SAMSUNG MEDISON

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DIAGNOSTIC ULTRASOUND SYSTEM

RS80A

Service Manual

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English

SM-RS80A-ENG-01

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Safety Requirements

■ Categorization

- Type of protection against electric shock: Class I
- Degree of protection against electric shock (when the patient is in physical contact): Type BF or type CF applied part
- Degree of protection against the ingress of harmful liquids: General equipment
- Degree of safety of use in the presence of flammable anesthetic agent mixed with air, oxygen, or nitrous oxide: Not suitable for use near flammable anesthetic agent mixed with air, oxygen, or nitrous oxide
- Mode of operation: Continuous operation

■ Safety standards the device conforms to

- 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**

■ Statements

The “C” and “US” of the CSA mark certifies that the product conforms to applicable Canadian and American standards and has been certified by Canadian and American certification agencies.

CE 0123

This mark certifies that the product conforms to applicable EEC standards and has been certified by the European certification agency.

CE

This mark certifies that the product conforms to applicable EEC standards.

GMP

GMP symbol represents the **G**ood **M**anufacturing **P**ractice and quality standards in accordance with the Korean Quality Standards.

Precautions for Use

Be sure to read this operation manual thoroughly, to familiarize yourself with the operation of the product and the relevant safety information, before attempting to use the product.

- Keep this manual near the product and refer to it when using the product.
- Please familiarize yourself with the safety precautions in ‘Chapter 2. Safety’ and ‘Chapter 10. Maintenance’, in particular, contain important safety information and must be thoroughly understood.
- This manual does not include diagnosis results or opinions. Also, check the reference information for the measured area of the body before using the application’s measurement results in any diagnosis.
- This product is an ultrasound diagnosis device and cannot be used from the user’s PC. The manufacturer is not responsible for any problems that may be caused by such attempts.
- This product must only be used by persons who are trained and/or certified to operate clinical diagnostic devices. Unqualified persons must not use this product.
- The manufacturer is not responsible for any damage to this product caused by user carelessness and/or neglect.
- Product orders are based on individually agreed specifications and may not include all functions specified in this manual.
- Some functions, options, or probes may not be available in certain countries or regions.
- All reference material on standards, regulations, and related revisions are valid at the time of the publication of this manual.
- Screen images in this manual are examples and may differ from the actual screen or system.
- The content and specifications described in this manual are 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	Disregarding this instruction may result in death, serious injury, or other dangerous situations.

WARNING	Follow these instructions to prevent a serious accident, or damage to property.

CAUTION	Follow these instructions to prevent a minor accident, or damage to property.

NOTE	The accompanying information covers an installation, operation, or maintenance procedure that requires careful attention from the user, but has little chance of leading directly to a dangerous situation.

If You Need Assistance

Contact the Samsung Medison customer service department or your local vendor if you need a service manual or any other support for the product.

Chapter 1

Introduction

Product Specifications

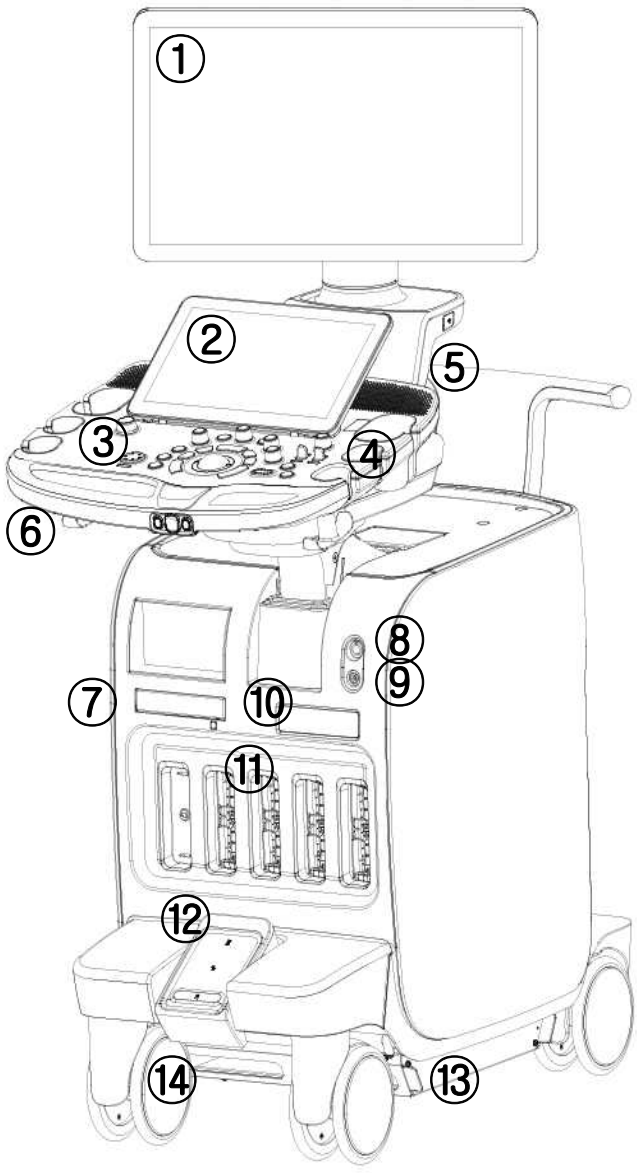
Physical Dimensions	Height: 1,342mm (with monitor) Width: 560mm Depth: 980mm Weight: 140kg (with monitor) Weight: Approx. 155kg (with Safety Working Load)
Imaging modes	2D Mode M-Mode Color Doppler Pulsed Wave (PW) Spectral Doppler Continuous Wave (CW) Doppler Tissue Doppler Imaging (TDI) Tissue Doppler Wave (TDW) Power Doppler (PD) S-Flow ElastoScan Mode Color M-Mode Anatomical Mode 3D imaging Mode 4D imaging 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, L5-13, L7-16, LA2-9A, LA3-16A, LA3-16AI Curved Array: C2-6, CA1-7A, CA2-8A, CF4-9, E3-12A 3D: V4-8, V5-9, LV3-14A Phased Array: PE2-4, PM1-6A CW: CW6.0
Probe connections	Five Active Probe Ports (include one CW probe connector)

Monitor	**Main Monitor** 23 inch LCD monitor (LED backlight unit) called "LCD monitor" henceforth **Touch Screen Monitor** 13.3 inch LCD monitor (LED backlight unit) called "LCD monitor" henceforth
ECG	USB Type (Type CF)
Rear Panel Input / Output Connections	Audio in / out Microphone External Trigger in / out External monitor DVI-I Network USB Foot Switch
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, Pediatric, MSK, Contrast, Cardiac, TCD
Electrical Parameters	100-240V~, 1400VA, 50/60Hz
Measurement Packages	OB, Gynecology, Cardiac, Vascular, Fetal Heart, Urology, Abdomen, Small Parts, Musculoskeletal, TCD, Pediatric Hips * Refer the Chapter 9 for additional information
Signal processing (Pre-processing)	TGC control 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 and up/down, 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 Line Printer USB to RS-232 Serial Cable Foot Switch (IPX8) USB Flash Memory Media USB HDD
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

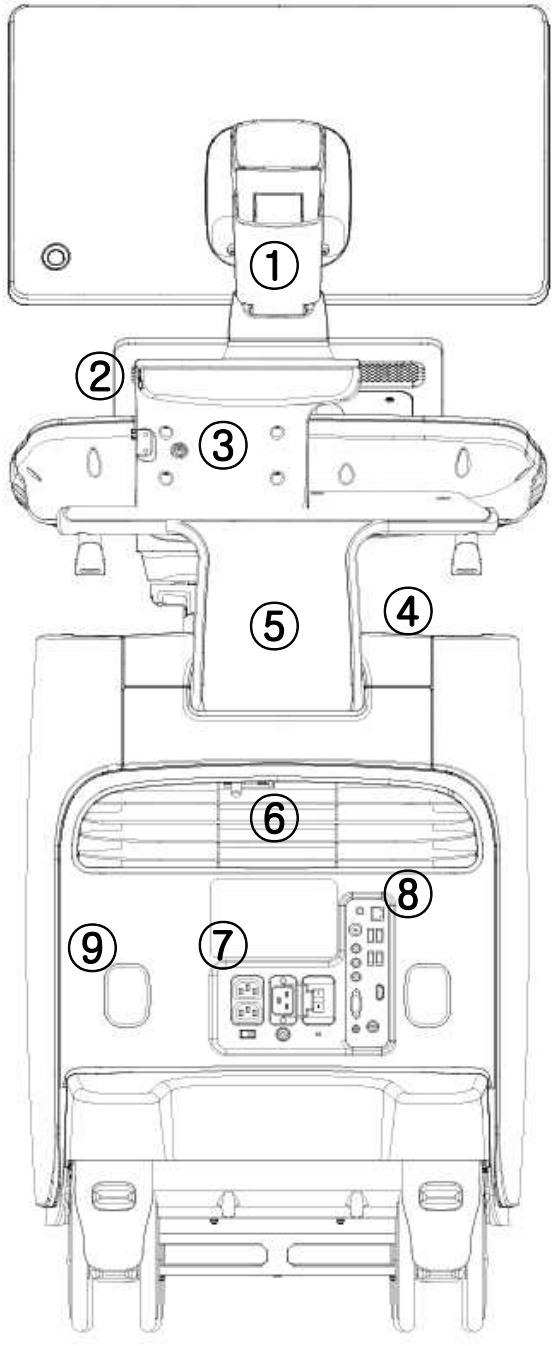
Product Configuration

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



① Monitor
② Touch Screen
③ Control Panel
④ Probe Holder
⑤ Place for Gel Warmer
⑥ Cable Holder
⑦ DVD Drive
⑧ CW Probe Port
⑨ ECG Port
⑩ Clear Track (Optional)
⑪ Probe Port
⑫ Brake
⑬ Air Filter
⑭ Wheels

[Figure 1.1 Product Front View]



① Monitor Arm

② USB Port

③ Motorized Lift

④ Storage Compartment

⑤ Handle

⑥ Air Vent

⑦ Power Receptacle

⑧ Rear Panel

⑨ Cable Holder

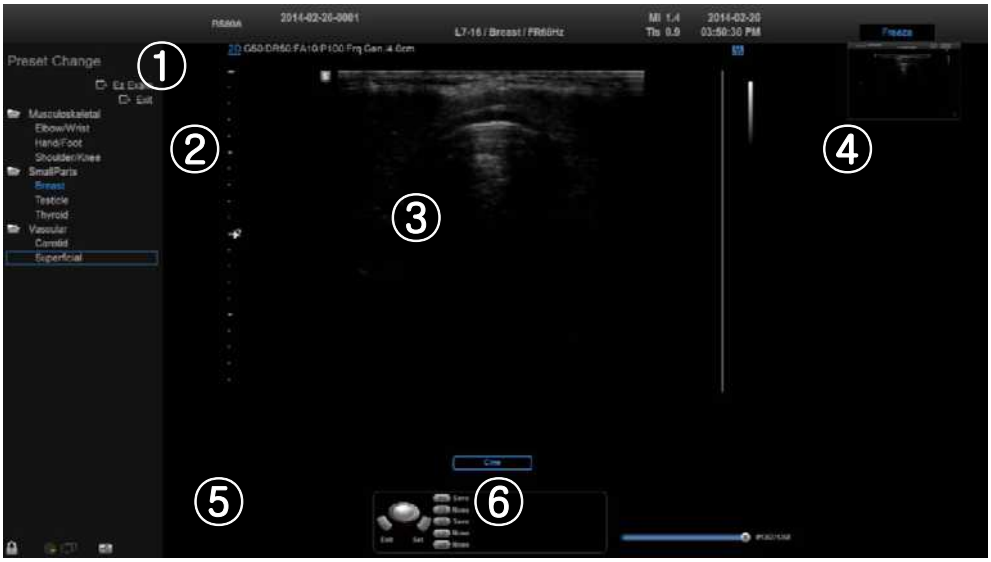
[Figure 1.2 Product Rear View]

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 the ① Title area, ② Preset Change and Ez Exam area, ③ Image area, ④ Thumbnail area, ⑤ User Information, and ⑥ User defined key area.



[Figure 1.3 Screen Layout]

① Title Area

Displays patient information, hospital name, application, frame rate, depth, probe information, acoustic output information, and the current 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	You can set up the Ez Exam menu in Ez Exam Setup. For more information, 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**

Images saved by selecting **Save** are displayed as thumbnails. If saving Single screens, up to 5 images are shown in a list; for Quad screens, up to 20 images can be displayed. Clicking with the pointer will enlarge the selected thumbnail in the Image area.

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 Key (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'.

※ Principles of Operation of Diagnostic Ultrasound System

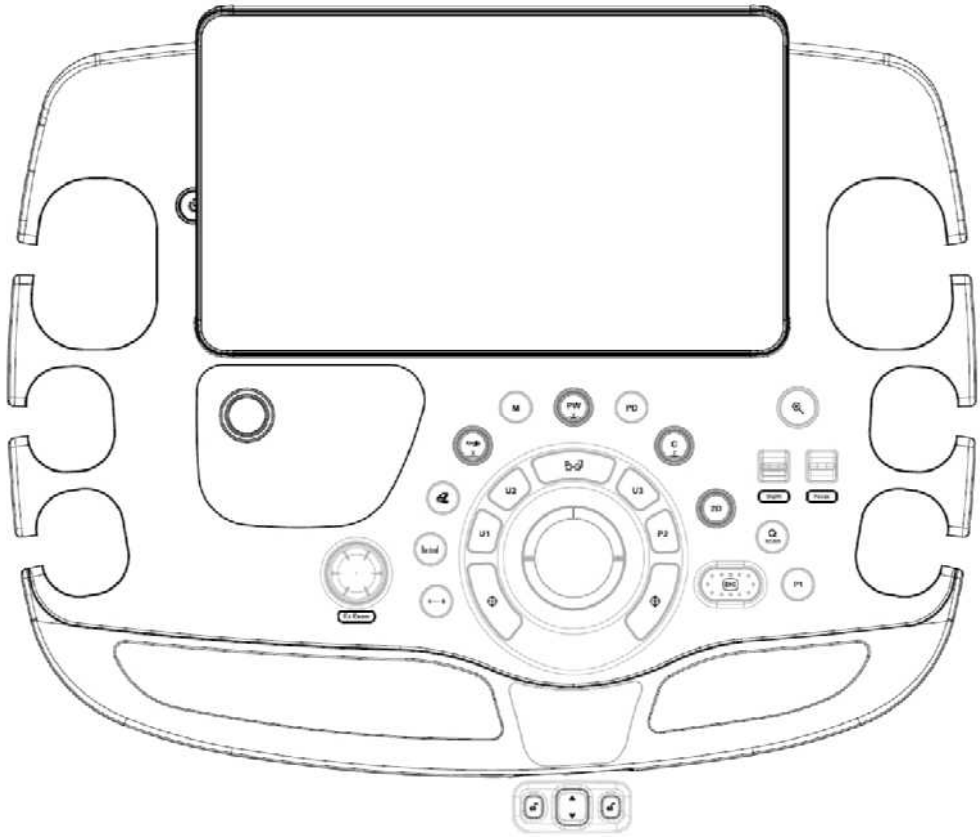
Medical ultrasound images are created by digital memory and computer when they convert the high-frequency wave signals that are transmitted and received by the probe.

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 in the storage device in real time.

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

Control Panel

You control the system by using the control panel.



[Figure 1.4 Control Panel]

The control panel consists of soft menus, buttons, dials, dial-buttons, slider, and track.
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 and later in this manual.

 On/Off	Button	Turns the system on/off.
2D	Dial-button	Button: Starts 2D Mode. Dial: Adjusts the 2D gain.
M	Button	Start or end M-Mode.
PD	Button	Press this button to start/stop Power Doppler mode.
PW / Y	Dial-button	Button: Press this button to start/stop PW Spectral Doppler mode. Dial: Adjusts the PW gain. In 3D View, rotates the image along the Y-axis.
C / Z	Dial-button	Button: Press this button to start/stop Color Doppler mode. Dial: Adjusts the C gain. In 3D View, rotates the image along the Z-axis.
Angle / X	Dial-button	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. Dial: In 3D View, rotates the image along the X-axis.
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	Magnifies an image.

