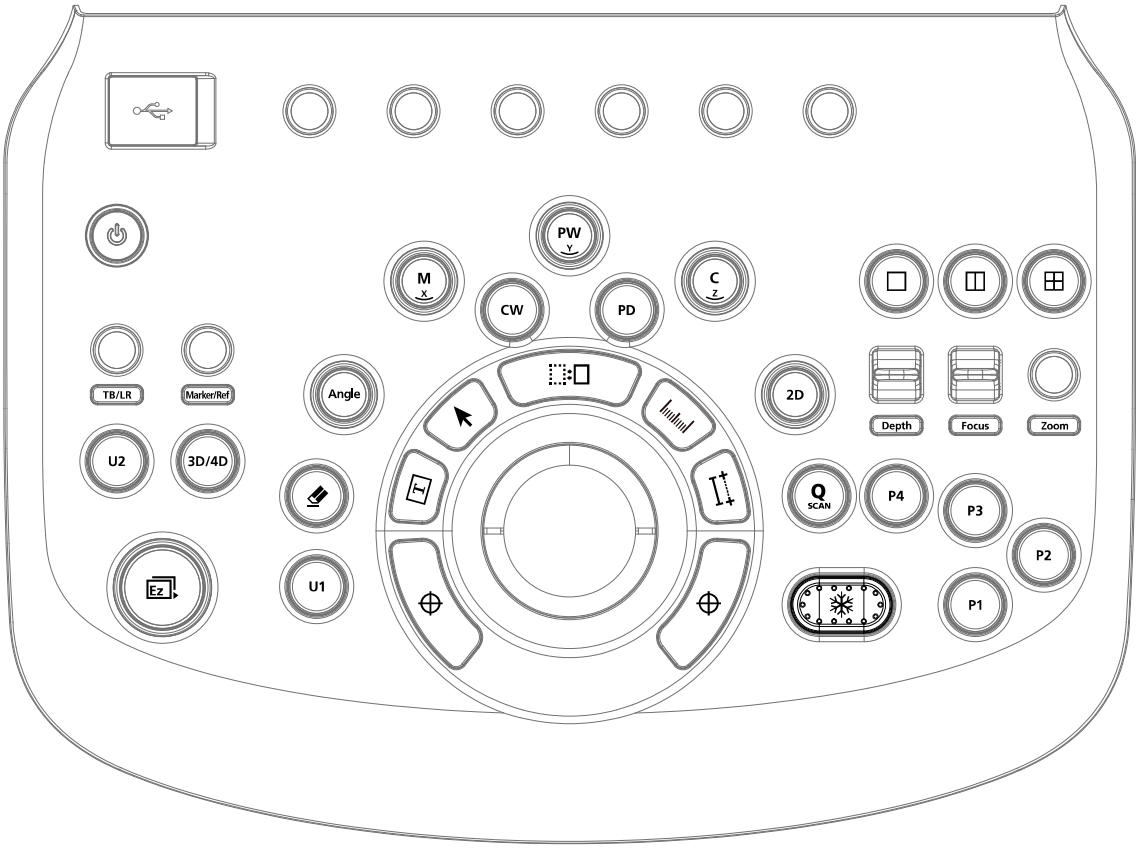
Medical ultrasound images are created when the computer’s digital memory converts the high-frequency wave signals that are transmitted and received by the probe.

As ultrasound waves propagate through the human body, they generate reflected signals whenever they encounter a change in density. For example, reflected signals are generated when signals pass from fatty tissues to muscle tissues. Reflected signals return to the probe where they are converted into electronic signals. The reflected signals are amplified and processed by analog and digital circuits that have filters for various frequencies and response time options. Then they are again converted into high-frequency electronic signals, and saved as a series of digital image signals. The monitor displays the image signals stored on the storage device in real time.

The entire process of transmitting, receiving, and processing signals is controlled by the computer.

Control Panel

The system can be controlled by using the control panel.



[Figure 2.4 Control Panel]

The control panel consists of a keyboard, soft menus, buttons, dials, dial-buttons, a slider, and a trackball.

The dial-button can be used both as a dial and a button.

Functions of the Control Panel

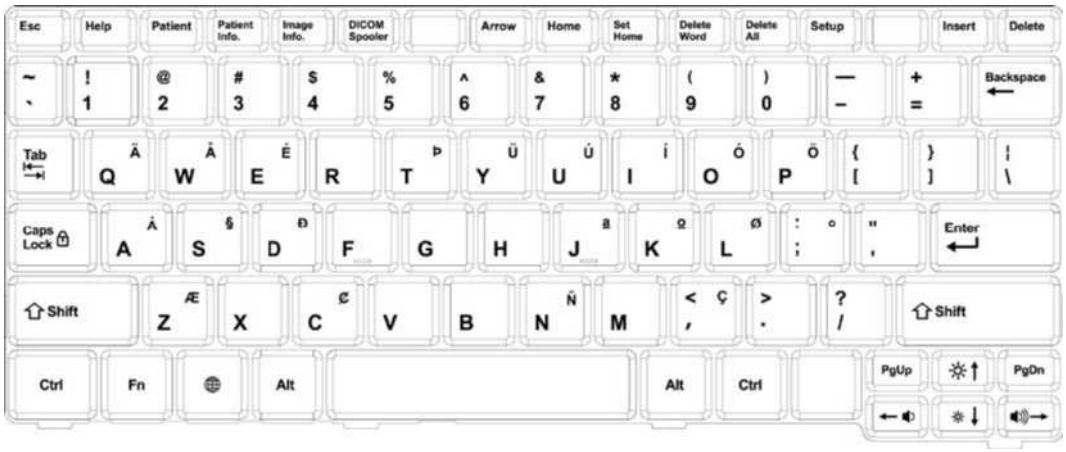
The following are the descriptions and instructions for the controls on the control panel. For more information on controls with multiple functions, see ‘Chapter 3. Utilities’ onwards in this manual.

On/Off	Button	Turns the system on/off.
2D	Dial-button	– Button: Starts 2D mode. – Dial: Adjusts the 2D gain.
M/x	Dial-button	– Button: Starts or ends M mode. – Dial: Adjusts M gain. Also, turning this dial-button when in 3D View rotates the image along the x-axis.
PW/y	Dial-button	– Button: Starts or ends PW Spectral Doppler mode. – Dial: Adjusts the PW gain. Also, turning this dial-button, when in 3D View rotates the image along the y-axis.
C/z	Dial-button	– Button: Starts or ends Color Doppler mode. – Dial: Adjusts the C gain. Also, turning this dial-button when in 3D View rotates the image along the z-axis.
CW	Button	– Button: Starts or ends CW Spectral Doppler mode. – Dial: Adjusts the CW gain.
PD	Button	Starts or ends Power Doppler mode.
3D/4D	Button	Starts or ends 3D/4D modes.
Angle	Dial-button	Adjusts the angle of the sample volume in Spectral Doppler mode. It is also used to adjust the BodyMarker’s probe cursor or indicator angle.
Depth	Switch	Adjusts the scanning depth of the image.
Focus	Switch	Changes location and number of focus on the target location you wish to study.
Zoom	Dial-button	You can magnify an image.
Q Scan	Button	Press this button to turn the Quick Scan function on. The ‘Q Scan’ mark will appear at the top of an image.
Freeze	Button	Pauses/resumes scanning.
P 1–4	Button	Stands for ‘Peripheral Key.’ This button allows users to select a function to apply to the button. The function of each button can be set in Setup > User Defined Key. The selected settings will be displayed in the User Defined Key area of the monitor.
U 1–2	Button	Stands for ‘User Key.’ This button allows users to select a function to apply to the button. The function of each button can be set in Setup > User Defined Key. The selected settings will

		be displayed in the User Defined Key area of the monitor.
TB/LR	Dial-button	In 3D View-MPR, this dial-button adjusts ROI boundaries. TB stands for Top-Bottom and LR stands for Left-Right.
Marker/Ref	Dial-button	Allows the user to enter a BodyMarker over an image. Moves the reference slice horizontally in 3D View.
Text	Button	Allows the user to place text on an image.
 Ez Exam+	Dial-button	Use the Ez Exam+ and Preset Change features.
	Button	In this mode, only the image is displayed on the screen.
	Button	Compares two independent images.
	Button	Compares four independent images.
 Set/Exit	Button	This button is used to assign user-defined functions. The function of each button can be set in Utility > Setup > User Defined Key. – Set: Selects an item or value using the trackball or changes the function of the trackball. – Exit: Exits the function currently being used and returns to the previous state.
 Pointer	Button	When this is pressed, an arrow marker appears to point to parts of the displayed image.
 Clear	Button	Deletes text, indicator, BodyMarker, and measurement result, etc. displayed on an image.
 Change	Button	This is used to change the current trackball function.
 Calculator	Button	Starts measurements by application.
Caliper	Button	Starts to measure distance, circumference, area, and volume.
Trackball	Trackball	Moves the cursor on the screen and scrolls through Cine images.

■ **Keyboard**

The keyboard is used to type in text.



[Figure 2.5 Keyboard]

Touch Panel

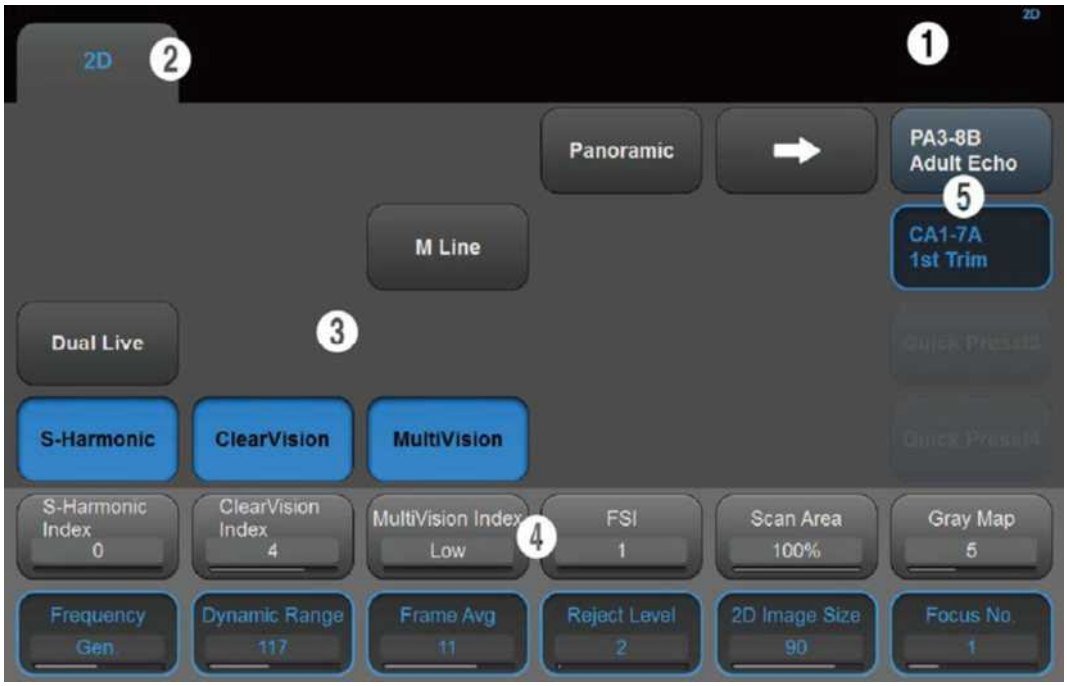
These control tools are located on both sides of the touch screen. Available buttons are as follows:

[Figure 2.6 Touch Panel]

	Patient	Displays the *Patient Information* screen, which is used for selecting a patient ID from the list or entering new patient information.
	Probe	Displays the *Probe Selection* screen to select or change the probe and application.
	Report	Displays the *Report* screen that shows the measurement results of the current application and other information.
	SonoView	Runs SonoView, which is the image filing program.
	End Exam	Finishes the exam of the currently selected patient and resets the related data.

	Utility	The Utility Menu appears on the touch screen.
	U5	Stands for User Key; functions can be assigned to these buttons as desired. The function of each button can be set in Setup > User Defined Key. The settings are displayed in the User Defined Key area in the monitor.
	U4	Stands for User Key; functions can be assigned to these buttons as desired. The function of each button can be set in Setup > User Defined Key. The settings are displayed in the User Defined Key area in the monitor.
	U3	Stands for User Key; functions can be assigned to these buttons as desired. The function of each button can be set in Setup > User Defined Key. The settings are displayed in the User Defined Key area in the monitor.
	TGC	The *TGC* screen will be displayed on the touch screen. TGC stands for Time Gain Compensation.

Touch Screen



[Figure 2.7 Touch Screen]

The touch screen is an operating tool that can be touched by the user to input data. The functions that are available in the current mode are shown in the form of buttons or a dial-button.

■ **Touch Screen Layout**

① Information Area: Shows the title of the touch screen currently displayed.

② Tab Area: Shows diagnostic modes and utilities under different tabs. The touch screen can be changed by pressing one of the tabs.

③ Menu Area: The menu items that are available in the current input mode are shown in the form of buttons. The user can access the desired menu item by pressing the corresponding button. The menu currently in use is shown in blue.

④ Soft Menu Area: The soft menu items that are available in the current input mode are shown.The menus in use are shown with blue borders. Press or rotate the dial-buttons right below each menu.

⑤ Quick Preset: With predefined diagnosis mode and presets of probes frequently used by the user, this function provides quick and easy access to frequently used probe in each diagnosis mode.

NOTE

For further details about setting up Quick Preset, please refer to Setup > General > Quick Preset > Quick Preset Setup in ‘Chapter 3. Utilities’.

Adjusting the Control Panel

CAUTION

- Do not apply excessive force to the control panel.
- Use the handle at the back of the product when moving it.

- **Adjusting to the Right and Left**

  Hold the control panel handle and move it carefully to the right or left.

- **Adjusting the Height**

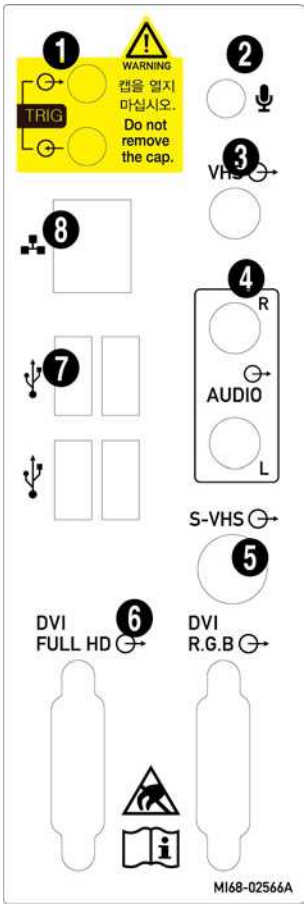
  Press the lever on the control panel handle and move it carefully up or down.

Console

The console consists of two main parts: the interior and the exterior. The interior of the console mainly contains devices that produce ultrasound images. On the exterior of the console are various connectors, probe holders, storage compartments, handles, and wheels, etc.

Rear Panel

A monitor and other peripheral devices are connected via the rear panel at the back of the system.



[Figure 2.8 Rear Panel]

① Trig port (In/Out): Not used.

② Microphone port (Input): Connects a microphone.

③ VHS port (Output): Outputs composite image to the monitor.

④ Audio port (Output): Outputs audio signal.

⑤ S-VHS port (Output): Outputs S-VHS image to the monitor.

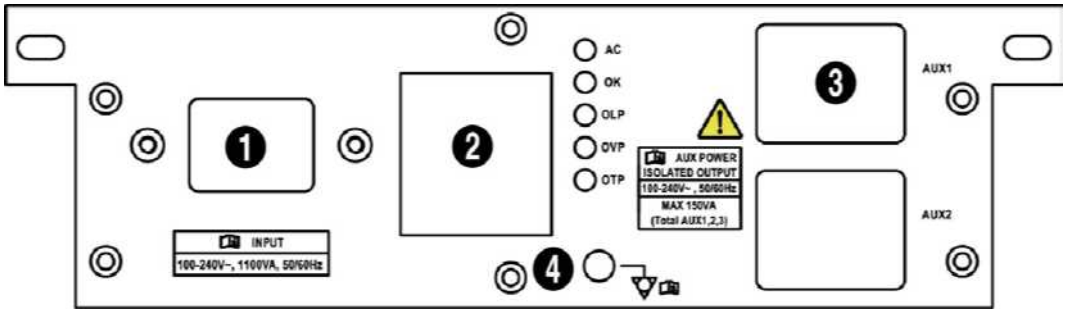
⑥ DVI port (Output): Outputs digital signal (DVI Full HD) and analog signal (DVI RGB) to the monitor.

⑦ USB port: Used to connect to USB peripheral devices.

⑧ Network port: Used to connect to a network. You can transfer patient information to another server via the DICOM network.

Power Connection Part

The power connection part is located at the bottom on the rear panel.



[Figure 2.9 Power Connection Part]

① Power switch: Supplies or blocks power to the entire system.

② Power Inlet: For the power cable to connect to external power.

③ Power Outlet: Supplies an external peripheral device with power from the product's internal power supply.

④ Equipotential Terminal: This should be connected to the equipotential connection part in the exam room.

Probe Holders

Probe holders are mounted at the left and right-hand sides of the control panel.

TIP **Vaginal Probe Holder**

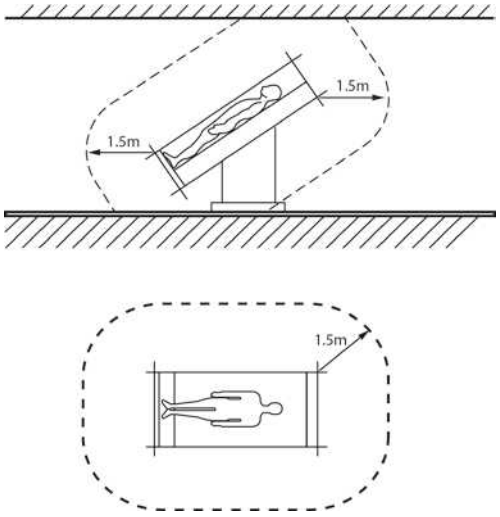
Install this to fix the vaginal probe onto the holder.

Peripheral Devices

Peripheral devices can be connected to their corresponding ports on the left/right or rear sides of the console, as needed.

CAUTION

- Do not install a peripheral device that is not listed in this user manual in the patient environment. If you install an unlisted device in the patient environment, it may cause an electrical hazard.
- Do not connect additional external peripheral devices to the auxiliary socket outlet. Doing so may decrease safety level.



[Figure 2.10 Patient Environment]

NOTE

Refer to the user manual of the peripheral device for its operating information.

Internal Peripheral Devices

These are peripheral devices mounted in the system.

- **DVD-Multi**

  DVD-RW, DVD+RW, DVD-R, DVD+R, CD-R, CD-RW, CD-ROM

- **Hard Disc Drive**

  At least 500 GB

External Peripheral Devices

These are peripheral devices that can be connected for use when needed and are connected via the USB port located at the rear panel.

CAUTION

When using a peripheral device via a USB port, always turn the power off before connecting/disconnecting the device. Connection/disconnection of USB devices during power-on may lead to malfunction of the system and the USB devices.

NOTE

- When removing the removable disk, use **Utility** > **Storage manager**.
- USB ports are located both on the control panel and the rear panel of the console.

  We recommend that you connect USB storage devices (flash memory media, etc.) to the ports on the control panel, and other USB peripheral devices to the rear panel for convenience.

The following products are recommended:

- **USB Video Printer**
  - Black and White: Mitsubishi P95DE (Japan: Mitsubishi P95D), SONYUP-D897, SONY UP-X898MD, SONY UP-D898MD
  - Color: Mitsubishi CP-30DW, SONY UP-D25MD
- **USB Line Printer**
  - Black and White: Samsung ML-2955DW
  - Color: Samsung CLP-615ND

CAUTION

- You must install a printer and driver compatible with the English version of Microsoft Windows 7. Contact Samsung Medison customer service department for inquiries about printer driver installation.
- When connecting the printer, ensure that the printer is configured under Microsoft Windows or system setup and has been chosen as the default printer.
- Please check the port that the printer uses before connecting. Printers should be connected to the printer port while the USB printer should be connected to the USB port.

- **USB to RS-232C Serial Cable**

  USB to Serial (RS-232C) Converter with FTDI Chipset (FTDI FT232BM Compatible)

NOTE

For more information about the Open Line Transfer, refer to ‘Chapter 9. Measurements and Calculations’.

- **Foot Switch**
  - 3 Pedals HID Type

    To configure the foot switch function, go to Utility > Setup > Peripherals > Foot Switch. You can select one function from the following: Freeze, Update, Record, Print1, Save, Store Clip, Volume Start, Ez Exam, PD Mode, Color Mode, M Mode, PW Mode, CW Mode, ElastoScan, TDI Mode, TDW Mode, or Biopsy.

- **Misc.**

  Flash Memory Media

NOTE

- The system cannot recognize USB 1.1 flash memory. Remove the flash memory from the console and equip again with an appropriate device.
- Regarding file formats that are not ordinarily saved: Please check first to see if it is possible to save the file format on a desktop PC before trying to save the file on flash memory.
- Do not use flash memory media which contain anti-virus programs or are defective. Otherwise, the product may fail to work properly.

Probes

Probes are devices that generate ultrasound waves and process reflected wave data for the purpose of image formation.

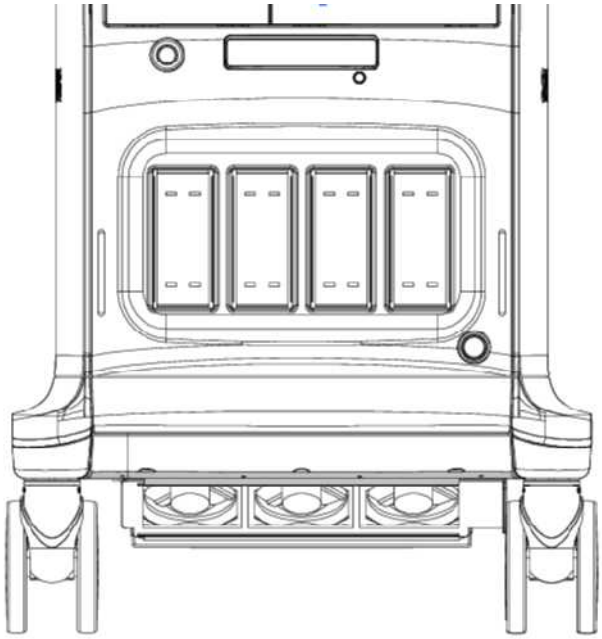
NOTE

For more information on probes, refer to ‘Chapter 5. Probes’ and the ‘Reference Manual’.

Connecting probes

To ensure the safety of the product and the probe, turn off the power before connecting the probe to, or disconnecting it from, the probe port.

1. Connect probes to the probe ports on the front panel of the system. A maximum of five probes including the CW probe can be connected at one time. The CW probe should CW only be connected to its own port.
2. To install, turn the connector turning handle clockwise.



[Figure 2.11 Probe Ports]

Accessories

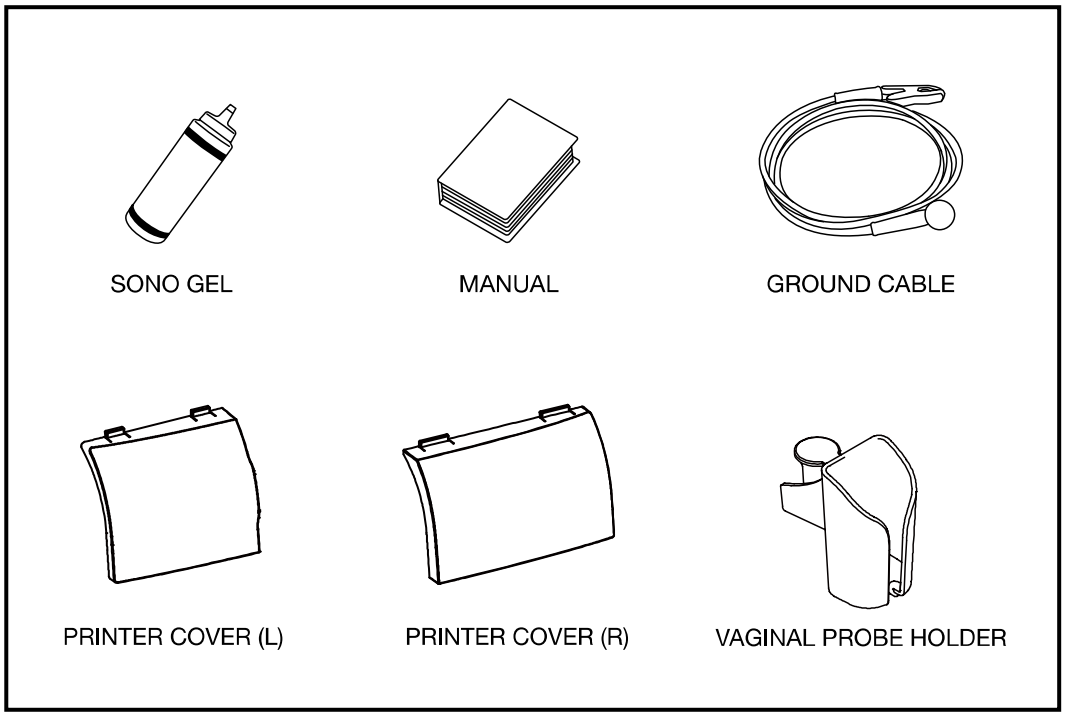
An accessory box containing the items below is supplied with the product.

CAUTION

Main cord set, separately certified according to the relevant standards, is to be used when supplied to EU and USA/CAN.

NOTE

Accessories can be different according to the country.



[Figure 2.12 Accessories]

Optional Functions

This product has the following S/W optional functions:

- SMART 4D
- CW Function
- Cardiac Measurement
- DICOM
- XI STIC
- ElastoScan
- Panoramic
- Stress Echo
- Strain+
- ADVR
- E-Thyroid
- Realistic Vue
- AutoIMT+
- E-Breast
- 2D NT
- Mobile Export
- 5D Follicle
- 5D NT
- 5D LB
- 5D CNS
- HDVI
- S-Shearwave
- Arterial Analysis
- DICOM Q/R
- CEUS+
- S-Detect for Breast
- S-Detect for Thyroid

For further information about optional functions, please refer to the relevant chapters in the HS70A User manual.

Chapter 3

Installing the Product

Transporting

This product is a finely tuned piece of medical electronic equipment; careful attention is required when transporting it.

Precautions when transporting the product

The box packaging is designed to reduce impact. However, take care to prevent any external impact from reaching the product.

Humidity and Temperature

"[Table 3-1. The Product's Humidity and Temperature Tolerance]" shown below illustrates the temperature and humidity ranges for transporting, storing, and operating the product.

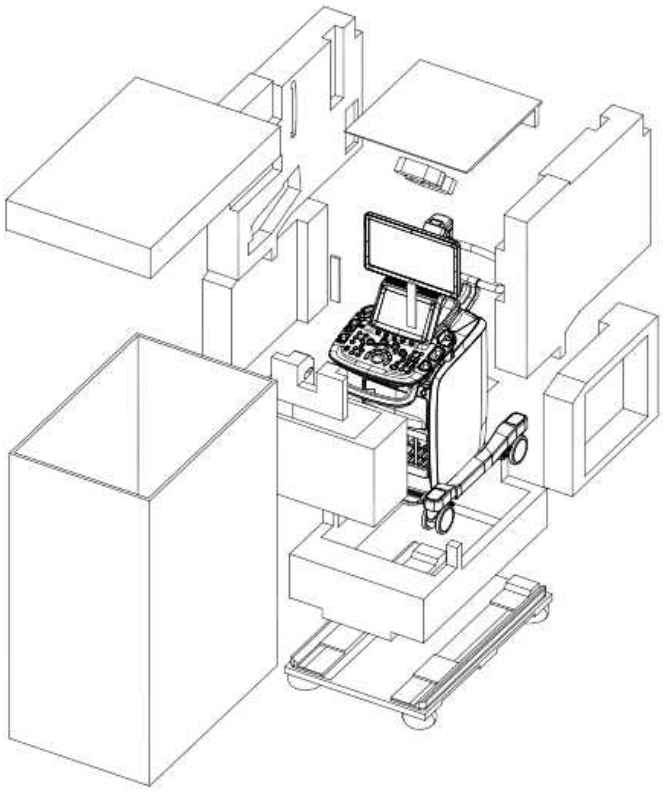
Category	Temperature OC	Humidity %
Transporting	-25 ~ 60	20 ~ 90
Storage	-10 ~ 50	20 ~ 90
Operating	10 ~ 35	30 ~ 75

[Table 3-1. The Product’s Humidity and Temperature Tolerance]

Unpacking the Product

Dismantling the Product Box

1. Open the box.
2. Remove the protection cover.
3. Take out the probe box and accessory box and store them in a safe place.
4. Unlock the brakes on wheels.
5. Grab the rear handle on the product and move it to a place to install.



[Figure 3.1 Dismantling the Product Box]

Accessory

An accessory box containing the items below is supplied with the product. If the items are not intended for your product, contact the store where you purchased the product.

Installation Environment

Caution

When installing the product, please pay attention to the following: For more information on using and setting up, refer to the accompanying manual for HS70A.

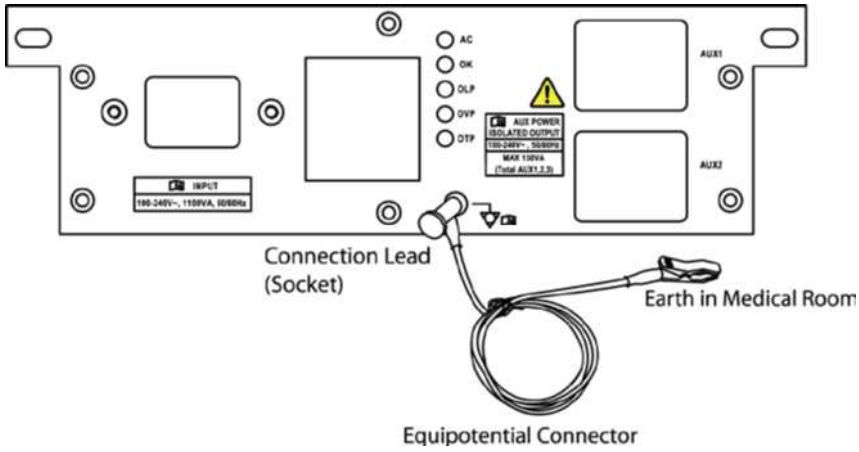
CAUTION	Placing the system near generators, X-ray machines or broadcast cables may result in screen noise and abnormal visual images. Sharing the power source with other electrical devices may also induce noise.

- Optimal conditions for the system are a temperature of 10-35° and a humidity of 30-75%.
- Avoid excess humidity.
- Avoid direct sunlight.
- Avoid excessive fluctuations in temperature.
- Maintain temperature of 10 - 35° and humidity of 30 - 75% for normal operation.
- Avoid installing the product near a heating appliance.
- Avoid dusty and/or poorly ventilated locations.
- Avoid locations that are subject to vibration.
- Avoid locations where chemical substances or harmful gases are present.

Installing the Product

Installation Safety

In a hospital environment, dangerous electric current may occur as a result of the potential difference between a contactable conductive part and connected equipment in treatment rooms. The solution to the problem is consistent equipotential bonding. Medical equipment is connected with connecting leads made up of sockets which are angled to the equipotential bonding network in medical rooms.



[Figure 3. 2 Equipotential bonding]

CAUTION	■ If the product needs to be transported or stored for an extended duration, the temperature and humidity of the environment must be checked. ■ A sudden change in temperature may cause condensation and lead to product failure.

Refer to "[Table 3-2. Operational Temperature of Product]" before turning the product on.

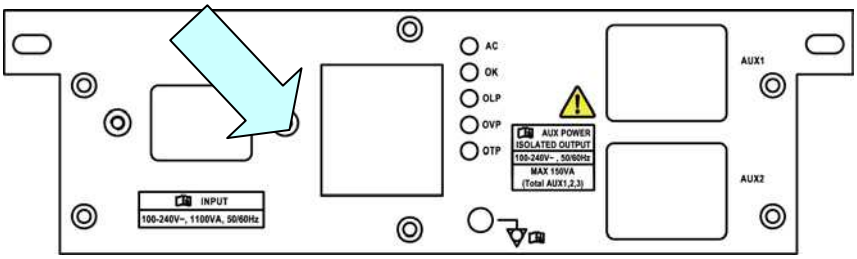
Temperature℃	-20	-15	-10	-5	0	5	10 ~ 35	45	50	55	60
Waiting time **Hour**	16	10	8	6	4	2	Use immediately	2	4	6	10

[Table 3-2. Operational Temperature of Product]

Power Cord Connection

Prior to connecting a power cord, verify that the voltage indicated on the power cord matches the voltage rating of the place to install.

NOTE	The product may ship with the power cable connected to the console.



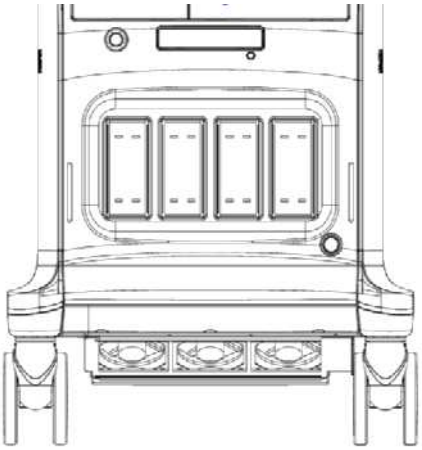
[Figure 3.3 Power Connection Part]

Probe Connection

Be sure to turn off the power before connecting or disconnecting a probe to ensure the safety of the system and the probes.

1. Connect probes to the probe connectors on the front panel of the system. A maximum of five probes including the CW probe can be connected at one time. The CW probe should only be connected to its own connector.

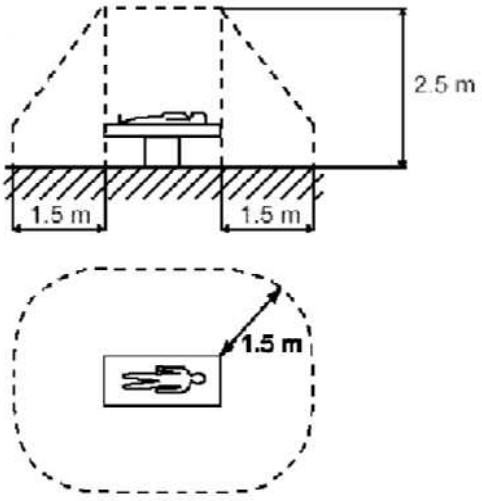
2. To install, turn the connector turning handle clockwise.



[Figure 3.4 Connecting the Probe]

Connecting Peripherals

CAUTION	Do not place peripheral devices that are not listed in this manual in the vicinity of the patient. If you place them in the patient environment, it may cause an electrical hazard**.**



[Figure 3.5 Patient Environment]

NOTE	For more information on the recommended peripheral devices, refer to "Chapter 1. Introduction".

Internal Peripheral Devices

These are peripheral devices mounted in the system.

- **DVD-Multi**
- **Hard Disc Drive**

External Peripheral Devices

These are peripheral devices that can be connected for use when needed and are connected via the USB port located at the rear panel.

CAUTION	■ When using a peripheral device via a USB port, always turn the power off before connecting/disconnecting the device. Connection/disconnection of USB devices during power-on may lead to malfunction of the system and the USB devices. ■ Do not connect additional external peripheral devices to the auxiliary socket outlet. Doing so may decrease safety level.

NOTE	■ When removing the removable disk, use Utility > Storage manager. ■ The system cannot recognize USB 1.1 flash memory. Remove the flash memory from the console and equip again with an appropriate device.