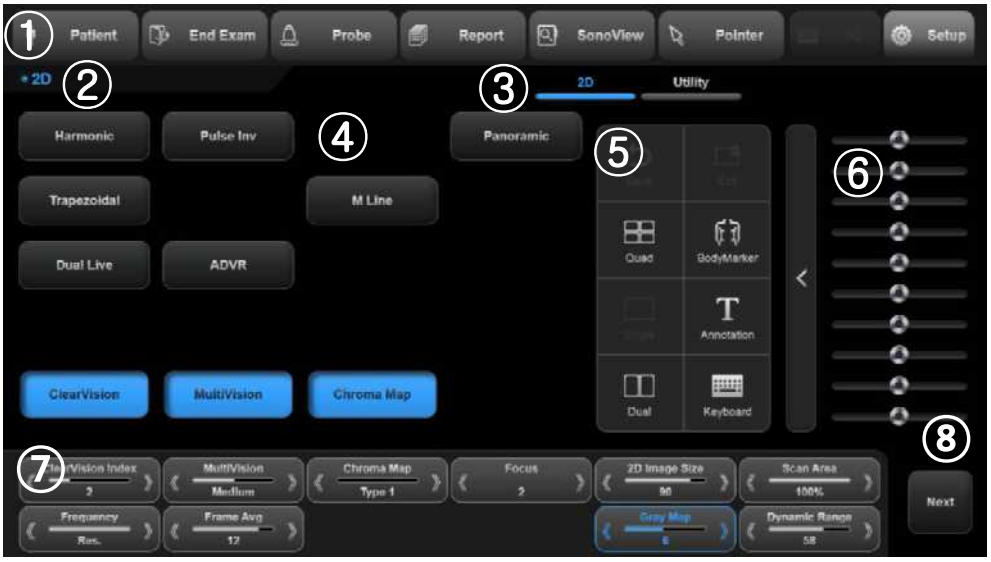
Q scan	Button	Press this button to turn the Quick Scan function on. The 'Q scan' mark will appear at the top of the image. It can be used only in specific applications of specific probes.
 Freeze	Button	Pauses/resumes scanning.
U 1~3	Button	Stands for User Key; functions can be assigned to these buttons 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.
P 1~2	Button	Stands for Peripheral 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.
 Set/Exit	Button	This button is used to assign user-defined functions. The function of each button can be set in Setup > User Defined Key. Set: Select an item or value using the trackball. Also used to change the function of the trackball. Exit: Exits the function currently being used and returns to the previous state.
Ez Exam	Dial-button	Uses the Ez Exam and Preset Change features.
 Clear	Button	Deletes text, indicators, BodyMarkers, measurement results, etc. displayed on an image.
 Change	Button	Switch the trackball's current function to the next supported function.
 Calculator	Button	Start measurements for the application.
 Caliper	Button	Start taking basic measurements such as distance, circumference, area, and volume.
Trackball	Trackball	Moves the cursor on the screen. Also scrolls through Cine images.

	Soft Menu Dial-button:	Selects Soft Menu or changes the settings of the selected Soft menu.

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



[Figure 1.5 Touch Screen]

① These buttons are always displayed on the touch screen. Buttons that are in use are shown in blue, and buttons that cannot be used are deactivated.

Patient	Displays the *Patient Information* screen, which is used for selecting a patient ID from the list or entering new patient information.
End Exam	Finishes the exam of the currently selected patient and resets the related data.
Probe	Displays the *Probe Selection* screen to select or change the probe and application.

Report	Displays the *Report* screen, which shows the summary of measurement results of the current application.
SonoView	Launches SonoView, an image filing program.
Pointer	Displays an arrow-shaped pointer on the screen. This can be used in Diagnosis mode.
3D	Starts or ends 3D mode.
Setup	Displays the Setup screen, where you can change the various settings of the product.

② Displays the mode that is currently in use.

③ The current Diagnosis mode and Utility are displayed in separate tabs. The tab currently in use is shown in blue; pressing the tab changes the content of the touch screen.

※ Changing Touchscreen Tabs

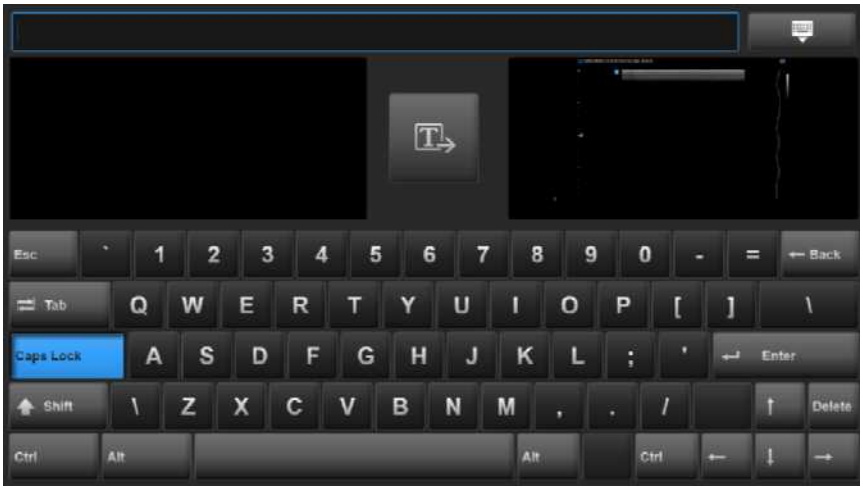
You can also change tabs by performing a page-turn action by dragging on the touch screen.

④ The menu items that are available in the current input mode are shown as buttons. The menu currently in use is shown in blue.

⑤ These buttons are always displayed on the touch screen. Buttons that are in use are shown in blue, and buttons that cannot be used are deactivated.

Back	Exits the current screen and returns to the previous state.
Exit	Exits the function currently being used and returns to the Scan mode.
Quad	Changes to Quad mode. Up to four images are displayed on the screen.
Single	Changes to Single mode. Only one image is displayed on the screen.
Dual	Changes to Dual mode. Up to two images are displayed on the screen.
BodyMarker	Changes to the *BodyMarker* screen.

Annotation	Changes to the *Annotation* screen.
Keyboard	Displays the Screen Keyboard.



[Figure 1.6 Screen Keyboard]

⑥ This is the TGC area. Ten sliders for controlling Gain are displayed here. Moving the slider to the right increases the Gain, which makes the image brighter. TGC stands for Time Gain Compensation.

CAUTION	An excessively large difference between the Gain value settings of adjacent TGC sliders may cause stripes to appear in an image.

⑦ The Soft Menu items that are available in the current input mode are shown. The menu currently in use is shown in blue. Tap a touch screen button or use the Soft Menu dial-button on the control panel to change settings.

⑧ Changes the page of the touch screen.

Adjusting the Control Panel

CAUTION	■ Do not apply excessive force to the control panel. ■ To transport the product, use the handle at the rear of the console.

■ **Adjusting Left-Right/Forward-Back**

Press and hold one of the two  buttons at the center of the control panel handle, and move carefully to the left or right to adjust the position. Release the button to fix the control panel in the current position.

■ **Moving Up and Down**

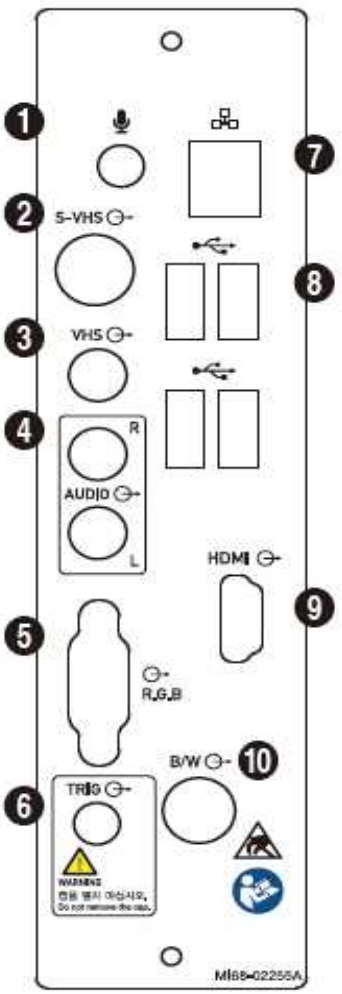
Press the  automatic switch located at the center of the control panel handle to adjust the position vertically.

Console

The console consists of 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 holder, storage compartment, handle, wheels, etc.

Rear Panel

Rear Panel is located at the back of the product; it connects the system to the monitor and other peripheral devices.



① Microphone Port (Input): Connects a microphone.

② S-VHS port (Output): Provides an S-VHS connection for a VCR.

③ VHS Port (Output): Provides a VHS connection for a VCR.

④ Audio Port (Output): Outputs audio signal.

⑤ RGB Port (Output): Provides analog RGB signal output (supports 1280*1024 resolution).

⑥ Trig Port (In/Out): Not used.

⑦ Network Port (Input/Output): Used to connect to a network. Via DICOM network, patient information can be transferred to other servers.

⑧ USB Port (Input/Output): Used to connect to USB peripheral devices.

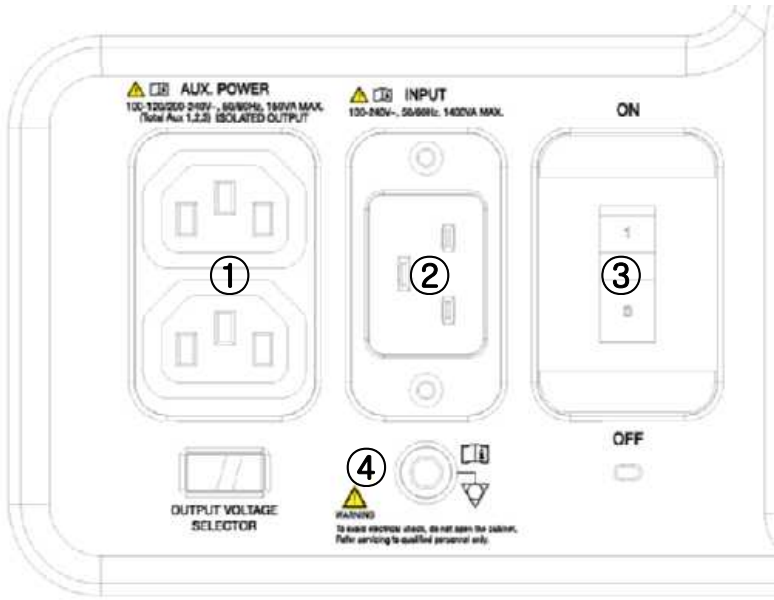
⑨ HDMI Port (Output): Outputs digital signals to the monitor. Use of a DVI monitor via a DVI adapter or cable is not recommended (supports 1920x1080 resolution only).

⑩ B/W Port (Output): Not used.

[Figure 1.7 Rear Panel]

Power Receptacle

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



[Figure 1.8 Power Receptacle]

① Power Outlet (Input): The power supply inside the product supplies electricity to external peripheral devices.

② Power Inlet: Accepts the power cord, which connects to an external power supply.

③ Power Switch: Supplies or cuts power to the entire system.

④ Equipotential terminal: Must be connected to the equipotential bonding in a treatment room.

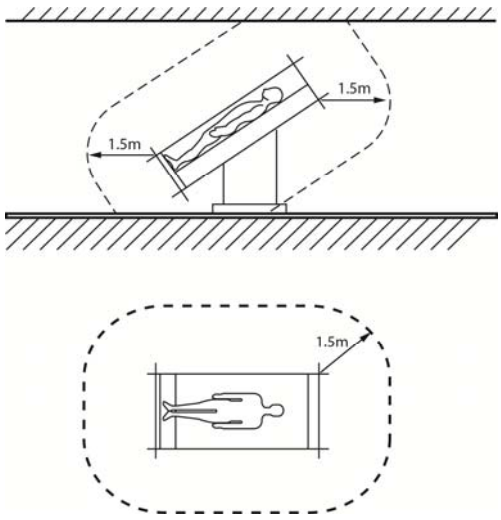
Probe Holder

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

Peripheral Devices

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

CAUTION	■ Do not install peripheral devices that are not listed in this manual within the patient environment. If you install an unlisted device in the patient environment, it may cause an electrical hazard. ■ Do not connect additional peripheral devices to socket of the auxiliary socket. Doing so may decrease the safety level.



[Figure 2.9 Patient Environment]

NOTE	For instructions on operating a peripheral device, please refer to the operation manual for the device.

Internal Peripheral Devices

These are peripheral devices mounted inside the system.

- **DVD-Multi**

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

- **Hard Disc Drive**

  Min. 64Gbytes SATA SSD

External Peripheral Devices

External peripherals are mounted when their use is desired by the user; they are usually connected via appropriate ports on the Rear Panel.

CAUTION	When using a peripheral device via a USB port, always turn the power off before connecting/disconnecting the device. Connecting or disconnecting a USB device while power is turned on may cause the system and/or the USB device to malfunction.

NOTE	■ Use Utility > Storage Manager to mount or dismount a removable disk. ■ USB ports are located on the console and the Rear Panel. We recommend that you connect USB storage devices (flash memory media, etc.) to the ports on the console, and other USB peripheral devices to the Rear Panel for convenience.

The following products are recommended:

- **USB Video Printer**
  - BW: Mitsubishi P-95DE, Sony UP-D897, Samsung ML-2955DW
  - Color: Mitsubishi CP-30DW, Sony UP-D25MD, Samsung CLP-615ND

CAUTION	■ You must install a printer and drivers that are compatible with the English version of Microsoft Windows 7™. Contact Samsung Medison customer support division for inquiries about printer driver installation. ■ When connecting a printer, make sure that it is the same as the printer that is configured in Microsoft Windows™ or Setup. ■ Please note that different printers are connected via different ports. 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. Probes’.

■ **Foot Switch**

- **3 Pedals HID Type**

  To assign functions to the foot switch, go to Setup > Peripherals > Foot Switch. You may select Freeze, Update, Record, Print1, Save, Store Clip, Volume Start, or Ez Exam.

■ **Other**

Flash Memory Media

NOTE	■ If you are using USB 1.1 flash memory, the system may fail to recognize the device. Remove the flash memory from the console and equip again with an appropriate device. ■ When using a flash memory device which supports functions other than saving files, please check first to see if it is possible to save the file on a desktop PC.

Probe

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

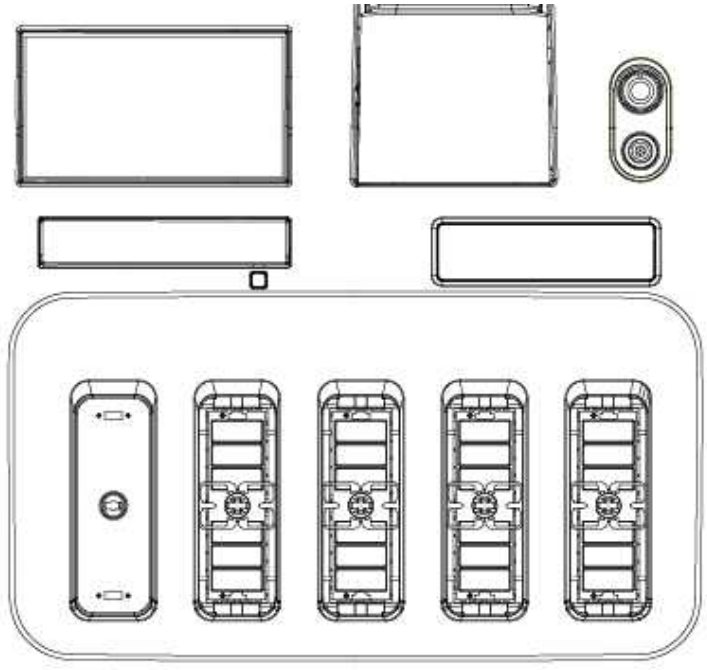
NOTE	For more information on probes, refer to ‘Chapter 5. Probes’ and the ‘Reference Manual’.

Connecting Probes

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

1. Connect probes to the probe connectors on the front panel of the system. Up to four (five including CW) probes may be connected. The CW probe should only be connected to its own connector.