- **USB Video Printer**
- **USB Line Printer**
- **USB to RS-232C Serial Cable**
- **Foot Switch**
- **Other Flash Memory Media**

System Power

Boot up the system for use.

CAUTION	Make sure to connect the probes and peripheral devices that will be used before powering on the system. If you attempt to connect them during system use, it may lead to patient injury or irreparable damage to the console.

Turning the Power On

Press the **On/Off** button when the power is off. Booting begins, and the product logo appears on the screen. When booting is completed, the 2D mode screen appears in End Exam status.

CAUTION	Before starting the diagnosis, you must register the patient information.

NOTE	■ If the power switch near the power connection port on the rear panel of the product has been switched off, wait for 10 seconds before turning on the product. ■ Do not press keyboard keys or buttons while booting is in progress. Doing so may cause the system to malfunction. ■ If you turn on the power after turning it off suddenly, the system may turn on and off momentarily. This is a characteristic of the Intel® PC main board, and not a system error.

Shutting Down the System

Press the **On/Off** button while using the system to initiate shutdown.

CAUTION	■ Pressing the **On/Off** button for longer than five seconds will immediately turn the power off and may damage the hard disk; do not turn off the power by using this method unless absolutely necessary. ■ To ensure that the product is safely cut off from electrical power, set the power switch at the rear of the product to Off position after using the product.

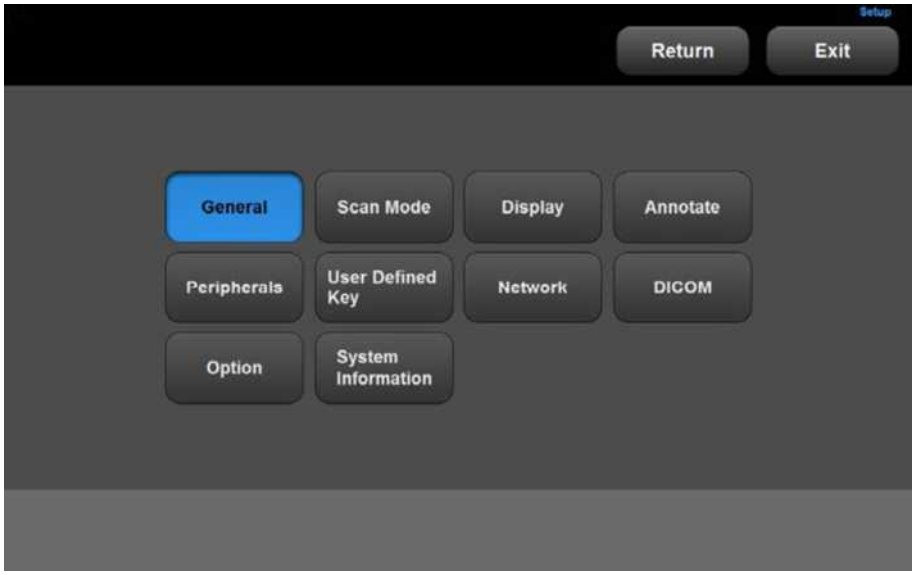
Preset

This mode is used for system settings. It does not affect image output. The setup may be modified depending on specific needs or preferences.

1. Press the **Setup** button on the touch panel, or tap **Utility** > **Setup** on the touch screen.
2. The Settings screen will appear. Select a tab that has items to specify.

> **※ Tip! – Selecting a tab**
>
> You can select a desired tab in either one of two ways. Select the method that suits you.
>
> - Use the trackball and the **Set** button to select a tab.
> - Tap a corresponding button on the touch screen.

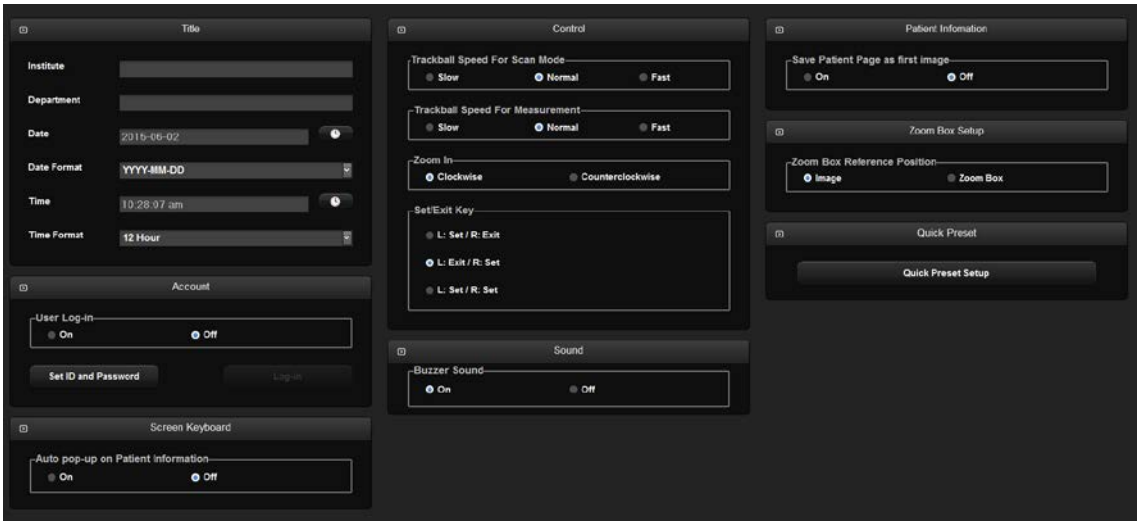
3. Specify settings for each item.
4. Save and close the settings. Click the Close button on the monitor screen or the Exit button on the touch screen or the control panel to switch to Scan Mode.
5. Tap **Return** on the touch screen to go back to the Utility menu.



[Figure 3.6 Setup - Touch Screen]

General

In the *Setup* screen, select the **General** tab. Or tap General on the touch screen. You can specify general settings such as title settings.



[Figure 3.7 Setup - General]

Title

You can specify the information that is displayed in the title area on the screen.

- **Institution**

Enter the name of the hospital/institution where the product is installed.

NOTE	You cannot input the following characters: #, [, ", :, ?, |, \, "

- **Department**

Enter details about the medical institution or the organization. These details are used to identify information at DICOM transfer.

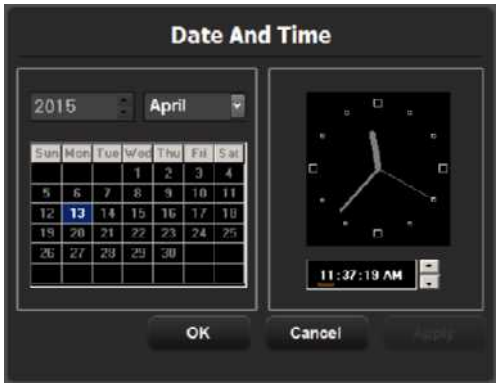
- **Date**

The current date is displayed. To change the date, press  .

NOTE	■ You cannot change the date and time when a patient ID has been registered. Before making a change, you should finish the current diagnosis by pressing the **End Exam** button on the control panel. ■ You can select a year from 2006 to 2027.

※Tip! How to set the date and time

1. In the Date (or Time) field, press  .
2. Set the date and time using the trackball and the **Set** button on the control panel.
3. When the details are correct, press **Apply** to apply the changes. To close the Date & Time window, press **OK**. To cancel, press **Cancel** or the **Exit** button on the control panel.



[Figure 3.8 Date And Time]

■ **Date Format**

Used to configure the date format. Select a format by using the combo button. The date format that you specify will be applied to various date fields in *Patient Information*.

■ **Time**

The current time is displayed.

■ **Time Format**

Select a time display format. Select a desired time format (12 Hour or 24 Hour) by pressing the combo button.

Account

Register a user ID and password.

■ **User Log-in**

Set the user account (log-in) function. If the user log-in is set to on, it can be used for the following areas:

– Screen Saver

- Accessing SonoView/Patient
- Search window for patient

■ **Set ID and Password**

This is the exclusive administrator function for approval and management of accounts. Account List window will be enabled.

- Add: Fill out the User ID, Password, and Name fields. Then click the Add button to create a new ID.
- Modify: Save the changes.
- Delete: Delete the selected ID.
- Close: Close the settings.

■ **Log-in**

You can set the User Account ID after logging in to the Admin account. For Admin account, contact a service engineer.

NOTE	■ The Admin account cannot be deleted. ■ Once the user account function is activated, you cannot load other exams without logging in. ■ The password must be 6 to 15 characters and composed of at least three of the following: - English alphabet upper case - English alphabet lower case - Numbers - Special characters

Screen keyboard

■ **Auto pop-up on patient Information**

Set this to on or off by using the trackball. If it is set to on, the on-screen keyboard appears automatically when entering patient information.

Control

■ **Trackball Speed For Scan Mode**

Specify the trackball speed at scanning mode as Slow, Normal, or Fast.

■ **Trackball Speed For Measurement**

Specify the trackball speed at measurement as Slow, Normal, or Fast. Slower speeds allow more precise measurements.

- **Zoom In**

Selects the direction in which to rotate the Zoom dial to zoom in on an image.

- Clockwise: Rotating the dial-button clockwise zooms in on an image.
- Counterclockwise: Rotating the dial-button counter-clockwise zooms in on an image.

- **Set / Exit Key**

Select the functions to assign to the buttons on the left and right sides of the trackball on the control panel.

- L: Set / R: Exit: The left button is set to Set and the right button is set to Exit.
- L: Exit / R: Set: The left button is set to **Exit** and the right button is set to **Set**.
- L: Set / R: Set: Both the left and the right buttons are assigned the Set function.

Sound

Generate a buzzer sound when a button or dial-button is used.

- **Buzzer Sound**

Set this to on or off by using the trackball. When this is set to on, the buzzer sounds each time a button or dial-button is used.

Patient Information

- **Save patient Page as first images**

Set this to on or off by using the trackball. If it is On, the Patient Information Entry screen will be saved when creating an ID.

Zoom Box Setup

- **Zoom Box Reference Position**

Select the position of the Zoom Box Reference. You may select either Image or Zoom Box.

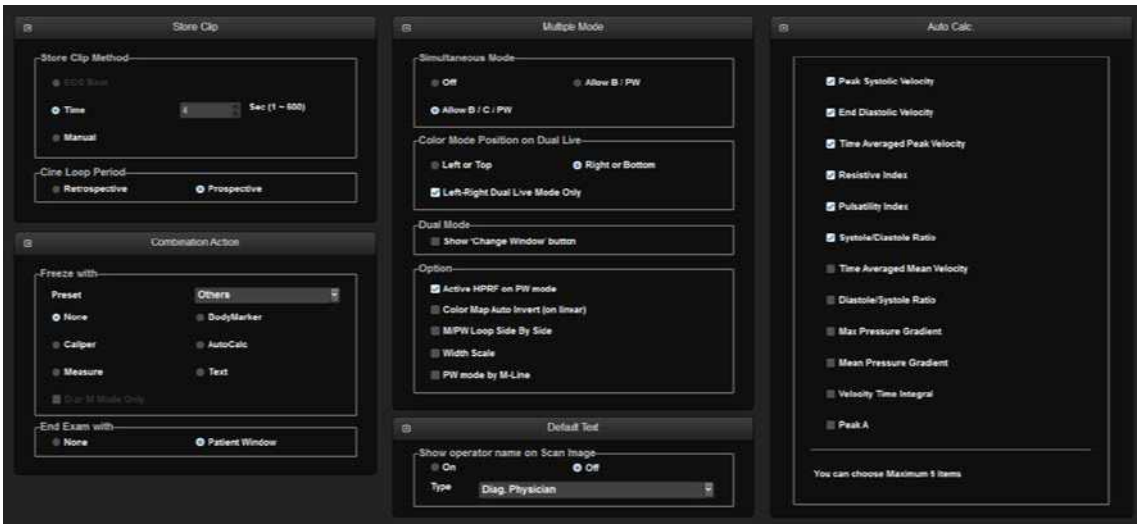
Quick Preset

■ Quick Preset seutp

Press the button to display the *Quick Preset Setup* screen. After selecting the Probe, Application, and Preset connected to the port, press the **+** button to add them to Quick Preset. Up to 4 sets can be saved. The Probe, Application, and Preset saved will be shown on the touch screen in the diagnosis mode.

Scan Mode

Select the **Scan Mode** tab on the *Setup* screen. Or tap **Scan Mode** on the touch screen.



[Figure 3.9 Setup – Scan Mode]

Store Clip

■ Store Clip Method

Specify the method and range in which an image is acquired and saved.

You can select ECG Beat, Time or Manual. Note that ECG Beat can be selected only when ECG is on.

- ECG Beat: Specify the heart beat as 1–8 beats.

- Time: Specify it as 1–600 seconds.

- Manual: Pressing the button on the control panel that has been designated as **Store Clip** automatically starts saving the images; pressing the same button again stops saving.

■ Cine Loop Period

- Retrospective: When the **Store Clip** button is pressed during scanning, the previous images are saved.
- Prospective: When the Store Clip button is pressed during scanning, the subsequent images are saved.

NOTE	To configure the **Store Clip** button, go to Utility > Setup > User Defined Key > User Key Setup.

Combination Action

- **Freeze with**

Select a function to execute when the **Freeze** button on the control panel is pressed. Available options are BodyMarker, Caliper, AutoCalc, Measure, Text, and None.

- D or M modes only: When 'Freeze with' is set to Measure, Measure Freeze Action will function only in Doppler and M Modes.

- **End Exam with**

- None: Tapping the End Exam button on the touch screen exits Exam Mode and switches the screen to the B Mode Scan screen.
- Patient Window: Tapping the End Exam button on the touch screen switches the screen to the *Patient Information* screen.

Multiple Mode

- **Simultaneous Mode**

You can decide whether to enable Simultaneous Mode in Spectral Doppler Mode, using the following three options:

- Off: Select this if you do not wish to use Simultaneous Mode.
- Allow B / PW: Select this option if you do not wish to use Simultaneous Mode in 2D/C/PW Modes, but do wish to use it in 2D/PW Mode
- Allow B / C / PW: Select this if you wish to use simultaneous mode for both 2D/PW and for 2D/C/PW.

- **Color Mode Position on Dual Live**

Select the position of the Color Doppler Mode in Dual Live Mode.

- Left or Top: Color Doppler Mode is located in the left or upper part of the screen.
- Right or Bottom: Color Doppler Mode is located in the right or lower part of the screen.
- Left-Right Dual Live Mode Only: The Top-Bottom Dual button disappears when you check this checkbox.

- **Dual Mode**

- Show ‘Change Window’ button: Select whether to activate the Change window in Dual Mode.

- **Option**

You can select multiple items. Use the trackball and the **Set** button to select and check or uncheck an item.

- Active HPRF on PW mode: Select whether to activate HPRF (High Pulse Repetition Frequency), which is supported in PW Spectral Doppler Mode. Check the checkbox to use the HPRF function.
- Color Map Auto invert(on linear): Check this checkbox to automatically highlight the Color Map. This is only applied when you change Steer in 2D/C/D Mode, C Mode, or DPDI Mode in PD Mode.
- M/PW Loop Side by Side: Add Loop Side By Side display in M Mode or Power Spectral Doppler Mode.
- Width Scale: Automatically fit the image size to the screen size when the depth of a 2D image is adjusted. Please note that this can be only used with linear probes.
- PW mode by M-Line: In 2D Mode, pressing the **Set** button when **M Line** is "on" will take you directly to PW Mode.

Default Text

- **Show operator name on Scan Image**
  - Type: Select Diag. Physician, Ref. Physician, or Sonographer. Turn this option off to hide it from the screen.

Auto Calc.

AutoCalc is a Spectral Doppler Mode feature that automatically performs specific calculations based on measured values.

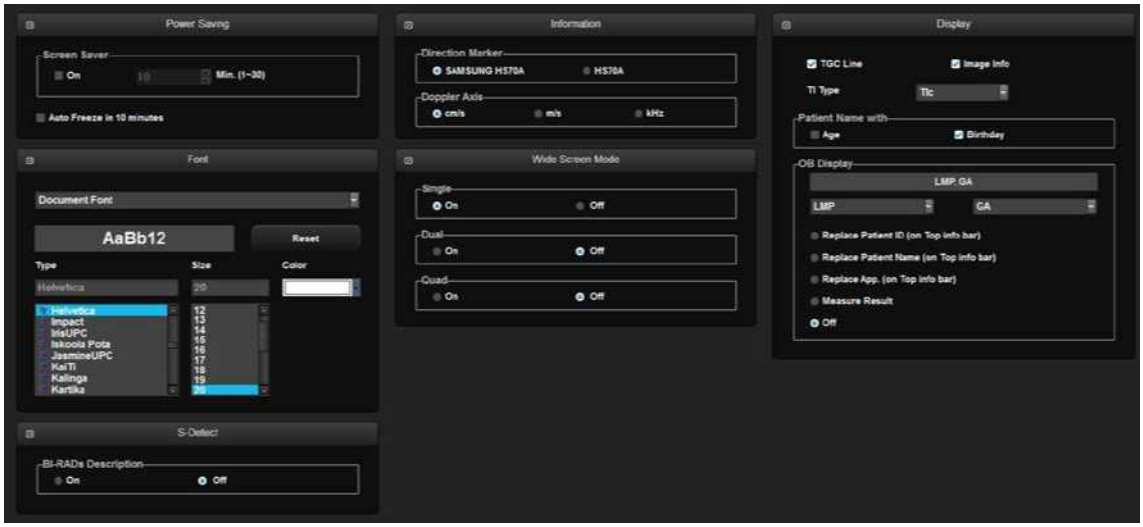
NOTE	The specified items will appear on the screen only when the **AutoCalc** button on the touch screen is tapped in Spectral Doppler Mode.

Add and remove automatic calculations by using the check boxes. You can select up to six values.

When the Peak Systolic Velocity and End Diastolic Velocity values are 0, not all results for the items will be displayed on the screen. In addition, the result value for Time Averaged Mean Velocity is displayed only when Mean Trace is turned on.

Display

Select the **Display** tab in the *Setup* screen. Or tap **Display** on the touch screen. Configure the settings for displaying images.



[Figure 3.10 Setup - Display]

Power Saving

- **Screen Saver:** Select whether or not to display the screen saver. When this is On, you can set the screensaver to be activated in 1 to 30 minutes.
- **Auto Freeze in 10 minutes:** Scan mode is frozen automatically when the product is not used for 10 minutes**.**

※Tip!

The Scan Mode is frozen automatically, regardless of Auto Freeze setting, when the product is not used for 1 hour.

NOTE	In 3D mode, Auto Freeze is activated when the product is not used for 20 minutes.

Font

Specify the target for which you want to set the font. Choose from Document Font and Measure Result Font. The selected font can be previewed.

- **Reset**

Uses the system's default fonts. The default settings are as follows:

	Document Font	Measure Result Font
Font Name	Helvetica	Verdana
Font Size	20	11
Font Color	White	Yellow

- **Type**

Select the font type to use.

- **Size**

Select the font size to use.

- **Color**

Select the font color to use.

NOTE	Certain fonts may not appear correctly on the screen.

S-Detect

- **S-Detect: BI- RADs Description**

  Show or hide the on-screen call text based on the BI-RADs score in S-Detect. Turn this option off to hide the call text from the screen.

Information

■ **Direction Marker**

Set the Direction Marker. Select between SAMSUNG HS70A and HS70A.

■ **Doppler Axis**

Select the units of measurement for the axis scale in Spectral Doppler Mode.

- cm/s: Specify the Doppler axis scale unit as cm/s.
- m/s: Specify the Doppler axis scale unit as m/s.
- kHz: Specify the Doppler axis scale unit as kHz.

Wide Screen Mode

The Wide Screen mode can be turned on or off by using the trackball in Single, Dual, or Quad mode. Turn this option off to set the screen to 4:3 ratio.

Display

■ TGC Line: Select whether or not to display the TGC Line. If this feature is not used, TGC line is displayed on the screen for 3 seconds when TGC is configured.

■ Image Info: Show or hide the image information. If the image information intrudes too much on the screen, disable this option to hide it.

■ TI(Thermal Index) Display: Specify the TI to display on the screen as TIs (Soft tissue Thermal Index), TIb (Bone Thermal Index), or TIc (Cranial bone Thermal Index).

■ **Patient Name with**

- Age: Select whether to display the name and age under the patient ID.
- Birthday: Select whether to display the name and date of birth underneath the patient ID.

NOTE	'Age' and 'Birthday' cannot be used simultaneously.

■ **OB Display**

Specify how the LMP, GA and EDD entered in the *Patient Information* screen will be displayed on the monitor screen. Select two from LMP, GA, and EDD.

- Replace Patient ID (on Top info bar): Replace the ID in the title area.

- Replace Patient Name (on Top info bar): Show the patient name in the title area.
- Replace App. (on Top info bar): Replaces the applications in the title area.
- Measure Result: Display the measurement result along with the selected LMP, GA or EDD.
- Off: None of the options are displayed on the screen.

Patient Name Formatting

This function is to display patient names in Asian languages, such as Korean, Chinese, and Japanese.

This setting is initialized when you click **Reset**.

NOTE	This button only appears on the screen in a product that supports Asian patient names.

■ Name Formatting

Select the order in which patients' names are displayed.

- Default**"Last, First Middle"**: Names are displayed in the order of last name, first name, and middle name (E.g. Smith, Robert L.).
- Custom: For "Item", specify the order in which you want to display the last name, first name, and middle name. For "Separator", specify the symbol (such as a comma, colon, or space) that should be used to separate each name.

■ Representation Priority

Patient Information

Select the method for displaying patients' names. Assign priorities of 1, 2, and 3 to the Roman, Ideographic, and Phonetic display methods.

Annotate

Select the **Annotate** tab in the *Setup* screen. Or tap Annotate on the touch screen. Configure information related to image input.

[Figure 3.11 Setup – Annotate]

BodyMarker

- **Size**

Set the BodyMarker size (Small, Medium, or Large).

- **BodyMarker Auto Active**

Select whether to activate the BodyMarker mode automatically when the active image area is changed.

- **BodyMarker Edit**

[Figure 3.12 BodyMarker Edit]

① BodyMarker list: The list varies depending on the group selected from Group. 'Current page/Total pages' is displayed below the list. If there are two or more pages, change pages by using ⇨ or ⇦.

② BodyMarker list for the probe or preset currently being used. 'Current page/Total pages' is displayed below the list. If there are two or more pages, change pages by using ⇨ or ⇦.

NOTE	You can add or save between 1 and 100 BodyMarkers in each list.

- Adding a BodyMarker

  Select a BodyMarker from the left list (①) and double-click it. The selected BodyMarker is added to the list on the right (②). The right list cannot have duplicated BodyMarkers. If this occurs, a warning message will pop-up.

- Removing a BodyMarker

  Select and double-click a BodyMarker in the list (②) on the right.

- Saving and Canceling the BodyMarker list

  Press **Save** to save the list. Press **Close** to cancel.

- Resetting the BodyMarker list

  Click **Reset**. This restores the system's default settings.

Text

Set to use Delete all Text with Un-freeze, Delete all Annotation with Mode Change, Autotext, Caps Lock On, and Quick Text.

- **Delete all Text with Un-freeze**

  If this checkbox is checked, all of the text that has been entered is deleted at once when you return to scan mode by pressing the **Freeze** button.

- **Delete all Annotation with Mode Change**

  Check this checkbox to clear the entered annotation when you change the mode.

- **Autotext**

  If an abbreviation is entered, the system retrieves and enters a full word automatically. When this option is selected, you can enter text more easily and quickly. For example, if

you enter 'AC', the system automatically looks up and displays the matching full term, which is ‘Abdominal Circumference’.

To enable Auto Text, check the **Autotext** checkbox by using the trackball. Otherwise, uncheck the checkbox.

If this option is selected, an abbreviation list appears on the screen when text is entered.

[Figure 3.13 List of Abbreviations]

A list of abbreviations for this function is stored on the system. You can add a new abbreviation or edit the existing abbreviations as desired.

■ **Caps Lock on**

Select this checkbox to turn on Caps Lock On. This means that when text is entered, it is entered in capital letters.

■ **Quick Text**

If the checkbox is selected, the Quick Text function is enabled. Quick Text switches the system to the Text Input Mode immediately after a character key on the Alphanumeric Keyboard is pressed.

NOTE	■ The Quick Text checkbox is checked by system default. ■ You can enter text even if you don't select Quick Text. To switch to Text Mode, tap Annotation on the touch screen.

※ Tip! Editing Abbreviation List

To enable the abbreviation list stored in the system, click the **Autotext Edit** button. The system will switch to the Autotext Edit screen.

To save the changes and finish editing, press the **Close** button.

- Modifying a word

1. Use the trackball and the **Set** button to select a word to modify from the list. In the Abbreviation and Full Word fields at the bottom of the screen, the abbreviation you have selected and the corresponding full term are displayed.
2. Modify the words in the Abbreviation and Full Word fields. The abbreviation list is updated in real time.

- Adding a word

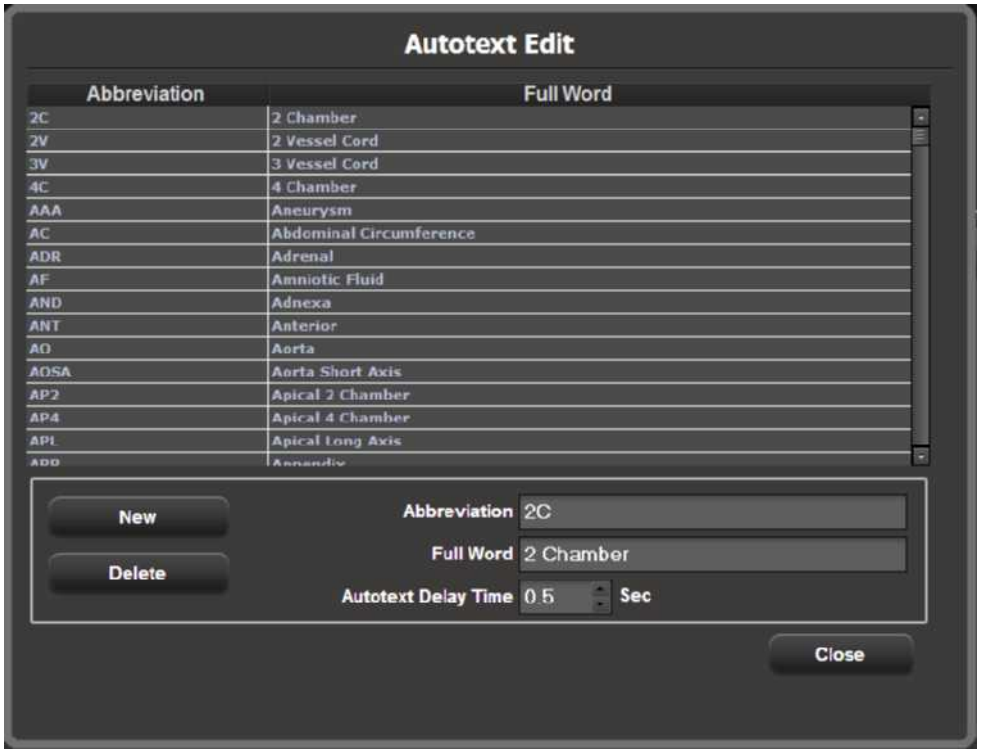
1. Press the **New** button.
2. Enter the terms you want to add into the Abbreviation and Full Word fields at the bottom of the screen. The word will be added to the abbreviation list.

- Deleting a word

1. Use the trackball and the **Set** button to select a word to delete from the list. In the Abbreviation and Full Word fields at the bottom of the screen, the abbreviation you have selected and the corresponding full term are displayed.
2. Press the **Delete** button. A warning message will appear.
3. To delete the selected word, click OK. The word will be deleted from the abbreviation list. Press **Cancel** to cancel.

- Selecting Autotext Delay Time

Specify the time taken by the system to automatically convert an abbreviation into a full word and display it on the screen. Set the delay time from 0.1 to 5 seconds in Autotext Delay Time at the bottom of the screen.



[Figure 3.14 Autotext Edit]

Text library (Touch Screen)

Select an application to modify and edit the corresponding text page.

- **Word list**

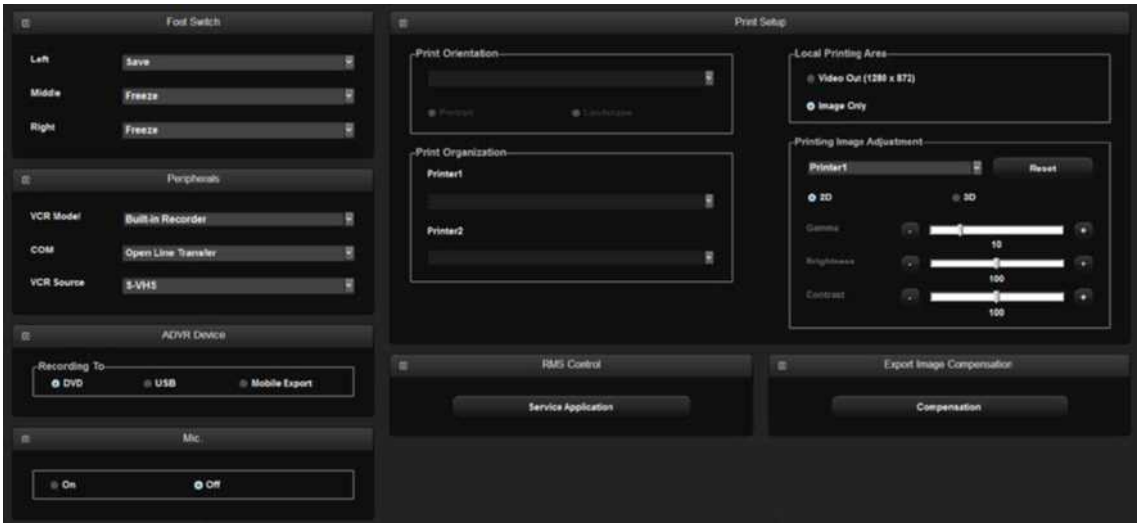
  Select and edit the text you wish to modify, and then save it by tapping the **Save** button. Up to four different preset text entries can be added for one text button.

- **Export/Import**

  Share the text saved on the system with another system, or import a text entry from another system.

Peripheral Device Settings

Select the **Peripherals** tab on the *Setup* screen. Or tap **Peripherals** on the touch screen. You can configure keys, buttons, and the peripheral devices connected to the product.



[Figure 3.15 Setup - Peripherals]

Foot Switch

Set the functions of the left and right pedals of the foot switch. The functions that can be set are shown below. Freeze, Update, Record, Printer 1, Save, Store Clip, Volume Start, EZ Exam+, PD Mode, Color Mode, M Mode, PW Mode, CW Mode, Elastoscan Mode, TDI Mode, TDW Mode, Biopsy.

Peripherals

- **VCR Model**

Set as Built-in Recorder. The user cannot change this setting.

- **COM**

Configure a device to connect to a serial port. Choose between Open Line Transfer and Reserved. If you select Reserved, the COM port will not be used.

To complete the device connection after selecting Open Line Transfer, you need to reboot the system.

- **VCR Source**

Sets a VCR source. You may select VHS or S-VHS.

Mic

Set this to on or off by using the trackball. The default setting for microphone is Off.

ADVR Device

- **Recording To**

Select a media type for real-time recording. You may select either DVD, USB, or Mobile Export.

Print Setup

- **Printer Orientation**

NOTE	This option is available only for an Echo printer that uses roll paper.

Set the type and page orientation of the Echo printer.

- Printer Settings: Select the printer to use by using the combo button.
- Portrait: When printed, the long side of the page is vertical.
- Landscape: When printed, the long side of the page is horizontal.

- **Printer Organization**

Used to assign printers to the control panel's **Printer 1** and **Printer 2** buttons.

- **Local Printing Area**

Set the area that will be printed.

- Video Out (1280 x 872): Print part of the monitor screen (1280*872), containing the image area.
- Image Only: Prints the image area only.

- **Printing Image Adjustment**

Used to adjust the image print quality. Select the image type and adjust Gamma, Brightness, and Contrast.

NOTE	This is only supported by some digital printers.

RMS Control

RMS stands for Remote Maintenance Service. If you are experiencing a technical problem with the product, this feature takes control of the system remotely and collects data to help solve the problem.

- **Service Application**

  Press the button to display the *Service Application* screen.

  The *Service Application* screen consists of Log and Service tabs.

※ Using RMS

To use the RMS, you must agree to the following in the Service tab:

Equipment status is inspected by remote access. The results are used for customer service and product failure prevention.

Product screen will be shared as service is conducted via remote access.

Information relating to patients will not be transmitted externally or to Samsung Medison.

※ Log

The various logs generated by the equipment, pertaining to the frequency of use, errors, system information, etc., can be viewed.

- Diagnostics: Show an Error Log of any errors that may be found while carrying out the hardware diagnosis.
- Error: Show information about the error that has occurred in the system. Select an image to view the circumstances in which the error occurred.
- Utilization: Specific utilization information such as Application, Probe, and Preset may be viewed.

Export Image Compensation

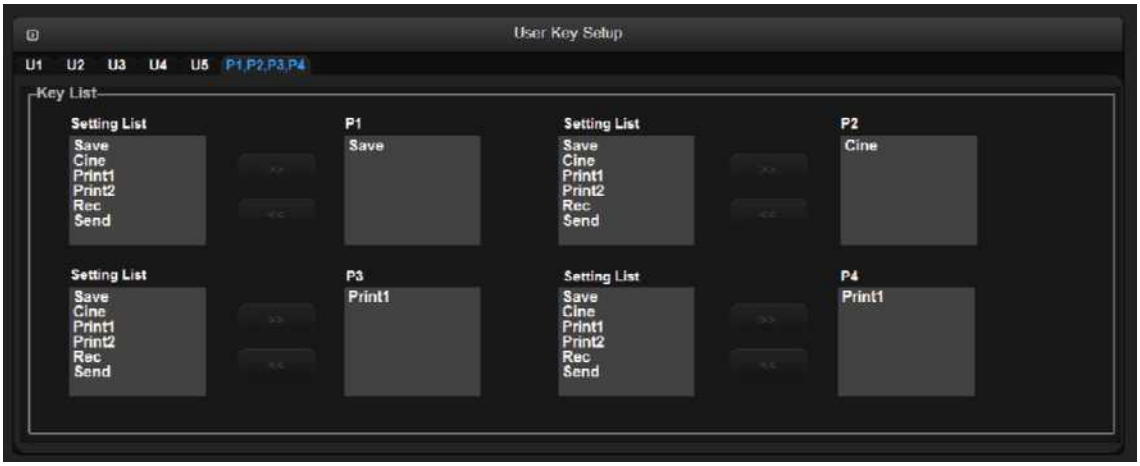
Used to set the Post Curve of the image to use the DICOM service. Press the button to display the *Compensation* window.

Adjust Gamma, Brightness, and Contrast by using the slider for each option. If **Default** is clicked, the system's default settings will be restored.

> **※ Tip! Compensation**
>
> Adjusting the post curve settings for images enables other monitors to display them as closely as possible to the original images, which is convenient for diagnosis.

User Defined Keys

Select the **User defined Key** tab in the *Setup* screen. Or tap User Defined Key on the touch screen. You can set the functions of the keys and buttons on the product.



[Figure 3.16 Setup – User Defined key]

User Key Setup

Assign functions to the **U1**, **U2**, **U3**, **U4**, and **U5** buttons on the control panel. The functions that can be set are shown below.

- **Key List**
  - Current key : Displays the current settings of the User Key button.

Mode	None, M Line, Annotation, BodyMarker
Features	Biopsy, Printer2
Measure	EFW Measure, EFW Result, BPD, HC, AC, FL, APTD, TTD, FTA, GS, CRL
Control	Single, Dual, Quad, Dual Live, Change Window, Probe Change, Application Change, Simultaneous, Send to DICOM, Exit (only **U1** can be set)
Print	Store Clip, Save, Record, Volume Save, Stressecho, TDI Mode, TDW Mode

Select the functions to assign to the Peripheral Keys (P1, P2, P3, and P4 buttons) on the control panel. The functions that can be set are shown below.

■ **Key List**

Setting List	Save, Cine, Print1, Print2, Rec, Send

NOTE	Up to three functions may be assigned to the P1, P2, P3, and P4 buttons,

Network

Select the **Network** tab in the *Setup* screen. Or tap **Network** on the touch screen. You can set E-mail, Network Status, etc.

[Figure 3.17 Setup - Network]

LAN

- **Network Configuration**

The System Network window will open to allow you to configure the IP.

Wireless

- **WLAN**

Use a USB adapter to connect the system to a wireless network.

NOTE	The Wireless Network Settings window is enabled only when the system is connected to a wireless USB adapter.

- SSID: Displays the name of the connected wireless network. SSID stands for Service Set IDentifier.
- Authentication: Displays the authentication method for the wireless network.
- Encryption: Displays the data encryption method for communicating with the wireless network.
- Password: Enter the password for the network.

※ Connecting to a wireless network

1. Use the trackball and the **Set** button to press the **Scan** button.
2. Select a wireless network to connect to.
3. Tap the **Connect** button to connect the system to the wireless network.
4. Tap the **Disconnect** button to disconnect the system from the wireless network.
5. Press the **Close** button to complete the setup.

E-mail

Enter the details of the server that this product should use to send/receive e-mails.

- **Mail(SMTP) Server**

  Configure the e-mail server.

- **Port No.**

  Enter the port number.

- **ID**

  Enter the log-on ID for the e-mail server to use.

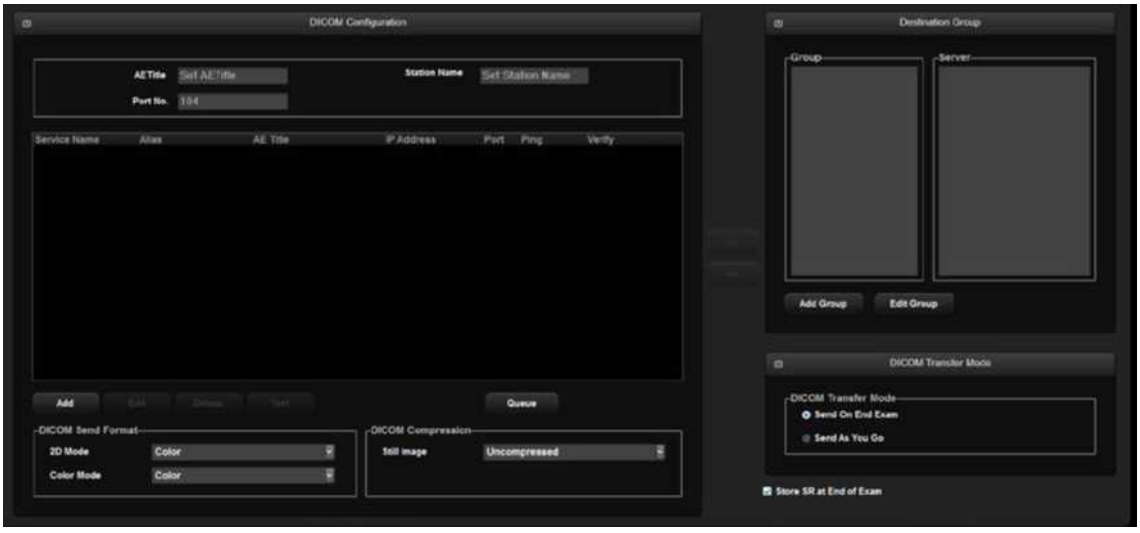
- **Password**

  Enter the log-on password for the e-mail server to use.

DICOM Setup (Optional)

Select the **DICOM** tab on the *Setup* screen. Or tap DICOM on the touch screen. You can configure the DICOM (Digital Imaging and Communication in Medicine) operations and the DICOM server.

NOTE	■ You cannot change DICOM settings time when a patient ID has been registered. To change the date and time, you should finish the current diagnosis by tapping the **End Exam** button on the touch screen. ■ For more information, please refer to the server's user manual, or the DICOM Conformance Statement.



[Figure 3.18 Setup - DICOM]

DICOM Configuration

Information about the DICOM server used by the system is displayed.
You can change the information, or add or delete a server. The server information is used to identify DICOM for the system within a network. It is also used to transfer data between other DICOM servers.

NOTE	For the 'IP Address', 'AE Title', and 'Port No' settings, contact your organization's network administrator.

■ **AE Title**

Enter the name of the DICOM AE (Application Entity). Used for identifying the equipment that uses DICOM on the network.

- **Station Name**

  Enter the name of the system. Along with AE Title, it is often used to identify the system in the DICOM network.

- **Port No.**

  Enter the port number for the server being used.

DICOM Send Format

Specify the storage format for the 2D or Color Mode images for which the DICOM services will be used. Select either Color or Gray using the Combo button. If you select Gray, images are saved in grayscale format.

NOTE	DICOM Send Format settings begin to apply when an image is saved. For example, if it is set to Gray, saving an image will save it in grayscale format.

DICOM Compression

Select whether to compress the still images for the DICOM service. Select Uncompressed or JPEG Baseline by using the Combo button. When you select Uncompressed, the images are saved without compression.

NOTE	DICOM Compression settings are applied when an image is saved. For example, if it is set to JPEG Baseline, saving the image will compress it.

Destination Group

Use Send to DICOM function to set the destination group for sending images when the User Defined Key (User Key or Peripheral Key) is pressed.

The set destination group will be displayed under DICOM Destination in the *Patient Information* screen. Once the destination group is set and the user defined key is pressed, image is sent to the destination group designated as DICOM Destination on the *Patient Information* screen.

Press **Add Group** or **Edit Group** to bring up *DICOM Group* window.

- Add: Add a Destination Group.
- Edit: Edit a Destination Group.

- Delete: Delete a Destination Group added by a user.
- Press **OK** to finish. Tap **Cancel** to cancel.

※ Automatic DICOM Transfer Settings

The system supports automatically transfer images to DICOM servers (storage or print service) using the Peripheral Keys (**P1**-**P4** keys).

The function can be set in the following steps: DICOM Settings → User Defined Key Settings → DICOM Destination Settings under Patient Information screen.

■ DICOM Settings

1. Navigate to *Setup* > *DICOM* and set the Storage (or Print) server and Destination Group.
2. Connect a Storage (or Print) service to the group. Select Storage (or Print) service on the screen and Destination Group on the screen and press **>>**.
3. Set DICOM Transfer Mode.

■ User Defined Key Settings

Navigate to **Setup** > **User Defined Key** > **Display**, and set the functions for **P1**- **P4** key. Select Save on the list, and press **Add** to set it as the function for the subject key. Repeat the same steps to add Send to DICOM.

■ DICOM Destination Settings

Select DICOM Destination in the *Patient Information* screen.

NOTE	You cannot change DICOM Settings or DICOM Destination Settings when a patient ID has been registered. To change the date and time, you should finish the current diagnosis by tapping the **End Exam** button on the touch screen.

DICOM Transfer Mode

Select a transfer method:

- **DICOM Transfer Mode**

- Send On End Exam: Send all saved images when you press the End Exam button.
- Send As You Go: Send an image whenever you press the **Save** button to save it.

Store SR at End of Exam

Select whether to store SR at the end of the exam. When you check this checkbox, SR is automatically stored at the end of the exam. Otherwise, it is not stored.

Adding DICOM Services

Click **Add** on the screen. A screen is displayed where you can enter a DICOM service to add. After adding a service, click **Save** to save the information. Click **Cancel** to cancel.

- **Services**

Select the type of service to use via DICOM. The supported DICOM servers are Storage, Print, Worklist, PPS, SC, Storage SR, and DICOM QR.

- **Alias**

Enter the name of the DICOM server.

- **AE Title**

Enter the AE title of the DICOM server. Consult your network administrator before specifying this option.

- **Connect Timeout**

The connection will time out if there is no response within the configured time period.

You can specify this time period in seconds.

- **IP Address**

Enter the IP address of the server being used. Consult your network administrator before specifying this option.

- **Port No.**

Enter the port number for the server being used. Consult your network administrator before specifying this option.

- **Retry Interval**

Specify how many seconds the system will wait before it retries a failed transmission. You can specify this time period in seconds.

- **Maximum Retries**

Specify how many times a failed transmission will be retried.

Storage Server Information

Select STORAGE under **Services**. Configure the Image Storage Service using DICOM.

- **Storage Options**

- Send Cine Loops: Select this checkbox to transfer Cine Loops.
- Include Pixel Spacing: In addition to the area information used in ultrasonography, the area information used in CT or radiography is also included. Measurements can be taken from a PACS system that does not support ultrasonic area information.

NOTE	However, only 2D and 2D Color Mode images are supported. In Dual and Quad Mode, the depths of the included images must be identical.

- Include 3D Volume: Select whether to send 3D volume data together with the 3D images.

NOTE	Only select this option if you use a storage service that supports the 3D volume data format used by Samsung Medison.

- **VOI LUT Setup**

Configure VOI LUT (Value Of Interest, Look Up Table). Adjust the brightness and

contrast of a DICOM image when saving it. The saved image can be viewed with any PACS device that has DICOM VOI LUT implemented.

- Window Center: Enter a value for the DICOM Tag (0028, 1050) setting. The setting value indicates the brightness of an image that is displayed by the storage service. Relative to 128, a higher value results in a darker image. Note that this function can be used only when it is supported by the storage service.
- Window Width: Enter a value for the DICOM Tag (0028, 1051) setting. The setting value indicates the contrast of the image displayed by the storage service. Relative to 256, higher values result in lower contrast. Note that this function is available only when it is supported by the storage service.

■ **Maintain association**

If Transfer Mode is set to 'Send As You Go' in Storage Service, you can configure 'Maintain Association'.

- If the checkbox is selected: Even after image transfer has been completed, association is maintained until End Exam is selected.

- If the checkbox is not selected: Association is terminated once the image has been transferred.

Print Server Information

Select 'PRINT' under **Services**. Configure the Print Service using DICOM.

NOTE	■ You can configure a printer connected to the DICOM network only. ■ Depending on the printer, some of the following functions may not be available. Before configuring the printer service, refer to the printer's user manual or its DICOM Conformance Statement.

■ **Color**

Specify whether to use color for printing. Select Grayscale or RGB.

■ **Format**

Specify the paper layout. Select from 1x1, 1x2, 2x2, 2x3, 3x3, 3x4, 3x5, 4x4, 4x5, and 4x6.

■ **Orientation**

Specify the orientation of the paper. Select either Landscape or Portrait.

- **Magnification**

Specify the type of interpolation to use when resizing an image to print. Select from Replicate, Bilinear, Cubic and None.

- **Border Density**

Specify the border density of an image to print. Select Black or White.

- **Empty Density**

Select the background color for the printed area. Select Black or White.

- **Min Density**

Specify the minimum brightness of an image to print. If this option is not specified, the default value is applied.

- **Max Density**

Specify the maximum brightness of an image to print. If this option is not specified, the default value is applied.

- **Medium Type**

Specify the material type for the printout. Select from Paper, Clear Film, Blue Film, Mammo Clear Film, and Mammo Blue Film.

- **Film Size**

Specify the paper size. Select from 8 inch x 10 inch, 5 inch x 11 inch, 10 inch x 12 inch, 10 inch x 14 inch, 11 inch x 14 inch, 11 inch x 17 inch, 14 inch x 14 inch, 14 inch x 17 inch, 24cm x 24cm, 24cm x 30cm, A4 and A3.

- **Destination**

Specify the paper pathway. Select Magazine or Processor.

- **Smoothing Type**

This option is available only when Magnification is set to CUBIC. Enter a value for the printer which is specified in the DICOM Conformance Statement.

- **Priority**

Specify a priority for the print command. Select High, Med, or Low.

■ **Copies**

Enter the number of copies between 1 and 99.

■ **Configuration Info**

Specify the unique value for a printer. Please refer to the DICOM Conformance Statement for the printer.

Worklist Server Information

Select WORKLIST under **Services**. Configure the Modality Worklist Service using DICOM.

■ **Show Worklist first when the patient screen opens**

When you check this checkbox, the *Worklist* window appears when you press the control panel's **Patient** button. Otherwise, the *Study Information* window appears.

■ **Update Method**

Specify the update method for Worklist.

- Only on user Request: Update the worklist only when the user wishes to.

> ※ **Tip!** - *To update a worklist, set Search Source to* ***Worklist*** *in the* ***Search*** *tab on the* Patient Information screen, and then click **Search**.

- On Startup and Every: Update the worklist when the system boots up, and then automatically update it at specified intervals.

■ **Scheduled Station AE Title**

Specify the range of AE Titles to retrieve from the Worklist server in a hospital.

- Any: Retrieve the patient list stored in all AE Titles on the server.
- This System: Retrieve the patient list in the AE Title specified under the DICOM tab.
- Another: Retrieve the patient list stored in the AE Title specified by the user.

NOTE	This option is only available when the Worklist server is enabled.

■ **Start Date**

Specify the range of dates to search.

- Today: Retrieve the patient list for the current date.
- Range: Retrieve the patient list for 'n' days before and 'n' days after the current date.
- Past Week: Retrieve the patient list for 7 days before the current date.

- Past Month: Retrieve the patient list for a month before the current date.
- Custom Date: Specify a certain date and retrieve the patient list for that date.

■ **Study Description Priority**

Specify the sorting order for when an exam is retrieved from the worklist server under Patient Information > Patient > Description. The list is sorted in order of high to low priority. Select an item that you wish to rearrange, and change its position by using the **Up** and **Dn** buttons.

■ **Modality Type**

These options are used to specify the modality of exams retrieved from the worklist server.

- Any: Retrieves all registered worklist exams, regardless of their modality.
- US: Retrieves ultrasound exams only.
- Another: Allows you to specify the modality and retrieve matching exams only. Leaving it blank means “Any”.

PPS Server Information

Select PPS (Performed Procedure Step) under **Services**. Configure the Modality Performed Procedure Step Service using DICOM.

The configuration options are the same as those for the storage server.

■ **Always complete exams**

When you check this checkbox, exams are always reported in complete condition. If you click the **Cancel** button without checking this checkbox, the cancel message is sent to the RIS server.

SC Server Information

Select SC (Storage Commitment) under **Services**. Configure the Storage Commitment Service using DICOM. The Storage Commitment Service is used after a diagnosis is finished and all saved images and reports are sent.

■ **Associated Storage Server**

Select an Image Storage server to connect to.

Storage SR Server Information

Select Storage SR (Storage Structured Report) under **Services**. Configure the Report

Storage Service using DICOM.

The configuration options are the same as those for the storage server.

DICOM QR Sever Information

Select 'DICOM QR' under **Services**.

The configuration options are the same as those for the storage server.

Editing DICOM Information

Select a service and click **Edit** on the screen. The information on the selected service will appear.

After changing the information, click **Save** to save the changes. Click **Cancel** to cancel.

Deleting DICOM Services

Select a service and click **Delete** on the screen.

Testing DICOM Servers

Select a service and click **Test** on the screen. The connection with the selected service is tested and the results are shown under Ping and Verify. If the result is Normal, it indicates that the connection is functioning as it should be.

Managing DICOM

Click **Queue** on the screen to switch to the DICOM Job Status screen. You can review the current job status using the Job ID, Patient ID, etc.

The following describes the elements of the *DICOM Job Status* screen.

- Job ID: Displays the job ID.
- Patient ID: Displays the patient ID.
- Alias: Displays the alias set in the *DICOM Configuration* screen.
- Type: Displays the job type. The available job types are Storage, Print, Storage SR, MPPS Start, MPPS End, and Storage CMT.
- Instances: Displays the number of instances. What this denotes differs depending on

the job type. For Storage and Print, this means the number of images. For Storage SR, it means the amount of measurement data. For MPPS Start, it is always displayed as 0.

- Data/Time: Displays the date and time when the job was created.
- Status: Displays the current status of the job.

Status	Description
Fail	The job failed.
Transfer	The job is in progress.
Imperfect	Job suspended while being processed. The status will be switched to the Ready state immediately.
Wait	The job is waiting for execution.
Wait Resp	The job is waiting for a response.
Hold	The job is waiting for a retry. This occurs when the job has failed, but the maximum retry count has not yet been reached.
Ready	The job is waiting for execution. This occurs when the network is not connected.
Not Ready	The Ready state is not complete. This occurs when MPPS (Modality Performed Procedure Step) End occurs before MPPS Start has been completed. Or when a Storage or Print batch job has not completed.

■ **Network Status**

The network connection status is displayed. When connected, ‘Connected’ is displayed. When disconnected, ‘Disconnected’ is displayed.

■ **Number of Jobs**

Displays the number of jobs listed in the *DICOM Job Status* screen.

■ **Log**

Displays the *DICOM Log* window.

■ **Retry**

Performs the selected job again. This button is enabled only when the status of the selected job is Fail or Wait Resp.

■ **Retry All**

Retries all jobs for which the status is Fail.

■ **Delete**

Deletes the selected job. This button is enabled only when the status of the selected job is Fail, Imperfect, Wait Resp, or Not Ready.

■ **Clear**

Deletes all jobs.

DICOM Log

Click **Log** on the *DICOM Job Status* window to display the *DICOM Log* window. This is used to manage the history of all DICOM services performed on this product.

■ **Log Settings**

Specify how log files will be managed.

- Delete Archived Log Afterwards: Specify how long a log file will be archived. Enter a number of days. If the specified time has elapsed after the log file was created, the file is deleted from the system.
- Log File Maximum Size: Specify the maximum size of a log file that can be archived. Enter a number of kilobytes. A log file that is larger than the specified size is not archived on the system and is deleted immediately.

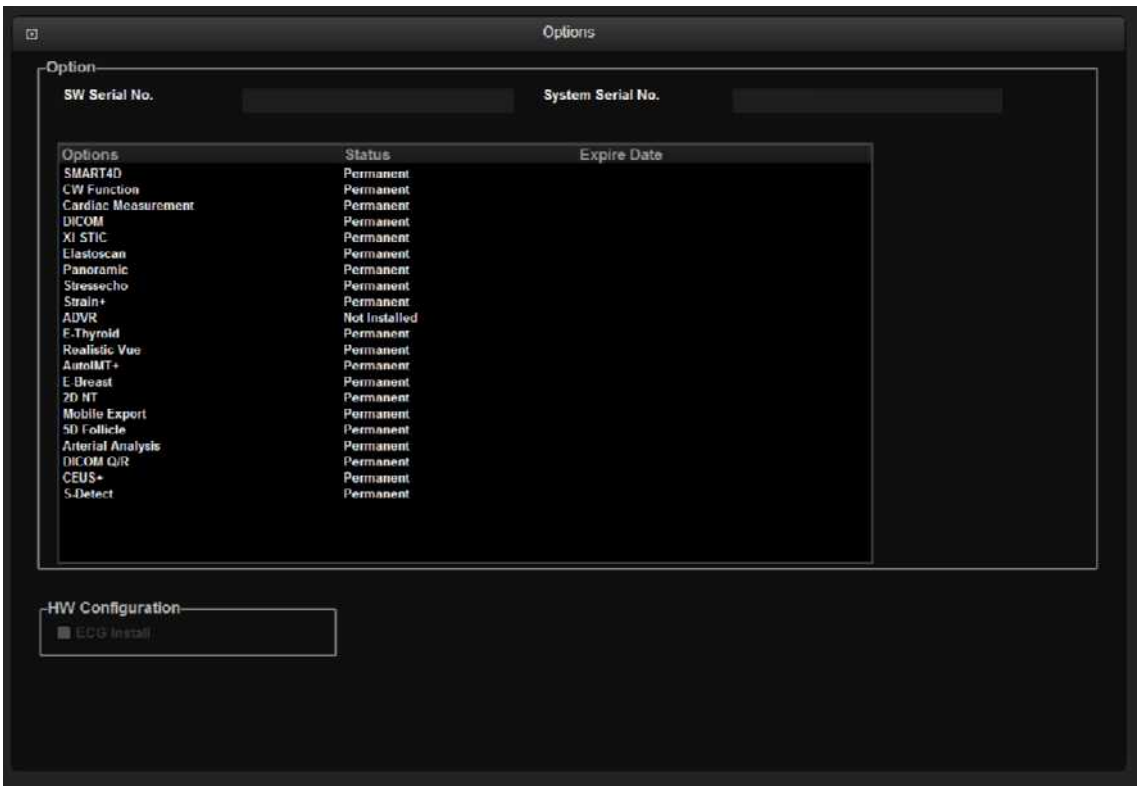
■ **DICOM Log**

Displays a list of log files with their information.

- Select All: Selects all log files.
- Delete Selected Files: Deletes the selected log files.
- Copy Selected Files: Copies the selected log file to external storage media.
- View Selected File: Displays the details of the selected log file on the screen.
- Refresh: Updates the information of a log file.

Options

Select the **Option** tab on the *Setup* screen. Or tap Options on the touch screen. Enables or disables optional software or hardware.



[Figure 3.19 Setup - Option]

* Actual options may vary.

Options

The list of optional software will appear.

NOTE	To purchase optional software, please contact the software's distributor.

- **Option**

  This shows the types of optional software that can be installed on the product.

- **Status**

  Shows the current status of optional software.

- Lock_Not Installed: Hardware is not connected.
- Lock_Unregistered: The software license has not been registered yet.
- Lock _Installed: Hardware is installed but cannot be used yet.
- Unlock_Permanent: The hardware or software can be used for an unlimited period.
- Unlock_Restricted: The hardware or software can be used only for a certain period of time.
- Lock_Expired: Use of the software is restricted, and it cannot be used because the specified period of use has expired.

■ **HW Configuration**

The list of optional hardware will appear. Currently, only ECG is supported.

Select a hardware item to use by using the checkbox. Reboot the system to complete the settings.

System Information

In the *Setup* screen, select the **System Information** tab. Or tap **System Information** on the touch screen. Displays the software version of the product.

Press **Detail** to view detailed version information about the product.

[Figure 3.20 Setup – System Information]

* The actual system version may differ from the software version shown in the above image.

Chapter 4

Product Inspection

Inspecting Functions

After installation, inspect the device and use the major functions to verify that the product works properly.

Basic Inspections

Monitor

Check the screen for color, focus, dots, afterimage, stain, and blurriness.
Check the screen while impacting the monitor, and check the signal while shaking the cable to the left and right.

Control Panel and LED Status

Press any keys on the control panel and see if text appears or breaks.
Verify that the Keyboard LEDs turn on.

Body Mark Key

Check if BodyMarker image appears correctly, and whether selection works properly.

Indicator Key

Check that the trackball works properly by rolling it up, down, left, and right.

Clear Key

Check that all text and measurements are cleared properly.

Check Zoom Functionality

Check the zoom function for proper action and ensure that there are no errors.

Check SonoView

Save images and Cine images in each mode.

Check for errors in saving the images.

Check whether Backup & Restore function properly.

Measure

Check the operation of Distance, Caliper, Calc, etc.

Patient

Enter information in Patient, and check that the same Patient information is displayed in the Report, SonoView, etc.

End Exam

Make an arbitrary measurement in New Patient, and see whether the measurement is erased when you press End Exam.

Probe Key

Perform a Probe Change, and check that it functions correctly.

Detailed Inspections

2D Mode

① Perform a Knife Test to check that a part of image is not displayed.

② Perform a Phantom to check for errors in image.

③ Check the Freeze Cine actions (broken image, Auto Run, Auto Run Speed, Trackball Cine).

④ Check for changes in the image brightness when you adjust the Gain.

⑤ Check that the TGC Gain operates correctly by adjusting it and checking for changes in the image brightness in accordance with depth.

⑥ Perform Left/Right Flip, Up/Down Direction, and Rotation to check whether the image changes its orientation correctly.

⑦ Check whether the Select Image menus (EE, DR, View Area, Tissue, Frame Rate) work properly.

⑧ Check for errors in frequency (Phantom, Res, Pen, Gen).

⑨ Check for changes in the image in accordance with changes in depth.

⑩ Check for changes in the image by depth when you change the focus.

⑪ Check whether or not the Image Compensation Mode works.

Dual Mode

① Perform a Phantom to check for errors in image.

② Perform Left/Right Flip, Up/Down Direction, and Rotation to check whether the image changes its orientation correctly.

③ Check the proper operation of Select Image menus (EE, DR, View Area, Tissue, Frame Rate, Power).

④ Check for errors in frequency (Phantom, res, pen, gen).

⑤ Check for changes in the image in accordance with changes in depth.

⑥ Check for changes in the image by depth when you change the focus.

⑦ Check for errors in operations related to left and right image Cine (number of pages, Cine progression order, broken image, Auto Run, Auto Run Speed, Track Ball Cine).

M Mode

① Perform a Phantom to check for errors in image.

② Check whether the M-Line's information is displayed in the Image area.

③ Check for changes in the image brightness when you adjust the Gain.

④ Perform Left/Right Flip, Up/Down Direction, and Rotation to check whether the image changes its orientation correctly.

⑤ Check that the Select Image menus (EE, DR, View Area, Tissue, Frame Rate, Sane angle, Power) operate correctly.

⑥ Check for changes in the image in accordance with changes in depth.

⑦ Check for changes in the image by depth when you change the focus.

⑧ Check for changes in speed when you change Speed gradually, and for errors in the information.

⑨ Check whether the image becomes inverted when Negative is performed.

⑩ Check for errors in Top Down Format and Side by Side Format images when Loop Format is selected.

⑪ Check for changes in the Format B-Mode and M Line area sizes.

⑫ Check the Freeze Cine actions (broken image, Auto Run, Auto Run Speed, Trackball Cine).

Color Doppler and Power Doppler Modes

① Perform a Phantom to check for errors in image.

② Check the operations related to the Select Image menus (Balance, Sensitivity, Color Mode, Display, CFR).

③ Check for changes in the image in accordance with changes in depth.

④ Check the Freeze Cine actions (broken image, Auto Run, Auto Run Speed, Trackball Cine).

⑤ Check for changes in the image brightness when you adjust Color Gain.

⑥ Check for noises and breaks in the image (B or C Mode Noise) when you move the ROI Box.

⑦ Check for noises and breaks in the image (B or C Mode Noise) when you resize the ROI Box.

⑧ Adjust Scale up and down to check whether the frequency is changed and speed range of blood flow is adjusted. (Check with a direct scan)

⑨ Operate Filter to check whether small signals are removed by stage.

⑩ Check whether or not the Color Bar is inverted when you operate the Invert key.

⑪ Move the Baseline up and down to check whether the speed range of blood flow moves to "+" or "-" position.

PW Spectral Doppler Mode

① Perform a Phantom to check for errors in image.

② Check whether Doppler's PRF value changes when you set Simultaneous to on/off.

③ Check for errors in the Doppler spectrum.

④ Change the Scale to check the change in velocity range.

⑤ Move the Baseline up and down to check whether the spectrum range moves to "+" or "-" position.

⑥ Check whether changing Filter removes low signals from the Spectrum.

⑦ Check whether the Doppler wave form is inverted when you operate Invert.

⑧ Perform Angle action.

⑨ Change the position and size of SV, and check for errors.

⑩ Check whether Spectrum's image changes when you change Spectrum's Type.

⑪ Check for errors in Sound Volume.

⑫ Perform Auto Calc, and check whether the line is displayed without breaks; check whether the calculated results are automatically carried out.

⑬ Check for errors in Top Down Format and Side by Side Format images when Loop Format is selected.

⑭ Check the Cine/Loop (broken image, Auto run, Auto run speed, Trackball Cine) operations.

3D/4D Mode

① Check whether loading is performed correctly when you proceed with Free Hand 3D SCAN and when you skip to Freeze; check for broken images and noise while you are proceeding.

② Check whether loading is performed correctly when you proceed with Static 3D Scan, and check for broken images and noise while you are proceeding.
Check the probe for noise, and check whether the probe's motor works normally.

③ Check whether loading is performed correctly when you proceed with Live 3D Scan, and check for broken images and noise while you are proceeding.

Check the probe for noise, and check whether the probe's motor works normally.

④ Check for errors in ROI 3D, ABC 3D, and Full images.

⑤ Check whether the 3D image changes to the selected angle.

⑥ Check whether the 3D image's contrast changes to the selected value.

⑦ Check for errors in the image when you change the size of the image.

⑧ Check the Display Format Image (ACB, Volume CT Image).

⑨ Step Angle , Rotation Angle, Rot. Axis and then proceed with Cine; check whether Cine Loading works in accordance with the Setting items, and check for breaks and errors in the image.

Chapter 5

Product Structure

Overview

HS70A is an ultrasound diagnostic imaging system utilizing software DSC.

It features a 23-inch LCD monitor, provides high-resolution ultrasound images, and includes premium-grade features. Samsung Medison's new proprietary technology is incorporated into the latest spec PC and ultrasound system interface to enhance processing speed. Enhanced processor speed results in faster processing speed of the product, which in turn reduces exam time.

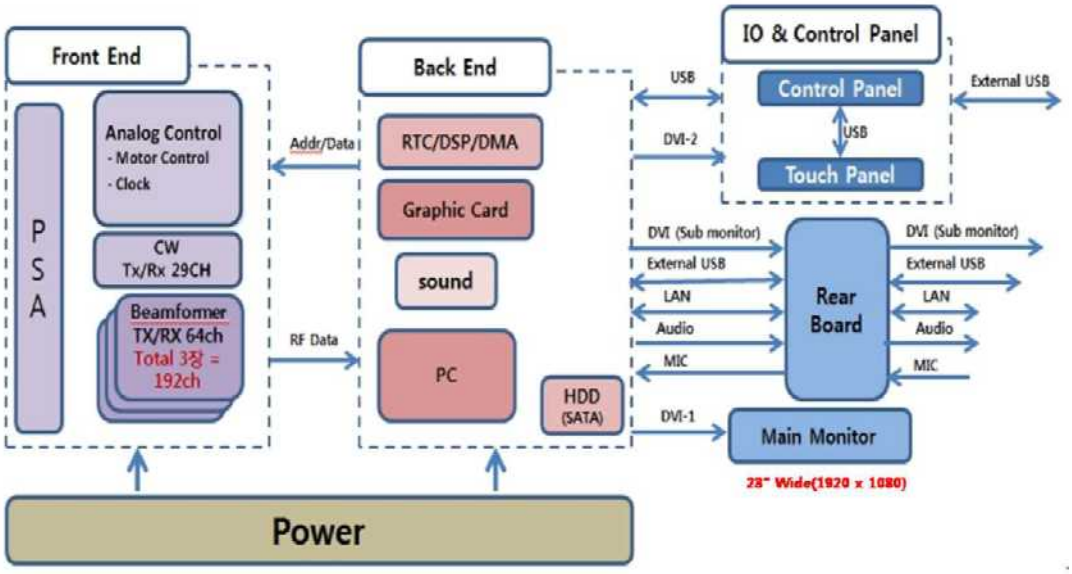
The major specifications are as follows:

Monitor	23" Full-HD Wide LED Backlight(1920*1080, Samsung Panel)
PC	Com-Express PC (Industrial, ADLINK)
CPU	Skylake i5-6440E
Memory	DDR4 4GB
OS	Windows 7 Embedded Standard
Storage	SSD 512G (Booting Time 59sec)
VGA	Internal VGA Card (Intel HD4000)
Chanel	TX 192 CH
Probe port	4 Probe Port (without CW Port, OB&GYN exclusive equipment)
BFIC	MCB124
MID Processor	MCB028
DSC	S/W DSC
3D Driver	AC B/D

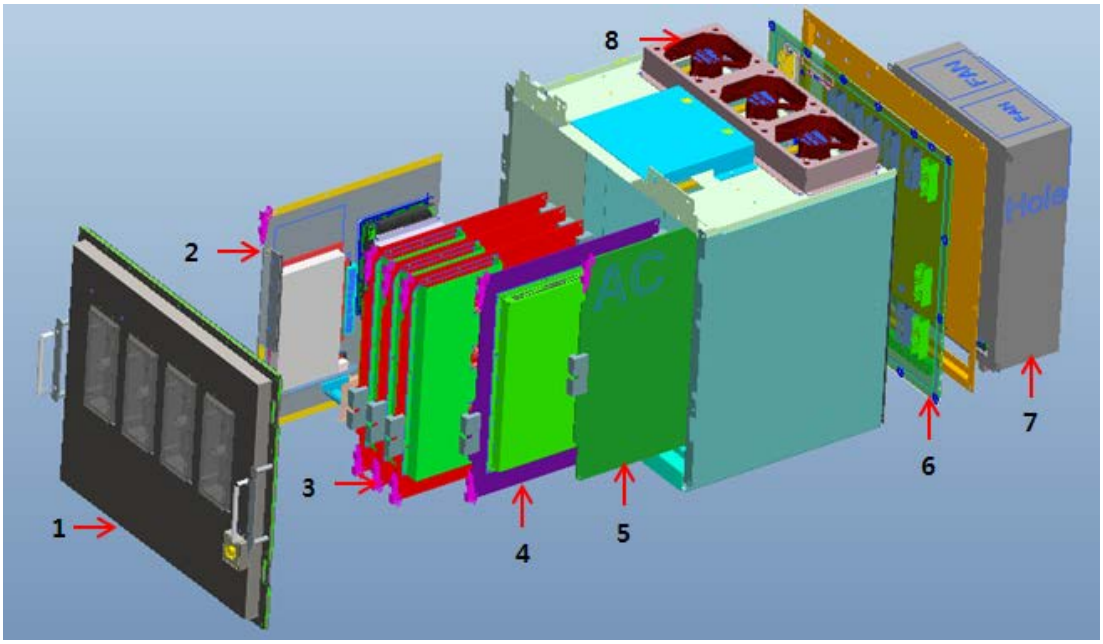
HS70A's major structure includes the following:

Ultrasound System Part	• BF(Beamformer Board) 3ea 192ch • PSA(Probe Select Assembly) 4 Ports • BE(Back End Board) • AC(Analog Control Board) • USB ECG Module • USB Foot Switch • Gel Warmer • Easy Install System FAN
User Interface Part	• 23” Wide LED Monitor • 10.1” Touch LED Backlight LCD • Key Matrix Board • Alpha Numeric Key Board • 1.2” Track Ball • SW ECG • Easy Touch on the side of the touch
PC Part	• PC Module : COM Express I, CPU : Intel Core i7-3635QM(2.4G, 6M) • RAM : DDR3 SDRAM 8GB(4GB*2) • HDD : SSD 512G • VGA : Internal VGA(Intel HD4000)
Power Module	• DDM • ACM

System Block Diagram



[Figure 5.1 System Block Diagram]



[Figure 5.2 System RACK Design]

No	Name
1	PSA
2	BE (Back End Board) + PC included
3	BF (Beamformer Board) : 3EA, 192ch
4	CW (Continuous Wave Board)
5	AC (Analog Control Board)
6	BP
7	DDM
8	FAN

Basic Structure of HS70A

Overview

HS70A consists of the Ultrasound System Part and the User Interface Part. However, when considered as an electronic structure, it consists of a Front End Part, a Back End Part, a User Interface Part, and a Power Part. A description of HS70A as an electronic structure is as follows:

Front End Part refers to the PSA (Probe Select Assembly), BF (Beamformer), and CW (Continuous Wave Board). The main functions of the Front End Part are to deliver High Voltage Pulser to the probe, thereby generating ultrasonic waves, and to amplify the returning echo signal to process Digital Beamforming. The RF signal generated here is sent to the Back End Part.

Back End Part refers to the BE (Back End) of the Ultrasound System Part as well as the PC Module.

It generates various diagnostic images such as BW, Color Doppler, PW Doppler, Power Doppler, etc. from the RF signal generated by the BF (Beamformer), and displays the images on the monitor so that the user can view them. In addition, it incorporates new technologies such as SCI and SDMR to facilitate a wide variety of diagnostic exams.