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



[Figure 1.10 Probe Connector]

Clear Track

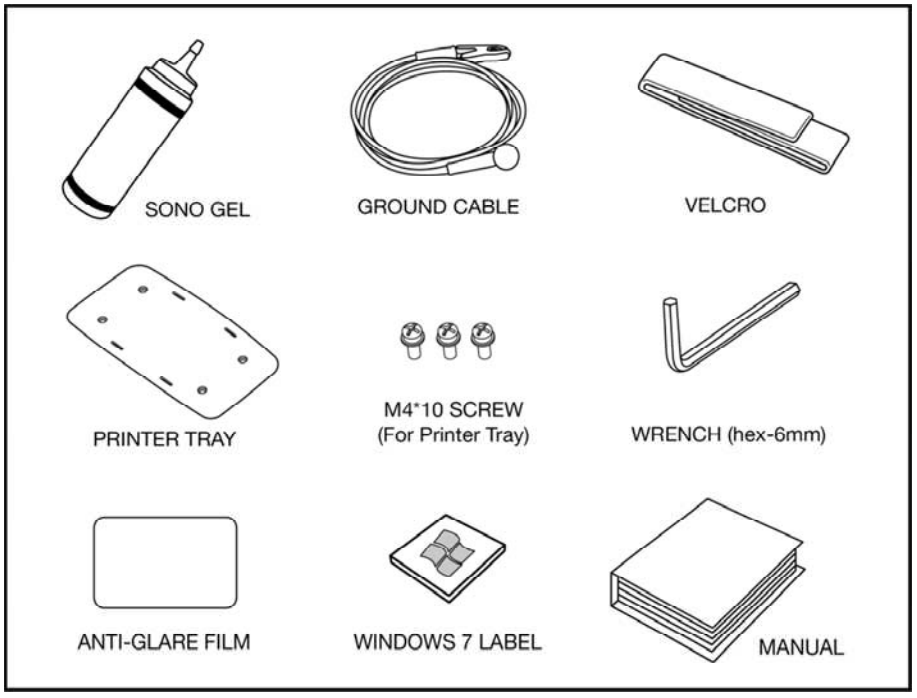
NOTE	Clear Track is an optional feature of this product.

Clear Track assists inexperienced practitioners to conduct a biopsy accurately and safely; it improves on the older biopsy function, in which the position and the direction of the biopsy always had to be predetermined. It also prevents the needle from damaging an organ during a biopsy.

Clear Track consists of Clear Track System and Clear Track Stand. For more information on using Clear Track, please refer to the instruction manual for this product and Clear Track.

Accessories

A box containing various accessories is supplied with the product.



[Figure 1.11 Accessories]

Optional Features

This product has the following optional features:

- Smart 4D
- Cardiac Measurement
- XI STIC
- ElastoScan
- Panoramic
- HDVI
- ADVR
- E-Thyroid
- Realistic Vue
- S-Detect
- Clear Track
- Auto IMT+
- E-Breast

For more information about these optional features, please refer to the relevant sections in this manual.

Chapter 2

Safety

Safety Instructions

Ultrasound diagnostic system and probes were designed for obtaining ultrasound images and analyzing human blood; their clinical applications are as follows: 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.

Contraindications

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

CAUTION	For information on the use or clinical application of this product, please refer to ‘Chapter 6. Starting Diagnosis’ and ‘Chapter 7. Diagnosis Mode’ in this operation manual.

Safety Information

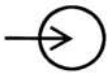
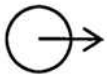
Please read the following safety information before using this product. It contains information on the ultrasound system, probes, recording device, and other peripherals.
This product is intended for use by, or by the order of, and under the supervision of, a licensed physician who is qualified for direct 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 Electrotechnical 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: Follow these instructions to prevent a serious accident, or damage to property
	Caution: Follow these instructions to prevent a minor accident, or damage to property
	Please refer to the operation manual.
	Follow the operation manual.

Symbols	Description
	Caution: Risk of electric shocks
	Type BF applied part (category of protection against electrical danger)
	Defibrillation-proof type CF applied part (category of protection against electrical danger)
	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
	Indicates dangerous voltages over 1,000 V AC or over 1,500 V DC.
	Protective grounding terminal

Symbols	Description
	Equipotential terminal
	Data output port
	Data input port
	Data input/output port
	Input port
	Output port
	Print remote output
	Foot Switch port
	Electrocardiograph port
	USB port
	Network port
	Microphone port
	Probe Port
IPX 1	Dripping-proof device: Protected against vertically falling water

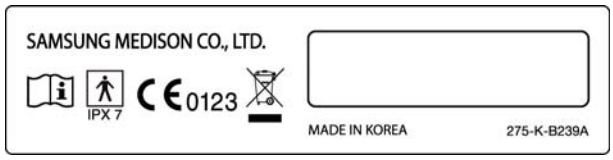
Symbols	Description
IPX 7	Immersion-proof device: Protected against the effects of non-continuous immersion in water
IPX 8	Submersion-proof device: Protected against the effects of continuous immersion in water
	Caution: Device is sensitive to electrostatic discharge (ESD)
	Do not sit on the product.
	Do not push the product.
	Do not lean against the product.
	Mind the empty space. Do not place hand, finger, or any other part of the body in the empty space.
	Patients with heart assist device must not come near.

LABEL

Warning and caution labels that contain information and instructions concerning the protection of the product can be found on the exterior of the product.

[Label 1. Example of ID Label]

[Label 2. Example of Probe ID Label]



[Label 3. Example of Probe Label]

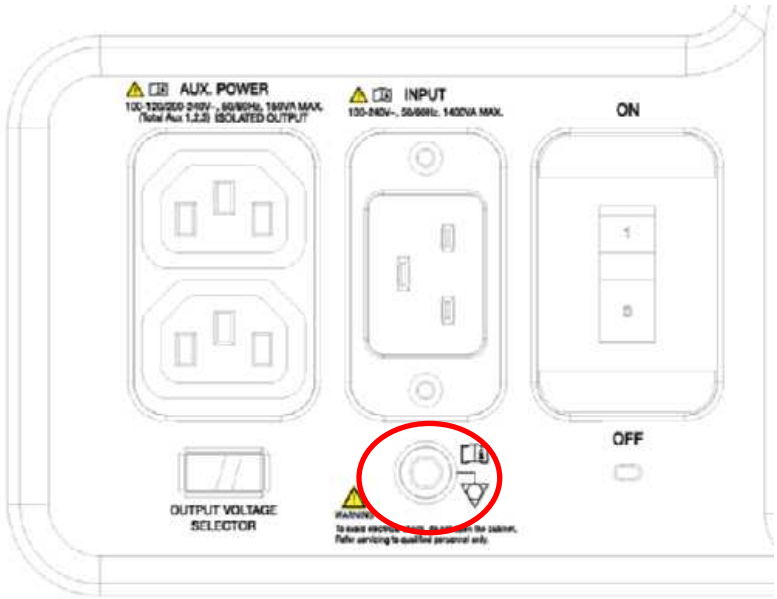
[Label 4. Example of Clear Track Stand ID Label]

Electrical Safety

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

Prevention of Electric Shocks

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. Equipotential terminal of a medical equipment should be connected to the equipotential bonding network in medical rooms as shown in the picture.



[Figure 2.1 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 configurations must comply with the requirements for medical electrical systems

(IEC 60601-1-1/EN 60601-1-1). When connecting a peripheral to the signal input or output port of medical equipment, you must make sure that the peripheral complies with the IEC 60601-1-1/EN 60601-1-1 specification.

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. The interior of this product contains dangerous high-voltage electricity. All interior servicing of the product or replacement of parts must be performed by Samsung Medison. ■ Always check the product's housing, cables, cords, and plugs before using the product. Disconnect the power source and do not use the equipment if the housing is damaged (for example cracked or chipped), or if the cable is worn. ■ Always disconnect the system from the wall outlet prior to cleaning the system. ■ All equipment that comes in physical contact with the patient, such as probes and ECG leads, must be detached from the patient prior to using high-voltage defibrillator. ■ Never use the product in the presence of flammable or anesthetic gas. There is a risk of explosion. ■ Avoid installing the system in such a way that it is difficult for the operator to disconnect it from the power source. ■ Do not use together with HF surgical equipment. HF surgical equipment may be damaged, which may result in fire. ■ 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. The isolation transformer continues to operate when the system is in standby. ■ Do not immerse the cable in liquids. Cables are not waterproof. ■ The auxiliary socket outlets installed on this system are rated 100-240VAC, with a maximum total load of 150VA. Use these outlets only 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 that are not listed in this operation manual to the auxiliary socket outlet of the system. Doing so may cause an electrical hazard. ■ Do not touch SIP/SOP and the patient simultaneously. There is a risk of electric shock from leakage current.

ECG-Related Information

WARNING	■ This product does not provide an ECG monitoring function. Therefore, it does not recognize unsuitable ECG signals. ■ Do not use ECG electrodes for HF surgical equipment. HF surgical equipment may be damaged, which may result in fire. ■ Do not use ECG electrodes during cardiac pacemaker procedures or any procedures that involve other types of electrical stimulators. ■ Do not use ECG leads and electrodes in an operating room.

ESD

Electrostatic discharge (ESD), which is commonly referred to as static shock, is a naturally occurring phenomenon. ESD is most prevalent during conditions of low humidity, including during heater or air-conditioner use. The static shock or ESD is a discharge of the electrical energy build-up from a charged individual to a less- or non-charged individual or object. An ESD occurs when an individual with an electrical energy build-up comes in 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 patient to an ultrasound system can be significant enough to cause damage to the system or probes. ■ Always perform the ESD preventive procedure before using connectors bearing the ESD warning symbol. - Apply anti-static spray to carpets or linoleum. - Use anti-static mats. - Ground the product to the patient's table or bed. ■ It is highly recommended that the user be given training on ESD-related warning symbols and preventive procedures.

EMI

Although this system has been manufactured in compliance with existing EMI (ElectroMagnetic Interface) requirements, use of this system in the presence of an electromagnetic field can cause degradation of the ultrasound image or product damage.

If this occurs often, Samsung Medison suggests a review of the environment in which the system is being used, to identify possible sources of electromagnetic 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	If electromagnetic waves are causing interference with the operation of the system, relocate the product far away from the EMI.

EMC

The testing for EMC (Electro-Magnetic Compatibility) of this system has been performed according to the international standard for EMC with medical devices (IEC-60601-1-2). In Europe, the European Standard (EN 60601-1-2) is adopted as the IEC Standard.

Guidance and Manufacturer's Declaration – Electromagnetic Emission

This product is intended for use in the electromagnetic environment specified below. The user must make sure that this product is used in the following environment.

Emission Test	Compliance	Electromagnetic Environment - Guidance
RF emission CISPR 11	Group 1	The ultrasound system only uses RF energy to operate the internal functions. Therefore, the RF energy emitted is very low, and unlikely to cause interference to nearby electronic equipment.
RF emission CISPR 11	Class A	The ultrasound system is suitable for use in all environment except residential environment. By paying attention to the following warning, the system may be used in environments where electricity is supplied to a residential
Harmonic emission IEC 61000-3-2	Class A	

Emission Test	Compliance	Electromagnetic Environment - Guidance
Flicker emission IEC 61000-3-3	Compliant	building, or when it is directly connected to a low-voltage common power supply network that supplies electricity to residential buildings. Warning: This system must be used only by qualified healthcare professionals. This system may cause radio interference, or interfere with operation of nearby equipment. You must take alleviating measures by reorienting, relocating, or shielding the ultrasound system.

Approved Cables, Probes and Accessories for EMC

- **Cable**

  Cables connected to this product may affect its emissions;
  use only the cable types and lengths listed in the table below.

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

- **Probe**

  The probes used with this product may affect the electromagnetic emissions of the product. Probes listed in 'Chapter 9. Probes' meet the Group 1, Class A requirements of the CISPR 11 standard.

- **Peripheral Devices**

  Peripheral devices used with this product may affect the electromagnetic emissions of the product.

CAUTION	Before connecting one of your own accessories to the system, you must verify the system's electromagnetic compatibility.

WARNING	The use of unapproved cables, probes, and accessories may result in increased emission or decreased immunity of the ultrasound system.

Immunity Test	IEC 60601 Test Level	Regulation Level	Electromagnetic Environment - Guidance
Electrostatic discharge (ESD) IEC 61000-4-2	±6KV contact discharge ±8KV air discharge	±6KV contact discharge ±8KV air discharge	Floor must be made of wood, concrete, or ceramic tiles. If floor is made of synthetic material, relative humidity must be maintained at 30% or higher.
Electrical fast transient/burst IEC 61000-4-4	±2KV (for power supply cables) ±1KV (for input/output cables)	±2KV (for power supply cables) ±1KV (for input/output cables)	The quality of main power supply must be equal to the quality of power supply that is used in general commercial or medical environments.
Surge IEC 61000-4-5	±1KV differential mode ±2KV common mode	±1KV differential mode ±2KV common mode	The quality of main power supply must be equal to the quality of power supply that is used in general commercial or medical environments.

Immunity Test	**IEC 60601 Test Level**	**Regulation Level**	**Electromagnetic Environment - Guidance**
Voltage dips, short interruptions, or voltage variations in power supply cables IEC 61000-4-11	<5%*U*T within 0.5 cycle (>95% dip, unit: *U*T) 40%*U*T within 5 cycles (60% dip, unit: *U*T) 70%*U*T within 25 cycles (30% dip, unit: *U*T) <5%*U*T for 5 seconds (<95% dip, unit: *U*T)	<5%*U*T within 0.5 cycle (>95% dip, unit: *U*T) 40%*U*T within 5 cycles (60% dip, unit: *U*T) 70%*U*T within 25 cycles (30% dip, unit: *U*T) <5%*U*T for 5 seconds (<95% dip, unit: *U*T)	The quality of main power supply must be equal to the quality of power supply that is used in general commercial or medical environments. If operation must continue during a failure of the main power, it is recommended that power is supplied through an uninterruptible power supply or a battery .
Commercial frequency (50/60Hz) EM field IEC 61000-4-8	3A/m	3A/m	The electromagnetic field from power frequency must be equal to the EM field in general commercial or medical environments.
Note: *U*T is the primary voltage (AC) before applying test level.			

Immunity Test	IEC 60601 Test Level	Regulation Level	Electromagnetic Environment - Guidance
RF conduction IEC 61000-4-6	3Vrms 150kHz ~ 80MHz	0.01V	Portable/mobile RF communication equipment must be separated by the recommended separation distance from the cable and other specific components of the ultrasound system. Recommended separation distance is calculated by using an equation that is applicable to the frequency of the transmitter. **Recommended separation distance** $d = [\frac{3,5}{V_1}]\sqrt{P}$ $d = [\frac{3,5}{E_1}]\sqrt{P}$ 80MHz ~ 800MHZ $d = [\frac{7}{E_1}]\sqrt{P}$ 800MHz ~ 2.5GHz
RF radiation IEC 61000-4-3	3V/m 80MHz ~ 2.5GHz	3V/m	*P* is the maximum rated power output (W) provided by the manufacturer of the transmitter, and *d* is the recommended separation distance (m). According to on-site inspection of electromagnetic waves, the electric field strength of a fixed RF transmitter [a] must be lower than the level specified in the regulation at each frequency range ([b]). Interference may occur near equipment bearing the following symbol: 
Note 1) At 80MHz and 800MHz, greater frequency range is applied. Note 2) This guidance may not apply to all circumstances. Radio waves of electromagnetic waves are affected by absorption and reflection by structure, objects, and persons.			

[a] It is not theoretically possible to precisely predict the electric field strength of fixed transmitters such as wireless (mobile/wireless) telephones, base stations for industrial radio, amateur radio communication, AM/FM radio stations, and TV stations. To assess the electromagnetic wave environment of a fixed RF transmitter, an on-site investigation of EM waves needs to be considered. If the strength of electric field measured at the location the ultrasound system is used exceeds the level of applicable RF regulation, you must verify whether the ultrasound system is functioning normally. If the ultrasound system is found to be functioning abnormally, you need to take corrective measures such as reorienting or relocating the system, or isolating the system in a shielded space with high RF shielding effect and filter attenuation.
[b] If the frequency range exceeds 150kHz ~ 80MHz, the strength of electric field must be lower than $\mathbf{V_1}$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 user can help to prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and this product, and by controlling the maximum output of communication equipment as recommended below:

Maximum Rated Power Output of Transmitter W	**Separation Distance by Transmitter Frequency m**		
	150kHz ~ 80MHz $d = [\frac{3,5}{V_1}]\sqrt{P}$	**80MHz ~ 800MHz** $d = [\frac{3,5}{E_1}]\sqrt{P}$	**800MHz ~ 2.5GHz** $d = [\frac{7}{E_1}]\sqrt{P}$
	V_1=0.01Vrms	**E_1=3V/m**	**E_1=3V/m**
0.01	35.00	0.11	0.23
0.1	110.68	0.36	0.73
1	350.00	1.16	2.33
10	1106.80	3.68	7.37
100	3500.00	11.66	23.33

For transmitters whose maximum rated power output is not listed in the above list, an approximate recommended separation distance *d* (m) can be calculated by using the equation applicable to the frequency of the transmitted. *p* represents the maximum rated power output (W) of the transmitter that is provided by the manufacturer of the transmitter.

Note 1) At 80MHz and 800MHz, a separation distance for greater frequency range is applied.
Note 2) This guidance may not apply to all circumstances. Radio waves of electromagnetic waves are affected by absorption and reflection by structure, objects, and persons.

Electromagnetic Environment – Guidance

Ultrasound systems must be used only in shielded locations offering at least the minimal level of RF shielding effectiveness, and where all the cables are also shielded. Field strengths outside the shielded location from fixed RF transmitters, as determined by an electromagnetic site survey, should be less than 3V/m.

It is essential to verify that the actual shielding effectiveness and filter attenuation of the shielded location meet the minimum specifications.

CAUTION	If the system is connected to 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 emission 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 Cable[3]
2D	When you change the operation mode or system setting, or reset the system, Brief flickering appears on the on-screen image or recorded image.	For sector imaging probes, white radiating bands or flickerings appear on the center line of the image. For linear imaging probes, white radiating bands appear; sometimes they appear more clearly around the periphery of the image.	White dots, dashes, or diagonal lines appear, or diagonal lines appear near the center of the image.
M		Background noise of the image increases, or white M-Mode line appears.	White dots, dashes, or diagonal lines appear, or background noise of the image increases.
Color		Color flickers, radiating/vertical band appears, background noise increases, or color image changes.	Color flickers, dots or dashes appear, or amount of color noise changes.
Doppler		Horizontal lines appear on the spectrum display, abnormal noise is heard on the speaker, or both.	Vertical lines appear on the spectrum display, popping noise is heard on the speaker, or both.

1. ESD that occurs when the charge accumulated in insulated flooring or human body is discharged
2. RF energy generated by RF transmitters such as mobile phones, portable radios, wireless equipment, commercial radio, and TV
3. Interference caused by switching the power supply that is connected to power cables or connected cables, electrical control, or 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's ultrasound systems do not generate electromagnetic interference in excess of the referenced standards.

An 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 probe operating at the same frequency or with several probes?
- Do two different probes 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. Answer each of the questions and then contact a Samsung Medison Service Representative in your area.

Mechanical Safety

Caution on Transporting

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, make sure that the brakes on the wheels are unlocked. Also, be 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 such as the product falling over may seriously damage the product.

If the product fails to operate normally after being transported, contact the Samsung Medison Service Department.

Brake

Use the brake to control the movement of the product. The brake is located at the center of the footplate; you can control all wheels at once by using the footplate.

To lock the brakes, press the front part of the brake with your foot. To unlock the brakes, press the back of the pedal.

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. It is recommended that you practice beforehand before climbing up or down an incline.

If you leave the product on an incline, the product may fall over even if the brakes are engaged. Avoid leaving the product on an incline.

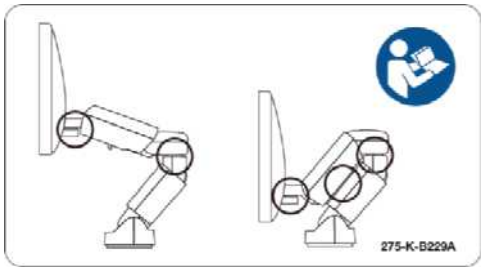
Caution on Use

CAUTION	■ Do not press the control panel excessively. ■ Never attempt to modify the product in any way. ■ Read the instructions on safe operation of the product if using the product after a prolonged period of non-use. ■ Make sure that other objects, such as metal pieces, do not enter the system. ■ Do not block the ventilation slots. ■ Do not pull on the power cord to unplug the product. Doing so might damage the cord and cause the product to short-circuit, or the cord itself to break. Unplug the cord by pulling on the plug itself. ■ Excessive bending or twisting of cables on patient-applied parts may cause failure or intermittent operation of the system. ■ Improper cleaning or sterilization of a patient-applied part may cause permanent damage. ■ All internal component repairs and part replacements 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 lifespan of the product is approximately 7 years.

For information on cleaning, disinfecting, and other information on protecting the product, refer to ‘Chapter 10. Maintenance’.

Caution on Using Monitor

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



[Figure 2.2 Caution on Using the Monitor]

Caution on Using Control Panel

CAUTION	■ Do not push the control panel with excessive force or lean on it. ■ Do not sit on the control panel or exert excessive force on it.

When adjusting the height or position of the control panel, pay attention to the space between the control panel and the lift. Catching your fingers or other body parts in it may result in injury.

[Figure 2.3 Caution on Using the Lift]

■ **Caution on Using Touch Screen**

CAUTION	Do not push the touch screen with excessive force.

When adjusting the angle of the touch screen, mind the space behind the touch screen. Catching your fingers or other body parts in it may result in injury.

[Figure 2.4 Caution on Adjusting Touch Screen Angle]

Biological Safety

For safety information on the probe and biopsy kit, refer to ‘Chapter 9. Probes’ in this 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. Write down the message displayed on the screen, turn off the power, and call the Samsung Medison service department. ■ Do not use a system that exhibits erratic or inconsistent updating. Discontinuities in the scanning sequence are an indication of a hardware failure that should be corrected before use. ■ The system limits the maximum contact temperature to 43SYMBOLC, and the ultrasonic waves output observes American FDA regulations.

ALARA Principle

Performing diagnoses using an ultrasound device is defined by the “As Low As Reasonably Achievable” (ALARA) principle. The decision as to what is reasonable has been considered and defined by many people. However, no set of rules can be formulated that would be sufficiently complete to dictate the correct response for 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

of the exam.

The user's knowledge of, and the ability to abide by, the ALARA principle is very important. Advances in diagnostic ultrasound, not only in the technology, but also in the applications of the technology, have resulted in the need for more and better information to guide the user. This important information is based on a variety of ultrasound output data, and plays an important role in putting the ALARA principle into effect.

Numerous variables affect the output data that forms the basis of the provided information. These variables include mass, body size, location of the bone relative to the focal point, attenuation in the body, and ultrasound exposure time. Among these, exposure time is the variable that one must pay the most attention to. For, unlike other variables, exposure time is entirely controlled by the operator of the ultrasound system.

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 unscanned modes like M-Mode or Doppler concentrate 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 definition of 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 bioeffect is actually

occurring, a high index reading 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. These controls can be divided into three categories: direct, indirect, and receiver controls.

Direct Controls

Application selection and the output intensity control directly affect acoustic intensity. There are different ranges of allowable intensity or output based on your selection. Selecting the correct range of acoustic intensity for the application is one of the priorities 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. This Samsung Medison system provides both automatic and user-definable settings.
Output has a direct impact on acoustic intensity. Once the application has been established, the output control can be used to increase or decrease the intensity output. The output control allows you to select intensity levels less than the defined maximum. Prudent use ensures good image quality while employing the lowest output intensity.

Indirect Controls

The indirect controls are those that have an indirect effect on the acoustic intensity. These controls affect the 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 scanned 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 necessary in an 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 is, the higher the number of pulses of energy that will be emitted will be, in the given period of time. Pulse repetition frequency is affected by a number of controls, including 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. Maintaining or increasing the resolution at a different focal zone involves the adjustment of numerous outputs from the focal zone. This output adjustment is one of the system's optimization features. 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 greater output intensity to scan at a deeper 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 of these indices is displayed is determined by the nearest application, system settings, and choice of the user.

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 three indices, only one of which is displayed at all times. 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 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 the 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 of 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 a bone. Certain factors such as the presence of fluid or bone, or the flow of blood, might create artificially high or low thermal index readings. 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. 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 bioeffects varies with peak pressure and ultrasound frequency. The MI accounts for these two factors. The higher the MI value, the greater the likelihood of mechanical bioeffects occurring. However, there is no specific MI value that means that a mechanical effect 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, and mode of operation. 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 the bones of a 2 to 3 months old fetus. The cranial bone thermal index (TIc) informs the user about the potential heating of bone at or near the surface, 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 at Utility > Setup > Display > Display.

- **Mechanical and Thermal indices Display Precision and Accuracy**

  The system expresses the precision of MI and TI in units of 0.1.

  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 variability range of probes and systems, inherent acoustic output modeling errors and measurement variability, 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 of the tissue or organs in question. 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 applied to algorithms to calculate 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 de-rated 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.

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, measurement variability and variability among probes and systems are significant factors. 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, and variability 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 variability ranges of probes and systems, inherent acoustic output modeling errors, and measurement variability. Display accuracy estimates are measured according to AIUM measurement standards but not based on errors caused during the measurement. 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**

  The power controls the system's acoustic output. Two real-time output values are on the screen: a TI and a 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.

D Mode Controls

- **2D Mode Size**

  Narrowing the sector angle may increase the frame rate. This will increase the TI. Pulse voltage may be automatically adjusted down with 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 frame rate. This will increase the TI. The number of focal zones may also increase automatically to improve resolution. This action may change 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 frame rate or focal depth automatically. Lower frame rates decrease the TI. 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 increases TI and the time spent for scanning color images. Color pulses are the dominant pulse type in this mode.

- **Color Sector Width**

  Narrower color sector width will increase the color frame rate, and so 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 select a new 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 be automatically adjusted to maintain pulse voltage below the system maximum. A decrease in pulse voltage will decrease the MI.

- **Sector Width**

  A narrower 2D Mode sector width in Color imaging will increase color frame rate. The TI will increase. 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 MI is the MI 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. Settings are initialized when you select a probe. Samsung Medison's factory defaults vary with probe, application and mode. Defaults that are below the FDA limits have been chosen 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 will also automatically choose a deeper 2D-mode focal depth. A change of focal depth will 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. Samsung Medison's factory defaults vary with probe, application and selected mode. Defaults that are below the FDA limits have been chosen for intended use.

Related Guidance Documents

For more information on 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 (Bioeffects Considerations for the Safety of Diagnostic Ultrasound, J Ultrasound Med., Sept. 1988: 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 January 28, 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 not 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 and the In Situ value have been estimated by 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 commonly reported *In Situ* value uses the following formula:

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

Since this value is not the true *In Situ* intensity, the term "derated" is used. The maximum derated and the maximum water values do not always occur

under the same operating conditions. 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 has the greatest water value intensities in its deepest zone. The same transducer may have its largest de-rated 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 operational condition giving rise to ISPTA.3, WO is the total time-average power. For operational condition to be reported as ISPPA.3 or less, WO is the **Ultrasonic power** associated with the transmit pattern that gives rise to value that is reported as ISPPA.3 or less.

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 acoustic power measurements using systemic uncertainties radiation force are measured by using calibrated NIST acoustic power sources.

We also recommend 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.

Protecting the Environment

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

Chapter 3

Installing the Product

Transporting

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

Caution on Transporting

The box packaging is designed to reduce impact. However, excessive shock such as the product falling over may seriously damage the product.

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, make sure that the brakes on the wheels are unlocked. Also, be 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.

Brake

Use the brake to control the movement of the product. The brake is located at the center of the footplate; you can control all wheels at once by using the footplate.
To lock the brakes, press the front part of the brake with your foot. To unlock the brakes, press the back of the pedal.

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. If you leave the product on an incline, the product may fall over even if the brakes are engaged. Avoid leaving the product on an incline.

WARNING	Be aware of the castors, especially when moving the system. It is recommended that you practice beforehand before climbing up or down an incline.

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.

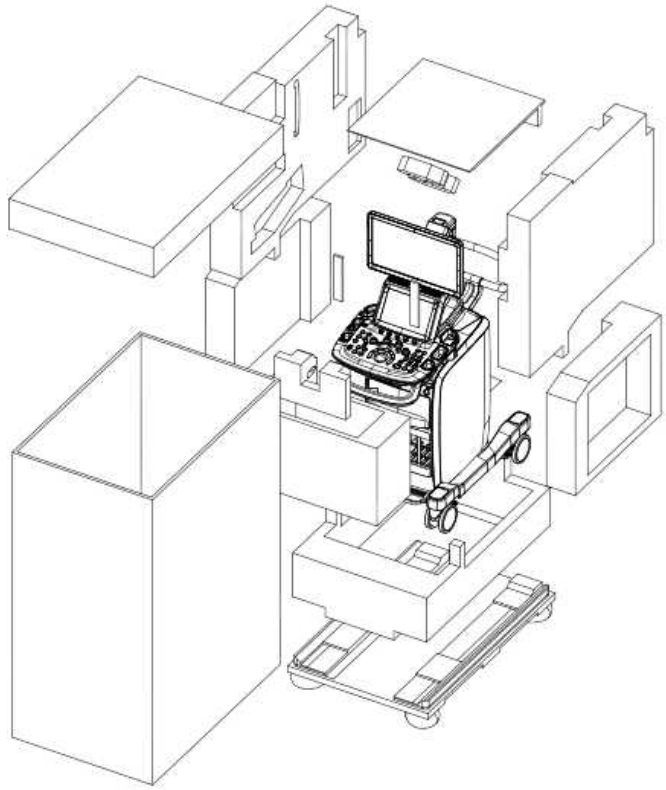
Category	Temperature **OC**	Humidity **%**
Transporting	-25 ~ 60	20 ~ 90
Storage	-10 ~ 50	20 ~ 90
Operating	10 ~ 35	30 ~ 75

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

Unpacking the Product

Dismantling the Product Box

1. Dismantle 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]

Accessories

A box containing various accessories is supplied with the product. If it is not consistent with your order, please contact the Samsung Medison customer service department or your local vendor.

Disengaging Locking Mechanisms

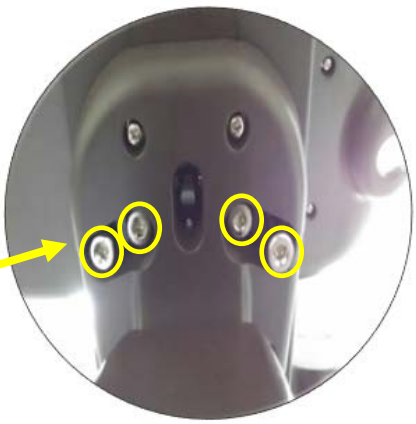
When this product is being transported, the monitor arm and the control panel are secured in place with locking mechanisms to ensure safety. Disengage the locking mechanisms before using the product by following the procedure shown below.

Monitor Arm

1. Press down the locking mechanism in the middle of the monitor arm to disengage the lock.

Control Panel

1. Loosen the four screws under the control panel to disengage the lock.



2. Remove the rubber from the top grill of the rear vent. Release the manually operated lever from its current position (right) to secure the control panel in place.

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.

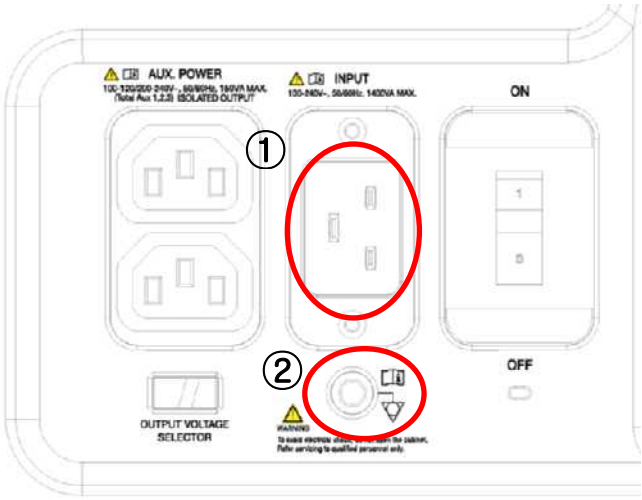
CAUTION	Placing the system near generators, X-ray machines or broadcast cables may result in screen noise and abnormal visual images. Sharing the power source with other electrical devices may also cause noise.

- 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.
- 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.

How to install the Product

Installation Safety

Power receptacle and equipotential terminal are located at the rear of product.



[Figure 3.2 Power Receptacle and Equipotential Terminal]

① Power inlet: Accepts the power cord, which connects to an external power supply.

② Equipotential terminal: Must be connected to the equipotential bonding in a treatment room.

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.