User Interface Part means the LCD monitor and control panel (including touch panel).

The Power Part can be divided as AC-DC Power Module and DC-DC Power Module; AC-DC Power Module converts AC voltage into DC to supply power to DC-DC Power Module as well as PC power of the PC part. DC-DC Power Module supplies voltage to boards of the Ultrasound System, while the PC Power supplies voltage to the PC Part.

Ultrasound System Part

The main function of the Main Board is to implement the ultrasound data up to the stage before Scan Converter. It performs some Front End Part and Back End Part functions. This detects probes and sends system information and application information in accordance with

user environment to each Board. it performs TX Focusing and RX Focusing based on such information. When high voltage Pulser is sent to the probe according to TX Focusing, ultrasonic waves are generated; echo signals returning from the body go through an amplification circuit to undergo Digital Beamforming processing. The RF signal obtained here goes through various filtering and processing to generate image signals such as BW, Color Doppler, PW Doppler, CW Doppler, Power Doppler, etc., which are sent to the PC Module to be implemented on the monitor.

The DC to DC Power Module supplies power to the Ultrasound System Part.

The Ultrasound System Part consists of the following:

- PSA(Probe Select Assembly) Board
- AC(Analog Control)
- BF(Beamformer) Board
- BE(Back End Board)
- DDM (DC to DC Power Module)
- CW(Continuous Wave Board)

PC Part

It main function consists of the Scan Converter and image output circuits for displaying the ultrasound information generated by the Ultrasound System Part on the monitor. It also performs control panel and interface functions.

The ultrasound image information from the Ultrasound System Part is connected to PC Part at PCIF with DMA method, and the ultrasound image is displayed through software DSC and VGA.

Previous type of the ultrasound image scanner uses the Hardware DSC method, but HS70A uses the Software DSC and the ultrasound images are displayed on a LCD monitor.

PC Power Supply uses Micro ATX as standard, and it supplies power to PC Part.

The PC Part consists of the following:

- PCIE(Peripheral Component Interconnect Express)

- DVI(Digital Video Interface)
- VGA(Video Graphics Array)
- PC Mother Board
- Rear Panel
- PC Power Supply

User Interface Part

This part allows the user to view ultrasound images on the LCD monitor to make a diagnosis, and to control HS70A by using the control panel and touch panel.

Images are sent by the Ultrasound Part to the LCD monitor and peripherals. Output images available include VHS, S-VHS, Composite and DVI, while input images include VHS and S-VHS. In addition, the control panel consists of various interfaces to allow the user to operate the system conveniently.

The User Interface Part consists of the following:

- LCD Monitor(LCD Inverter Board, LCD Control Volume)
- AD Board
- Control Panel Board
- Touch Panel
- Track Ball
- Alpha-Numeric Key Board

AC to Power Module

It converts external 110/230V AC voltage to the DC voltage to supply power to DDM (DC to DC Power Module) of Ultrasound System Part, and it also supplies stabilized AC voltage to PC Power Supply of PC Part. Power circuit breaker prevents any possible troubles due to overcurrent.

Ultrasound System Part

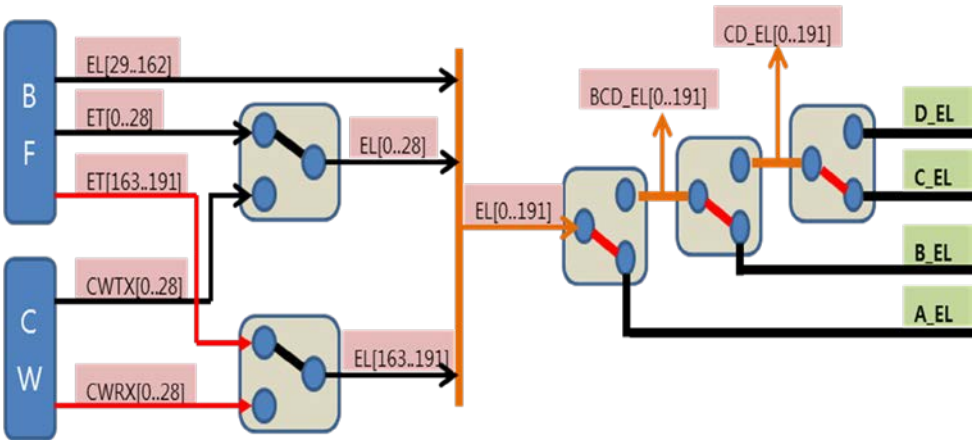
PSA

Main Functions

PSA serves as an interface for the System and the Probe.

Probe Connector has 4 of 408-pin Connectors and 1 of LEMO Connector and has the CW selection relay to support CW.

Also, it has 3D Probe Drive Path, Probe Insert Path, Port Select Path and CW Path and it has the Relay circuit to select one probe out of 4 probes.



[Figure 5.3 PSA Block Diagram]

Specification

- Local Power distribution
- LV/HV Power Switching
- 4 Probe Port Support
- Probe Check
- 3D probe path

Operational Principles

■ High Voltage Switching Process

HS70A는 supports 128 Channels, and uses up to 192-Element Probes. Since the Beamformer's Pulser and Receiver circuit structure has only 128 Channels, additional Element Selection is required. Element Selection uses 24 High Voltage Switches, and performs switching with the control signal sent from the Main Board's Control Logic (CPLD). Control Signal is connected via Mother Board Connectorfmf.

The inner structure of the High Voltage Switch consists of Shift Register and High Voltage FET.

■ High Voltage Switching Process

It consists of circuits to choose one of four probes. It can use the relay of the latched type to select a probe chosen by user.

The relay is operated by the probe select signal transmitted from the control logic (CPLD) of CW (Continuous Wave Board). Probe Select signal is connected through the Mother Board Connector. Probe Select signals are connected via the Mother Board Connector.

■ CW Probe Switching

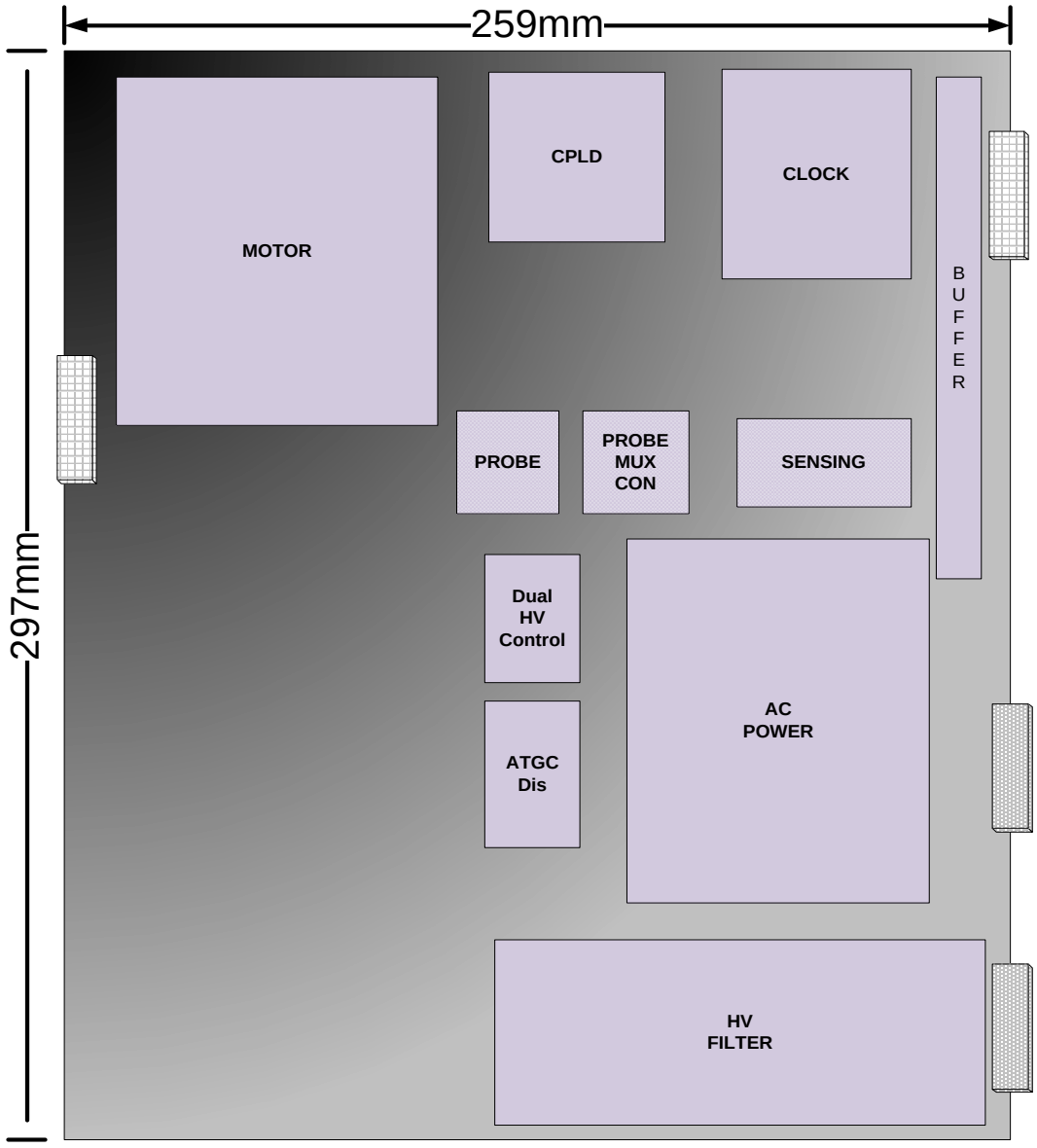
Steered CW Switching: Steered CW has, separate from the Beam former Board, Tx 29CH and Rx 29CH and, by using Not latch Relay, it converts the signal line from Phased Array Probe to the CW Board at Steered CW Mode. Because it has 29CH, there are 15 AGN20012s for CW Tx and there are 15 AGN20012 for CW Rx.

Static CW Switching:Static CW has Tx 1CH and Rx 1CH separately from the Beam Former Board. Signal lines from Pencil Probe in the Stactic CW Mode will be directly connected to the CW Board without Relay.

Analog Control

Main Functions

It checks the versions of 3D probe drive, Clock Generation, Probe Control, HV Switch Control, and BackPlane.



[Figure 5.4 AC Board Layout]

- The main function of the **Analog Control**board is to control the motor of 3D Probe, to supply clocks to the entire system and to monitor the status of power.
- **Motor Part**controls the stepping motor inside the 3D Probe.
- **HV Filter** is a high voltage filter used in BF.
- **Clock Part**generates system Clock 61.6Mhz used in BF and BE.
- **Pulser Sensing Part**monitors the status of High Voltage and current used in the BF board.
- **ATGC Part**supports analog time gain control curve used in BF.
- **AC Power**generates power for the AC & PSA board.
- **Probe Part** checks Probe port selection,
- Probe ID read, and Probe Insert of the PSA board at all times.

Specification

- 3D Probe Motor Driver
- System Clock Drive
- Pulser Voltage Sensing
- HV Mux Sensing
- ATGC
- AC Power
- Probe Check (ID/Insert/Port)

Operational Principles

The operational principle of the 3D Probe is the implementation of 3D mode through the actuation of Stepping Motor. The Motor Board performs feedback control with SIN and COS waveforms that have a 90^{o}-phase difference with the 3D Probe. Here, the 3D Probe provides a Null Position signal to the Motor Board, and the Motor Board provides One Frame signal, which is the standard signal for obtaining 3D images, to BE Board.

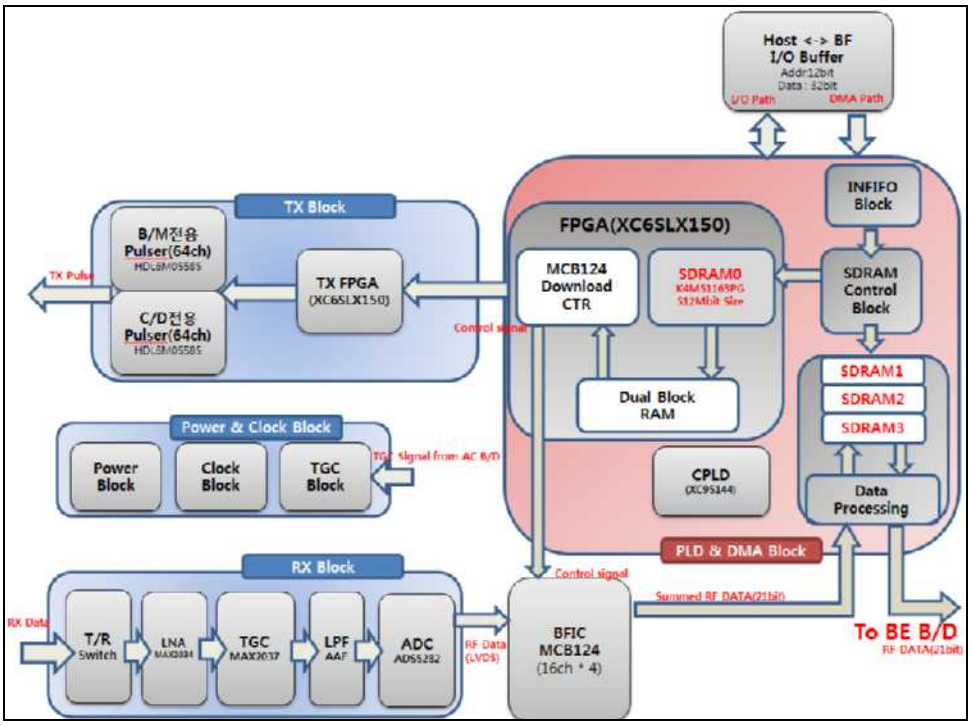
It monitors the voltage of HV Power in the BF Board and sends it to PC.

It provides the ATGC Curve to the BF Board.

Beam Former Board

Main Functions

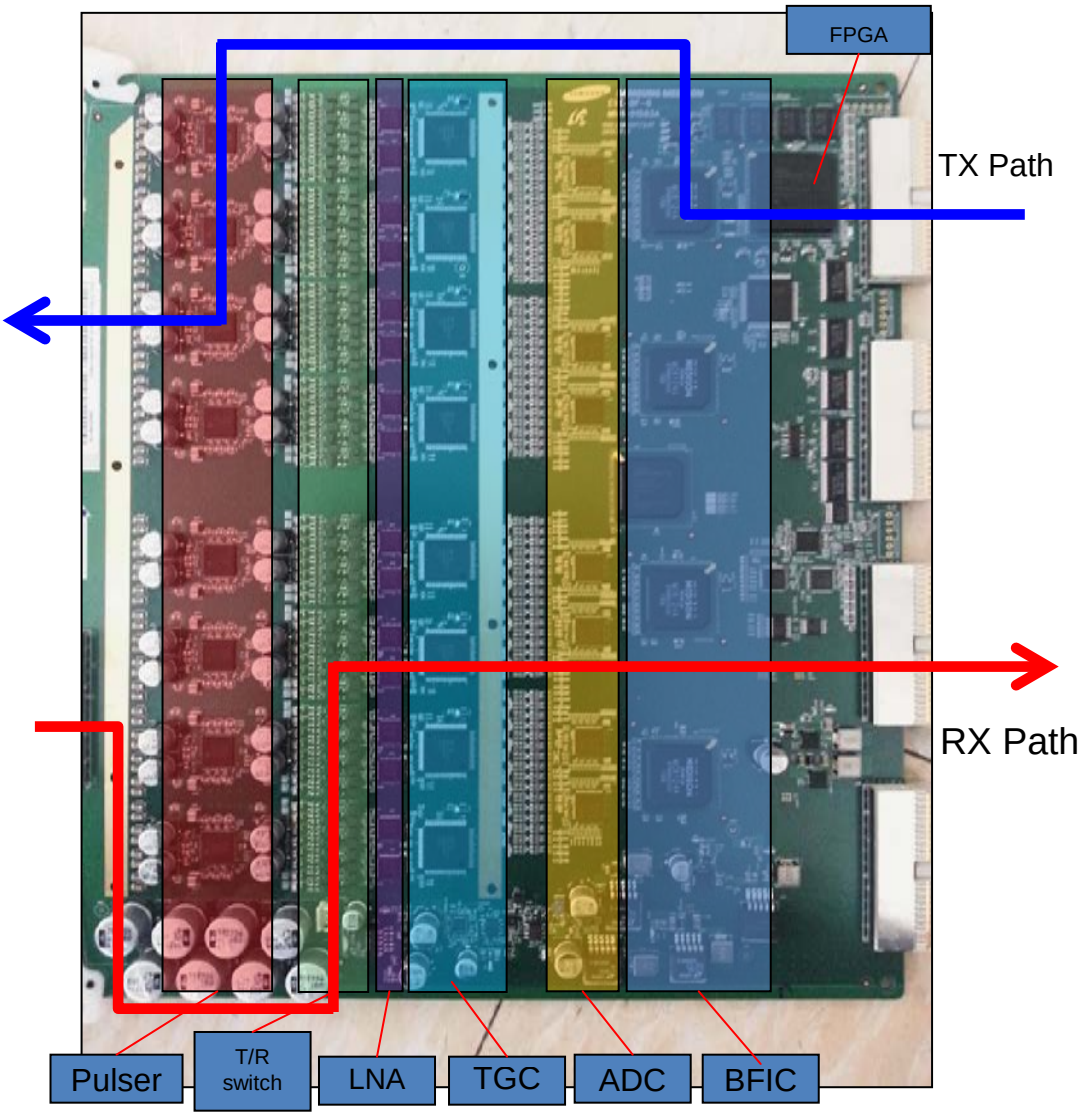
Beamformer board is located between PSA and Back-end and it sends a ultrasound signal focused on a specific position of the body and amplifies the received signal to convert it to a Digital signal. Then it beamforms the signal and relays the Focused data to Back-end for Mid-processing. BF Board consists of Pulser, TR Switch, LNA, TGC, ADC and BFIC.



[Figure 5.5 Front End Block Diagram]

- Pulser: consists of 192 channels and it can run 192 element Probes.
- TR Switch: deletes the HV element from Probe to prevent it from flowing to LNA.
- LNA: amplifies the received ultrasound signal and TGC Amp compensates the attenuation due to Depth to send the signal to ADC.
- ADC: converts the amplified Echo signal to digital data.
- BFIC: It Rx focuses the RX echo signals of 128 CH and sends them to BE Part.
- TX FPGA: The generated exciting pulse signal is entered into Pulser, converted to high-

pressured bipolar pulse and sent to Probe.



[Figure 5.6 Signal Path]

Specification

- TX Pulser 16 (HDL6M05585, 4CH)
- T/R switch 64CH
- Pre amp 32 (MAX2034, 4CH)
- TGC amp 8 (MAX2037, 8CH)

- AD converter 8 (ADS5282, 8CH)
- BF ASIC 4 (MCB124,16CH)
- RX Dynamic Aperture
- RX Apodization
- BFIC controlling
- Synthetic Aperture
- Trapezoidal imaging
- Multi-line receiving
- TX Focal point

Operational Principles

■ TX Pulser

Exciting pulse data provided by the BF ASIC (MCB124) go through the TX Pulse Buffer and are provided to the TX Pulse (MAX4811). The TX Pulser uses the high voltage and Exciting pulse data provided by the DC-DC Module to generate Bipolar Pulser. Bipolar Pulser uses PSA (Probe Select Assembly) to send to the Probe Element, thereby generating ultrasonic waves.

■ Receive Channel

The Receive Channel serves the function of an Analog Digital Conversion, which enables Beamforming by amplifying the Echo propagated through, and reflected from, the media of human body.

It consists of a Limiter, a Pre-Amp, a TGC-Amp, a Low-Pass Filter, and an A/D Converter.

1) Limiter

It removes unnecessary signals from the Echo signals returned through High Voltage Switch of PSA(Probe Select Assembly. Tx Pulse up to 180 Vpp and echo signals of a few mV are mixed together, but since the RX data actually needed are echo signals of extremely small magnitude in mV range, the Tx Pulse must be eliminated before they are sent to the Pre-Amp. The Limiter removes signal over approximately 0.6V before sending

the echo signal to the Pre-Amp.

2) Pre-Amp

The Pre-Amp amplifies the unprocessed small-magnitude echo signal in mV range.

3) TGC-Amp

The TGC (Time Gain Compensation) Amp consists of 4 channels per one unit.

It compensates for the time or distance-dependent reduction characteristics of echo signals that have been propagated through, or reflected from media.

4) Anti-aliasing Filter (Low Pass Filter)

The Low-Pass Filter filters the nose out of Stop Band, which is not the band of ultrasound signals. It also serves as an anti-aliasing filter, minimizing the aliasing phenomena that may occur with high frequency probes such as the 7.5MHz probe. Aliasing phenomena of high-frequency probes are caused by the restriction of the sampling clock in BF ASIC.

5) A/D Converter

This converts an analog signal into a digital signal to be used for Digital Beamforming.

■ Digital Beam forming

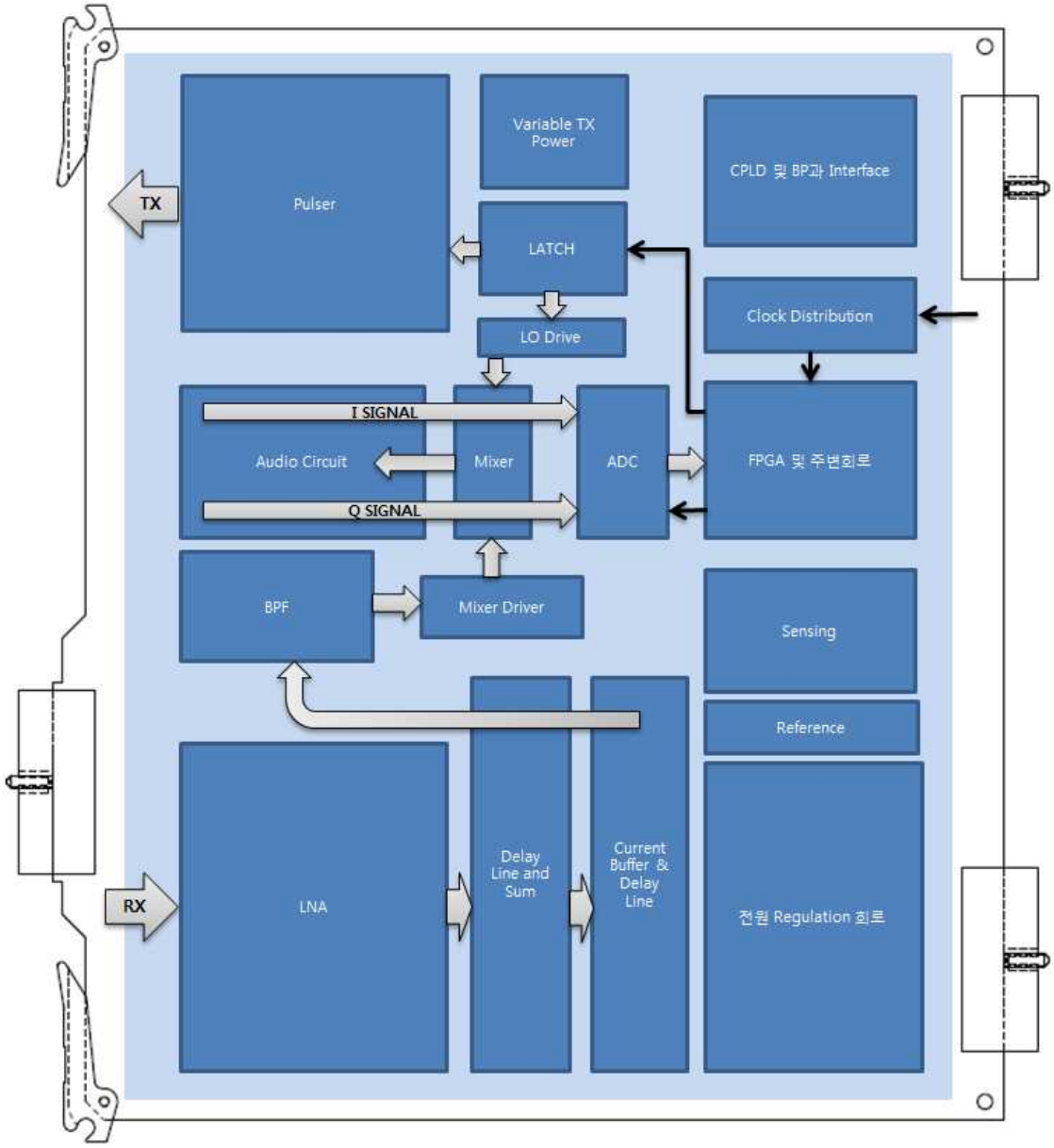
Ultrasonic waves generated by a probe use a Channel method that utilizes multiple Elements to perform TX Focusing. Ultrasonic waves generated from each channel are reflected by media and return as reflected echo signals. However, the echoes do not return to the Probe Element simultaneously; they return to each Element at different times, which necessitates a way to compensate for this time difference. It is required to perform RX Focusing; it is also very important for generating ultrasound images.

Digital Beam forming takes the echo signals entering the Probe Element and samples the data at the junction of the time axis and the curve, which is then stored in the memory. When sampling is complete, the data accumulated in the memory have been time-compensated when they were stored; time compensation is performed by the Sampling Clock itself. RX Focusing is completed by simply reading the data stored in the memory and adding them. Since this method requires different Sampling Clocks for each Element, the VSCG (Variable Sampling Clock Generator) is necessary. The VSCG (Variable Sampling Clock Generator) uses 61.6Mhz, which is same as the A/D Sampling Clock; necessary data is generated within BF ASIC (MCB124A).

CW Board

Main Functions

The CW Board provides the basic functions for system operation and Continuous Wave Doppler function.



[Figure 5.7 AC Board Layout]

- The CW Board connects to PSA Board to process CW Tx and CW Rx input/output signals and relays power for PSA Board.
- The CW Board connects to Back Plane Board to relay CW I/Q signals, Master Clock input and information from PSA.
- Pulser: It consists of 29 channels and it can run 29 element Probes.
- LNA: It amplifies the received ultrasound signal.
- ADC: It converts the amplified signal to digital data.
- FPGA and Clock Part generate system Clock 61.6Mhz used in the system.
- Sensing Part monitors the status of High Voltage and current used in the CW board.

Specification

- Input noise: 3nV/SqRtHz
- Input Signal Level: ~250mVpp
- Usable frequency: 1.5~6MHz
- Input impedance: 1Kohm
- Gain: 60dB
- PRF: ~ 43KHz
- Number of Channel: TX/RX 29 channels each
- Transmit Delay Tab: 32.5MHz
- Receive Delay Tab: Min. 30ns, Max.100ns
- Power Noise: Less than 100nV/SqRtHz

Operational Principles

■ TX Pulser

Pulse data provided by FPGA goes through latch and gets relayed to Tx Pulse (Max4811). It uses PSA (Probe Select Assembly) to send to the Probe Element, thereby generating ultrasonic waves.

■ Receive Channel

The Receive Channel serves the function of an Analog Digital Conversion, which enables Delay & Focusing by amplifying the Echo propagated through, and reflected from, the media of

human body.

1) LNA: It amplifies the received signal.
2) Delay & Focusing: It combines Rx input signals from 29 channels as a single signal.
3) Mixer: To detect Doppler signals, it mixes RF signal and signal which has the same transmission frequency.
4) I/Q Signal: To find a direction of blood flow, enter a signal which has 90 ° phase difference from the standard signal.
5) Audio Circuit: After mixing, remove the higher frequency element for the signal to get the Doppler frequency signal.
6) ADC: It converts a digital signal to an analog signal.

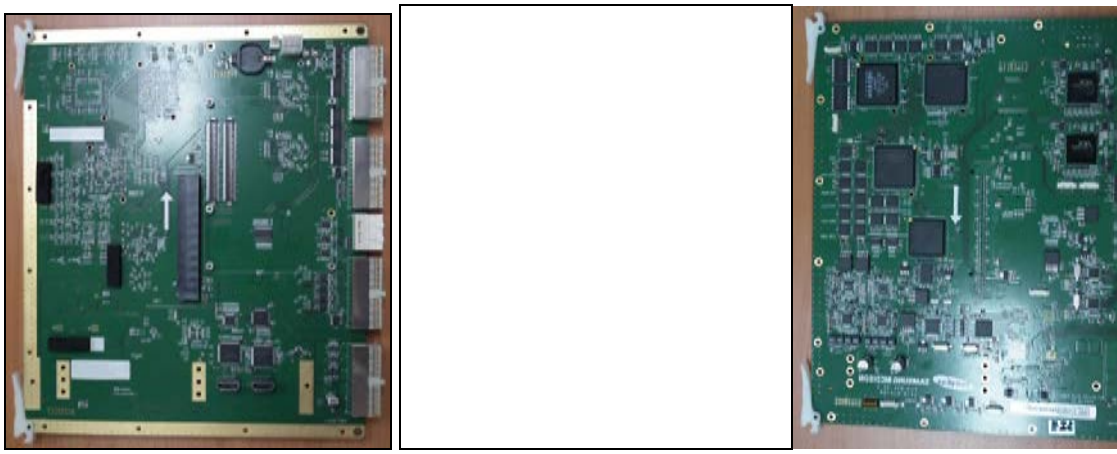
Back End Board

Main Functions

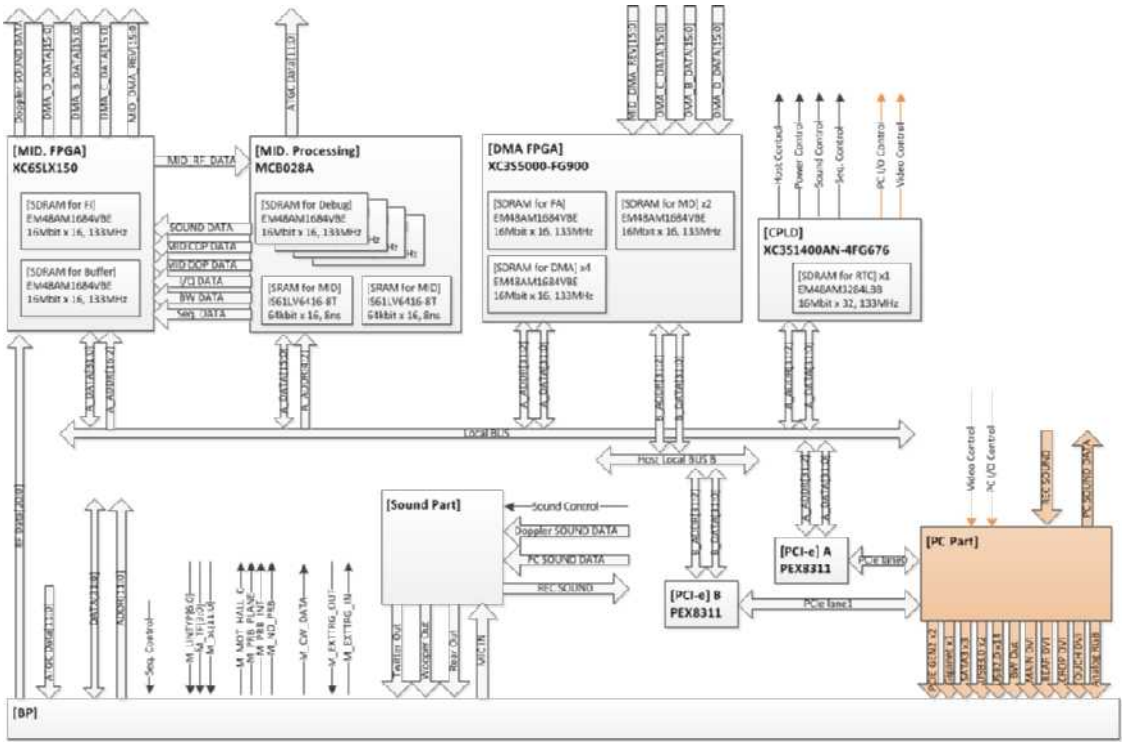
Back End Board (hereinafter BE Board) can be divided into DSP (Digital Signal Processing) Part, DMA & RTC Part, and, Analog Sound Part.

The DSP Part receives RF data and CW I/Q data from the BF Board and CW Board and processes the data into image data such as BW Image, PW Doppler, CW Doppler, Color Doppler, Power Doppler, etc. The created Image Data is processed by DMA & RTC Part of BE Board for Frame Average etc., and then sent to the PC Part through PCI BUS to be calculated by Software DSC. The Analog Sound Part receives Doppler sound data from the DSP Part, processes the data with the Digital Analog Converter, amplifies and sends them to the speaker.

BE Board consists of ASIC (MCB028A), FPGA, Analog Sound part and more.



[Figure 5.8 Back End Board]



[Figure 5.9 Back End Board Block Diagram]

Specification

- Focused RF Data Interface
- RTC(Real Time Controller)
- PCI-express Interface
- BW Data Processing
- Spectral Doppler Data Processing
- Color Doppler Data Processing
- Motion Data Processing
- Digital Signal Processing (Pre Processing, Post Processing)
- Direct Memory Access
- Sound Control(Doppler, PC Wave) - 4CH Sound System(2CH Twitter, 2CH Woofer)

Operational Principles of DSP Part

■ Image Data Processing in BW Mode and M Mode

RF Data generated by the BF Board is entered as FPGA Input.

The entered RF Data is converted into computable RF Data at FPGA Input, and then entered as the input for ASIC (MCB028A).

ASIC(MCB028A) generates BW mode Image Data (hereinafter, BW Data) and sends it to FPGA.

ASIC(MCB028A) creates BW Data and processes FSI (Full Spectrum Image), Spatial Compound Imaging (SCI), Trapezoidal imaging, Synthetic aperture, and more.

To generate BW Data, it receives RF Data input and go through the process of DTGC (Digital Time Gain Compensation), Decimation, Quadrature mixer, Envelope detection, Log compression and several filtering.

BW Data generated by ASIC (MCB028A) as described above is entered into FPGA again. It goes through FSI (Full Spectrum Image) and Lateral filter to remove Multibeam artifact and BW Data is sent to FPGA.

Note that the BW Data can be used as Motion mode Image Data.

■ Doppler Image Data Processing

RF Data generated by the BF Board is entered as FPGA Input.

The entered RF Data is converted into computable RF Data at FPGA, and then entered as the input for ASIC (MCB028A).

ASIC (MCB028A) receives RF Data input and processes through DTGC (Digital Time Gain Compensation), Decimation, Quadrature Mixer, etc. to create I/Q data (In-phase & Quadrature Data). I/Q Data is entered into FPGA again.

I/Q Data is processed at FPGA to generate Doppler Data and it is sent to DMA & RTC Part. Detailed descriptions are as follows.

FPGA which received I/Q Data filters the data and filters CW I/Q Data from CW Board in the same way to send the final Doppler Data to PC Part. PW and CW cannot be processed simultaneously, therefore all operations are controlled by the internal control process.

In addition, I/Q Data go through a Clutter Filter and are sent to a FFT (Fast Fourier Transform) circuit for generating Doppler Spectrum, which isolates the basic elements of Doppler, i.e. power, velocity, and variance, to generate Doppler Data. It is entered into DSP FPGA again and is sent to DMA & RTC Part of BE Board.

Doppler Sound Filtered I/Q Data from FPGA go through the Clutter filtering to remove the Wall Noise from Doppler DSP and is processed with Hilbert transform. The direction of sound is removed to generate Doppler Sound.

■ Color Image Data Processing

RF Data generated by the BF Board is entered as FPGA Input.

The entered RF Data is converted into computable RF Data at the ASIC (MCB028A), and then entered as the input for ASIC (MCB028A).