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**°C**	-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]

Connecting the Equipotential Terminal

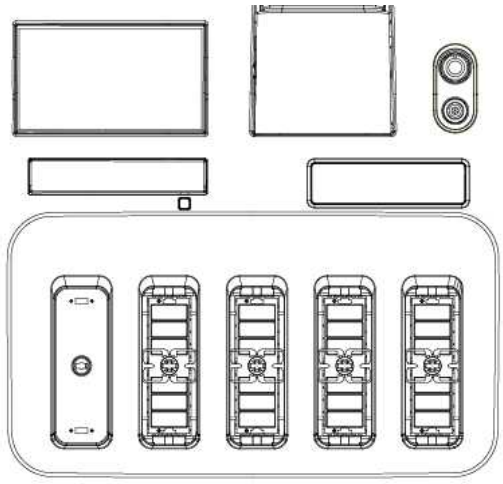
In a hospital environment, dangerous electric current may occur as a result of the potential difference between a contactable conductive part and connected equipment in treatment rooms. The solution to the problem is consistent equipotential bonding. Equipotential terminal of a medical equipment should be connected to the equipotential bonding network in medical rooms as shown in the picture.

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. Up to four (five including CW) probes may be connected. The CW probe should only be connected to its own connector.

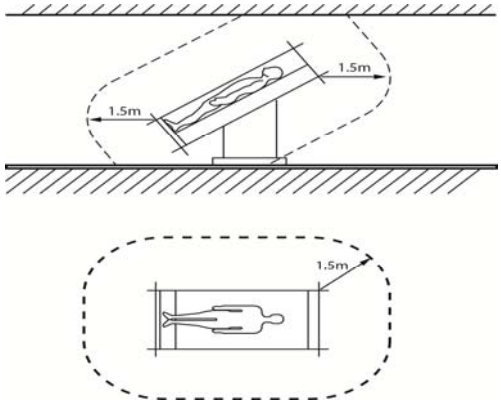
2. To mount, turn the connector turning handle clockwise.



[Figure 3.3 Probe Connector]

Connecting Peripherals

CAUTION	■ Do not install peripheral devices that are not listed in this manual within the patient environment. If you install an unlisted device in the patient environment, it may cause an electrical hazard. ■ Do not connect additional peripheral devices to socket of the auxiliary socket. Doing so may decrease the safety level.



[Figure 3.4 Patient Environment]

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

Internal Peripheral Devices

These are peripheral devices mounted inside the system.

- **DVD-Multi**

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

- **Hard Disc Drive**

  Min. 64Gbytes SATA SSD

External Peripheral Devices

External peripherals are mounted when their use is desired by the user; they are usually connected via appropriate ports on 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 while the power is on may lead to malfunction of the system and the USB devices. ■ Do not connect additional peripheral devices to socket of the auxiliary socket. Doing so may decrease the safety level.

NOTE	■ Use Utility > Storage Manager to mount or dismount a removable disk. ■ If you are using USB 1.1 flash memory, the system may fail to recognize the device. Remove the flash memory from the console and equip again with an appropriate device.

■ **USB Video Printer**

The following products are recommended:

- BW: Mitsubishi P-95DE, Sony UP-D897, Samsung ML-2955DW
- Color: Mitsubishi CP-30DW, Sony UP-D25MD, Samsung CLP-615ND

CAUTION	■ You must install a printer and drivers that are compatible with the English version of Microsoft Windows 7™. Contact Samsung Medison customer support division for inquiries about printer driver installation. ■ When connecting a printer, make sure that it is the same as the printer that is configured in Microsoft Windows™ or Setup. ■ Please note that different printers are connected via different ports. 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**
- **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. Press **Shut Down** on the screen to shut down the system, or press **Cancel** to cancel.

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.

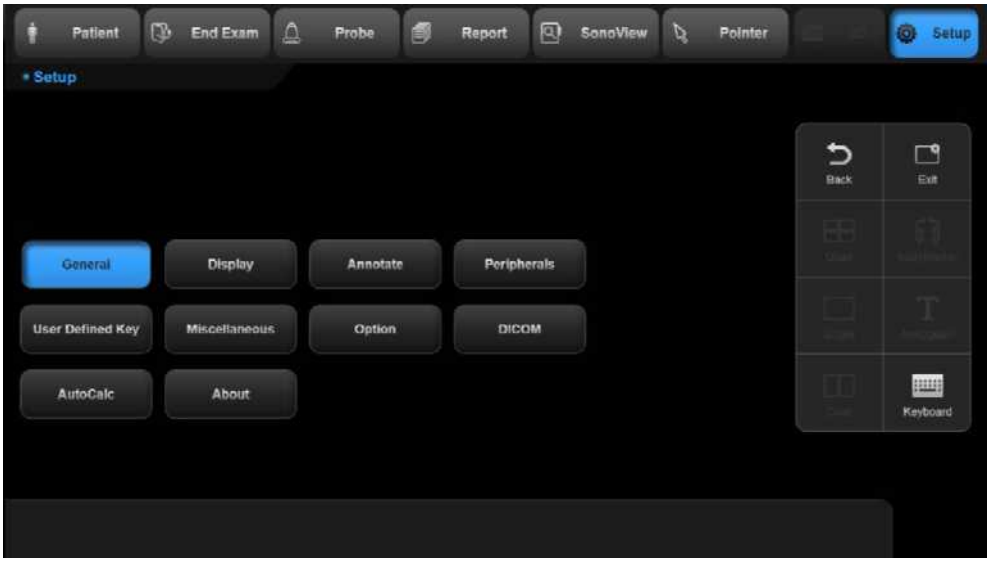
System Settings

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. Tap the Setup button on the touch screen.
2. *The Setup* screen will appear on the monitor and the touch screen. Select a tab that has items to specify.

> ※ **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.

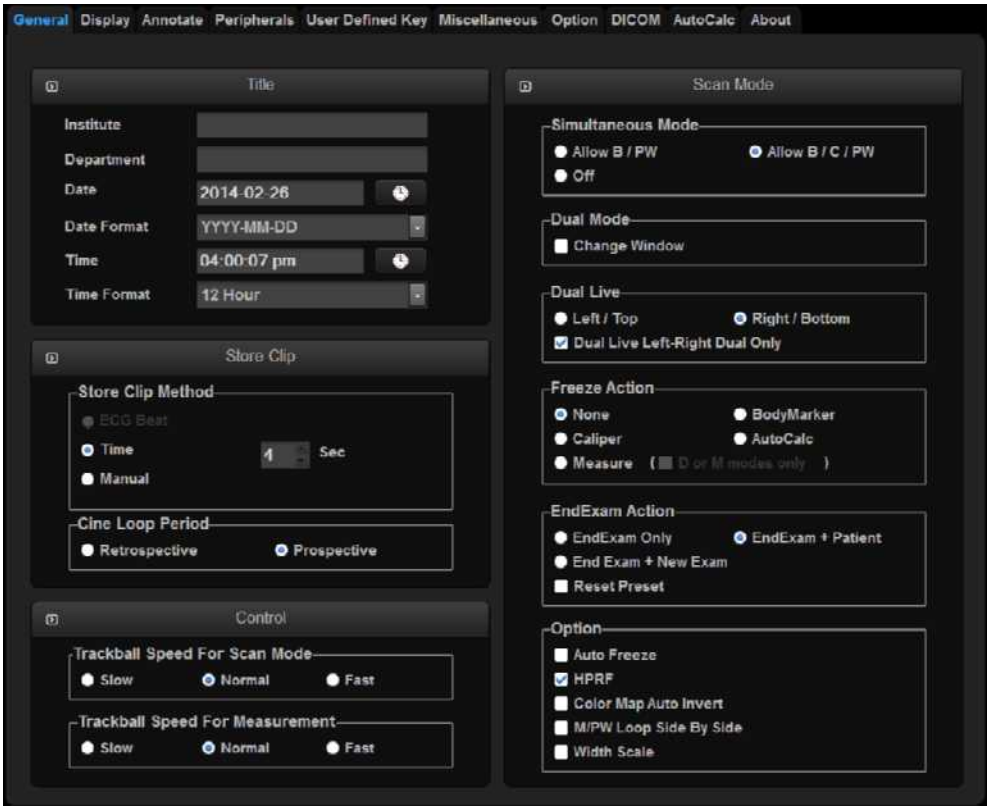
3. Specify settings for each item.
4. Save and close the settings. Click **OK** on the monitor screen, or tap **Exit** on the touch screen, or press **Exit** button on the control panel to switch to Scan mode.
5. Tap **Return** on the touch screen to go back to the *Utility* screen.



[Figure 3.5 Setup - Touch Screen]

System General Setting

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 3.6 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. This information is used to identify information transferred via DICOM.

■ **Date**

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

NOTE	■ You cannot change the date and 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. ■ You can select a year from 2006 to 2027.

※Tip! How to set the date and time

1. Click  next to the Date (or Time) field.
2. Set the date and time using the trackball and the **Set** button on the control panel.
3. If it is properly set, press **Apply** to apply changes. To close the date and time setting window, press **OK**. To cancel, press **Cancel**.

[Figure 3.7 Date & 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.

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

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

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.

Scan 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.

- **Dual Mode**

  Select whether to activate the Change window in Dual Mode.

- **Dual Live**

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

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

- **Freeze Action**

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

  - D or M Mode Only: When the Freeze Action is set to Measure, Measure Freeze Action will function only in Doppler and M Modes.

- **End Exam Action**
  - End Exam Only: Tapping the End Exam button on the touch screen exits Exam Mode and switches the screen to the B Mode Scan screen.
  - End Exam + Patient: Tapping the End Exam button on the touch screen switches the screen to the *Patient Information* screen.
  - End Exam + New Exam: Tapping the End Exam button on the touch screen switches the screen to the *Patient Information* screen, and automatically generates an ID.
  - Reset Preset: If this checkbox is checked, the Preset will be reset when you tap the End Exam button.

- **Option**

  You can select multiple items. Use the trackball and the **Set** button to select and check or uncheck an item.
  - Auto Freeze: Scan mode is frozen automatically when the product is not used for 10 minutes.

※Tip!

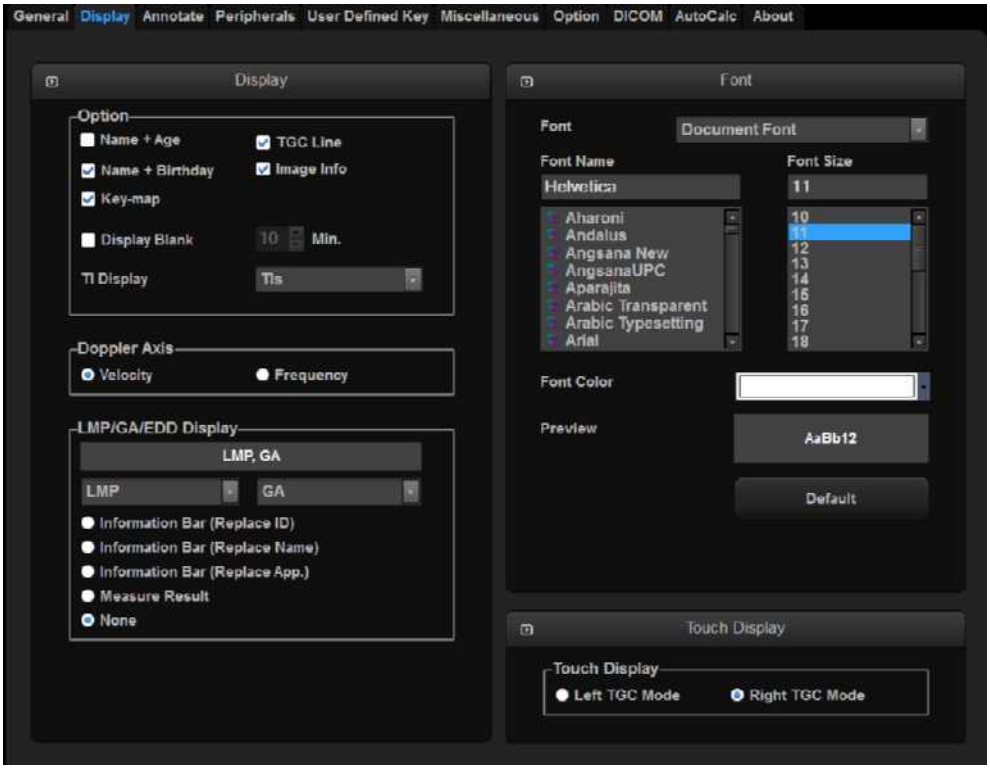
The Scan Mode is frozen automatically, regardless of Auto Freeze setting, when the product is not used for 1 hour.

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

  - HPRF: 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: 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.

Display

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



[Figure 3.8 Setup - Display]

Display

■ Option

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

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

NOTE	“Name + Age” and “Name + Birthday” cannot be used simultaneously.

- 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.
- Key map: Details of the User Defined Keys, including the positions of the **Set** and **Exit** buttons, are displayed in the User Key area of the monitor screen.
- Display Blank: Select whether to display the screen saver. When this is on, you can set the screen saver activation time to a period of between 1 and 30 minutes.
- 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).

■ **Doppler Axis**

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

- Velocity: Specify the Doppler axis scale unit as cm/s (m/s).
- Frequency: Specify the Doppler axis scale unit as kHz.

■ **LMP / GA / EDD 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.

- Information Bar (Replace ID): Replaces the ID in the title area.
- Information Bar (Replace Name): Show the patient name in the title area.
- Information Bar (Replace App.): Replaces the applications in the title area.
- Measure Result: Displays the selected LMP, GA or EDD along with the measurement result.
- None: None of the options are displayed on the screen.

Font

- **Font**

  Specify the target for which you want to set the font. Choose from Document Font and Measure Result Font.

- **Font Name**

  Select the font type to use.

- **Font Size**

  Select the font size to use.

- **Font Color**

  Select the font color to use.

- **Preview**

  The Preview window displays the font that you have selected.

- **Default**

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

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

NOTE	Certain fonts may not appear correctly on the screen.

Touch Display

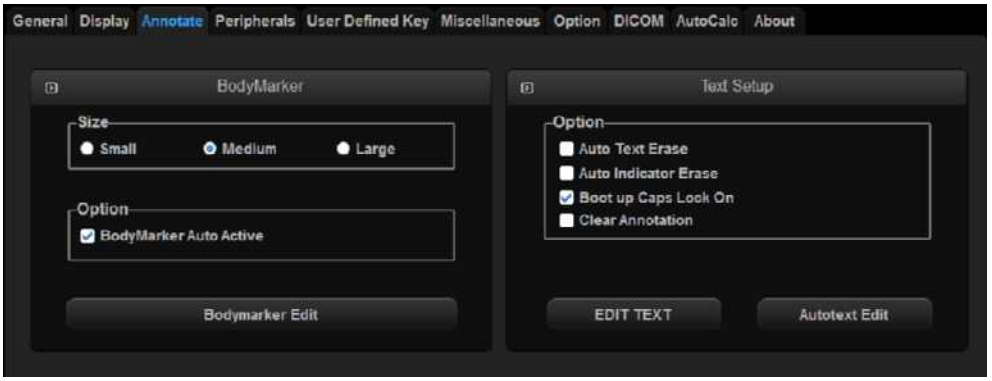
- **Touch Display**

  Select where to display TGC on the touch screen.

  - Left TGC Mode: TGC is displayed on the left side of the touch screen.
  - Right TGC Mode: TGC is displayed on the right side of the touch screen.

Annotate

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



[Figure 3.9 Setup - Annotate]

BodyMarker

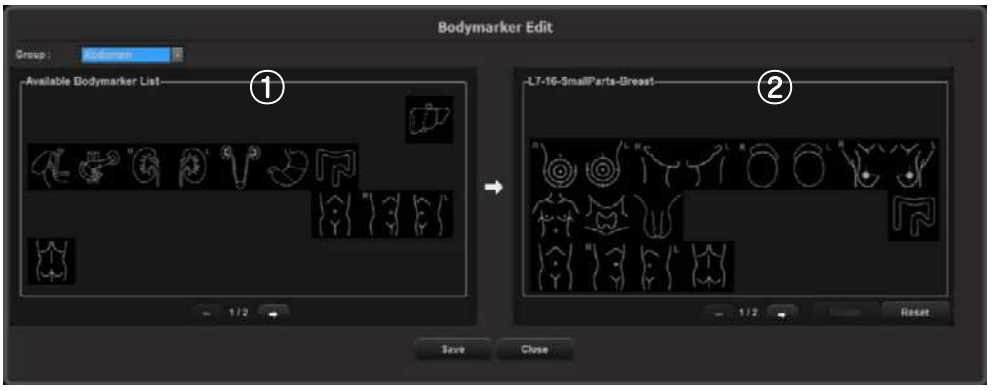
- **Size**

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

- **Option**

  - BodyMarker Auto Active: Select whether to activate the BodyMarker mode automatically when the active image area is changed.