ASIC (MCB028A) receives RF Data input and processes through DTGC (Digital Time Gain Compensation), Decimation, Quadrature mixer, etc. to create I/Q data (In-phase & Quadrature Data). I/Q Data is entered into FPGA again.

I/Q data is processed at ASIC (MCB028A) to generate Color data and is sent to PC Part. Detailed descriptions are as follows.

FPGA that receives I/Q data will send it to ASIC (MCB028A) to detect Color elements. However, as Color elements include Wall (blood vessel wall) Noise, it is sent to FPGA again for Rejection, Smooth Filter and Post filter processing. In these processes, Color Data is completed and sent to DMA & RTC Part of the BE Board.

▌Operational Principles of Analog Sound Part

The Analog Sound Part processes Doppler Sound and sends it to the speaker.

Doppler Sound is generated in the Doppler Part, and sent to the Analog Sound Part.

Doppler Sound goes through the Audio Digital Analog Converter process, because the speaker only receives analog sound waves. Next, noise removal and Doppler Sound amplification are performed before sending to the speaker.

▌Operational principle of DMA & RTC Part (including FPGA function)

■ DMA Part

DMA (Direct Memory Access) consists of FA (Frame Average), DMA and ECG In/Out Part.

FA (Frame Average) processes BW, Doppler, and Color Data by averaging the current frame's scan line data and the previous frame's scan line data. DMA temporarily stores the BW, Doppler, and Color Data that have been Frame Averaged, to send them through PCI BUS when requested by the PC Part. It also stores ECG Data and sends it in the same manner.

Since DMA uses the PC Part and the DMA Path for processing, it plays a very important role in enhancing the performance of the product.

■ RTC Part

RTC (Real Time Controller) creates the standard signal for the entire system operations in real time to control the system operations. It generates PRF(Pulse Repeat Frequency), OF(One Frame), RP(Rate Pulse), Linotype and Scan Line, which are required for BF Board and DSP Part of the BE Board. Also, internally it controls data flow at the DMA FPGA.

PC Part

PC Module

Main Functions

It implements existing Hardware DSC Board and Video Manager Board in the PC Part. Since PC Module implements DSC Part through Software Program, the capability is very important.

COM Express Type II PC Module applies.

Specification

- PC : Com-Express Industrial PC (ADLINK PC Module)
- CPU : Skylake i5 - 6440E
- RAM : DDR4 4GB Memory
- Storage : SATA SSD 512GB
- OS : WES(Windows Embedded Standard) 7
- Graphic : Internal Intel HD 4000 chipset
- Monitor : 23" Full-HD(1924 X1080) LED Display
- DVD

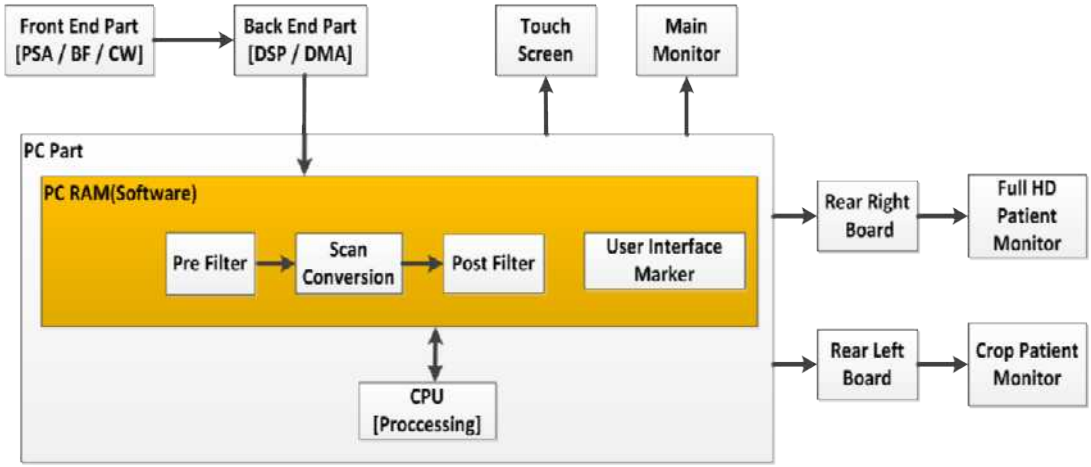
[Figure 5.10 PC Module]

Software DSC

Main Functions

It processes Hardware DSC with the Software DSC created with the Software Program.

Image signals generated by the BE Board are copied directly to PC Memory by using DMA, where they are processed by Software DSC and the programs needed for ultrasound images, to be implemented as images on the monitor through VGA card and DVI board.



[Figure 5.11 Software DSC Block Diagram]

Specification

- Cine for 5,140 frame
- Loop Review for 8,192 lines
- Zoom
- Edge Enhancement
- Multi-Slice View
- Dynamic MR (Optional)
- Quick Scan
- Real-Time Auto Calculation time Doppler Auto Trace
- Free Angle M-Mode
- Post measurement
- Post image optimizing process Arbitrary M mode

- Help function

Operational Principles

The image data generated from DMA Part of BE Board is copied directly to PC Memory by DMA method through cables connected to Mother Board and PCI Board.

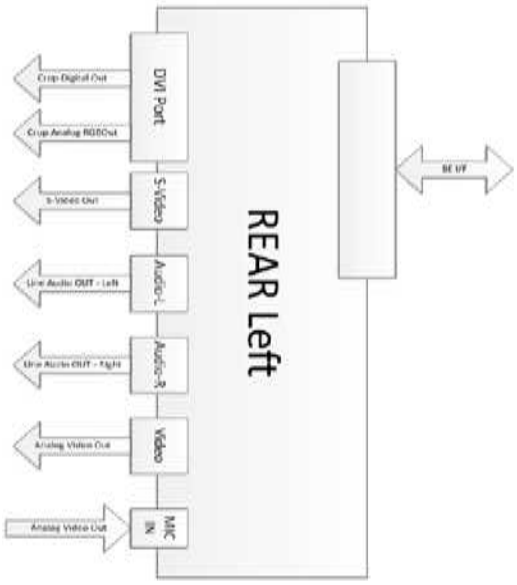
They are stored into Cine Memory through UCAgency Buffer, in which they are processed with Software DSC and Image Save.

Software DSC processes all functions that can be handled by Hardware DSC with Program; Filter and Rendering handle DSC, and sends data to VGA Card.

Rear Board

Main Functions

It serves as In/Out Interface to external device



[Figure 5.12 Rear Board Block Diagram]

Specification

- Rear Left
  - DVI Patient Monitor Port(Image Only)
  - BW Video Out
  - Audio Line Out
  - S-Video Out
  - Mic In
- Rear Right
  - DVI Patient Monitor Port(Full-HD)
  - Ext. Trigger In / Out
  - LAN Port
  - USB Port x4(A30 6Port)0

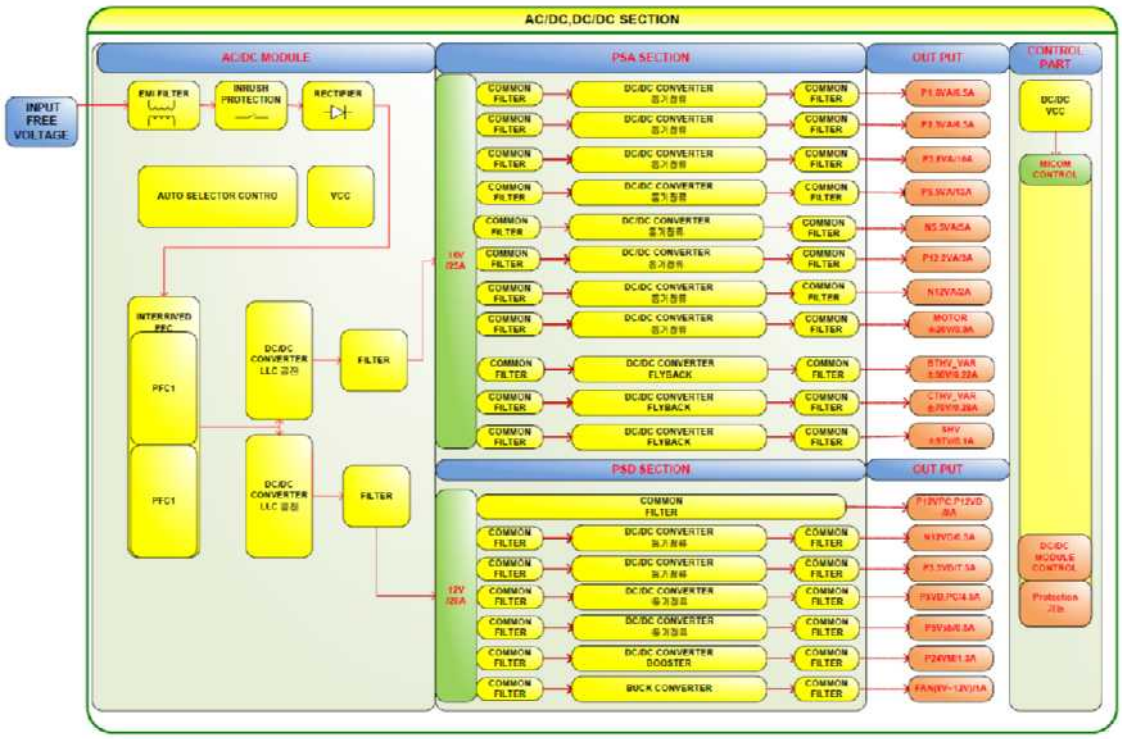
Power Supply

Main Functions

Power supply for HS70A is designed to operate in 90V ~ 264V input voltage range. It is designed to be used in any voltage and there is no need to adjust the power voltage.

INPUT Voltage Selector is used to set the voltage and power for the product and OUTPUT Voltage Selector is used to set the power directly provided for the external devices.

AC voltage and DC voltage are generated; AC voltage is for external devices and PC Power Supply, and DC voltage is to supply power for Ultrasound System Part.



[Figure 5.13 Power supply Block Diagram]

- **Analog Input Module(AIM)**

[Figure 5.14 AC-DC Power Module]

- **Digital Output Module(DOM)**

[Figure 5.15 DC-DC Power Module]

PC Power Supply

It receives AC 220V from AIM and uses it as internal power for PC Part. Also, it uses the voltage as power for LCD Monitor and DVD RW Drive through the external connector of PC Part.

Power Control

The operation flow of Power when the power is on/off is described.

When the Power On Switch in the Control Panel is on, the power for PC part is supplied and the Power On Signal from the PCI Board is relayed to trigger the Ultrasound power.

Vice versa, when the Power Off Switch in the Control Panel is pressed, the power for PC part is no longer supplied and the Power Off Signal from the PCI Board is relayed to turn off the Ultrasound power.

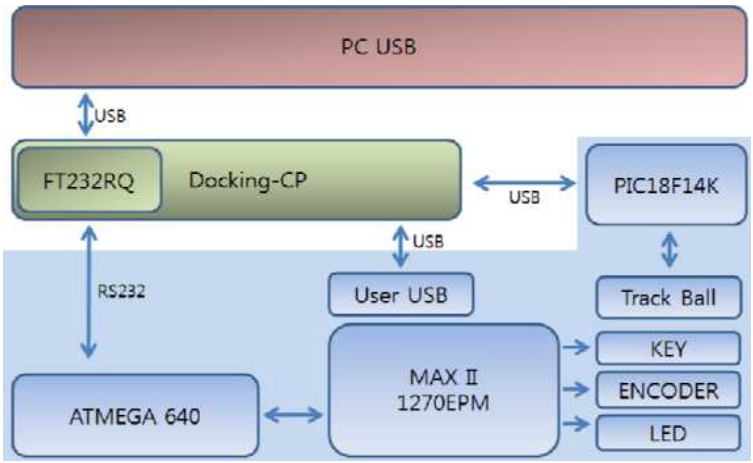
User Interface Part

Control Panel

Main Functions

The Control Panel serves as the interface between the user and the system.

Key Matrix Board, Touch Panel, Alpha-Numeric Keyboard, and Track Ball serve as User Interface.



[Figure 5.16 Control Panel Block Diagram]

Specification

- **Docking Part** - Supplies power and sends signals to CP Board (USB, reset, RS232).
- **Input part** - Consists of Switch, Encoder, and Trackball.
- **Control part**

  1). ATMEGA640(8bit Microcontroller)

  Processes input Data and relays it to Docking B/D.

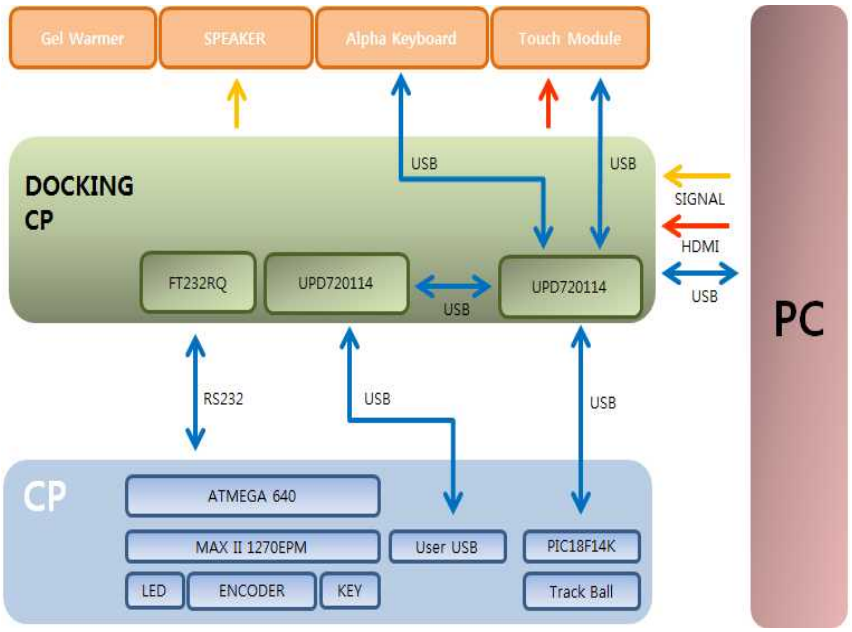
  2). MAX II EPM1270 (Altera CPLD)

  - Touch Panel Backlight on/off Control
  - LED outputs / Knob control
  - Alpha Key, Trackball power on/off control

  3). PIC18F14K50 (USB Mouse Controller)

  - Track ball interface

Docking CP Board



[Figure 5.17 Docking-CP Block Diagram]

Specification

- **UPD720114 USB HUB(2ea)** - HUB2 (port1), touch Key (port2), alpha key (port3), trackball (port4) connection
- **Power part(PVX006A)** - 12V input 5V output
- **I/O part** - Uses HDMI, Data, and USB Connector FT232 Chip to send the CP control signal to PC.
- **Hub part** - Uses UPD720114 Chip (HUB) to connect each module to PC.

Touch Panel

Main Functions

10.1 Inch Samsung panel applies.

Specification

Item	SPECIFICATION	UNIT
Display Size	10.1 Inch Samsung Display	mm
Display colors	16.2M	colors
Number of pixel	1280 x 800(16:9)	pixel
Pixel arrangements	RGB vertical stripe	
Pixel pitch	0.1695(H) x 0.1695 (V) (TYP.)	Mm
Display Mode	Normally Black	
Surface treatment	Hardness 3H	

Monitor

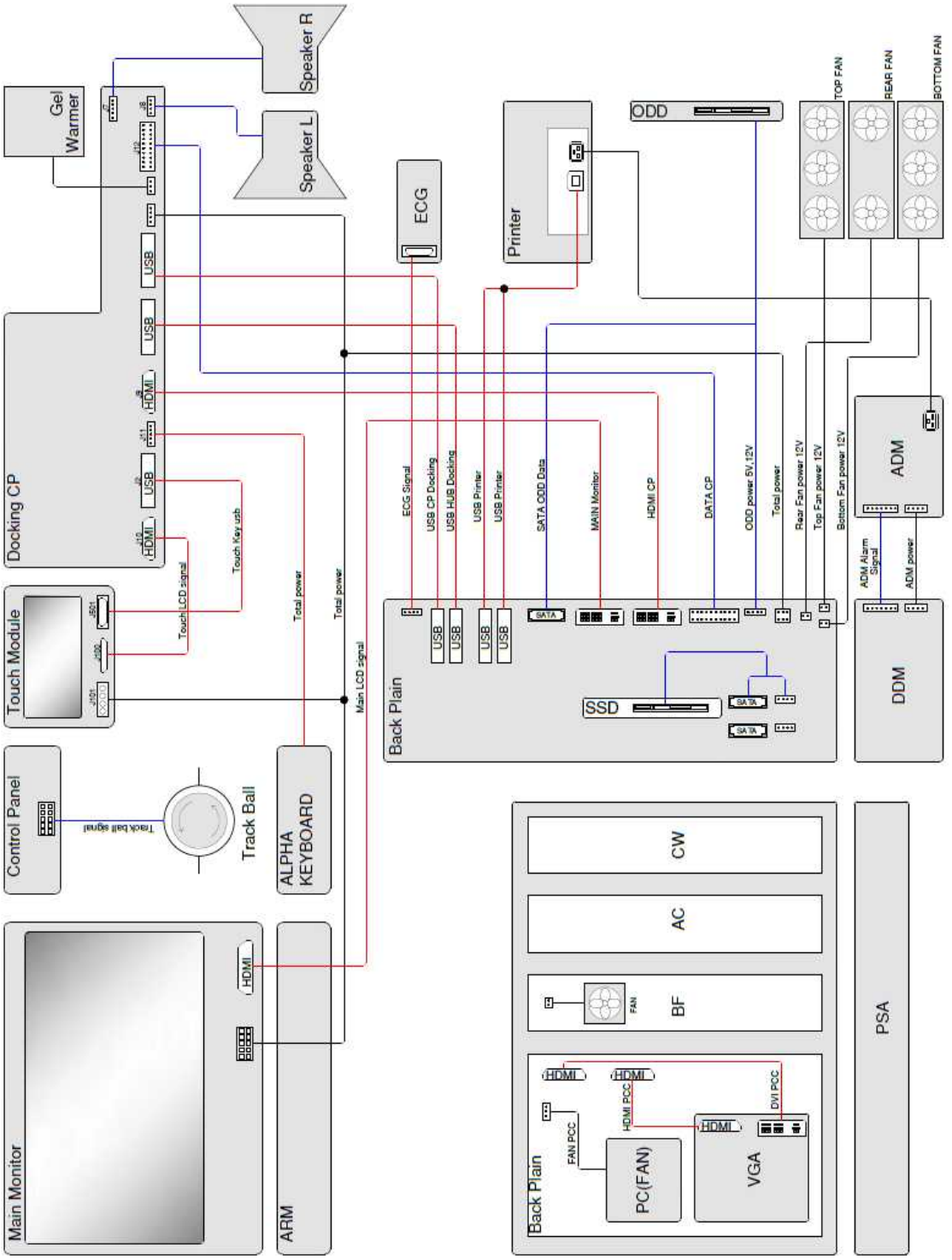
Main Functions

23 Inch Samsung Panel is applied

Specification

Item	SPECIFICATION	UNIT
Display area	23” SAMSUNG Display	Inch
Number of Pixels	1920 x 1080 RGB vertical stripe arrangement	Pixels
Pixel Pitch	0.2652 (H) × 0.2652 (W)	mm
Electrical Interface	LCD Panel Input: Display Port (LVDS 2CH) Monitor Input: HDMI	
Display colors	16,777,216 (Hi-FRC)	
Viewing angle	89°/89°/89°/89° (CR≥10)	
Display mode	Normally Black	

Interconnect Diagram



Chapter 6

Service Mode

Enter Installation Key

Register the system after installing the software.

1. Once the system reboots after installation, the *System Installation* screen will be displayed.

[Figure 6.1 System Installation Input Screen]

2. Enter the Installation Key.

- Installation Key can be acquired from Samsung Remote Service.

※ Samsung Remote Service

Samsung Remote Service is used to issue the installation keys required for product authentication. Please enter the required information, such as the product name, user, and distributor.

- URL: http://www.samsungremoteservice.com/rm/identity/anonymous/ussInstKey.html

1. Enter product name, user, and distributor information.

   - Serial No: Enter the product serial number. The serial number is located on a label on the exterior of the product.
   - Code: Enter the code shown on the *System Installation* screen.
   - Enter the name of the hospital and your vendor information in the Hospital Info and Distributor field.

2. Press **Install key Generate** to acquire your installation key.

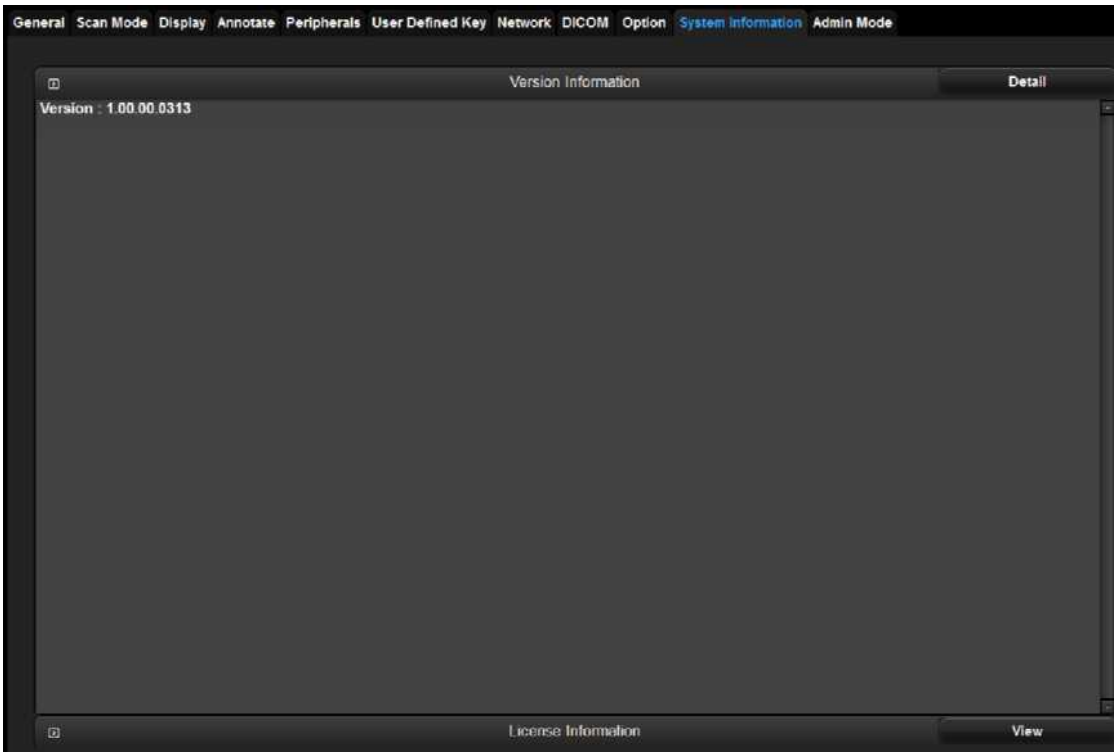
[Figure 6.2 Samsung Remote Service]

3. Press **Authentication** to complete the authentication process.

System Information

In the *Setup* screen, select the **System Information** tab. Or tap **System Information** on the touch screen. Information about the system software version will be displayed.

Click **Detail** to view more detailed information on the product version.



[Figure 6.3 Setup- System Information]

* The actual system version may differ from the software version shown in the above image.

Windows Mode

You can switch from the ultrasound system to Windows mode; you need to do so in order to upgrade the version of the software.

Accessing method

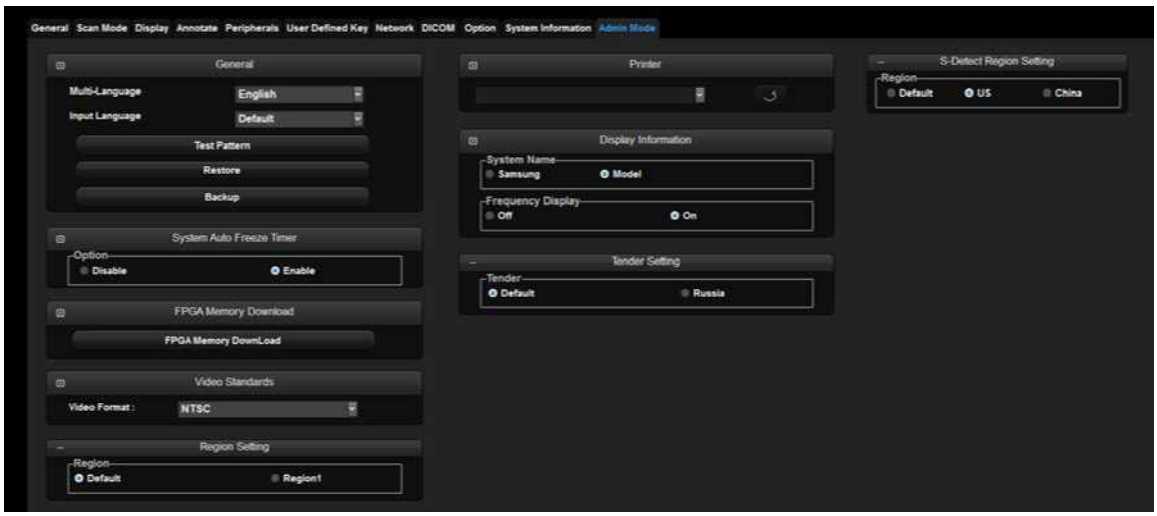
1. Enter **Shift**, **Ctrl**, and **Delete** keys together. The *Windows Password* opens.
2. Enter the password and press **Enter**.
3. When you press Shift + Ctrl + Esc, “Windows Task Manager” will be displayed.

Admin Mode

It is called Service Mode. You can specify major settings for the product by add or delete options.

Accessing method

1. Enter a password while holding down **Ctrl** key on the keyboard.
2. If the password is correct, the **Admin Mode** tap appears on the *Setup* screen.
3. Enter the **Admin Mode** tab to enter.



[Figure 6.4 Admin Mode]

Admin Mode Functions

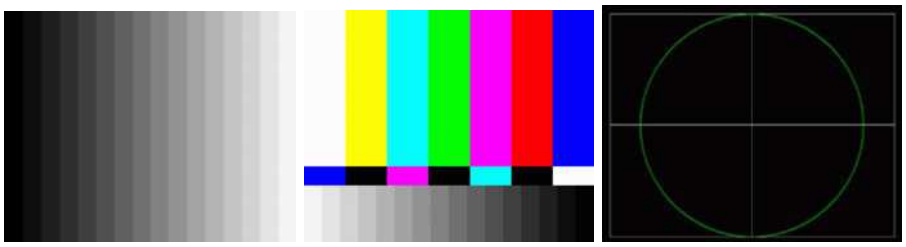
General

■ **Multi Language, Input Language**

Select the language to be used by the product. Supports English, German, French, Spanish, Italian, Russian, and Chinese.

■ **Test Pattern**

You can test the properties of the monitor. Three different types of test pattern are displayed and pattern changes every time you press the **Set** button on the control panel.

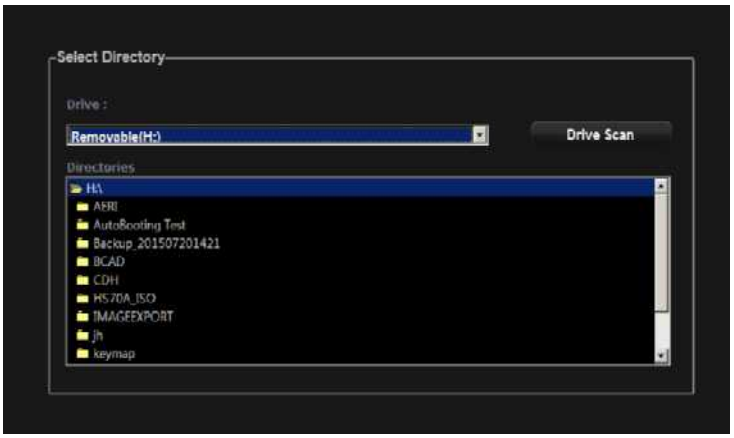


[Figure 6.5 Test Pattern]

■ **Restore**

This function restores the system with backed-up user settings.

1. Press **Restore** to exit the ultrasound system and start Restore function. Select OK when you are asked whether you want to exit the ultrasound program before starting Restore.
2. In the **Restore** screen, you can select user setting items and backup media.
3. Press **Next** to perform the Restore function.
4. The system will reboot when the restoration is complete.

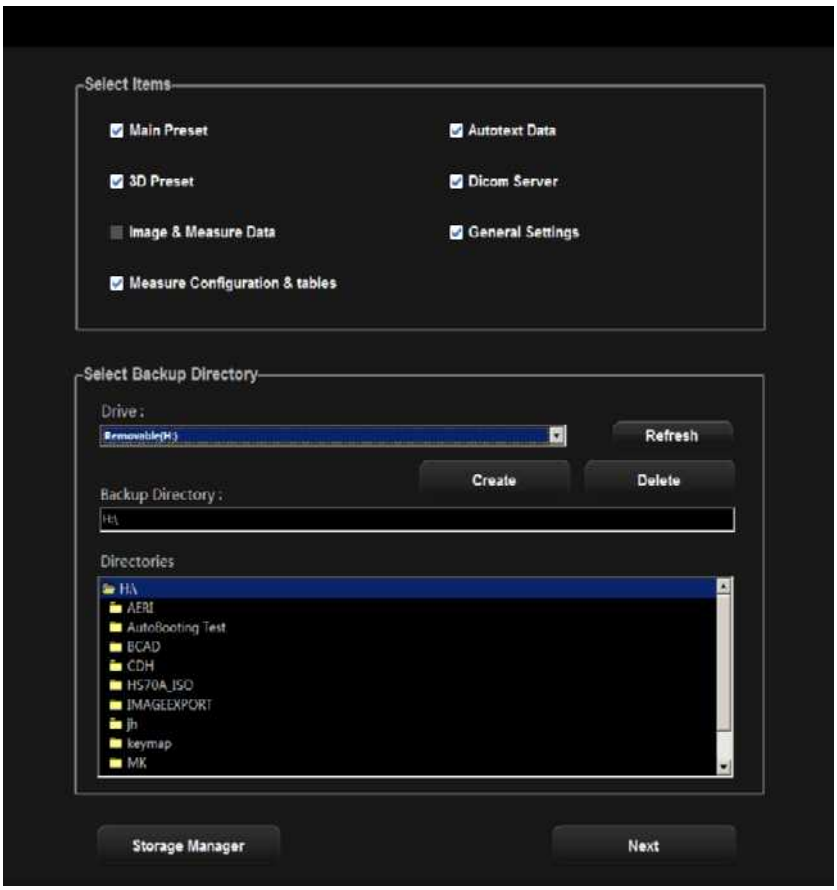


[Figure 6.6 Restore]

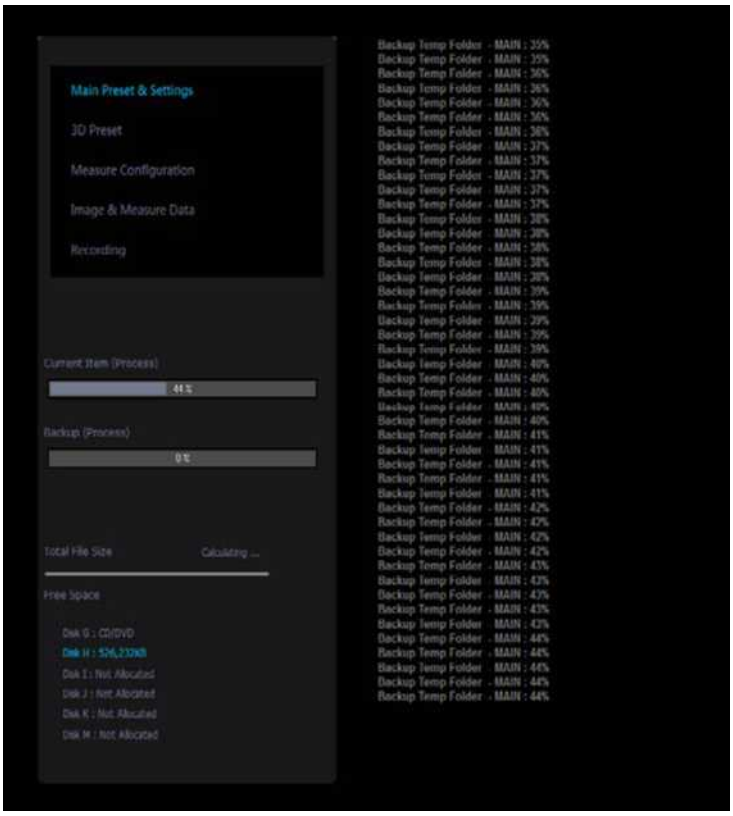
■ **Backup**

You can export and save user settings to external storage media.

1. When you press **Backup**, the ultrasound program will close, and the Backup function will be initiated. Select OK when you are asked whether you want to exit the ultrasound program before starting Backup.
2. In **Backup** screen, you can select a user settings item and backup media.
3. Press **Next** to perform the Backup function.
4. The system will reboot when the backup is complete. In case of failure, format the USB storage media in *Storage Manager* and try backing up again.



[Figure 6.7 Backup]



[Figure 6.8 Performing Backup]

System Auto Freeze Timer

Enable or Disable the Auto Freeze function in the options. If set to 'Enable', Scan mode will be frozen automatically when the product is not used for 1 hour.

FPGA Memory Download

Supports FPGA Memory Download function. Select the a desired board from BF, AC, MID or DMA, and press the FPGA Memory Download button. Once the download is complete and a reboot message is displayed, reboot the system.

Video Standards

Select the resolution and the screen output format for the monitor connected to the product. Select a resolution if you are connecting the monitor to the RGB port. Select 1280x1024, 1280x768, 800x600, or 640x480. Select the screen output format if you are connecting the monitor to the S-VHS or VHS port. Select NTSC or PAL.

Region Preset

Select a preset for your region. Select either Global or Region 1, and reboot.

Printer

You can configure the Printing Preferences for the printer. After connecting the Samsung CLP-615NDK printer, and when the name of the printer is changed to Samsung CLP-615NDK Copy 1, you can use Printing Preferences settings to change the Paper settings for 615NDK from Letter to A4.

Display Information

- **System Name**

  Select the System Name displayed in the title area of the screen between the Samsung logo and the model name.

- **Frequency Display**

  Turn on/off the probe frequency displayed in the title area of the screen.

Tender Setting

Select a preset for your region. For Tender, select either Default or Russia and reboot the system.

S-Detect Region Setting

Select a S-Detect for your region. ‘Default’ is selected by default.

Adding and Deleting Options

Options are added and deleted by using the Unlock/Lock method; Unlock means that an option can be used, while Lock means that the option cannot be used.

Options

This shows the types of optional software that can be installed on the product. Optional software for HS70A includes the following:

SMART4D	Realistic Vue
CW Function	AutoIMT+
Cardiac Measurement	E-Breast
DICOM	2D NT
XI STIC	Mobile Export
Elastoscan	5D Follicle
Panoramic	Arterial Analysis
Stressecho	DICOM Q/R
Strain+	CEUS+
ADVR	S-Detect
E-Thyroid	

Status

Status: Shows the current status of optional software.

Lock_Not Installed: Hardware is not connected.

Lock_Unregistered: The software license has not been registered yet.

Lock_Installed: Hardware is installed but cannot be used yet.