- **BodyMarker Edit**



[Figure 3.10 BodyMarker Edit]

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

NOTE	You can add or save between 1 and 64 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 a BodyMarker from the right list (②) and double-click it.

- Saving **and Canceling the BodyMarker list**

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

- Resetting **the BodyMarker list**

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

Text Setup

Enable or disable features such as Auto Text Erase, Auto Indicator Erase, Boot up Caps Lock on, and Clear Annotation.

- **Auto Text Erase**

  If this checkbox is checked, all the texts that have been entered are erased automatically when you return to Scan mode by pressing the Freeze button after entering text.

- **Auto Indicator Erase**

  If this checkbox is checked, all the Indicators that have been entered are erased automatically when you return to Scan mode by pressing the Freeze button after entering text.

- **Boot up Caps Lock on**

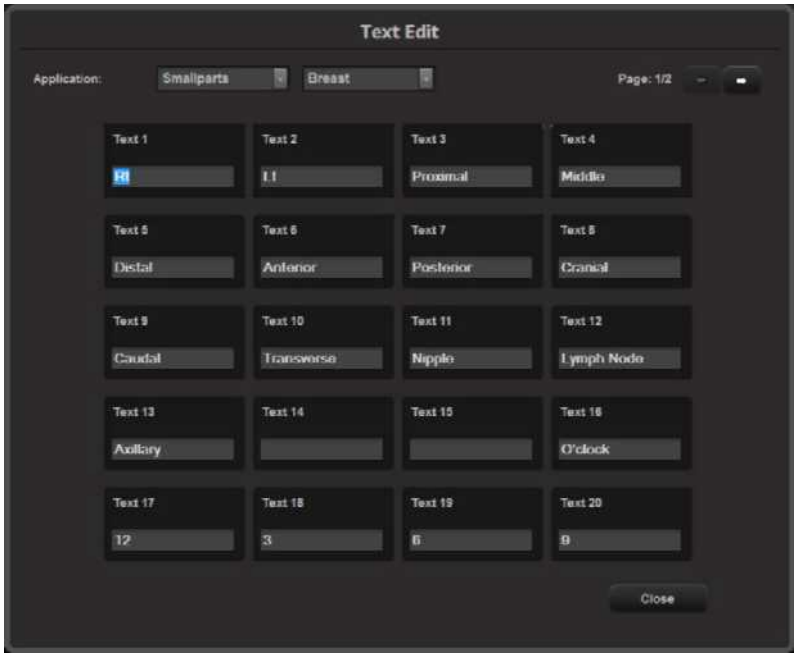
  If this checkbox is checked, Boot up Caps Lock On is turned on. This means that when text is entered, it is entered in capital letters.

- **Clear Annotation**

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

- **Edit Text**

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



[Figure 3.11 Edit Text]

- **Autotext Edit**

  Modify the list of abbreviations stored on the system. Press the button to switch to the *Autotext Edit* screen. To exit, press the **Close** button.

※ Autotext

Autotext is a function that accepts the abbreviations and automatically looks up and replaces them with the corresponding full term. 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'.

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.

- Modifying a word

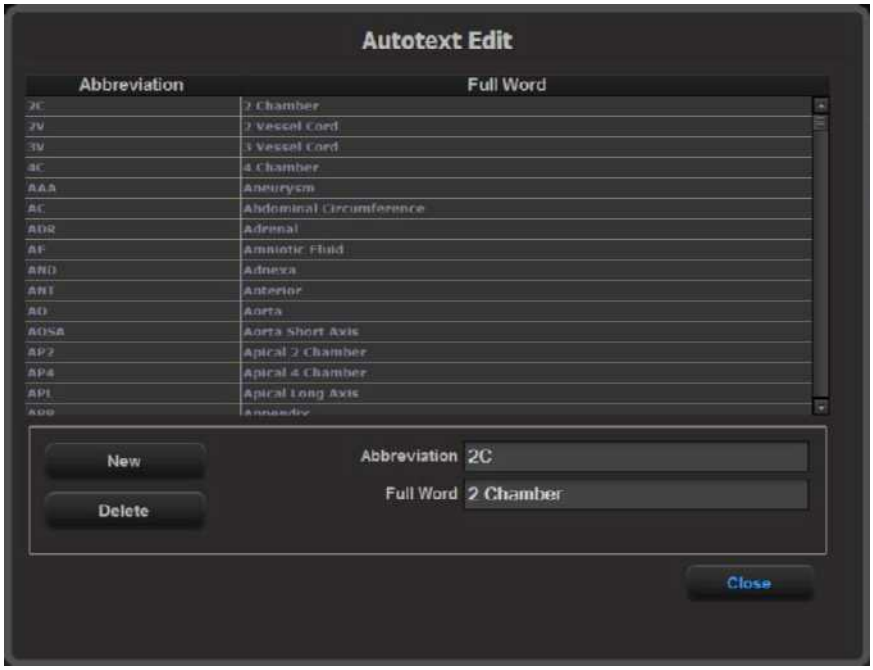
  1. Use the trackball and the **Set** button to select a word to modify from the list. In the Abbreviation and Full Word fields at the bottom of the screen, the abbreviation you have selected and the corresponding full term are displayed.
  2. Modify the words in the Abbreviation and Full Word fields.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

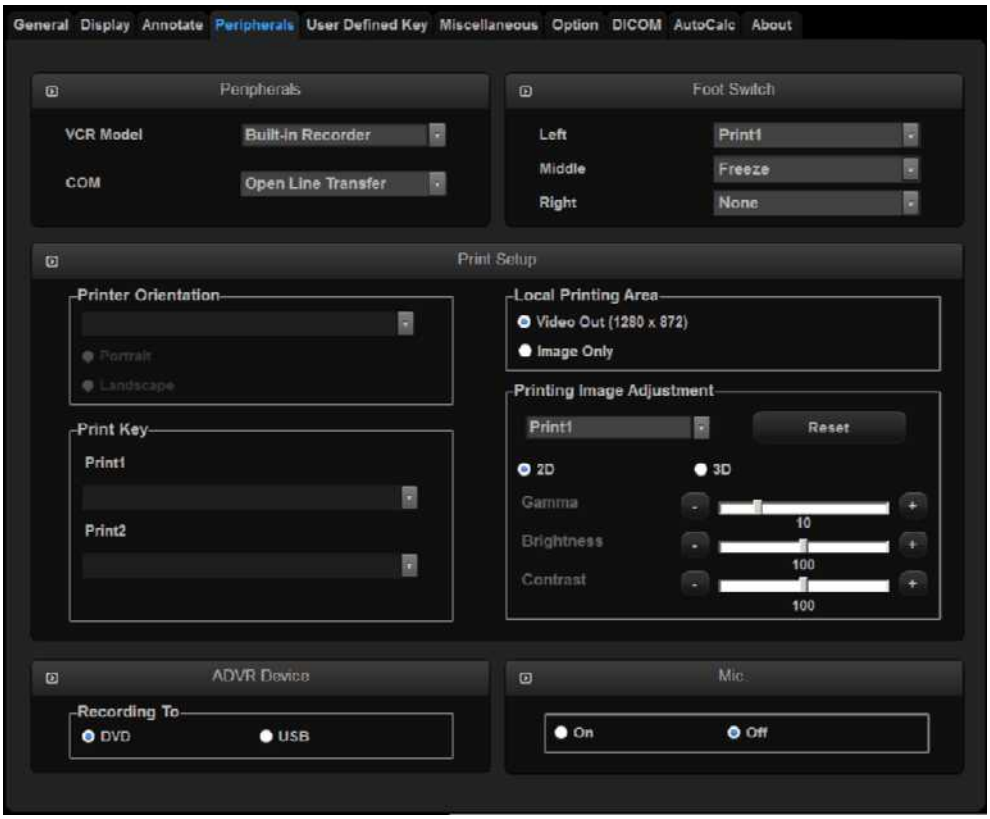
  1. Use the trackball and the **Set** button to select a word to delete from the list. In the Abbreviation and Full Word fields at the bottom of the screen, the abbreviation you have selected and the corresponding full term are displayed.
  2. Press the **Delete** button. A warning message will appear.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



[Figure 3.12 Autotext Edit]

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 3.13 Setup - Peripherals]

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.

Foot Switch

Set the functions of the left and right pedals of the foot switch. Configurable functions are: Freeze, Update, Record, Print 1, Save, Store Clip, Volume Start and Ez Exam.

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: Vertical orientation.
- Landscape: Horizontal orientation.

- **Print Key**

Used to assign printers to the control panel's **P1** and **P2** 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.

ADVR Device

- **Recording To**

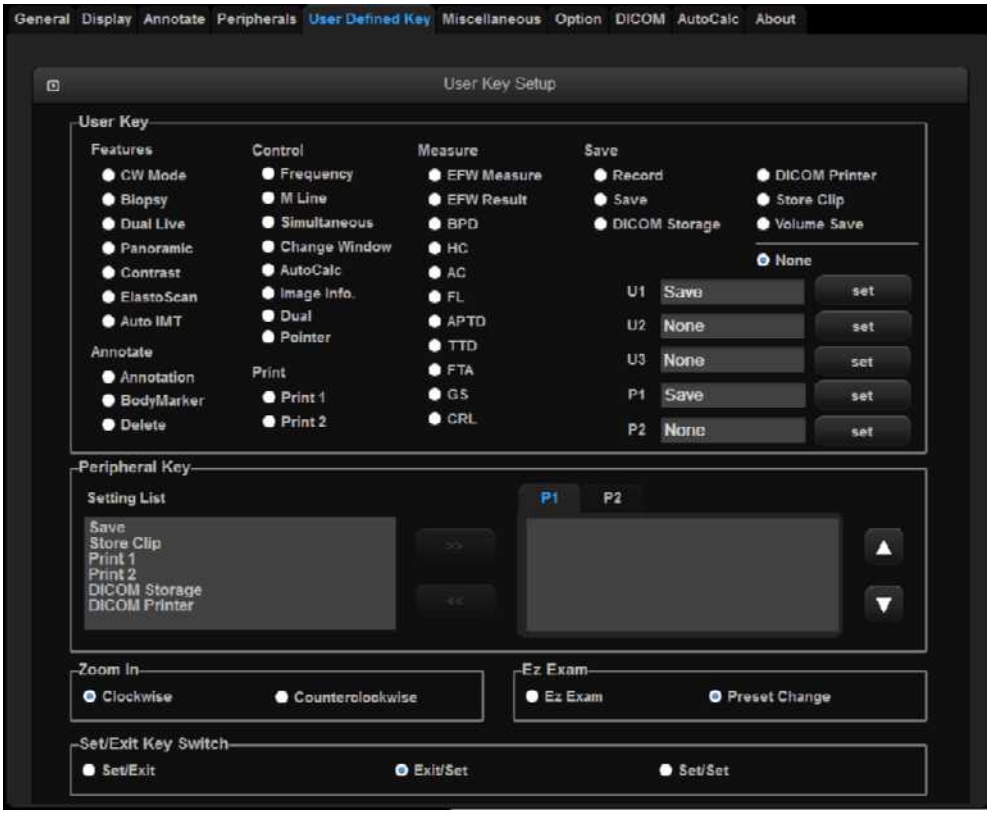
  Select a media type for real-time recording. You may select either DVD or USB.

Mic.

Set this to on or off using the trackball. The default setting for mic is off.

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 3.14 Setup - User Defined key]

User Key Setup

- **User Key**

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

Features	CW Mode, Biopsy, Dual Live, Panoramic, Contrast, ElastoScan, Auto IMT
Annotate	Annotation, BodyMarker, Delete
Control	Frequency, M Line, Simultaneous, Change Window, AutoCalc, Image Info., Dual, Pointer
Print	Print1, Print 2
Measure	EFW Measure, EFW Result, BPD, HC, AC, FL, APTD, TTD, FTA, GS, CRL
Save	Record, Save, DICOM Storage, DICOM Printer, Store Clip, Volume Save

- **Peripheral Key**

  Select the functions to assign to the Peripheral Keys (P1 and P2 buttons) on the control panel.

  Up to three functions may be assigned to the P1 and P2 buttons, including Save, Store Clip, Print1, Print2, DICOM Storage, and DICOM Printer.

  Select a function from the Setting List and then press **>>** to move it to the right side to assign the function.

- **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.

- **Ez Exam**

  Selects functions for Ez Exam dial-buttons on the control panel. You can select EZ Exam and Preset Change features.

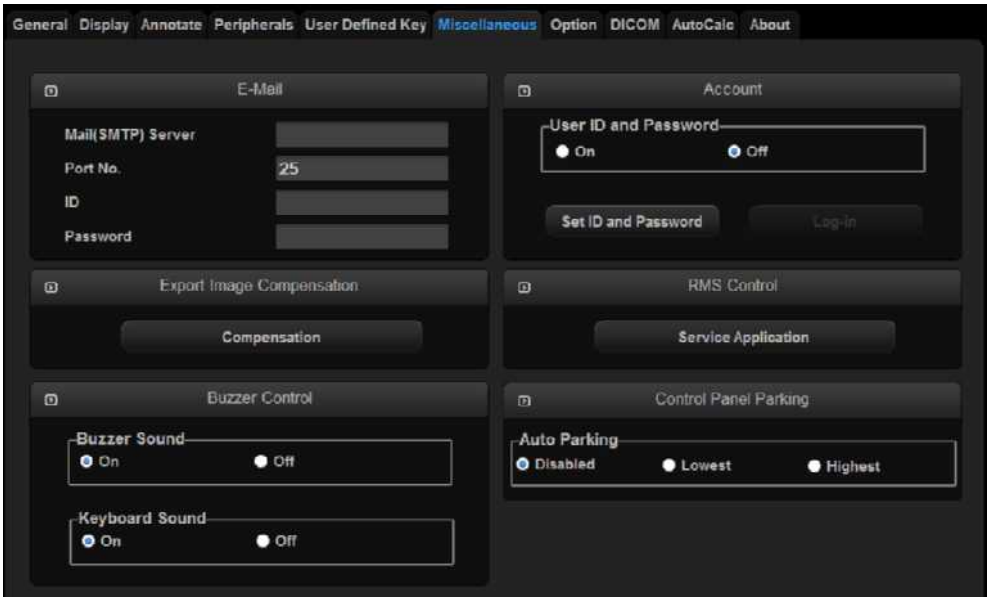
- **Set / Exit Key Switch**

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

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

Miscellaneous

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



[Figure 3.15 Setup - Miscellaneous]

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.

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.

[Figure 3.16 Compensation]

Buzzer Control

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

- **Buzzer Sound**

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

- **Keyboard Sound**

  Set this to on or off using the trackball. When this is set to on, the buzzer sounds each time screen keyboard is used.

Account

Register a user ID and password.

- **User ID and Password**

  Set the user account (Log-in) function. If the account is set to On, it can be used for the following areas:
  - Blank Image (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 (~, !, @, #, $, %, *, etc.)

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 errors that may be discovered 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.

Control Panel Parking

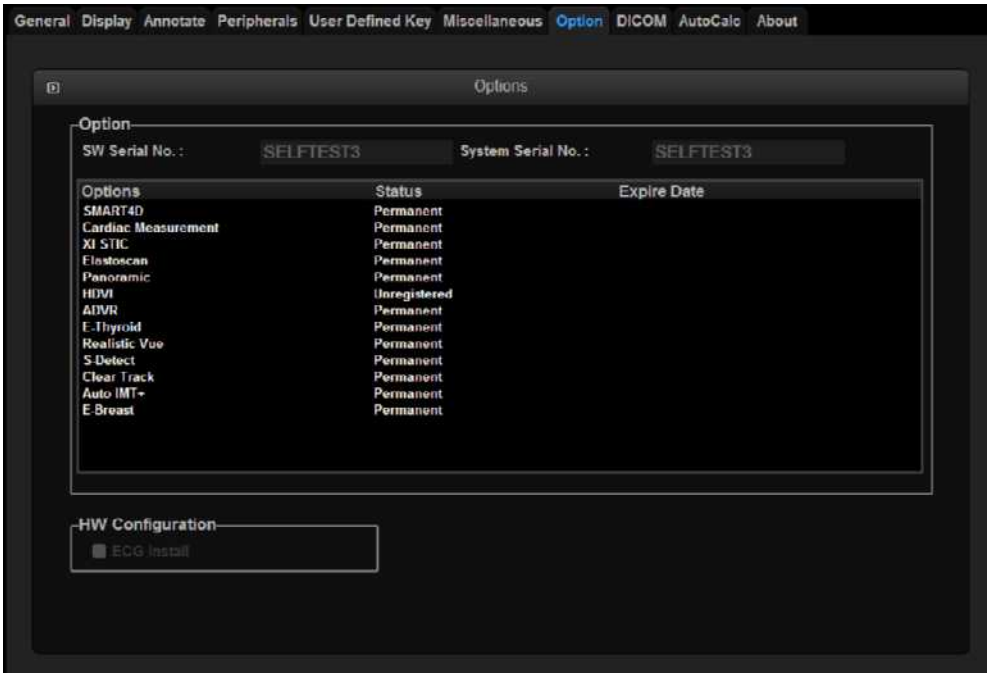
- **Auto Parking**

  Set the parking position to use when shutting down the system. You may select Disabled, Lowest, or Highest.