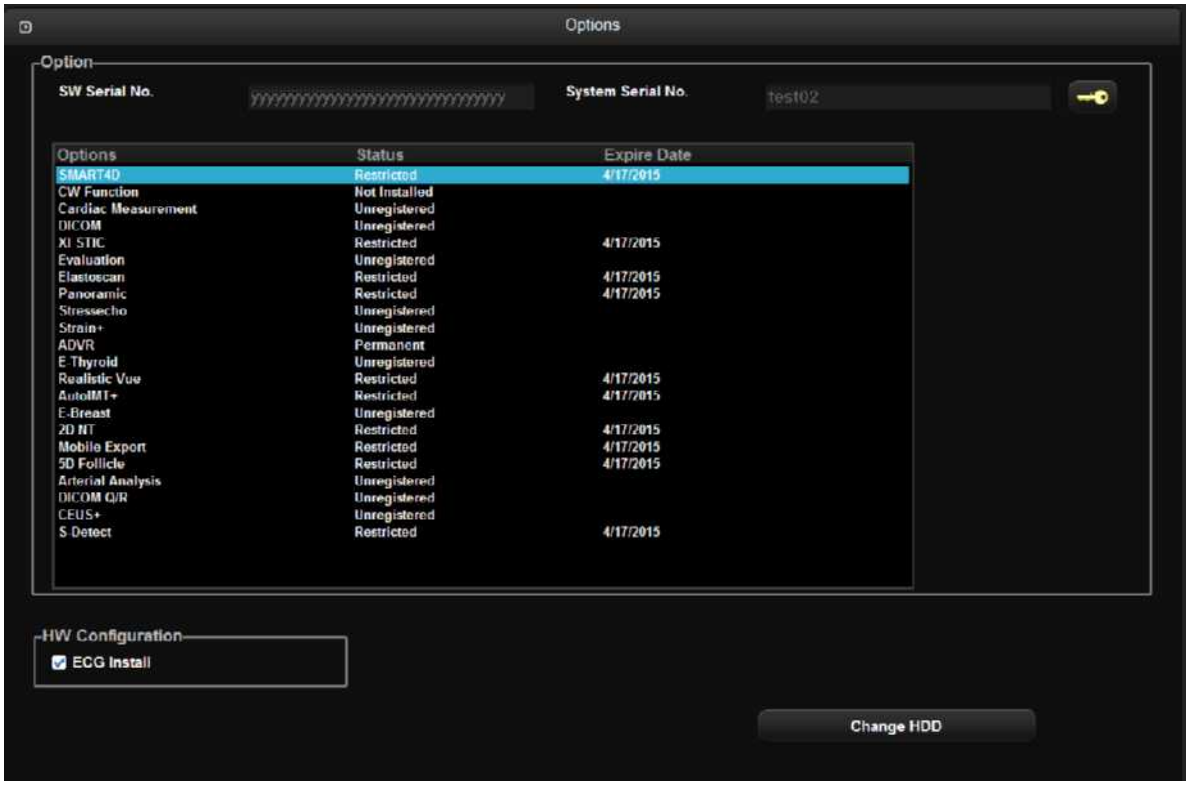
Unlock_Permanent: The hardware or software can be used for an unlimited period.

UnlLock_Restricted: The hardware or software can be used only for a certain period of time.

Adding an Option

Entering Option Password

1. Switch to Admin mode. Please refer to ‘Entering Admin Mode’. .
2. A key-shaped button will be enabled at the upper right corner of the Option tab. You can only enter the option password if this button is enabled.
3. Select the option that you want to add, and press the key-shaped button to enter the password.
4. If the password is correct, press OK button and reboot the system.



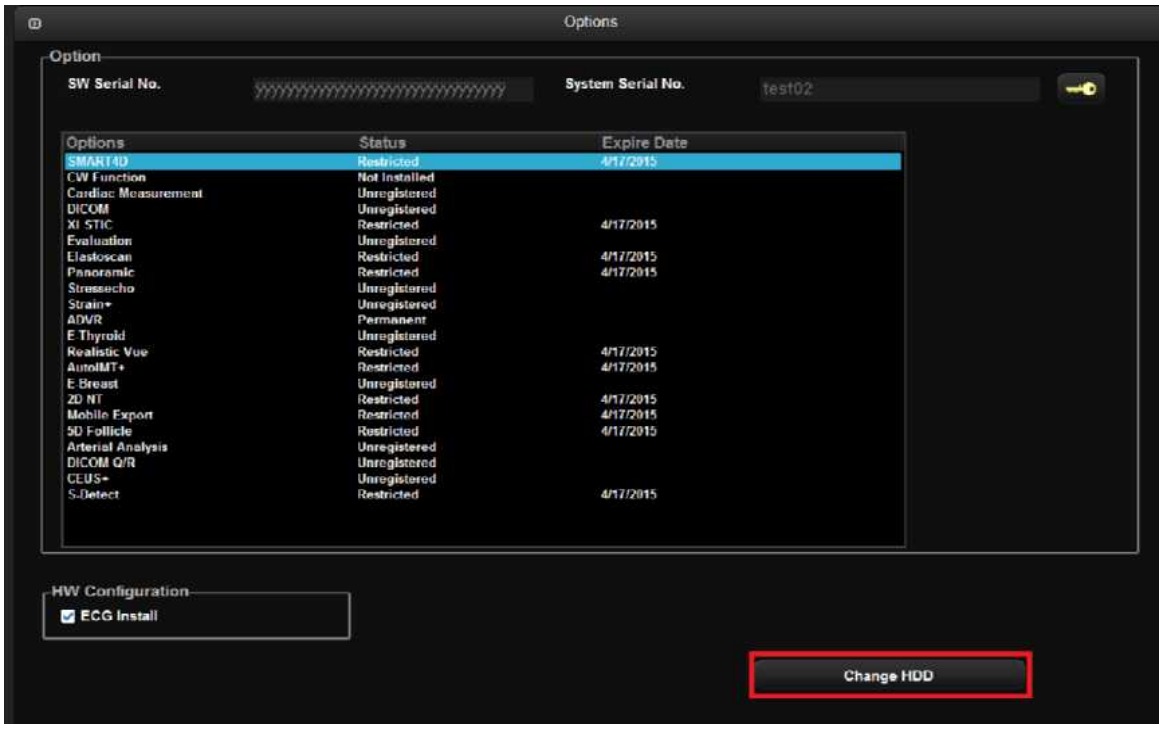
[Figure 6.9 Options]

Adding Option Password after Replacing HDD

HS70A is designed to preserve the option password even if the HDD fails and is replaced.

The method of entering the option password (Unlocking) after replacing the HDD is described.

1. Switch to Admin mode. Please refer to ‘Entering Admin Mode’.
2. A Change HDD button will be created in the middle of the Option tab.
3. When you press the **Change HDD** button, the option password for the product will be entered (Unlocked).
4. Check if the option is unlocked and reboot the system.
5. Select the option that you want to add, and press the key-shaped button to enter the password.
6. If the password is correct, press OK button and reboot the system.



[Figure 6.10 Change HDD]

Chapter 7

Troubleshooting

Power Issues

Power Does Not Turn On

The power cord may be unplugged or power supply may be broken.

1. Make sure the power cord is properly plugged and power switch is on.
2. Connect a different appliance to the power outlet to see whether it works.
   - If the appliance works, the power supply has failed.
   - If the appliance doesn't work, the power outlet has failed.
3. Check whether the system's fan works.
   - If the fan works, the problem is likely to be caused by some reason other than the Power Supply.
   - If the fan does not work, it is likely that the PC Power has failed.
4. Check the output voltage of ADM.
5. Check the PC Power and DDM.

Power Does Not Turn Off

A software error may have occurred, or the PC Motherboard and/or Main Board may have failed.

1. Press and hold the Power Switch for at least 3 seconds, and the power will turn off automatically.

   However, the power will not turn off if hardware such as the printer hasn't stopped working yet, or if an OS error has occurred.
2. If the method in "1" fails to turn off the power, it is likely that the PC board and/or BE board have failed.

Power Turns Off by Itself

The power cord, PC Motherboard, and/or Main Board may have failed.

1. Make sure the power cord is properly plugged and power switch is on.
2. Connect a different appliance to the power outlet to see whether it works.
   - If the appliance works, the power supply has failed.
   - If the appliance doesn't work, the power outlet has failed.
3. If the problem is not solved by the methods in '1' and '2', it is likely that the PC Motherboard, PCI Board, DVI Board, and/or LCD IF Board have failed.

Monitor

Nothing Is Displayed on the Screen

The DVI Cable, VGA Cable, the monitor, or the PC part may have failed.

1. Check the status of the product with the printer output.
2. Check the status of the monitor connection cable.
3. Check the status of Bios setup in PC.
4. If the method in '1' and '2' fails to solve the problem, it is likely that the monitor and/or PC part have failed.

   Check the PC Module and VGA card of the computer.

Screen is Discolored

The DVI Cable, the monitor, or the PC Part may have failed.

1. Check the status of the monitor connection cable.
2. If the method in '1' fails to solve the problem, it is likely that the monitor and/or PC part have failed.

   Check the PC Module and VGA card of the computer.

Error Messages

Error Occurs during Booting

A temporary error in the software or a temporary failure of the product may have occurred.

1. Force the power to turn off, and turn the power back on 1 to 2 minutes after.
2. If the method in “1” does not solve the problem, identify when the error message is shown.
   If the error occurs while WINDOWS is initiating, it is likely that the OS and/or PC part have failed.
   If the error occurs after the logo is displayed, it is likely that the System Software or Ultrasound System part has failed.

Image

2D Mode: There is No IMAGE ECHO or IMAGE FORMAT

Contact between the probe and the product may be poor, or the Main Board or DDM may have failed.

1. Check whether the contact between the probe and the system is poor.
2. Check the probe for vibrating sound. If you can hear the sound, it is likely that the DDM has failed.
3. If the methods in "1" and "2" fail to solve the problem, it is likely that the Main Board has failed.

Lines (Noise) Appear in 2D Mode Image

Power noise and/or Main Board failure may have occurred.

1. Check whether the product is sharing its power outlet with another appliance.

   Sharing a power outlet with a motor or other appliance that consumes large amount of power may cause noise.
2. Check whether the symptom persists when you plug the system into an outlet in a different room.

   If the noise occurs, it is caused by power noise.
3. If the methods in "1" and "2" fail to solve the problem, it is likely that the Main Board has failed.

M, C, PW, CW Mode Trouble

It is likely that Main Board has failed.

Error Code

Error code	Location of failure	Estimated failure
0	FILE and OTHERS	FILE_NOT_FOUND
1	FILE and OTHERS	DEMO_PERIOD_EXPIRED_ERROR
2	FILE and OTHERS	CRC32DLL_LOAD_FAIL
10	PC Module, MAIN Board	C_INTERFACE_OPENDMA_FAIL_IN_HWINIT
15	MAIN Board(BE & OS)	PC_INTERFACE_INIT_INTERRUPT_FAIL
21	MAIN Board(AC part)	NO_MOTOR_CONTROL_FOUND
22	MAIN Board(AC part)	MOTOR_NULL_POSITION_LOST
23	MAIN Board(AC part)	MOTOR_CONTROL_SEQUENCE_BROKEN
24	MAIN Board(AC part)	GAIAMOT_DLL_LOAD_ERROR
25	MAIN Board(AC part)	GAIAMOT_DLL_OLD_LOAD_ERROR
40	BF Board	FPGA_DOWNLOAD_ERROR_BF
163	MAIN Board(AC part)	BF_DMA_WRITE_CHECKSUM_ERROR
100	MAIN Board(BE part)	FPGA_DOWNLOAD_ERROR_BE
101	MAIN Board(CW part)	FPGA_DOWNLOAD_ERROR_DMA
102	MAIN Board(BE part)	FPGA_DOWNLOAD_ERROR_DMA
114	MAIN Board(BE part)	RTC_STOP_ERROR
162	DDM, BF Board	HV_HIGH

[Table 7.1] Error Code Table

Chapter 8

Disassembly and Assembly

Caution

This chapter describes the procedure for disassembling and assembling HS70A. Refer to this chapter when you are upgrading or servicing the system's hardware.

WARNING	■ Samsung Medison customer service department or its authorized engineers are allowed to repair or replace the parts of the products. ■ Hazardously high voltage flows through the product. Do not disassemble the product. There is a risk of electrocution. ■ Do not wear an antistatic wrist strap while you are working with the product powered on. You may sustain an electrical injury.

Preparation

You will need the following items: A Phillips (+) screwdriver, antistatic gloves, and an antistatic wrist strap.

Turn off the power of the product and detach the battery.

NOTE	Wear antistatic gloves and wrist strap when you are disassembling or reassembling the product. They help to prevent accidents to the engineer and product failure caused by static electricity.

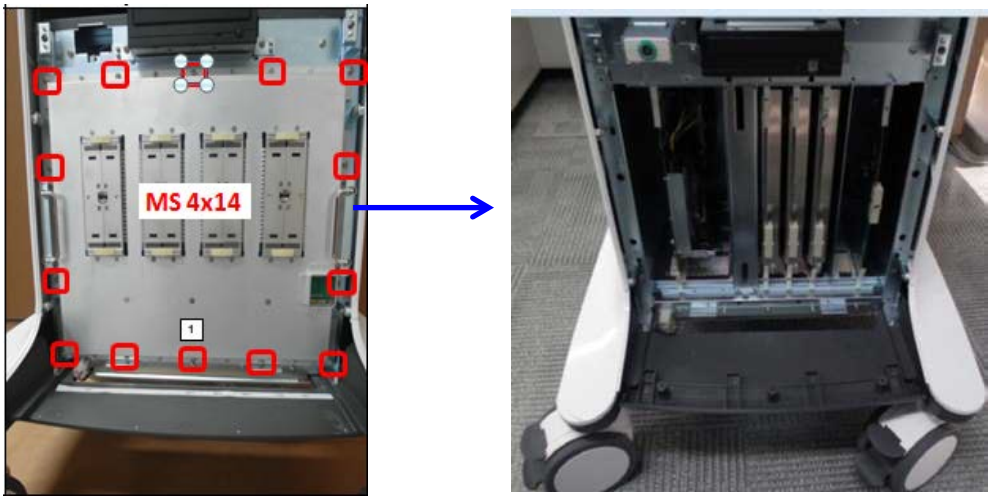
[Figure 8.1] Antistatic Gloves and Wrist Strap

Disassembling the Product

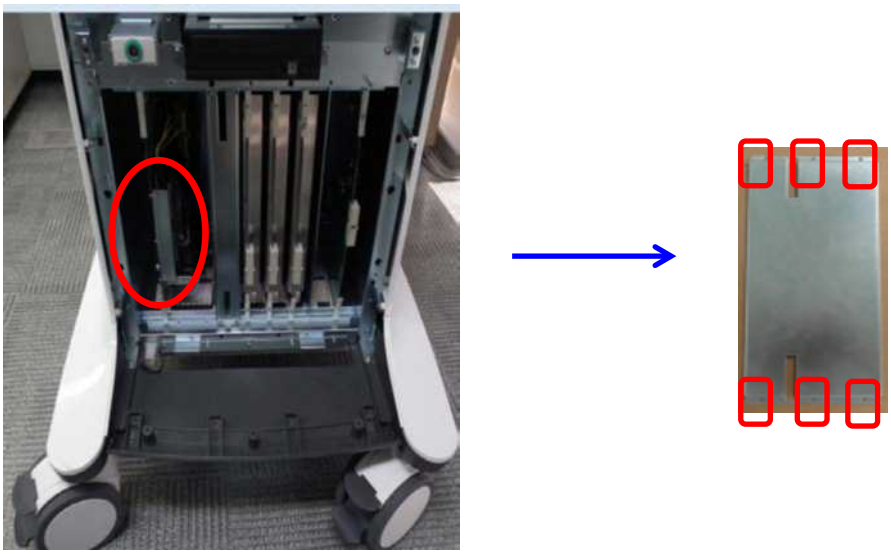
Front cover disassembly

1. Remove 3 screws and pull the front cover to the front to detach.

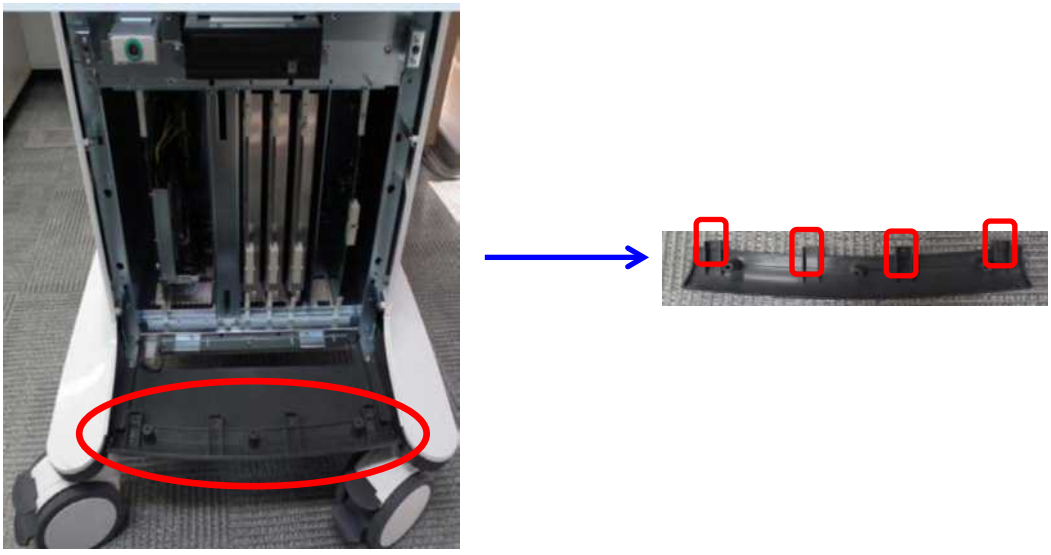
2. Remove 14 screws and detach PSA.



3. Remove 6 screws and detach the cover.



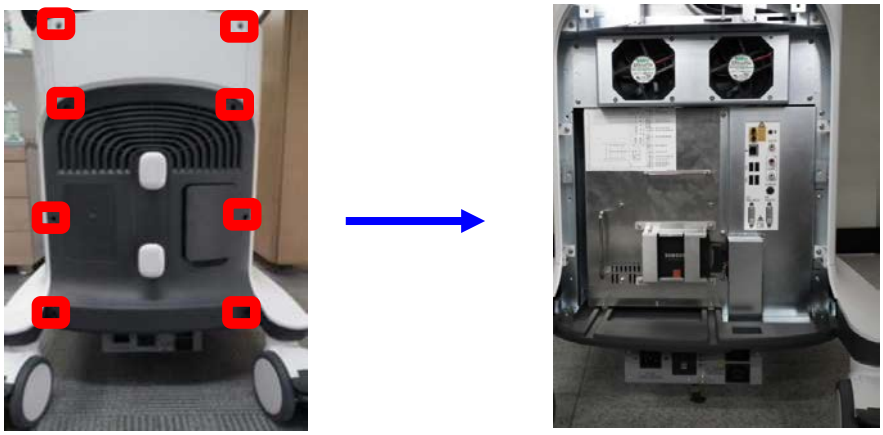
4. Remove 4 screws and detach the cover.



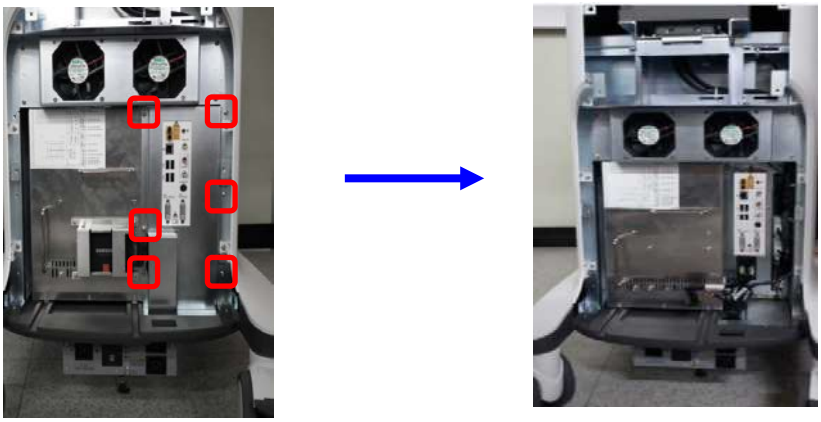
5. Remove 5 screws and 1 connector and detach the fan.

Rear Cover Disassembly

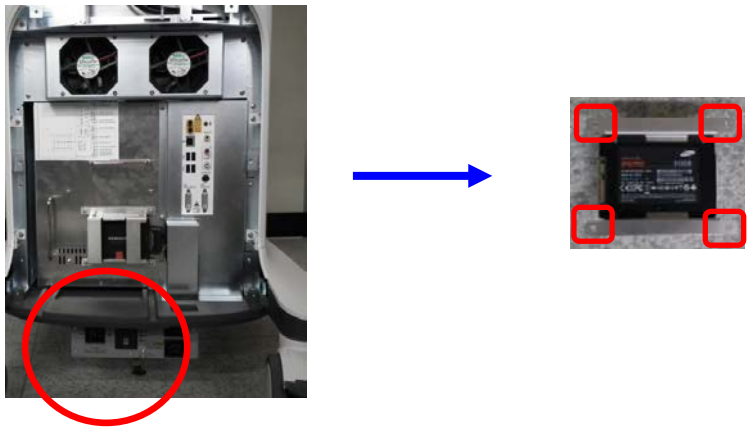
1. Remove 8 screws and detach the rear cover.



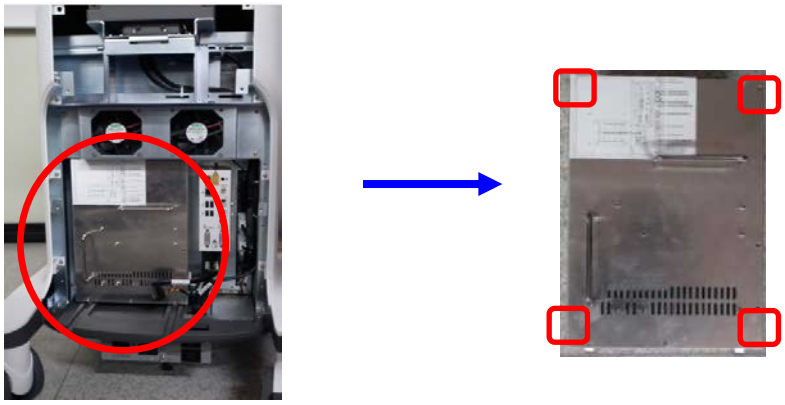
2. Remove 6 screws and detach the shield cover.



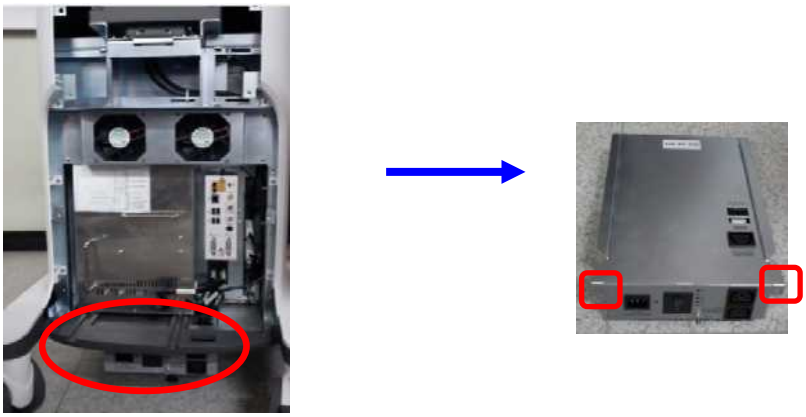
3. Remove 4 screws and detach SSD.



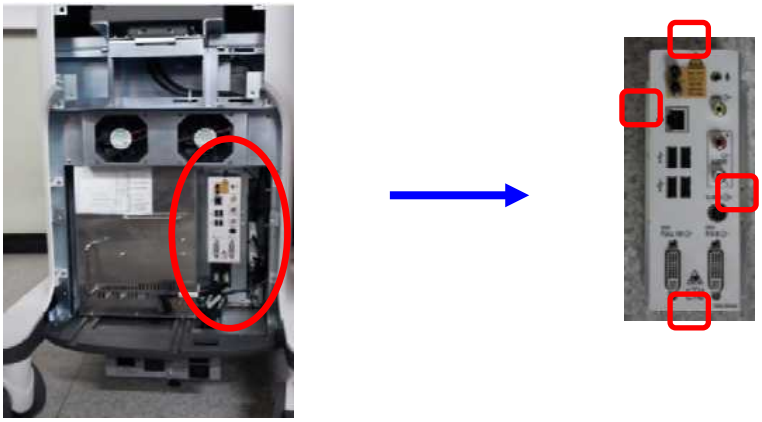
4. Remove 4 screws and detach DDM.



5. Remove 4 screws and detach ADM.

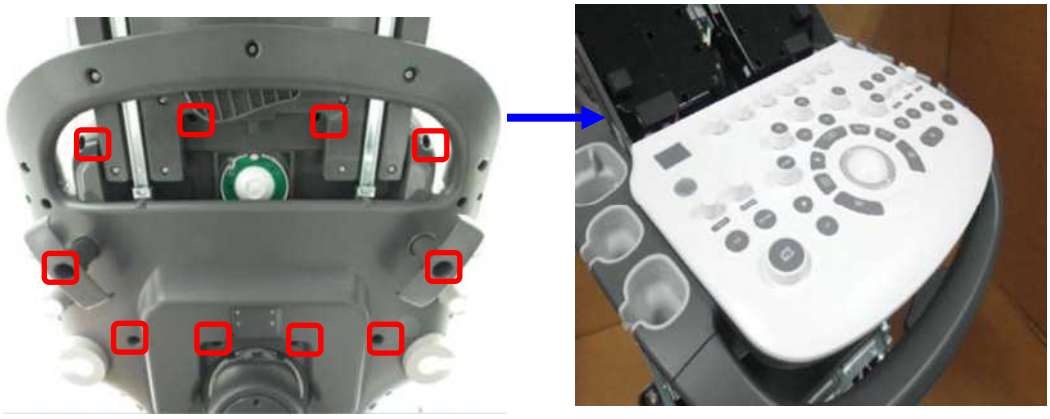


6. Remove 4 screws and detach the rear.

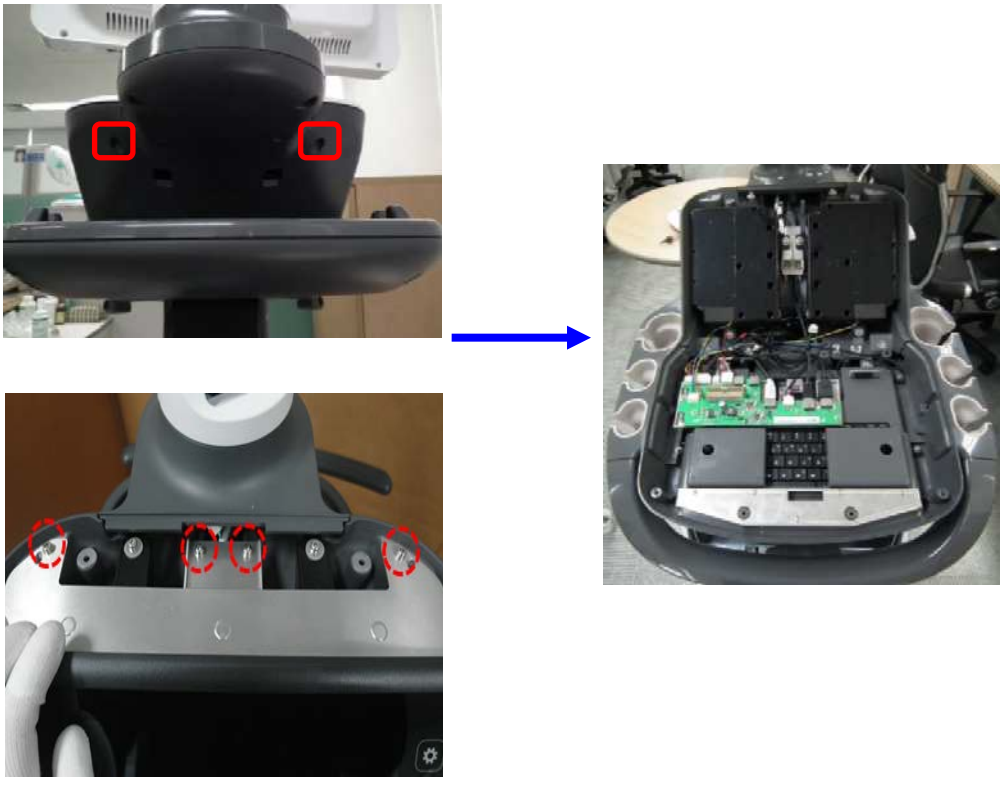


Control Panel Disassembly

1. Remove 10 screws on the floor of the control panel and lift the CP module to detach.



2. Remove 6 screws and detach the touch panel.



Monitor Disassembly

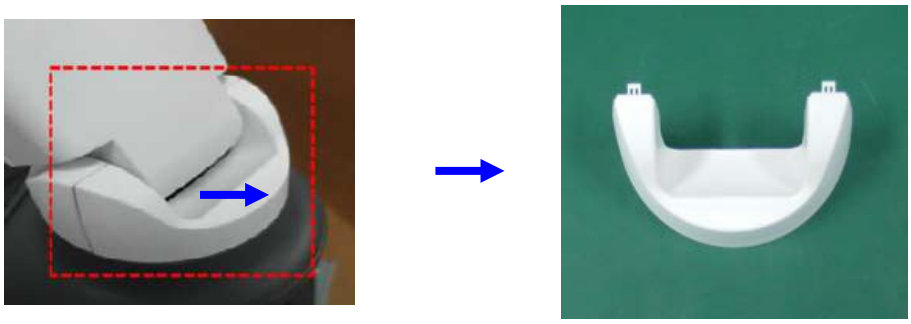
1. Remove 2 screws and detach the cover.

2. Remove 2 screws and detach the HDMI Bracket.

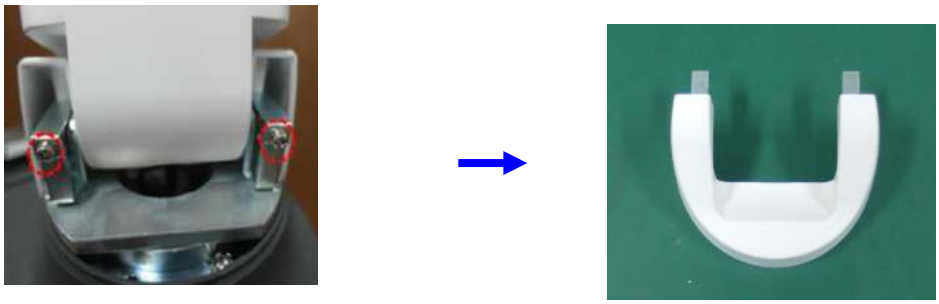
3. Remove 4 screws and detach the monitor module.

Monitor Arm Disassembly

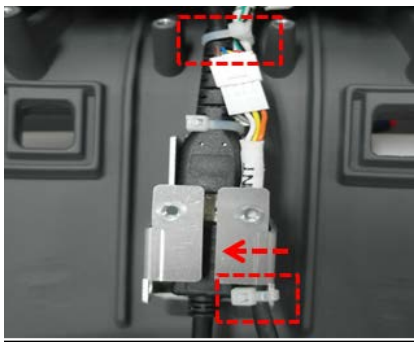
1. Push the edge of the Coverdml and pull in the arrow direction to detach (not screw).



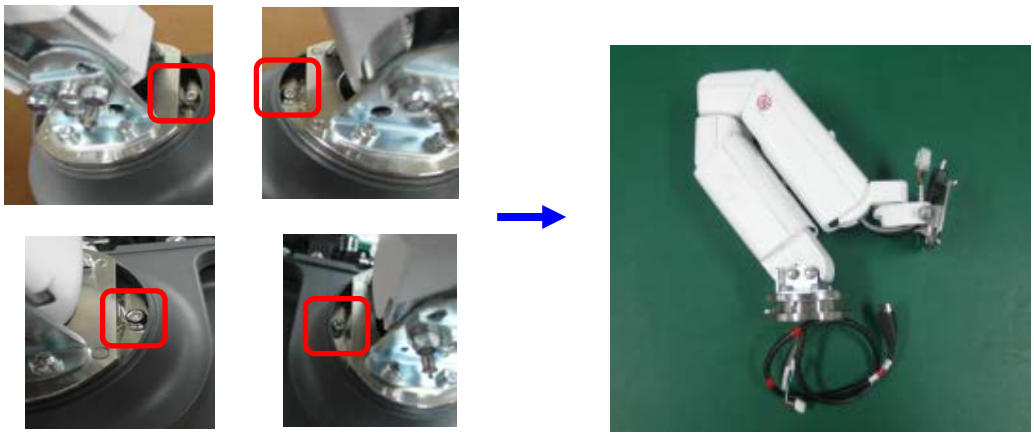
2. Remove 2 screws and detach the left cap.



3. Cut the cable ties and detach 2 connectors.



4. Remove 4 screws which fix the arm and detach the arm.



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Assembling the Product

To assemble the product, follow the disassembly procedure described in this chapter in reverse order.

Chapter 9

Probes

Probes

The probe is a device that sends and receives ultrasound for acquiring image data. It is also called a Transducer or Scanhead.

The system limits patient contact temperature to 43°C, and acoustic output values to their respective U.S. FDA limits. A power protection fuse circuit protects against overcurrent conditions. If the power monitor protection circuit senses an overcurrent condition, then the drive current to the probe is shut off immediately, preventing overheating of the probe surfaces and limiting acoustic output.

Probe List

The ultrasound image scanner uses probes to obtain graphic data of the human body and then displays it on the screen. Always use application-specific probes in order to obtain the best quality images. It is also important to use a preset that is best suited to the particular organ being scanned.

■ Probe Application and Presets

The types of probes, applications, and presets available with this product are as follows:

Probe	Application	Preset
L3-12A	Small Parts	Bowel, Breast, Breast1, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist, Penetration, Pediatric Hip
	OB	1st Trimester
	Abdomen	General, Superficial, Pediatric ABD
LA3-16A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist, Penetration
LA3-16AI	MSK	General, Superficial
	Intraoperative	General
LA2-9A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	Abdomen	General
	MSK	General
LA4-18B	Small Parts	Breast, Testicle, Thyroid
	Vascular	Carotid, Superficial
	MSK	General, Superficial
CA1-7A	Abdomen	Aorta, General, General1, Pediatric ABD, Penetration, Renal, Urology
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Heart, NT

Probe	Application	Preset
	Gynecology	General, Adnexa
	MSK	General, Spine
CA2-8A	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Heart, NT
	Gynecology	General, Adnexa
CA2-9A	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 2nd Trimester 1,3rd Trimester, Fetal Heart, NT
	Gynecology	General, Adnexa
CA3-10A	Abdomen	Bowel, General, Renal
	OB	1st Trimester, 2nd Trimester, Fetal Heart, NT
	Gynecology	Uterus, Adnexa
	Pediatric	Pediatric ABD, Pediatric Hip
CF4-9	Pediatric	Abdomen, Neohead
	Vascular	Arterial, Carotid, Venous
E3-12A	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
EA2-11B	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
VR5-9	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
PA3-8B	Abdomen	Aorta, General, Renal
	Cardiac	Aortic Arch, Adult Echo, Ped Echo
	Pediatric	Abdomen, NeoHead
PA1-5A	Abdomen	Aorta, General, Renal
	Cardiac	Aortic Arch, Adult Echo, Ped Echo
	TCD	General
PA4-12B	Cardiac	Aortic Arch, Ped Echo
	Pediatric	Abdomen, NeoHead
PE2-4	Abdomen	Aorta, General, Renal
	Cardiac	Aortic Arch, Adult Echo, Adult Echo1, Adult Echo2, Ped Echo
	TCD	General

Probe	Application	Preset
CV1-8A	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Heart, Fetal Heart-Pen, NT
	Gynecology	General, Adnexa
LV3-14A	Small Parts	Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
V5-9	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
CW4.0	Cardiac	Adult Echo, Ped Echo
CW6.0	Cardiac	Ped Echo
	Vascular	Arterial, Venous
DP2B	Cardiac	Adult Echo
DP8B	Cardiac	Ped Echo
	Vascular	Arterial, Venous
MMPT3-7	Cardiac	Adult Echo

NOTE

- In addition to the system-optimized presets, users can configure the user presets to meet their needs.
- For information on the selection and settings of probes, refer to ‘Chapter 6. Starting Diagnosis’.