  - Disabled: The Control Panel positioning feature is disabled.
  - Lowest: The Control Panel will be positioned at the bottom of the screen.
  - Highest: The Control Panel will be positioned at the top of the screen.

Options

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



[Figure 3.17 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**

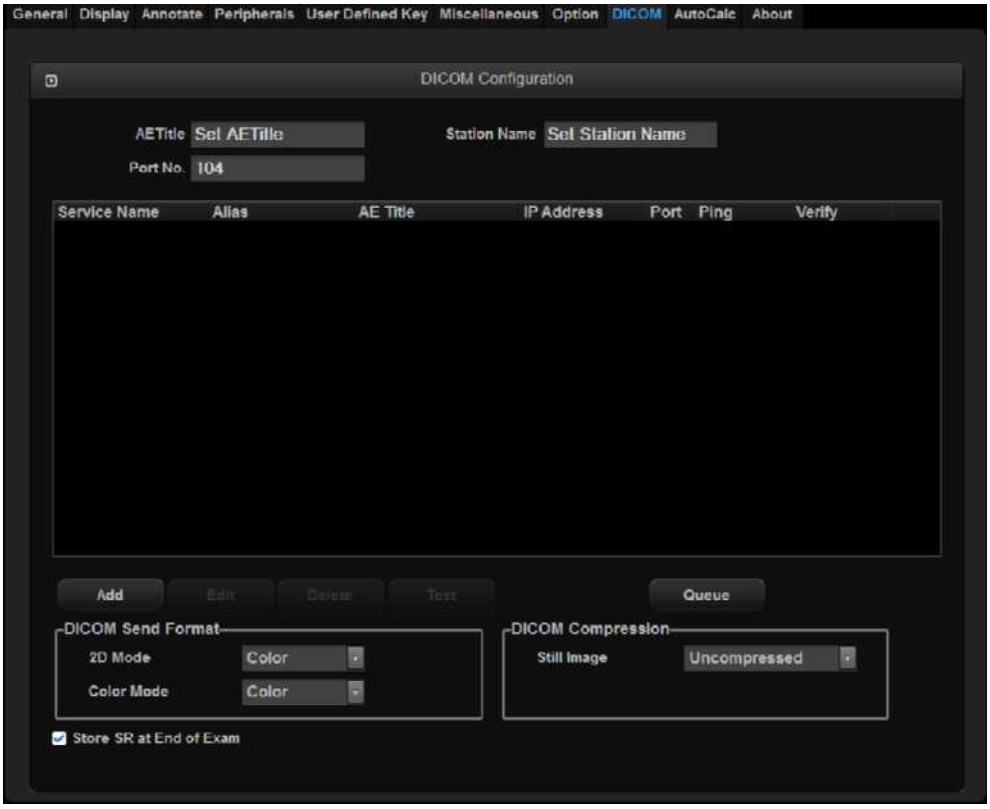
  The list of optional hardware will appear. Currently, only ECG is supported.

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

DICOM Settings

Select the **DICOM** tab on the *Setup* screen. Or tap **DICOM** on the touch screen. Used to configure DICOM (Digital Imaging and Communication in Medicine) operation and server.

NOTE	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 the DICOM for the system within a network. It is also used to transfer data to 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 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.

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, Printer, Worklist, PPS, SC and Storage SR.

- **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.

- **Transfer Mode**

  Select a transfer method:

  - Batch: 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.

- Manual: Send an image selected from the Exam List or in SonoView.

- **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

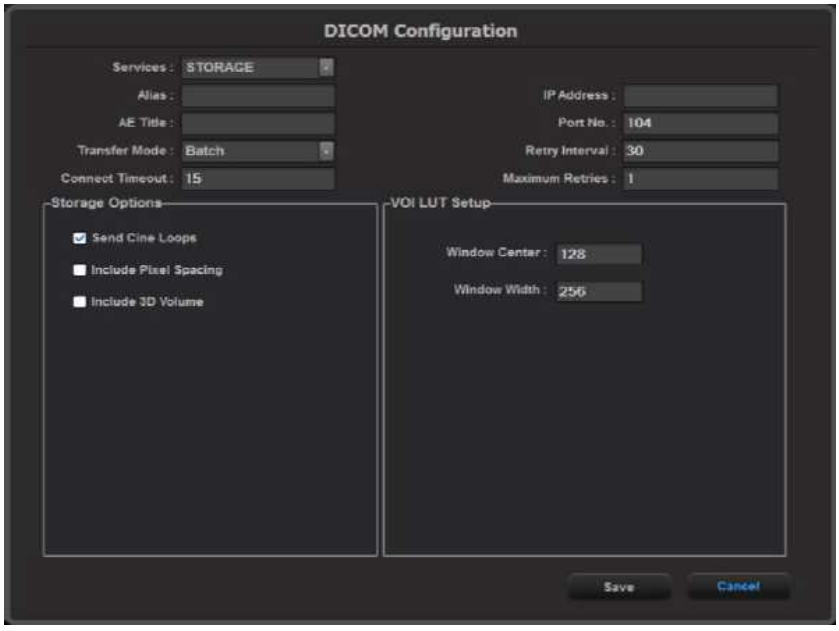
with the 3D images.

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 an image that is 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.



[Figure 3.19 DICOM Configuration - Storage]

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 a printer, please refer to the printer's user manual, or the 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 to resize 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 8inch x 10inch, 5inch x 11inch, 10inch x 12inch, 10inch x 14inch, 11inch x 14inch, 11inch x 17inch, 14inch x 14inch, 14inch x 17inch, 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.

[Figure 3.20 DICOM Configuration - Print]

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 *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 in 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 available only 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.

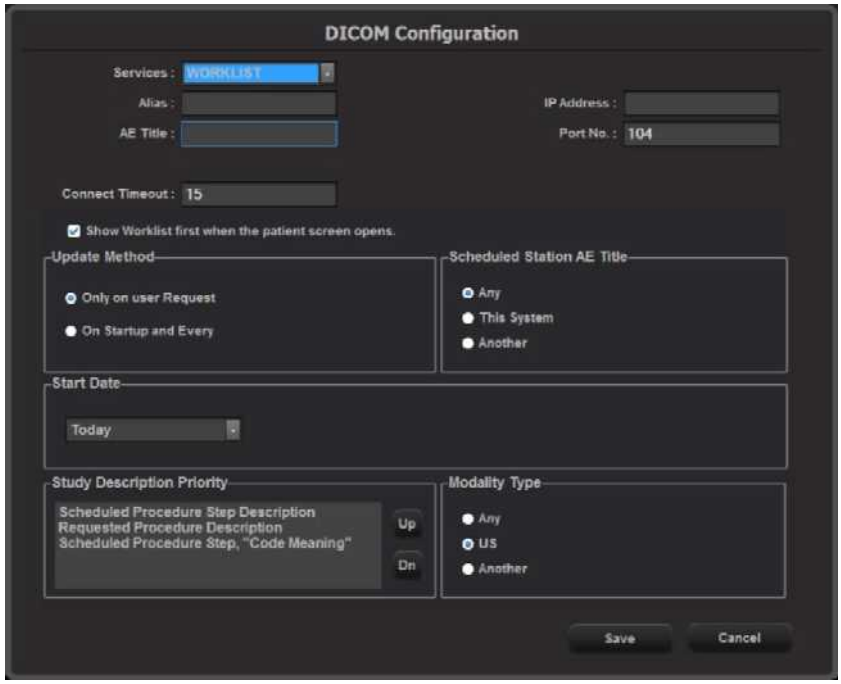
- **Study Description Priority**

  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”.

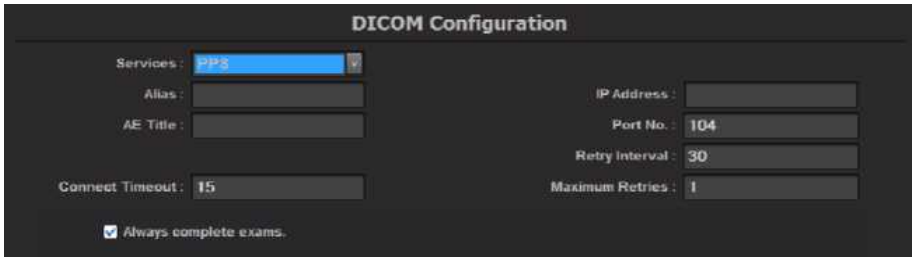


[Figure 3.21 DICOM Configuration - Worklist]

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.



[Figure 3.22 DICOM Configuration - PPS]

- **Always complete exams**

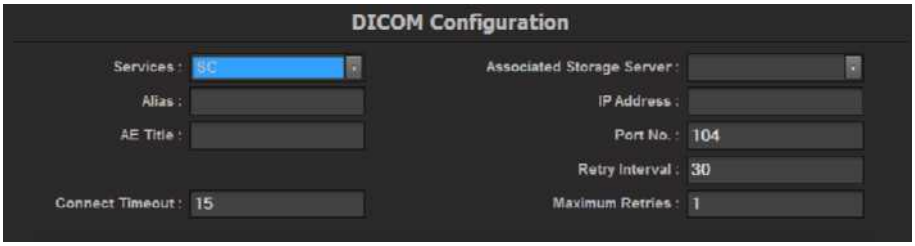
  When you check this checkbox, exams are always reported in complete condition. If you click the **Cancel** button without checking this checkbox, the cancel message is sent to the RIS server.

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.



[Figure 3.23 DICOM Configuration - SC]

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.

[Figure 3.24 DICOM Configuration - Storage SR]

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 a DICOM Service

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

Testing a DICOM Server

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.

[Figure 3.25 DICOM Job Status]

① Job ID: Displays the job ID.

② Patient ID: Displays the patient ID.

③ Alias: Displays the alias set in the *DICOM Configuration* screen.

④ Type: Displays the job type. The available job types are Storage, Print, Storage SR, MPPS Start, MPPS End, and Storage CMT.

⑤ Instances: Displays the number of instances. What this denotes differs depending on the job type. For Storage and Print, it means the number of images. For Storage SR, it means the amount of measurement data. For MPPS Start, it is always displayed as 0.

⑥ Date/Time: Displays the date and time when the job was created.

⑦ 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**

  Used to specify the log file management method.

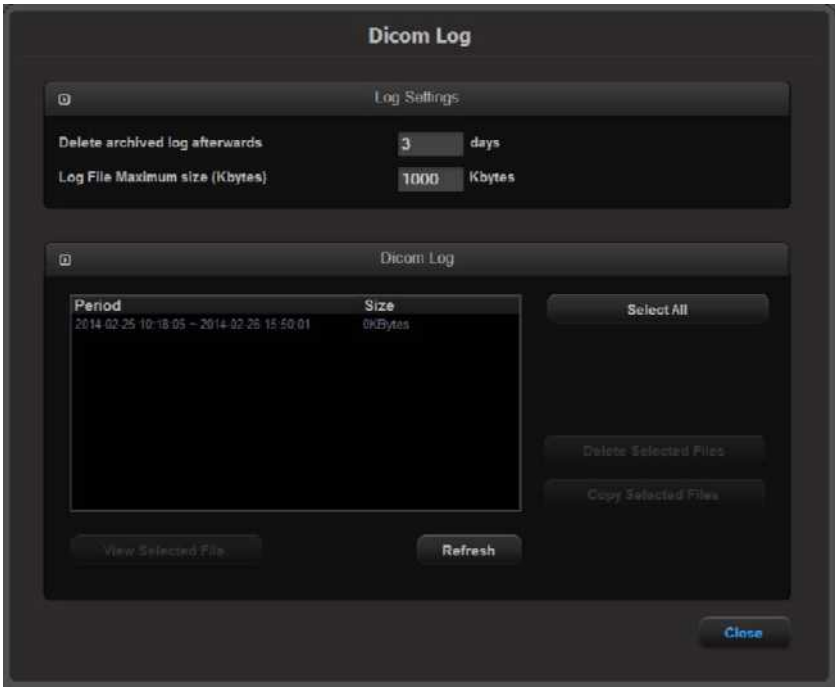
  - Delete Archived Log Afterwards: Used to specify how long to keep the log file. Enter a number of days. If the specified time has elapsed after the log file was created, the file is deleted from the system.
  - Log File Maximum Size: Specify the maximum size of a log file that can be archived. Enter 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 files 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.

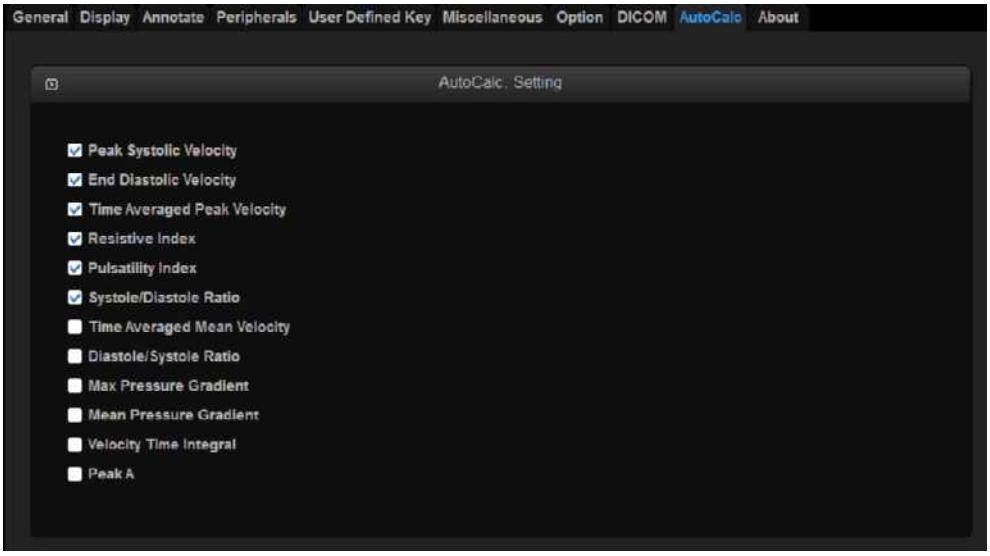


[Figure 3.26 DICOM Log]

AutoCalc

Select the **AutoCalc** tab on the *Setup* screen. Or tap **AutoCalc** on the touch screen. 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.



[Figure 3.27 Setup - AutoCalc]

AutoCalc. Setting

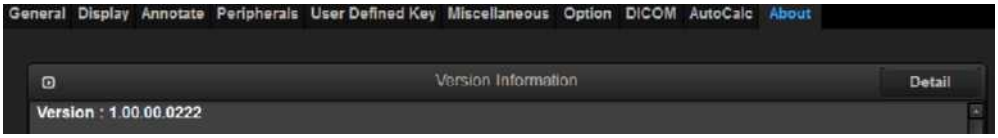
Add and remove automatic calculations by using the check boxes. You can select up to six values.

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.

About

Select the **About** tab in the *Setup* screen. Or tap **About** on the touch screen. Displays the software version of the product.

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



[Figure 3.28 Setup - 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 LED lights up.

BodyMarker Key

Verify that 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.

Inspect SonoView

Save images and Cine images in each mode.

Check for errors in saving the images.

Verify that Backup & Restore function correctly.