■ Function list

The probe- and application-specific functions of this product are as follows:

Probe	Application	Har	S-Har	Multi Vision	Clear Vision	Q Scan	ECG	Elasto Scan	Biopsy
L3-12A	Small Parts	O	O	O	O	O	O	O (Only Breast, Thyroid)	O
	Vascular	O	O	O	O	O	O	X	O
	MSK	O	X	O	O	O	O	X	O
	OB	O	X	O	O	O	X	X	O
	Abdomen	O	O	O	O	O	O	X	O
LA3-16A	Small Parts	O	X	O	O	O	O	O (Only Breast, Thyroid)	O
	Vascular	O	X	O	O	O	O	X	O
	MSK	O	X	O	O	O	O	X	O
LA3-16AI	MSK	O	X	O	O	O	O	X	X
	Intraoperative	O	X	O	O	O	O	X	X
LA2-9A	Small Parts	O	O	O	O	O	O	X	O
	Vascular	O	O	O	O	O	O	X	O
	Abdomen	O	O	O	O	O	O	X	O
	MSK	O	O	O	O	O	O	X	O
LA4-18B	Small Parts	O	O	O	O	O	O	O (Only Breast, Thyroid)	O
	Vascular	O	O	O	O	O	O	X	O
	MSK	O	O	O	O	O	O	X	O
CA1-7A	Abdomen	O	O	O	O	O	X	X	X
	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O (Except Adnexa)	O	O	X	X	O
	MSK	O	O	O	O	O	X	X	O
CA2-8A	Abdomen	O	O	O (Only General)	O	O	X	X	O
	OB	O	O	O	O	O	X	X	O
	Gynecology	O	O	X	O	O	X	X	O

Probe	Application	Har	S-Har	Multi Vision	Clear Vision	Q Scan	ECG	Elasto Scan	Biopsy
CA2-9A	Abdomen	O	O	O	O	O	X	X	O
	OB	O	O	O	O	O	X	X	O
	Gynecology	O	O	O	O	O	X	X	O
CA3-10A	Abdomen	O	O	O	O	O	X	X	O
	OB	O	O	O	O	O	X	X	O
	Gynecology	O	O	O	O	O	X	X	O
	Pediatric	O	O	O	O	O	X	X	O
PA4-12B	Cardiac	O	O	X	O	O	O	X	X
	Pediatric	O	O	X	O	O	X	X	X
CF4-9	Pediatric	X	X	O	O	O	X	X	X
	Vascular	X	X	O	O	O	X	X	X
E3-12A	OB	O	X	O	O	O	X	X	X
	Gynecology	O	X	O	O	O	X	O	X
	Urology	O	X	O	O	O	X	O	X
EA2-11B	OB	O	X	O	O	O	X	X	O
	Gynecology	O	X	O	O	O	X	O	O
	Urology	O	X	O	O	O	X	O	O
VR5-9	OB	O	X	O	O	O	X	X	O
	Gynecology	O	X	O	O	O	X	O	O
	Urology	O	X	O	O	O	X	O	O
PA3-8B	Abdomen	O	O	X	O	O	X	X	X
	Pediatric	O	O	X	O	O	X	X	X
	Cardiac	O	O	X	O	O	O	X	X
PA1-5A	Abdomen	O	O	X	O	O	X	X	X
	Cardiac	O	O	X	O	O	O	X	X
	TCD	O	O	X	O	O	X	X	X
PE2-4	Abdomen	O	O	X	O	O	X	X	X
	Cardiac	O	O	X	O	O	O	X	X
	TCD	O	O	X	O	O	X	X	X
CV1-8A	Abdomen	O	O	X	O	O	X	X	O
	OB	O	O	O	O	O	X	X	O
	Gynecology	O	O	X	O	O	X	X	O
LV3-14A	Small Parts	O	X	O	O	O	X	X	O
	Vascular	O	X	O	O	O	X	X	O

Probe	Application	Har	S-Har	Multi Vision	Clear Vision	Q Scan	ECG	Elasto Scan	Biopsy
	MSK	O	X	O	O	O	X	X	O
V5-9	OB	O	X	O	O	O	X	X	O
	Gynecology	O	X	O	O	O	X	X	O
	Urology	O	X	O	O	O	X	X	O
CW4.0	Cardiac	X	X	X	X	O	O	X	X
CW6.0	Cardiac	X	X	X	X	O	O	X	X
	Vascular	X	X	X	X	O	O	X	X
DP2B	Cardiac	X	X	X	X	O	O	X	X
DP8B	Cardiac	X	X	X	X	O	O	X	X
	Vascular	X	X	X	X	O	O	X	X
MMPT3-7	Cardiac	O	O	X	X	O	O	X	X

Probe	Application	CM	TDI	PD	S-Flow	TDW	CW
L3-12A	Small Parts	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
	OB	X	X	O	O	X	X
	Abdomen	X	X	O	O	X	X
LA3-16A	Small Parts	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
LA3-16AI	MSK	X	X	O	O	X	X
	Intraoperative	X	X	O	O	X	X
LA2-9A	Small Parts	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
	Abdomen	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
LA4-18B	Small Parts	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
CA1-7A	Abdomen	X	X	O	O	X	X
	OB	O (Only Fetal Heart)	X	O (Except Fetal Heart)	O	X	X

Probe	Application	CM	TDI	PD	S-Flow	TDW	CW
	Gynecology	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
CA2-8A	Abdomen	X	X	O	O	X	X
	OB	O (Only Fetal Heart)	X	O (Except Fetal Heart)	O	X	X
	Gynecology	X	X	O	O	X	X
CA2-9A	Abdomen	X	X	O	O	X	X
	OB	O (Fetal Heart)	X	X (Fetal Heart)	O	X	X
	Gynecology	X	X	O	O	X	X
CA3-10A	Abdomen	X	X	O	O	X	X
	OB	X	X	O	O	X	X
	Gynecology	X	X	O	O	X	X
	Pediatric	X	X	O	O	X	X
PA4-12B	Cardiac	O	O	X	X	O	O
	Pediatric	X	X	O	O	X	O
CF4-9	Pediatric	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
E3-12A	OB	X	X	O	O	X	X
	Gynecology	X	X	O	O	X	X
	Urology	X	X	O	O	X	X
EA2-11B	OB	X	X	O	O	X	X
	Gynecology	X	X	O	O	X	X
	Urology	X	X	O	O	X	X
VR5-9	OB	X	X	O	O	X	X
	Gynecology	X	X	O	O	X	X
	Urology	X	X	O	O	X	X
PA3-8B	Abdomen	X	X	O	O	X	O
	Pediatric	X	X	O	O	X	O
	Cardiac	O	O	X	X	O	O
PA1-5A	Abdomen	X	X	O	O	X	O
	Cardiac	O	O	X	X	O	O
	TCD	X	X	O	O	X	O
PE2-4	Abdomen	X	X	O	O	X	O
	Cardiac	O	O	X	X	O	O

Probe	Application	CM	TDI	PD	S-Flow	TDW	CW
	TCD	X	X	O	O	X	O
CV1-8A	Abdomen	X	X	O	O	X	X
	OB	O (Only Fetal Heart, Fetal Heart_Pen)	X	O (Except Fetal Heart, Fetal Heart_Pen)	O	X	X
	Gynecology	X	X	O	O	X	X
LV3-14A	Small Parts	X	X	O	O	X	X
	Vascular	X	X	O	O	X	X
	MSK	X	X	O	O	X	X
V5-9	OB	X	X	O	O	X	X
	Gynecology	X	X	O	O	X	X
	Urology	X	X	O	O	X	X
CW4.0	Cardiac	X	X	X	X	X	O
CW6.0	Cardiac	X	X	X	X	X	O
	Vascular	X	X	X	X	X	O
DP2B	Cardiac	X	X	X	X	X	O
DP8B	Cardiac	X	X	X	X	X	O
	Vascular	X	X	X	X	X	O
MMPT3-7	Cardiac	X	X	X	X	O	O

NOTE

The symbols used in the table have the following meanings:

- S-Har: S-Harmonic Imaging
- Q Scan: Quick Scan
- ECG: Electro Cardio Graph Imaging
- CM: Color M
- TDI: Tissue Doppler
- PD: Power Doppler
- TDW: Tissue Doppler Wave
- CW: Continuous Wave

Thermal Index (TI) Tables

The TI values displayed on the screen title bar can change depending on the probes and applications. There are body organ (TIs), bone (TIb), and cranial bone thermal (TIc) indexes, depending on the body part. This product has been designed to automatically display the thermal index based on the probe and application being used. The TI values are as follows:

Probe	Application	Preset	Thermal Index
L3-12A	Small Parts	Bowel, Breast, Breast1, Testicle, Thyroid	TIs
	Vascular	Arterial, Carotid, Venous	TIs
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist, Penetration, Pediatric Hip	TIs
	OB	1st Trimester	TIs
	Abdomen	General, Superficial, Pediatric ABD	TIs
LA3-16A	Small Parts	Bowel, Breast, Testicle, Thyroid	TIs
	Vascular	Arterial, Carotid, Venous	TIs
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist, Penetration	TIs
LA3-16AI	MSK	General, Superficial	TIs
	Intraoperative	General	TIs
LA2-9A	Small Parts	Bowel, Breast, Testicle, Thyroid	TIs
	Vascular	Arterial, Carotid, Venous	TIs
	Abdomen	General	TIs
	MSK	General	TIs
LA4-18B	Small Parts	Breast, Testicle, Thyroid	TIs
	Vascular	Carotid, Superficial	TIs
	MSK	General, Superficial	TIs
CA1-7A	Abdomen	Aorta, General, General1, Pediatric ABD, Penetration, Renal, Urology	TIs
	OB	1st Trimester	TIs
		2nd Trimester, 3rd Trimester, Fetal Heart, NT	TIb
	Gynecology	General, Adnexa	TIs
	MSK	General, Spine	TIs
CA2-8A	Abdomen	Aorta, General, Renal	TIs
	OB	1st Trimester	TIs
		2nd Trimester, 3rd Trimester, Fetal Heart, NT	TIb
	Gynecology	General, Adnexa	TIs
CA2-9A	Abdomen	Aorta, General, Renal	TIs

Probe	Application	Preset	Thermal Index
	OB	1st Trimester	TIs
		2nd Trimester, 2nd Trimester 1, 3rd Trimester, Fetal Heart, NT	TIb
	Gynecology	General, Adnexa	TIs
CA3-10A	Abdomen	Bowel, General, Renal	TIs
	OB	1st Trimester	TIs
		2nd Trimester, Fetal Heart, NT	TIb
	Gynecology	Uterus, Adnexa	TIs
	Pediatric	Pediatric ABD, Pediatric Hip	TIs
CF4-9	Pediatric	Abdomen	TIs
		Neohead	TIc
	Vascular	Arterial, Carotid, Venous	TIs
E3-12A	OB	1st Trimester	TIs
	Gynecology	General, Adnexa	TIs
	Urology	Prostate	TIs
EA2-11B	OB	1st Trimester	TIs
	Gynecology	General, Adnexa	TIs
	Urology	Prostate	TIs
VR5-9	OB	1st Trimester	TIs
	Gynecology	General, Adnexa	TIs
	Urology	Prostate	TIs
PA3-8B	Abdomen	Aorta, General, Renal	TIs
	Cardiac	Aortic Arch, Adult Echo, Ped Echo	TIs
	Pediatric	Abdomen	TIs
		NeoHead	TIc
PA1-5A	Abdomen	Aorta, General, Renal	TIs
	Cardiac	Aortic Arch, Adult Echo, Ped Echo	TIs
	TCD	General	TIs
PA4-12B	Cardiac	Aortic Arch, Ped Echo	TIs
	Pediatric	Abdomen	TIs
		NeoHead	TIc
PE2-4	Abdomen	Aorta, General, Renal	TIs
	Cardiac	Aortic Arch, Adult Echo, Adult Echo1, Adult Echo2, Ped Echo	TIs
	TCD	General	TIs
CV1-8A	Abdomen	Aorta, General, Renal	TIs

Probe	Application	Preset	Thermal Index
	OB	1st Trimester	TIs
		2nd Trimester, 3rd Trimester, Fetal Heart, NT, Fetal Heart_Pen	TIb
	Gynecology	General, Adnexa	TIs
LV3-14A	Small Parts	Breast, Testicle, Thyroid	TIs
	Vascular	Arterial, Carotid, Venous	TIs
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist	TIs
V5-9	OB	1st Trimester	TIs
	Gynecology	General, Adnexa	TIs
	Urology	Prostate	TIs
CW4.0	Cardiac	Adult Echo, Ped Echo	TIs
CW6.0	Cardiac	Ped Echo	TIs
	Vascular	Arterial, Venous	TIs
DP2B	Cardiac	Adult Echo	TIs
DP8B	Cardiac	Ped Echo	TIs
	Vascular	Arterial, Venous	TIs
MMPT3-7	Cardiac	Adult Echo	TIs

NOTE

- The default thermal index may vary by preset.
- You may change the thermal index at Setup > Display > Option > TI Display.

Ultrasound Transmission Gel

For successful acoustic signal transmission, please only use the ultrasound gels approved by Samsung Medison.

WARNING

- The use of inappropriate ultrasound gels could result in damages in the probe. Using damaged probe could cause injuries such as electric shock in users or patients.
- Do not use ultrasound gels or contact media that contain the following contents.
  - Oils such as mineral oil, cooking oil, gasoline, solvents, rust inhibitors, lanolin, paraffin-based grease, ester and excessive silicon-based release agent.
  - Alcohols such as acetone, methanol, plasticizer (dioctylphtalate) or denatured alcohols.
  - Glacial acetic acid and iodine.
  - All types of lotions or gels that contain aromatic substances.

Gel Warmer (Optional)

The Gel Warmer keeps the ultrasound gel warm. Warming up ultrasound gel takes approximately 5 minutes.

WARNING

- Always turn the Gel Warmer off when it is not in use.
- Do not put your hands inside the Gel Warmer, as it may burn your skin.

CAUTION

- Do not use the Gel Warmer for purposes other than to control the temperature of ultrasound gel.
- Do not place the probe or any other equipment inside the Gel Warmer.
- Do not touch the power terminal of the Gel Warmer while you are examining a patient. There is a risk of electric shock from leakage current.
- Do not apply excessive force to the Gel Warmer, or you may damage its support parts.

Using Sheath

Sheaths are recommended for clinical applications of an invasive nature, including intraoperative, transrectal, transvaginal, and biopsy procedures.

Samsung Medison does not supply sheaths, so you should purchase appropriate supplies from your regular supplier.

WARNING

- Always keep sheaths in a sterile state.
- Sheaths are disposable. Do not reuse them.
- If sheaths are torn or soiled after use, clean and disinfect the probe.
- In neurosurgical applications, a disinfected probe must be used with sterile gel and a sterile pyrogen-free sheath.
- If the sterile sheath becomes compromised during neurosurgical applications involving a patient with Creutzfeldt-Jakob disease, the probe cannot be successfully sterilized by any disinfection method.
- Some sheaths contain natural rubber latex and talc, which can cause allergic reactions in some individuals. Please refer to the FDA Medical Alert released on March 29, 1991.

Installing the Sheath

1. Put on sterile gloves. Unpack the sheath and fill it with acoustic coupling gel.
2. Insert the probe into the sheath and pull the latex tip to cover the probe completely. If possible, cover the probe cable as well.
3. Ensure that there are no air bubbles within the ultrasound gel. If necessary, secure the sheath to the probe and the probe cable.
4. Dispose of the sheath after use.

Probe Precautions

CAUTION

- Do not apply mechanical shocks to the probe.
- Do not place the probe cable on the floor where the cable can be run over by equipment wheels, etc. Do not apply excessive force to bend or pull the cable.
- Do not immerse the probe into any inappropriate substances such as alcohol, bleach, ammonium chloride, and hydrogen peroxide.
- Do not expose the probe to temperatures of 50°C or higher.

The probe can easily be damaged by improper use or by coming into contact with certain chemical substances. Always follow the instructions in the user manual to inspect the probe cable, case and lens before and after each use.

Check for cracks, broken parts, leaks and sharp edges. If there is any damage, immediately stop using the probe and contact Samsung Medison's servicing department. Using damaged probes may result in electric shocks and other hazards to the patients and/or users.

Use and Infection Control of the Probe

WARNING

No neurosurgical treatments or examinations should be carried out on a patient with Creutzfeldt-Jakob disease (critical brain disease caused by virus). If the probe has been used on such a patient, it cannot be sterilized by any method whatsoever.

CAUTION

Sufficient washing and disinfecting must be carried out to prevent infection. This is the responsibility of the user who manages and maintains the disinfection procedures for the equipment. Always use legally approved detergents.

The ultrasonographic image scanner uses ultrasound, and it makes direct contact with the patient when in use. Depending on the types of examinations, such contact can be made to a wide variety of locations, including the ordinary skin or the location of blood transfusion during surgery.

The most effective method to prevent infection among patients is to use each probe only once. However, probes may need to be reused, as they are complex in design and expensive. Consequently, the safety instructions must be followed carefully in order to minimize the risk of infection among patients.

Electric Shocks

The probe uses electrical energy. If it touches conductive materials, there are risks of electric shocks to the patient or the user.

WARNING

- Have the system regularly inspected by Samsung Medison technicians for electric leaks.
- Do not immerse the probe into liquid.
- Do not drop the probe or apply mechanical shocks.
- Inspect the housing, strain relief, lens and seal for damage, and check for any functional problem before and after each use.
- Do not apply excessive force to twist, pull or bend the probe cable.
- The power protection fuse protects the probe and the product from excess current. If the power monitoring protection circuit detects excess current, it immediately shuts off the current to the probe in order to prevent the probe surface from overheating and to restrict the ultrasound power output.
- The temperature of the product for making contact with patients is limited under 43°C. The ultrasound power output (AP&I) is in compliance with US FDA standards.

Cleaning and Disinfecting the Probe

Using an inappropriate cleaning or sterilizing agent may damage the product.

WARNING

- Always use protective eyewear and gloves when cleaning and disinfecting probes.
- Inspect the housing, strain relief, lens and seal for damage, and check for any functional problem after cleaning and disinfecting the probe.

Information of Detergent, Disinfectant, and Ultrasound Gel

- **Classification of Disinfectants**

  To maintain the performance of ultrasound probes, proper maintenance is required.

  As ultrasound probes are classified into critical, semi-critical, or non-critical devices based on the standards of FDA guidance*, proper disinfection, cleaning or sterilization methods for that classification should be used.

Classification Criteria	Contact Area	Application Probe	Level Selection
Non-critical device	Intact skin	Convex, Linear array, and sector transducers	Low level disinfectant
Semi-critical device	Mucous membrane and damaged skin	Endocavity	High level disinfectant
Critical device	blood, sterile tissue, etc.	Intraoperative, TEE	High level disinfectant or sterilization

*Guidance for Industry and FDA Staff - Information for Manufacturers Seeking Marketing Clearance of Diagnostic Ultrasound Systems and Transducers - Appendix D

Use an appropriate substance in accordance with the following tables. All probes are tested under IPX 7 Criteria.

Names	Disinfectants																	
	Tristel Duo	Tristel Sporicidal Wipe	T-Spray II	T-Spray	Sani-Cloth HB	Sani-Cloth Plus[7)]	Sani-Cloth Active	Sani-Cloth AF Germicidal	Sani-Cloth AF3 Germicidal	Sani-Cloth Bleach Germicidal[7)]	Septiwipes	Cleanisept Wipes	Ster-Bac Blu	Cleanisept wipe forte	Transeptic Spray	Incidin Foam	Super Sani-Cloth	Sani-Cloth Germicidal
Type	S	W	S	S	W	W	W	W	W	W	W	W	L	W	S	S	W	W
Disinfectant Level (High/Low)	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Active Ingredient	Chlorine dioxide		Quaternary Ammonium (N-Alkyl)											Ammonium Chlorides	Quaternary Ammonium (N-Alkyl)			
L3-12A	●	●	●		●				●	●		●		●				
LA3-16A			●		●					●								
LA3-16AI	●	●		●	●				●	●		●		●				
LA2-9A			◆	◆	◎								▣		▲			
LA4-18B																		
CA1-7A	●	●	●		●				●	●		●		●				
CA2-8A	●	●	●		●				●	●		●		●			●	
CA2-9A	●	●	●		●				●	●		●		●			●	
CA3-10A	×	●	●		●				●	●		●		●			●	
CF4-9			◆	◆	◎										◆			
E3-12A				●														
EA2-11B			◆	◆	◎								▣		▲			

Names	Disinfectants																	
	Tristel Duo	Tristel Sporicidal Wipe	T-Spray II	T-Spray	Sani-Cloth HB	Sani-Cloth Plus[7)]	Sani-Cloth Active	Sani-Cloth AF Germicidal	Sani-Cloth AF3 Germicidal	Sani-Cloth Bleach Germicidal[7)]	Septiwipes	Cleanisept Wipes	Ster-Bac Blu	Cleanisept wipe forte	Transeptic Spray	Incidin Foam	Super Sani-Cloth	Sani-Cloth Germicidal
Type	S	W	S	S	W	W	W	W	W	W	W	W	L	W	S	S	W	W
Disinfectant Level (High/Low)	H	H	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L	L
Active Ingredient	Chlorine dioxide		Quaternary Ammonium (N-Alkyl)											Ammonium Chlorides	Quaternary Ammonium (N-Alkyl)			
VR5-9			◆	◆	◎								▣		▲			
PA3-8B			●	●	●	●		●	●	●								
PA1-5A	●	●	●		●	●			●	●	●			●			●	
PA4-12B			●	●	●	●												
PE2-4			●	●	●	●		●	●	●								
CV1-8A	●	●	●		●				●	●		●		●				
LV3-14A			◆	◆			▲				▲	▲						
V5-9			◆	◆	◎		▲				▲	▲			▲	■		▲
CW4.0																		
CW6.0			◆	◆	◎								▣		▲			
DP2B			◆	◆	◎								▣		▲			
DP8B					●													
MMPT3-7																		

Names	Disinfectants															
	Asepti-Wipes	Asepti-Wipes II	CaviWipes[7]	MetriWipes	Cidex[7]	Cidex OPA[2,3,7]	Cidex 2%	Cidex Plus[2]	Metricide[2,7]	Metricide 14	Metricide 28[7]	Metricide 30[7]	Metricide OPA Plus	Omnicide 28	Omnicide 14NS	Omnicide - FG2
Type	W	W	W	W	L	L	L	L	L	L	Soak	Soak	Soak	L	L	L
Disinfectant Level (High/Low)	L	L	L	L	H	H	H	H	H	H	H	H	H	H	H	H
Active Ingredient	Quaternary Ammonium (N-Alkyl)			Alcohol	Glutaraldehyde	Ortho-phthalaldehyde	Glutaraldehyde						Ortho-Phthalaldehyde	Glutaraldehyde		
L3-12A					●	●		●					●			●
LA3-16A					●	●	●	●			●	●				●
LA3-16AI					●	●	●	●			●	●	×			●
LA2-9A					▣	▲		◇		▣						
LA4-18B						●	●									
CA1-7A					●	●		●					●			●
CA2-8A					●	●	●	●			●	●	●			×
CA2-9A					●	●		●			●	●				●
CA3-10A					●	●		●			●	●	●			●
CF4-9					▣	▲		◇		▣						
E3-12A						●		●								
EA2-11B					▣	▲		◇		▣						
VR5-9					▣	▲		◇		▣						
PA3-8B					●	●	●	●	●		●	●		●	●	

Names	Disinfectants															
	Asepti-Wipes	**Asepti-Wipes II**	**CaviWipes[7)]**	**MetriWipes**	**Cidex[7)]**	**Cidex OPA[2,3,7)]**	**Cidex 2%**	**Cidex Plus[2)]**	**Metricide[2,7)]**	**Metricide 14**	**Metricide 28[7)]**	**Metricide 30[7)]**	**Metricide OPA Plus**	**Omnicide 28**	**Omnicide 14NS**	**Omnicide - FG2**
Type	**W**	**W**	**W**	**W**	**L**	**L**	**L**	**L**	**L**	**L**	**Soak**	**Soak**	**Soak**	**L**	**L**	**L**
Disinfectant Level (High/Low)	**L**	**L**	**L**	**L**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
Active Ingredient	**Quaternary Ammonium (N-Alkyl)**			**Alcohol**	**Glutaraldehyde**	**Ortho-phthalaldehyde**	**Glutaraldehyde**						**Ortho-Phthalaldehyde**	**Glutaraldehyde**		
PA1-5A		●	●		●			●	●		●	●		●	●	●
PA4-12B					●	●		●	●					●	●	
PE2-4					●	●	●	●	●		●	●		●	●	
CV1-8A					●	●		●					●			●
LV3-14A					●	▲			▣			●				
V5-9			●		●	▲		◇		●			●			
CW4.0						●		●								
CW6.0						▲	▣	◇	▣							
DP2B					●	▲		◇		●						
DP8B						●		●								
MMPT3-7					●	●			●					●		

Names	Disinfectants														
	Nuclean	Wavicide-01[3]	Sekusept Extra	Salvanios pH 7	Salvanios pH 10	Steranios 2%	Surfaces Hautes	Sekusept Plus	Milton	Bleach 5.25%	Virkon[7]	Sporox	Sporox II[7]	Gigasept	Gigasept AF[3]
Type	L	L	L	L	L	L	S	L	L	L	L	L	L	L	L
Disinfectant Level (High/Low)	L	H	H	H	H	H	H	H	L	L	H	H	H	H	H
Active Ingredient	Alcohol	Glutaraldehyde						Nonionic surfactant	Sodium Hypochlorite		potassium peroxymonosulfate	Hydrogen Peroxide		Succindialdehyde, formaldehyde	Quaternary Ammonium
L3-12A	●	●							●			●			
LA3-16A	●	●							●			×			
LA3-16AI	×	×							●				●		
LA2-9A		▣													◎
LA4-18B					●	●									
CA1-7A	●	●							●			●			
CA2-8A	●	●							●			●			
CA2-9A	●	●							●			●			
CA3-10A	●	●							●			●			
CF4-9		▣													◎
E3-12A									●		●		●		
EA2-11B		▣													◎
VR5-9		▣													◎
PA3-8B		●			●	●			●						
PA1-5A	●	●				●			●				●		

Names	Disinfectants														
	Nuclean	**Wavicide-01[3)]**	**Sekusept Extra**	**Salvanios pH 7**	**Salvanios pH 10**	**Steranios 2%**	**Surfaces Hautes**	**Sekusept Plus**	**Milton**	**Bleach 5.25%**	**Virkon[7)]**	**Sporox**	**Sporox II[7)]**	**Gigasept**	**Gigasept AF[3)]**
Type	**L**	**L**	**L**	**L**	**L**	**L**	**S**	**L**	**L**	**L**	**L**	**L**	**L**	**L**	**L**
Disinfectant Level (High/Low)	**L**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**	**L**	**H**	**H**	**H**	**H**	**H**
Active Ingredient	**Alcohol**	**Glutaraldehyde**						**Nonionic surfactant**	**Sodium Hypochlorite**		**potassium peroxymonosulfate**	**Hydrogen Peroxide**		**Succindialdehyde, formaldehyde**	**Quaternary Ammonium**
PA4-12B		●			●	●			●						
PE2-4		●			●	●			●						
CV1-8A	●	●							●			●			
LV3-14A		▣													●
V5-9		▣						◎							◎
CW4.0															
CW6.0		▣													◎
DP2B		▣													◎
DP8B		●					●						●		
MMPT3-7															●

Names	Disinfectants					Cleaner						
	Gigasept FF	Hibitane[7)]	PeraSafe	Anioxyde 1000	STERIS REVITAL OX RESERT	Enzol	Alkazyme	Cidezyme	Klenzyme	Isopropyl alcohol (70%)	Isopropyl alcohol (80%)	Ethanol 75%
Type	L	L	P	Soak	L	L	L/W	L	L	L	L	L
Disinfectant Level (High/Low)	H	-	H	H	H							
Active Ingredient	Bersteinsaure	Chlorhexidine gluconate solution	Citric Acid	Peracetic Acid	Accelerated Hydrogen Peroxide	Dodecylphenolethoxylate, Sodium Xylene Sulfonate	Proteolytic Enzymes			Alcohol		
L3-12A			×	●				●	●	●		
LA3-16A								●	●	●		
LA3-16AI			●	●				●	●			
LA2-9A	◎	◎	▲									
LA4-18B							●	●	●			
CA1-7A			●	●				●	●	●		
CA2-8A			●	●				●	●	●		
CA2-9A			●	●				●	●	●		
CA3-10A			●	●				●	●	●		
CF4-9	◎	◎	▲									
E3-12A												
EA2-11B	◎	◎	▲									
VR5-9	◎	◎	▲									
PA3-8B						●			●	●		

Names	Disinfectants					Cleaner						
	Gigasept FF	Hibitane[7)]	PeraSafe	Anioxyde 1000	STERIS REVITAL OX RESERT	Enzol	Alkazyme	Cidezyme	Klenzyme	Isopropyl alcohol (70%)	Isopropyl alcohol (80%)	Ethanol 75%
Type	L	L	P	Soak	L	L	L/W	L	L	L	L	L
Disinfectant Level (High/Low)	H	-	H	H	H							
Active Ingredient	Bersteinsaure	Chlorhexidine gluconate solution	Citric Acid	Peracetic Acid	Accelerated Hydrogen Peroxide	Dodecylphenolethoxylate, Sodium Xylene Sulfonate	Proteolytic Enzymes			Alcohol		
PA1-5A			●	●				●	●	●		
PA4-12B						●			●	●		
PE2-4						●			●	●		
CV1-8A			●	●				●	●	●		
LV3-14A	◎		▲									
V5-9			▲						◐			
CW4.0	●											
CW6.0	◎	◎	▲									
DP2B	◎	◎	▲									
DP8B						●			●			
MMPT3-7						●				●		

Names	Cleaner			Gel							Trophon	Antigermx S1
	Metrizyme	McKesson	Natural Image	Aquasonics 100[3)]	GE Ultrasound Contact Gel	Clear Image	Kendall	SCAN	Wavelength	Sonogel		
Type	L	L	G	G	G	G	G	G	G	G		
Disinfectant Level (High/Low)												
Active Ingredient	Propylene Glycol	PCMX (Chloroxylenol)	Ammonium Chlorides	NA								
L3-12A	●	●		●								
LA3-16A	●	●		●								
LA3-16AI	●	●		●								
LA2-9A				●				●		●	●	
LA4-18B											●	
CA1-7A	●	●		●							●	
CA2-8A	●	●		●							●	
CA2-9A	●	●		●							●	
CA3-10A	●	●		●							×	
CF4-9				●				●		●	●	
E3-12A				●								
EA2-11B				●				●		●		
VR5-9				●				●		●	●	
PA3-8B	●			●							●	●
PA1-5A	●	●		●							●	

Names	Cleaner			Gel							Trophon	Antigermx S1
	Metrizyme	McKesson	Natural Image	Aquasonics 100[3)]	GE Ultrasound Contact Gel	Clear Image	Kendall	SCAN	Wavelength	Sonogel		
Type	L	L	G	G	G	G	G	G	G	G		
Disinfectant Level (High/Low)												
Active Ingredient	Propylene Glycol	PCMX (Chloroxylenol)	Ammonium Chlorides	NA								
PA4-12B	●			●							●	●
PE2-4	●			●							●	●
CV1-8A	●	●		●							●	
LV3-14A				●				●		●	●	
V5-9				●				●		●	●	
CW4.0												
CW6.0				●				●		●		
DP2B				●				●		●		
DP8B	●		●									
MMPT3-7				●								

TIP **Symbols**

The significance of each symbol is as follows:

(1)	Compatible, but no EPA Registration
(2)	FDA 510(k) Cleared
(3)	Has CE mark
(4)	Discontinued
(5)	Under Development
(6)	ANVISA Registered
(7)	Health Canada Approved; Sani-Cloth Plus (DIN: 02242608), Sani-Cloth Bleach Germicidal (DIN: 02450410), CaviWipes (DIN: 02242209), Cidex (DIN: 02158418), Cidex OPA (DIN: 02239732), Metricide (DIN: 01963996), Metricide 28 (DIN: 01964461), Metricide 30 (DIN: 01964496), Virkon (DIN: 02125021), Sporox II (DIN: 02243075), Hibitane (DIN: 00053201)
S	Spray
W	Wipe
L	Liquid
P	Powder
G	Gel
Soak	Soak
x	Not compatible (DO NOT USE)
●	Compatible
★	Staining may occur on housing parts; however, the acoustic performance and image quality are not affected.
■	Must not be used for longer than 5 minutes.
◐	Must not be used for longer than 10 minutes.
▲	Must not be used for longer than 15 minutes.
◆	Must not be used for longer than 20 minutes.
◇	Must not be used for longer than 25 minutes.
◎	Must not be used for longer than 30 minutes.
▣	Must not be used for longer than 50 minutes.
Blank	Untested (DO NOT USE)

The following table includes information about the manufacturers (or Distributors) of Detergents, Disinfectants, and Ultrasound Gels.

Product	**Manufacturer**
Alkazyme	Alkapharm UK Ltd.
Anioxyde 1000	Laboratoires Anios
Aquasonics 100	Parker laboratories, inc.
Asepti-Wipes	Ecolab
Asepti-Wipes II	Ecolab
Bleach 5.25%	-
CaviWipes	Metrex
Cidex	Advanced Sterilization Products
Cidex 2%	Advanced Sterilization Products
Cidex OPA	Advanced Sterilization Products
Cidex Plus	Advanced Sterilization Products
Cidezyme	Johnson&Johnson
Cleanisept Wipes	Dr.Schumacher GmbH
Clear Image	NEXT Medical Products
Enzol	Johnson&Johnson
Ethanol 75%	-
GE Ultrasound Contact Gel	GE Accessories
Gigasept	Schulke & Mayr GmbH
Gigasept AF	Schulke & Mayr GmbH
Gigasept FF	Schulke & Mayr GmbH
Hibitane	Regent Medical
Incidin Foam	Ecolab
Isopropyl alcohol (70%)	-
Isopropyl alcohol (80%)	-
Kendall	Tyco/Healthcare

Product	Manufacturer
Klenzyme	Steris
McKesson	McKesson Medical-Surgical Inc.
Metricide 14	Metrex
Metricide 28	Metrex
Metricide 30	Metrex
Metricide OPA Plus	Metrex
Metricide	Metrex
MetriWipes	Metrex
Metrizyme	Metrex
Milton	Procter & Gamble
Natural Image	Sonotech Inc.
Nuclean	Alkapharm
Omnicide - FG2	Coventry Chemicals Limited
Omnicide 14NS	Coventry Chemicals Limited
Omnicide 28	Coventry Chemicals Limited
PeraSafe	ANTEC International Limited
Salvanios pH 7	Laboratoires Anios
Salvanios pH 10	Laboratoires Anios
Sani-Cloth Active	PDI
Sani-Cloth AF Germicidal	PDI
Sani-Cloth AF3 Germicidal	PDI
Sani-Cloth Bleach Germicidal	PDI
Sani-Cloth Germicidal	PDI
Sani-Cloth HB	PDI
Sani-Cloth Plus	PDI
Scan	Parker laboratories, inc.

Product	Manufacturer
Sekusept Extra	Ecolab
Sekusept Plus	Ecolab
Septiwipes	Dr. Schumacher GmbH
Sonogel	Sonogel Vertriebs GmbH
Sporox	DSHealthcare Inc.
Sporox II	DSHealthcare Inc.
Steranios 2%	Laboratoires Anios
Ster-Bac Blu	Ecolab
Super Sani-cloth	PDI
Surfaces Hautes	Laboratoires Anios
Transeptic spray	Parker laboratories, inc.
Tristel Duo	Tristel Solutions Limited
Tristel Sporicidal Wipe	Tristel Solutions Limited
Trophon	Nanosonics Limited
T-Spray	Pharmaceutical Innovations, Inc.
T-Spray II	Pharmaceutical Innovations, Inc.
Virkon	DuPont
Wavelength	National Therapy Products Inc.
Wavicide-01	National Therapy Products Inc.

Cleaning

Cleaning is an important procedure that is carried out before disinfecting the probe. The probe must be cleaned after each use.

CAUTION

- Do not use a surgical brush when cleaning probes. Even the use of soft brushes can damage the probe.
- During cleaning and disinfection, keep the parts of the probe that must remain dry higher than the other parts, until all parts are dry.

1. Disconnect the probe from the system.
2. Remove any biopsy adapters or biopsy needle guides. (Biopsy adapters are re-usable and can be disinfected).
3. Remove the sheath. (Sheaths are disposable.)
4. Use a soft cloth lightly dampened with mild soap or compatible cleaning solution to remove any particulate matter and bodily fluids that remain on the probe or cable.
5. To remove remaining particulates, rinse with water up to the immersion point.
6. Wipe with a dry cloth.
7. If necessary, wipe first with a water-dampened cloth to remove soap residue, followed by a soft, dry cloth.

Disinfection

A 10^{-6} reduction in pathogens should be reached following the disinfection procedures in this Manual and using the following Samsung Medison recommended solutions.

WARNING

- If a pre-mixed solution is used, be sure to observe the solution expiration date.
- The type of tissue it will contact during use dictates the level of disinfection required for a device. Ensure that the solution strength and duration of contact are appropriate for disinfection.

CAUTION

- Using a non-recommended disinfectant or not following the recommended disinfection method can damage and/or discolor the probe, and will void the probe warranty.
- Do not immerse probes for longer than one hour, unless they are sterilizable.
- Only sterilize probes by using liquid solutions. Avoid using autoclave, gas (EtO), or other non-Samsung Medison-approved methods.

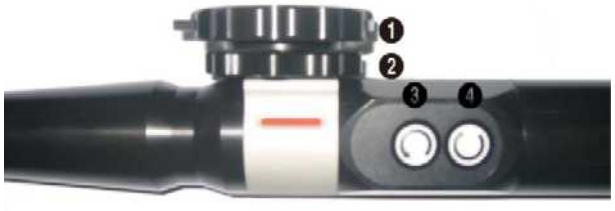
1. Follow the instructions on the disinfectant label for storage, use and disposal of the disinfectant.
2. Mix the disinfectant compatible with your probe according to the instructions for solution strength provided on the disinfectant's label.
3. Immerse the probe into the disinfectant as shown in the illustration below.
4. Using the instructions provided on the disinfectant's label, rinse the probe after the immersion process is complete.
5. Air dry the probe, or towel it dry with a clean cloth.

[Figure 5.1 Disinfection]

MPTEE Probe (optional)

The Multi-Planar Transesophageal Echocardiography (MPTEE) probe is used by inserting it insi de the body.

MMPT3-7 Probe Use



[Figure 5.2 MMPT3-7 Probe Dial]

■ **Lens Angle Adjustment**

The lens angle can be adjusted to between 0˚ and 180˚ by using buttons ③ and ④. Button ③ rotates the lens angle counterclockwise. Button ④ rotates the lens angle clockwise.

■ **Scan Head Tilting**

Use dials ① and ②. Rotate dial ① clockwise to tilt the lens forward. Rotate the dial counterclockwise to tilt the lens backward. Rotate dial ② clockwise to tilt the lens sideways.

[Figure 5.3 Scan Head Tilting]

■ **Locked Mode**

Makes the lens movement less natural than when left open, preventing movement of the lens and head during use. If a red marker is shown when you rotate MMPT3-7's silver handle, the probe is locked.

[Figure 5.4 Locked State]

Precautions for Use

DANGER

Do not use the product in a temperature outside the range of 25°C or lower and 42°C or higher. It may cause damage to the human body.

WARNING

- Do not transport the product while the MPTEE probe is placed in the probe holder. The probe is not secured and it may fall.
- To protect the patient and the probe, keep the probe in Unlocked state when inserting the probe.
- The image obtained with the TEE probe may differ from the image displayed on screen. It is necessary to perform an inspection in advance to reduce the risk of difference in images.
- Familiarize yourself with the use and safety instructions for the TEE probe completely before using it.
- Use the probe only as an internal insertion probe.

When the temperature of the MPTEE probe exceeds 41°C, the following warnings are displayed:

– 41.0°C ≤ TEE Temperature < 42.0°C: Estimated surface temperature of xx.x°C.

– 42.0°C ≤ TEE Temperature < 42.5°C: Estimated surface temperature of xx.x°C. Please reduce the power value.

– 42.5°C ≤ TEE Temperature < 43.0°C: Estimated surface temperature of xx.x°C. Please reduce the power value. Approaching thermal limit: 43.0°C.

– TEE Temperature = 43.0°C: Estimated surface temperature of 43.0°C. Please reduce the power value. Surface Temperature Reached: Currently 43.0°C.
– 43.0°C < TEE Temperature ≤ 50.0°C: Critical scanhead temperature. The system has stopped transmit and returned to the Probe Selection Dialog.
– 50.0°C < TEE Temperature or TEE Temperature < 5.0°C: Error condition detected. The System has stopped transmit and returned to the Probe Selection Dialog. Please contact a Service Representative.

For the MPTEE probe, the following warnings are displayed, depending on the status of the circuit:

– Short circuit or open circuit: Error condition detected. The System has stopped transmit and returned to the Probe Selection Dialog. Please contact a Service Representative.

CAUTION

The probe is intended to be inserted into the human body; always keep it clean. Never place the probe on the floor.

NOTE

- When the probe is not in use, place it in the probe holder located on the left side of the console. The probe holder on the right side is not suitable for the MPTEE probe.
- We recommend that you use pyrogen-free sheaths.

Maintenance

Proper cleaning and disinfection prevent infectious diseases. The user must clean and disinfect the probe by using an effective method, such as the one described in this user manual.

CAUTION

Do not allow the handle or the probe connector to come in contact with cleansing agent or disinfectant. Clean the handle and the cable with a moist cloth; disinfect only the area between, and including, the scan head at the end of the probe and the area marked as 100cm.

- **Cleaning**

CAUTION

Never clean the probe with methanol or ethanol. Doing so may cause serious problems with the product.

1. Remove the parts that do not need to be cleaned, and then clean the scan head and the cable with gauze soaked in non-irritant cleansing solution. Mix non-irritant cleaning agent in lukewarm water to prepare the cleansing solution; the recommended water temperature is 26°C or lower.

2. Rinse the product with lukewarm water until the cleansing solution is completely removed.
3. Either air-dry or use a soft cloth to remove moisture.

Cleaner	Supplier	Active ingredient	Concentration
Cidezyme/Enzol	ASP J&J	Proteolytic enzymes	<5%
EMpower	Metrex	Proteolytic enzymes	<2%
Hycolin	Coventry Chemicals	Alkyldimethylbenzylammonium chloride Tetrasodium EDTA Alcohol ethoxylate	1-10% 1-10% 1-10%
Metrizyme	Metrex	Proteolytic enzymes	<2%
Prolystica 2x conc. Enzymatic Presoak & cleaner	Steris	Ethanollamine Protease Ethoxylated alcohol Polyalkylene glycol Glycerine	1-5% 0.1-1% 1-5% 1-5% 1-5%
T-spray	Pharmaceutical Innovations Inc.	N-alkyl-(C12-18)-n-N-dimethyl-N-Benzyl-ammonium-chloride; Alkyl-dimethyl-ethyl-benzyl-ammonium-chloride	
T-spray 2	Pharmaceutical Innovations Inc.	Alkyl-dimethyl-benzyl-ammonium-chloride; Octyl-decyl-dimethyl-ammonium-chloride; Dioctyl-dimethyl-ammonium-chloride; Didecyl-dimethyl-ammonium-chloride	

■ **Disinfection**

WARNING

Do not use ethanol, iodine, steam, heat, or ethylene oxide to disinfect the product.

CAUTION

- Do not leave the probe in disinfectant solution for more than one hour.
- The probe must be rinsed immediately after disinfection.

When necessary, disinfect the MPTEE probe with a liquid disinfectant. Cidex, Cidex-OPA, Metricide, Omnicide, and Giasept solutions are suitable for disinfecting the MPTEE probe. For the preparation methods and required immersion periods of the different disinfectant solutions, refer to the instructions provided by the manufacturers.

1. Immerse the clean and dry surface of the probe in the disinfectant solution. Immerse only the portion of the probe between the scan head at the end of the probe and the area marked as 100cm.
2. Rinse away the disinfectant with water, and dry the probe completely before storage.

Disinfectance	Supplier	Active ingredient	Concentration
Cidex ADS	ASP J&J	Gluteraldehyde	2.55%
Cidex Plus	ASP J&J	Gluteraldehyde	3.40%
Cidex OPA	ASP J&J	Ortho-phthaladehyde	0.55%
Gigasept AF	Schulke und Mayr	Didecyldimethylammoniumchloride Glycine, aminoalkyl derivs Tridecylpolyethylenglycoether N-(3-Aminopropyl)-N-dodecylpropane-1, 3-diamine	15% 6.9% 15-30% <5%
Gigasept FF	Schulke und Mayr	Formaldehyde Dimethoxytetrohydrofurane Succindialdehyde	4.5% 3.2% 4.5%
Korsolex extra	Bode Chemie	Gluteraldehyde	5-10%
Metricide	Metrex	Gluteraldehyde	2.60%
Metricide 28	Metrex	Gluteraldehyde	2.50%
Metricide Plus 30	Metrex	Gluteraldehyde	3.40%
Metricide OPA Plus	Metrex	Ortho-phthaladehyde	0.60%
Omnicyde 14 N.S.	Coventry Chemicals	Gluteraldehyde	2.60%
Omnicide 28	Coventry Chemicals	Gluteraldehyde	2.50%
Perasafe	Dupont	Sodium Perborate	40-60%
Sekusept Aktiv	Ecolab	Sodium Perborate monohydrate Critic Acid Fatty alcohol ethoxylate	30-50% 15-20% <5%
Steranios 2%, 2% N.G., 2% E.C.S.	Anios	Gluteraldehyde	2.00%
TD100 & TD5	CS Medical	Gluteraldehyde	2.65%
Totacide 28	Coventry Chemicals	Gluteraldehyde	2.00%
Virkon	Dupont	Potassium peroxymonosulphate	<50%

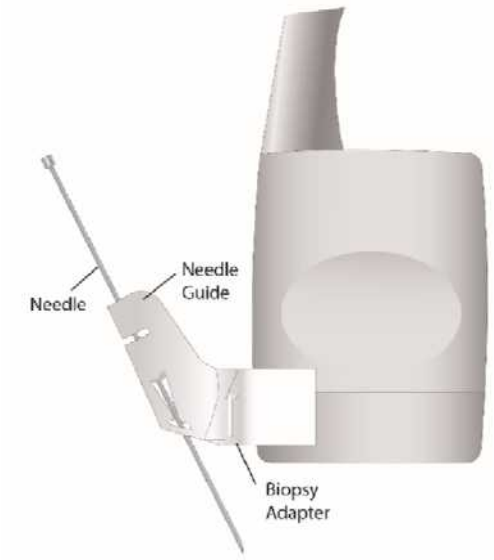
Biopsy

A biopsy is an examination method that surgically extracts tissue from the patient for examination. The probe and the biopsy kit are used together when conducting a biopsy with the ultrasonographic image scanner.

The ultrasound system shows the needle, which penetrates through the skin surface and veins, along with the examination location, minimizing the risk to the patient.

Biopsy Kit Components

The biopsy kit consists of the adapter, needle guide and needle. The components vary depending on the probe type.



[Figure 5.5 Biopsy Kit Components]

- Adapter: Secures the needle guide to the probe tightly.
- Needle Guide: Guides the angle (direction) of the needle so that it can reach the examination location accurately. It also secures the needle so that the needle is not loose.
- Needle: This is the needle that is inserted into the patient's body. Biopsy kits supplied by Samsung Medison do not include needles.
- Sheath: Prevents the probe and adapter from getting soiled by any unwanted substances during the examination (blood and other bodily fluids).
- Ultrasound Gel: The space between the probe and the sheath is filled with the ultrasound gel to obtain images of the best quality.

Using the Biopsy Kit

WARNING

- Only use the needles approved by the country's government.
- Verify the condition of the biopsy needle before use. Do not use a bent biopsy needle.
- The biopsy needle may bend during tissue penetration. The precise location of the needle must be checked by monitoring the echo generated from the needle.
- Never use the biopsy kit to biopsy prostate tissue.

Before Using Biopsy Kit

WARNING

- Do not attempt to use the biopsy until you read the instructions for installing the sheath and verifying alignment of the needle guide.
- Always ensure that the probe and the needle guide are secured on both the left and the right.
- Do not use in IVF, CVS, or PUBS procedures.

Ultrasonographic scanning using the biopsy kit must be conducted by medical doctors or experienced medical staff with appropriate qualifications. Always, without fail, verify all safety procedures and disinfection.

Other brands may not properly fit Samsung Medison probes. Use only Samsung Medison - approved biopsy kits. Improper installation may result in patient discomfort.

Inspect all components. Ensure that the biopsy kit you are using is the correct one for the probe, the system, and system software.

Biopsy Procedure

The system generates a needle guideline through the displayed real-time ultrasound images to indicate the anticipated path of the needle. You can use this guideline to ensure that the needle or instrument is following the correct path.

1. Ready the patient according to the procedure appropriate for the examination objectives.
2. Install the sheath and the biopsy kit.
3. Set the system controls for the biopsy procedure. If necessary, apply acoustic gel to the patient.
4. Begin scanning the patient. Adjust the patient so that the location for examination fits into the needle guideline on the screen.
5. Install the needle into the needle guide for use. Perform the puncture by sliding the needle through the groove in the guide until the needle intercepts the target. To keep the needle securely in the needle guide, press down on the top of the biopsy adapter with your index finger.
6. When the examination location is reached, take the needle out of the needle guide.
7. Detach the needle guide, adapter and sheath from the probe.
8. Dispose of the components that are not designed for reuse.

Needle Guide Alignment

WARNING

- The needle used for this alignment verification must not be used for the actual procedure. Always use a new, sterile needle for each biopsy procedure.
- To assist in accurate projection of the needle, use a straight, new needle for each alignment procedure.

Alignment of the needle guide displayed on the system is for the purpose of verifying whether the needle and the needle guide are properly installed. This must be done prior to the biopsy examination. Contact Samsung Medison ‘s servicing department for service.

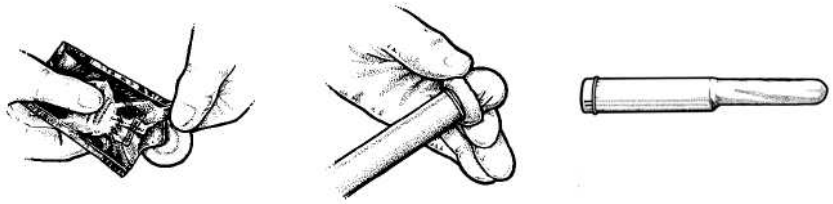
Reverberation or other tissue artifacts may produce false needle images, which can cause confusion. Ensure that the needle path is along the guideline, and that you are not using a false needle image to locate the needle.

1. Attach the biopsy kit.
2. Set the system depth for the procedure to be performed and select the Biopsy menu.
3. Immerse the probe into the water bath, and insert the needle into the needle guide.
4. Confirm that the needle image is on the needle guidelines. If so, the needle guide is properly aligned.
5. If the needle image is out of the needle guideline, check the needle guide or the probe adapter.

Assembling the Biopsy Kit

Disposable Biopsy KIT

1. Place a Sheath up to the top of the probe's handle.



2. Mount the biopsy adapter onto the probe. If the surface of probe is fluted, mount the adapter in accordance with it.

3. Install the needle into the needle guide and start the exam.

Reusable Biopsy KIT

1. Mount the biopsy adapter onto the probe.

2. Insert gel into the sheath. And cover the probe completely.

3. Install the needle guide onto the adapter.

4. Installing the Needle Guide Clip if it is included in the components.

5. Install the needle into the needle guide and start the exam.

TIP **Using Multi Angle**

Use the angle adjuster.

Biopsy Kit Specifications

Probe	Biopsy					
	Model	Component	Material of adapter	Reusable/ Disposable	Needle Gauge	Multi Angle Depth
CA1-7A	BP-KIT-058 [BP-KIT-058-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	14, 16, 18, 20, 22, 25G	1.969, 3.937, 5.906, 7.874 (in)
		Needle Guide		Disposable		
CA2-8A	BP-KIT-054 [BP-KIT-054-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	16, 18, 22, 25G	2.362, 3.150, 3.937 (in)
		Needle Guide		Disposable		
CA3-10A	BP-KIT-071	Biopsy Adapter	Acetal Copolymer	Reusable	14–23G (Except 19G)	3.5, 6.5, 8.5, 12cm
		Needle Guide		Disposable		
V5-9	BP-KIT-060	Biopsy Adapter	ABS	Disposable	16–18G	1.8°
	BP-KIT-029	Biopsy Adapter	Stainless	Reusable	18G	NA
L3-12A	BP-KIT-053 [BP-KIT-053-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	16, 18, 20, 22G	0.591, 0.984, 1.575 (in)
		Needle Guide		Disposable		
LV3-14A	BP-KIT-030	Biopsy Adapter	Stainless	Reusable	14, 18, 21G	2(cm)
LA3-16A	BP-KIT-055 [BP-KIT-055-NG] BP-KIT-068 [BP-KIT-068-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	16, 18, 20, 22G	0.591, 0.984, 1.575 (in)
		Needle Guide		Disposable		
LA2-9A	BP-KIT-043	Bracket	Acetal Copolymer	Reusable	14, 15, 16, 17, 18, 20, 21, 22, 23, 8.5FR	40.7°, 33, 27.6°/4, 5.5, 7 (cm)
		Utra-Pro II Needle Guides & CIV-Flex Cover		Disposable		
E3-12A	BP-KIT-057	Biopsy Adapter	ABS	Disposable	16–18 G	4.2°
LA4-18B	BP-KIT-069	Biopsy Adapter	Acetal Copolymer	Reusable	14–23G (Except 19G)	1.5, 2.5, 4(cm)
		Needle Guide		Disposable		
CV1-8A	BP-KIT-059 [BP-KIT-059-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	14, 16, 18, 20, 22, 25G	1.969, 3.937 (in)
		Needle Guide		Disposable		
VR5-9	BP-KIT-041	Biopsy Adapter	ABS	Disposable	16-18G	4.5°
EA2-11B	BP-KIT-065	Needle Guide	Stainless	Reusable	16–18G	2°
	BP-KIT-066	Needle Guide	ABS	Disposable		

Probe	Biopsy					
	Model	**Component**	**Material of adapter**	**Reusable/ Disposable**	**Needle Gauge**	**Multi Angle Depth**
CA2-9A	BP-KIT-054 [BP-KIT-054-NG]	Biopsy Adapter	Acetal Copolymer	Reusable	16, 18, 22, 25G	2.362, 3.150, 3.937 (in)
		Needle Guide		Disposable		

Cleaning and Disinfecting the Biopsy Kit

WARNING

Always use protective eyewear and gloves when cleaning and disinfecting the biopsy kit.

Wash and disinfect the biopsy kit to reduce pathogens to the level of 10^{-6}. Some components of the biopsy kit may be disposable. Please read the biopsy kit user manual carefully before use.

Cleaning and Disinfecting a Stainless Steel Biopsy Kit

- **Cleaning**
  1. After use, remove the biopsy kit from the probe.
  2. Disassemble the biopsy kit into its component parts, if applicable.
  3. Using a small brush and water, scrub each part to remove trapped material from the biopsy kit.
  4. Rinse with water to remove remaining particulates.

- **Disinfection**
  1. Disinfect the adapter by autoclaving (Steam) or using gas (Ethylene Oxide).
  2. After disinfection, follow the proper post-disinfection procedure for the disinfection method used. (Please refer to the disinfection user manual, etc.)
  3. Inspect the components for damage such as cracks, rust or breakage. If damage is evident, discontinue use of the biopsy kit and contact Samsung Medison's servicing department.

Cleaning and Disinfecting a Plastic Biopsy Kit

- **Cleaning**
  1. After use, remove the biopsy kit from the probe.
  2. Disassemble the biopsy kit into its component parts, if applicable. Discard the single-use parts. These parts cannot be disinfected.
  3. Using a small brush and water, scrub each part to remove trapped material from the reusable components.
  4. Rinse with water to remove remaining particulates.

■ **Disinfection**

CAUTION

Plastic biopsy kits can only be disinfected by using a chemically compatible cold-disinfectant. Disinfection by autoclaving or by using gas or radiation will cause damage to these parts.

Please refer to the user manual of the disinfectant for storage, use, and disposal of the disinfectant.

1. Check the disinfection duration (generally 10 hours) and temperature of the disinfectant.
2. After disinfection, follow the proper post-disinfection procedure for the disinfection method used.
3. Inspect the components for damage such as cracks, rust or breakage. If damage is evident, discontinue use of the biopsy kit and contact Samsung Medison's servicing department.

■ **Sterilization**

CAUTION

- The plastic biopsy adapter is reusable.
- The plastic biopsy needle guide is disposable.
- Do not sterilize with autoclave or gas.
- Please refer to the user manual in the biopsy kit.

Chapter 10

Maintenance

System Maintenance

Cleaning and Disinfecting

Using an inappropriate cleaning or sterilizing agent may damage the product. Please read the following carefully.

WARNING	■ Turn off the system and disconnect the power cord from the wall outlet before cleaning and disinfecting, otherwise, there is a risk of electric shock or fire. ■ Always use protective eyewear and gloves when cleaning and disinfecting the product.

Cleaning

CAUTION	■ Do not use a spray directly on the product exterior. It may cause cracks in the product or cause the color to deteriorate. ■ Do not use chemical substances such as wax, benzene, alcohol, paint thinner, insecticide, aerosol deodorant, lubricant or detergent.

■ **Console**

Use a soft cloth lightly dampened with a mild soap or detergent solution to clean the exterior surfaces of the system.

■ **Cleaning Monitor**

Wipe the LCD surface with a soft, dry cloth.

■ **Touch Screen**

Wipe the LCD surface with a soft dry cloth.

NOTE	Make sure that the touch screen is not contaminated by an electrically conductive substance. Contamination of the LCD screen by ultrasound gel or other substances may degrade the sensitivity of the touch screen and cause malfunctions. This phenomenon is caused by the contact between the capacitive touch screen and the conductive substance. If the screen is contaminated, clean it with a dry cloth and then reboot the system.

■ **Trackball**

CAUTION	Make sure that liquids or other objects do not enter the system while cleaning the trackball.

1. Turn the trackball rim counterclockwise to remove it from the control panel.
2. Wipe the trackball with a soft cloth and turn the trackball rim clockwise to reattach.

[Figure 10.1 Removing the trackball]

NOTE	For information on cleaning and disinfecting probes, please refer to HS70A User Manual.

Disinfecting

CAUTION	Use only recommended disinfectants on system surfaces.

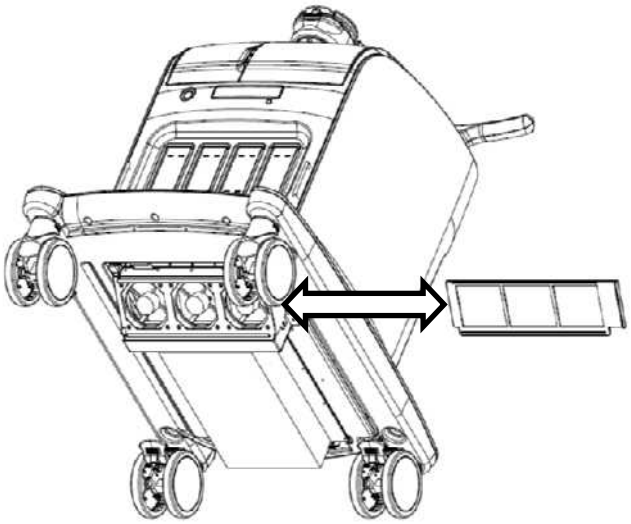
For disinfecting the product, disinfectants certified through the FDA 510 (k) process are recommended. For more information, please refer to 'Chapter 5. Probes' in the User Manual.

1. Turn off the system and disconnect the power cord from the wall outlet.
2. Mix the disinfectant solution that is compatible with your system to the solution strength specified on the instruction label.
3. Wipe the system surfaces with the disinfectant solution, following the disinfectant's instructions for wipe durations, solution strength, and disinfectant contact duration.
4. Air dry or towel dry with a sterile cloth according to the instructions on the disinfectant's label.

Cleaning Air Filters

The air filters minimize the intake of dust. Clean the air filter to ensure that a clogged filter does not cause the system to overheat and reduce the reliability and the system performance.
It is recommended that the air filters be cleaned once every three months.

CAUTION	Be sure to lock the brakes on the front wheels before cleaning the air filters to avoid injury by any unexpected movement of the product.



[Figure 10.2 Air filter cleaning]

1. Pull out the filter under the front of the console and take it away from the product.
2. Shake the filter to remove the dust and wash it in a mild, soapy solution.
3. Afterwards, dry the filter with a cloth, then air dry it in the shade.
4. Slide the filter back into the product.

NOTE	Allow the wet filter to dry thoroughly before reinstalling it. A wet filter can cause the system to malfunction.

Accuracy Check

NOTE	The user must ensure that safety inspections are performed every 2 years according to the requirements of safety standard EN 60601-1. Only trained persons are allowed to perform these safety inspections.

The product's maintenance status may affect the measurements obtained when using the product. The product should be maintained in an optimal state to ensure reliable measurements.

To ensure optimal operation of the product, perform an accuracy check every year. The equations and table related to measurement accuracy are included in the Service Manual.

Data Maintenance

CAUTION	You may lose information files on user settings or patients, because of physical shocks to the product or internal errors. Therefore, you should back-up on a regular basis.

User Setting Back up

Always keep a backup copy of all information related to the user settings in case of data loss. Clients cannot back up the user settings of the product. Please contact the Samsung Medison service engineer to obtain support for backup. However, clients can back up user settings of the GA table used in OB measurements. For further information about this, please refer to the HS70A User Manual.

Patient Information Backup

You can back up the basic information and scanned images of patients. You can save the backup manually; backups can only be saved to external media such as a CD or DVD. It is recommended that back up is performed on a regular basis. For further information about this, please refer to the HS70A User Manual.

Software

The product software may be updated to enhance performance. You cannot modify the software on your own; a service representative will help you with any software modifications.

CAUTION	Minor software updates may be carried out without prior notice from the manufacturer.

If errors occur in the operating system (Windows), or you desire to upgrade the operating system, please follow the instructions of the operating system manufacturer.

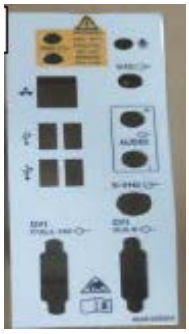
Chapter 11

Service Part List

Body Cover Parts

Part Code	Part Name	Part Image
MI61-01021A	BRACKET	
MI97-02866A	ASSY COVER-BASE LOWER-R	
MI63-02241A	COVER-ARM BASE LOWER L	
MI63-02005A	COVER CASE-BODY FRONT FAN FILTER	
MI96-01384A	ASSY TOUCH PANEL	
MI63-02020A	COVER-CP HANDLE REAR TOP	
MI63-02025A	COVER-BODY BOTTOM	
MI63-02193A	COVER-HINGE TOP	

Part Code	Part Name	Part Image
MI68-01976A	LABEL CAUTION	
MI68-01978A	LABEL CAUTION	
MI68-03243A	LABEL-ID	
MI68-02710A	LABEL CAUTION-HANDLE	
MI63-02021A	COVER-CP MAIN TOP	
MI63-02394A	COVER-CAP KEY TB/LR	
MI63-02395A	COVER-CAP KEY MAKER/REF	
MI63-02396A	COVER-CAP KEY DEPTH	
MI63-02397A	COVER-CAP KEY FOCUS	
MI63-02398A	COVER-CAP KEY ZOOM	
MI67-01090B	RUBBER-CP USB COVER	

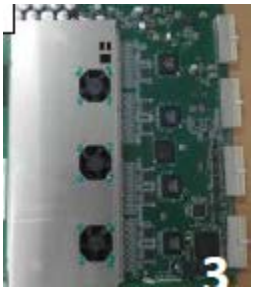
Part Code	Part Name	Part Image
MI67-01100A	RUBBER-CP POWER BUTTON	
MI67-01101A	RUBBER-CP BUTTON	
MI68-02566A	LABEL-I/O PORT	
MI96-01313A	ASSY FAN-RACK	
MI97-02656B	ASSY COVER-SIDE R	
MI97-02695B	ASSY COVER-TOP SIDE R	
MI97-02657B	ASSY COVER-SIDE L	
MI97-02696B	ASSY COVER-TOP SIDE L	

Part Code	Part Name	Part Image
MI97-02659B	ASSY COVER-FRONT	
MI97-02697B	ASSY COVER-FRONT BOTTOM	
MI63-02027B	COVER-BODY FRONT BOTTOM	
MI97-02660A	ASSY COVER-REAR	
MI63-02032A	COVER-BODY REAR TOP	
MI63-02034A	COVER-BODY REAR DOOR	
MI97-02698A	ASSY COVER-REAR BOTTOM	
MI63-02033A	COVER-BODY REAR	
MI97-02709A	ASSY COVER-HANGER	
MI61-03228A	HANGER-BODY TOP	
MI61-03229A	HANGER-BODY BOTTOM	
MI68-02095B	LABEL-CP DO NOT SIT	
MI97-02670A	ASSY CASE-CP MAIN BOTTOM 1	
MI61-03105A	BASE-CP TOUCH	

Part Code	Part Name	Part Image
MI97-02642A	ASSY BRACKET-GEL WARMER	
MI61-03107A	BASE-BODY HANDLE	
MI61-03268B	BRACKET-WIRE HOLDER	
MI63-02019A	COVER-CP HANDLE LEVER	
MI63-02022A	COVER-CP HANDLE TOP	
MI97-02004A	ASSY CASTER	
MI63-01687B	COVER-FRONT JOINT LIFT	
MI63-01688B	COVER-UPPER LINK	
MI63-01689B	COVER-BOTTOM LINK	
MI97-02658A	ASSY COVER-BODY TOP	
MI97-02699A	ASSY COVER-PRINT L	
MI97-02700A	ASSY COVER-PRINT R	

System Parts

Part Code	Part Name	Part Image
MI39-01378A	HARNESS UNIT	
MI92-02429B	ASSY BOARD-PSA 4P CW	
MI92-02419B	ASSY BOARD-AC	
MI82-02357A	ASSY-BOARD BE (WITHOUT PC MODULE)	
MI96-01387E	ASSY PC-MODULE	

Part Code	Part Name	Part Image
MI92-02107F	ASSY BOARD-BF	
3001-002741	SPEAKER	
MI61-01706A	MAGNET	
MI61-01766A	RAIL	
MI92-02140B	ASSY BOARD-USB-CP	
5903-005726	SSD	
MI92-01925C	ASSY BOARD-RL	
MI92-01926B	ASSY BOARD-RR	
MI61-03308A	MAGNET-CATCH	
MI92-01987C	ASSY BOARD-DOCKING-CP	

Part Code	Part Name	Part Image
MI92-01928A	ASSY BOARD BP-Back Plane	
5903-006140	ODD	
MI96-01385A	ASSY MONITOR UNIT	
MI96-01384B	ASSY TOUCH PANEL	
MI97-02878B	ASSY ARM	
MI96-01299C	ASSY ADM	
MI96-01300E	ASSY DDM	
MI96-01314A	ASSY FAN-FRONT	
MI97-02100B	ASSY LIFT-EVE	

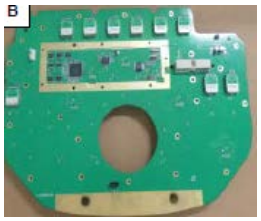
Part Code	Part Name	Part Image
MI61-02089A	SPRING ETC	
MI97-01995A	ASSY HINGE	

Control Panel Parts

Part Code	Part Name	Part Image
MI95-01306A	ASSY ALPHA KEYBOARD-EXP	
MI59-01111B	TRACK BALL	
MI64-01911C	KNOB-ENCORDER	
MI64-01912C	KNOB-ENCORDER EZ EXAM	
MI64-02020A	BUTTON-CAP KEY U1	
MI64-02018A	BUTTON-CAP KEY U2	
MI64-02019A	BUTTON-CAP KEY 3D/4D	
MI64-02020A	BUTTON-CAP KEY U1	
MI64-02021A	BUTTON-CAP KEY CLEAR	
MI64-02022A	BUTTON-CAP KEY CW	

Part Code	Part Name	Part Image
MI64-02023A	BUTTON-CAP KEY PD	
MI64-02024A	BUTTON-CAP KEY Q SCAN	
MI64-02025A	BUTTON-CAP KEY P4	
MI64-02026A	BUTTON-CAP KEY P3	
MI64-02027A	BUTTON-CAP KEY P2	
MI64-02028A	BUTTON-CAP KEY P1	
MI64-02029A	BUTTON-CAP KEY FREEZE	
MI64-02030A	BUTTON-CAP KEY SINGLE	
MI64-02031A	BUTTON-CAP KEY DUAL	
MI64-02032A	BUTTON-CAP KEY QUAD	
MI64-02033A	BUTTON-CAP KEY TEXT	
MI64-02034A	BUTTON-CAP KEY POINTER	
MI64-02035A	BUTTON-CAP KEY CHANGE	

Part Code	Part Name	Part Image
MI64-02036A	BUTTON-CAP KEY CALC	
MI64-02037A	BUTTON-CAP KEY CALIPER	
MI64-02038A	BUTTON-CAP KEY SET L	
MI64-02039A	BUTTON-CAP KEY SET R	
MI95-01304A	ASSY CAP KEY-POWER	
MI64-02012A	BUTTON-ENCORDER EZ EXAM	
MI64-02013A	BUTTON-ENCORDER ANGLE	
MI64-02014A	BUTTON-ENCORDER M	
MI64-02015A	BUTTON-ENCORDER PW	
MI64-02016A	BUTTON-ENCORDER COLOR	
MI64-02017A	BUTTON-ENCORDER 2D	
MI64-01913C	BUTTON-TOGGLE LOWER	
MI95-01311C	ASSY CAP KEY-KNOB	

Part Code	Part Name	Part Image
MI95-01438A	ASSY CONTROL PANEL-PROBE HOLDER L	
MI95-01439A	ASSY CONTROL PANEL-PROBE HOLDER R	
MI92-01924E	ASSY BOARD-CP	

Chapter 12

Parts Renewal

Renewal Parts Compatibility

Part Name	Part code	Description	Qty	SW Version	
				V1.0x	V2.0x
AC board	MI92-02419B	ASSY BOARD-AC	1	No	Yes
BF board	MI92-02107F	ASSY BOARD-BF	3	No	Yes
BE board	MI82-02357A	ASSY-BOARD BE (WITHOUT PC MODULE)	1	No	Yes
PC module	MI96-01387E	ASSY PC-MODULE	1	No	Yes
ADM	MI96-01299C	ASSY ADM	1	No	Yes
DDM	MI96-01300E	ASSY DDM	1	No	Yes