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 Select 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

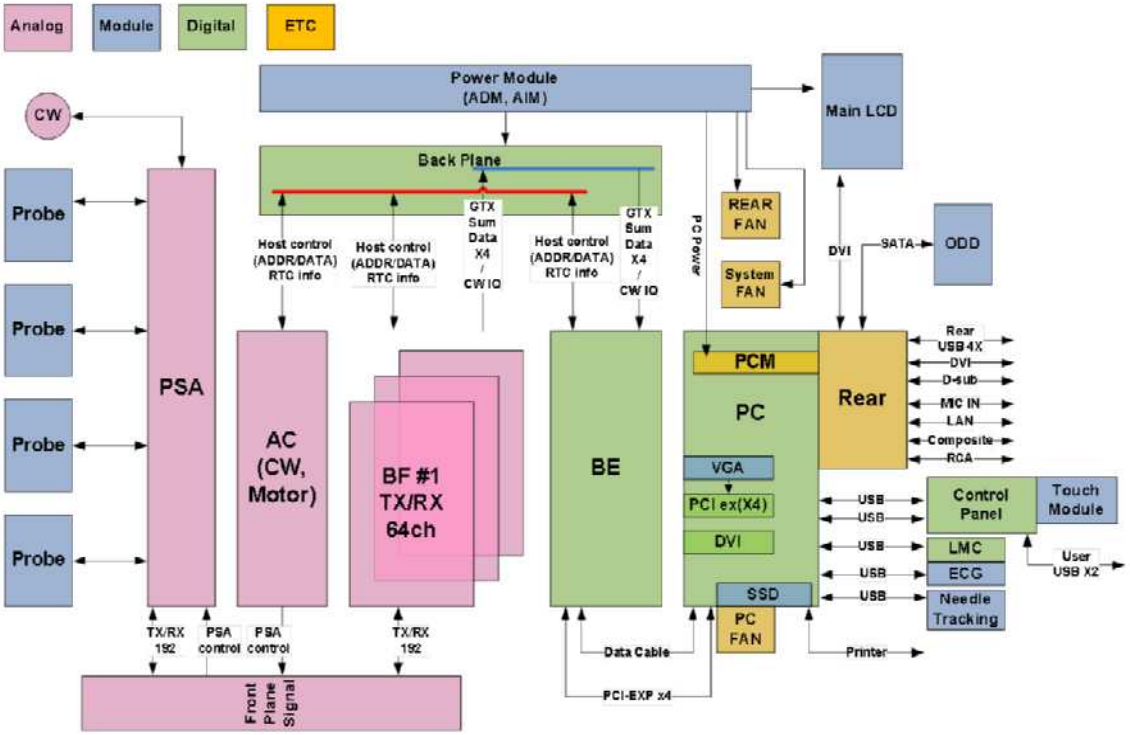
This is an ultrasound diagnostic imaging system utilizing software DSC.
It features a 23-inch Full Wide LED monitor and a 13.3-inch LED touch screen monitor, provides high-resolution ultrasound images, and includes premium-grade features. Samsung Medison's new proprietary technology is incorporated into the latest specifications 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:

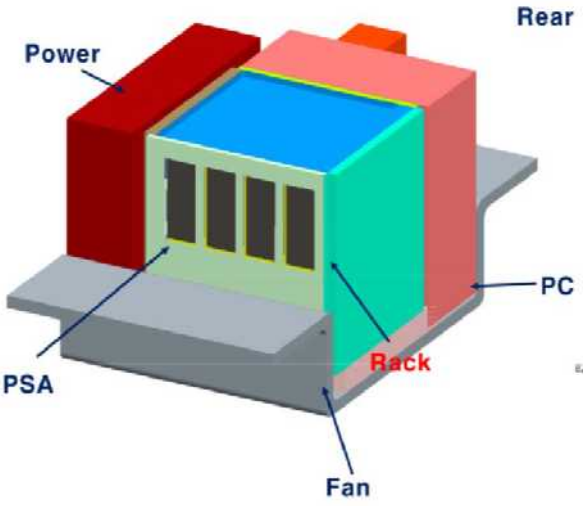
Monitor	**Main Monitor** 23" Full-HD Wide LED Backlight Panel(1920*1080), Folding **Touch Screen Monitor** 13.3" Full-HD Wide LED Backlight Panel(1920*1080), Tilting
PC	ATX size Server PC (Industrial)
CPU	Intel Xeon Processor E3-1275 (3.4G, 8M Cache, 4 core)
Memory	DDR3 SDRAM 16GB(4GB*4EA)
OS	Windows 7 Embedded Standard
Storage	SSD 512G (Booting Time 50sec), Samsung
VGA	VGA Card (Nvidia GTX 750TI)
Chanel	TX 192 CH
Probe port	4 Probe Port (with 1 port Dummy probe port)
3D Driver	AC B/D
Moving CP	Up/Down, Swivel CP using Button(motor installed)
Central Lock	3 Step (Locking Dual Front Wheels, Free, Straight)

The product's major structure includes the following:

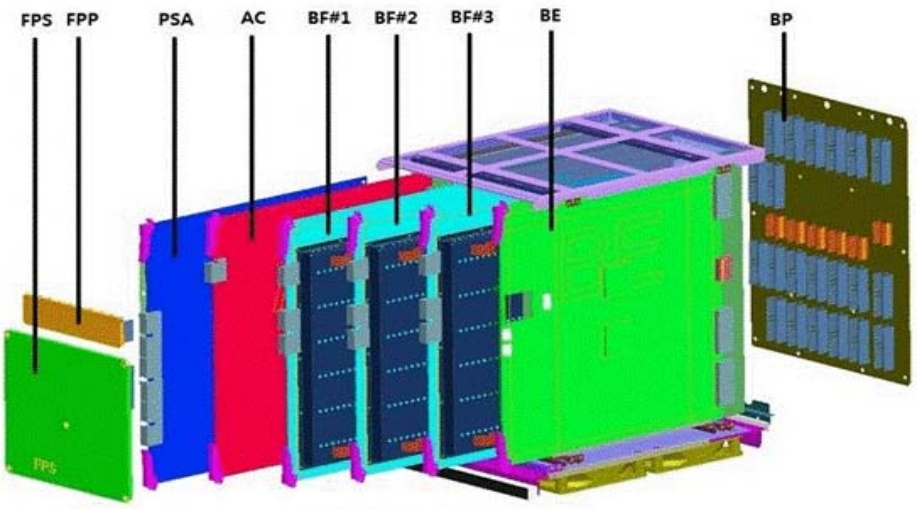
Ultrasound System Part	• PSA(Probe Select Assembly) 4 Ports • BF(Beamformer Board) 3ea 192ch • BE(Back End Board) • AC(Analog Control Board) • USB Clear Track • USB ECG Module • USB Foot Switch • Gel Warmer • Easy Install System FAN • Easy Install Side cover
User Interface Part	• 23” Full HD Wide LED Monitor • 13.3” Touch LED Backlight Panel • Key Matrix Board • Up/Down, Swivel, Auto CP button, • 1.2” Track Ball • SW ECG • Easy Touch
PC Part	• PC Module : Server PC CPU : Intel Core E3-1275(3.4G, 8M) • RAM : DDR3 SDRAM 16GB(4GB*4) • Storage : SSD 512G • VGA : GTX 750TI • Power Supported From DDM
Power Module	• ADM • AIM

System Block Diagram





[Figure 5.1 System Block Diagram]



Name	Full Name
FPS	Front Plane Signal
FPP	Front Plane Power
PSA	Probe Select Assembly
AC	Analog Control
BF	Beamformer (3EA)
BE	Back End
BP	Back Plane

[Figure 5.2 System Rack Design]

- **System Block Diagram Specification**

Components	Specification
Monitor	23” Full-HD Wide LED Backlight Panel(1920*1080), Folding
Touch	13.3” Full-HD Wide LED Backlight Panel(1920*1080), Tilting
PC	ATX size Server PC (Industrial)
CPU	INTEL Xeon Processor E3-1275 (3.4G, 8M Cache, 4 core)
Memory	DDR3 SDRAM 16GB (4GB X 4 EA)
OS	Windows 7 Embedded Standard
HDD	SSD 512G (Booting Time 50sec), Samsung
VGA	VGA Card (Nvidia GTX 750TI)
CHANNEL	TX 192 CH
PROBE PORT	4 Probe Port (with 1 port Dummy probe port)
3D DRIVER	AC B/D
Moving CP	Up/Down, Swivel CP using Button(motor installed)
Central Lock	3 Step (Locking Dual Front Wheels, Free, Straight)

Basic Structure of the Product

Overview

This product consists of the Ultrasound System Part and the User Interface Part. Considering electronic structure, it can be divided into a Front End Part, a Back End Part, a User Interface Part, and a Power Part. RS80A of the electronic structure is described below:

Electronic Structure

- **Front End Part**
  It consists of the PSA (Probe Select Assembly) and the BF (Beamformer). 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**
  Back End Part consists of the BE (Back End) of the Ultrasound System Part as well as the PC Module. BE (Back End) sends the RF signal generated by BF (Beamformer) as the raw data necessary for generating diagnostic images including BW, Color Doppler, PW Doppler, and CW Doppler in Image Processing and DMA Packet format to the PC Module, where it goes through various Post Processing to be displayed on screen. Up-to-date technologies including MultiVision and ClearVision are applied to provide more clear images.

- **User Interface Part**
  It consists of LED monitor, control panel and touch screen.

- **Power Part**
  Consists of AC Input Module (AIM) and AC-DC Module (ADM). AIM receives AC voltage and supplies AC power through the Circuit Breaker to ADM and AUX Output. ADM transforms AC power to DC Power and supplies power to the boards of the Ultrasound System and PC Module.

Ultrasound System Part

Processes the ultrasound data up to the stage before SW Post Image Processing. Detects probes and performs TX Focusing and RX Focusing based on the system information and application information sent by Host. When high voltage Pulser is sent to the probe according to TX Focusing, ultrasonic waves are generated. Echoes of ultrasound waves returning from the body go to an amplification circuit to undergo Digital Beamforming processing. The RF signal obtained here goes through various filtering and processing to generate I/Q signals such as BW, Color Doppler, PW Doppler, CW Doppler, Power Doppler, etc., which are sent to the PC Part to be post image processed and generate image signals.

The AC 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) Board
- BF(Beamformer) Board
- BE(Back End) Board
- AIM (AC Input Module), ADM (AC to DC Power Module)

PC Part

It displays ultrasonic information generated from the Ultrasound System Part on the screen. It consists of Scan Converter and image output circuits. It also performs control panel and interface functions.

The ultrasound image information from the Ultrasound System Part is connected to PC Part at PCIE Board connected via DMA, and the ultrasound image is displayed through software DSC and VGA.

Previous type of the ultrasound image scanner uses the Hardware DSC method, but this product uses the Software DSC and displays the ultrasound images on a LED monitor.

PC Part receives from ADM the same type of power as ATX Power.

The PC Part consists of the following:

- PCIE(Peripheral Component Interconnect Express) Board
- DVI(Digital Video Interface) Board
- VGA(Video Graphics Array)
- PC Mother Board
- Rear Module (Rear R Board + Rear L Board)
- PCM (PC Module) Board

User Interface Part

It consists LED monitor, control panel and touch screen that users can check and process ultrasound images. Images are sent by the Ultrasound Part to the LED monitor and peripherals. Image output includes VHS, S-VHS, Composite, and HDMI. Also with the control panel and touch screen, it provides features for users to set as needed.

The User Interface Part consists of the following:

- Monitor: 23” Full-HD Wide LED Backlight Panel(1920*1080)
- Touch Scrreen: 13.3” Full-HD Wide LED Backlight Panel(1920*1080)
- AD Board
- Control Panel Board + Control Panel USB Board
- Trackball

Power Part

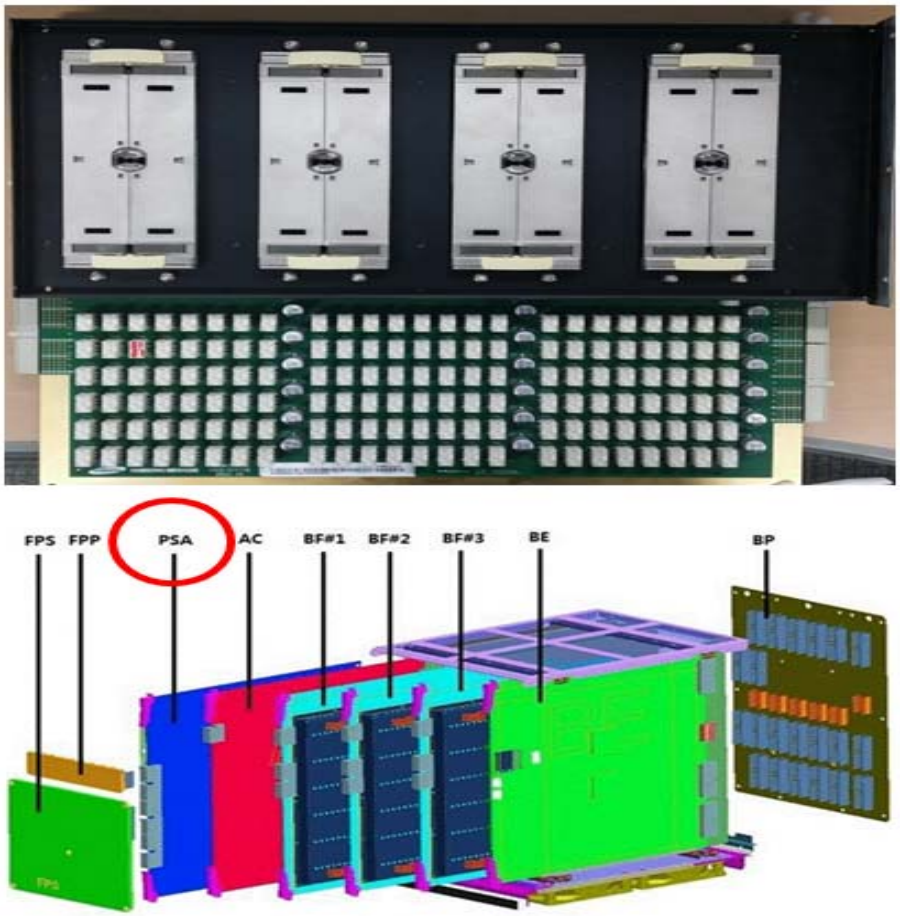
It transforms the 110/230V input AC voltage into DC power that is required by each part of the Ultrasound System. Power for PC Part is also supplied directly by ADM. AIM's switch acts as circuit breaker and prevents troubles caused by overcurrent.

Ultrasound System Part

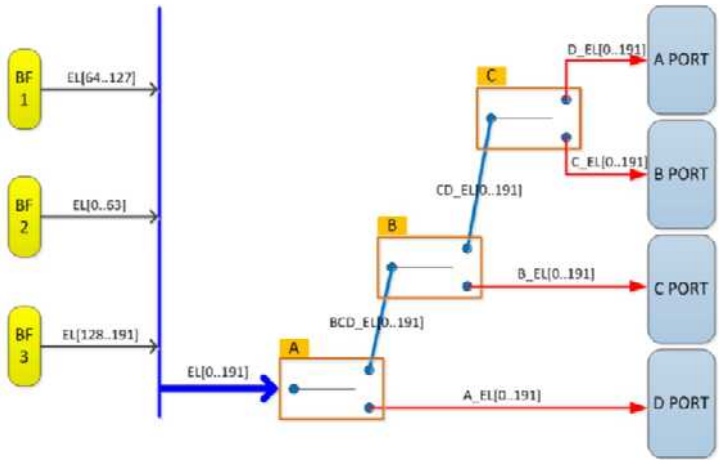
PSA

Main Functions

PSA connect the system to the probe. This product is equipped with four probe connectors (408-pin) and one CW-probe. 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. RS80A uses the probe select control signal transferred by the AC Board to actuate the relay and connect to each port of PSA to each channel through the FPS Board



[Figure 5.3 PSA Board Location Image]



	P_SEL_C	P_SEL_B	P_SEL_A
A_EL	1	1	1
B_EL	1	1	0
C_EL	1	0	0
D_EL	0	0	0

[Figure 5.4 PSA Board Block Diagram]

Specification

- 4 Probe Port Support
- CW Pencil Prob Port Support

Operational Principles

■ Probe Selection

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 Pencil Probe Connection

Static CW Probe uses coax-pin LEMO Connector.

LEMO Connector is located on a separate Connector Board and connected to PSA via a cable.

This Connector consists of two coax-pins and 6 pins. The two coax-pins are used for TX/RX of Static CW, and the 6 pins are used for Static Probe's Personality.

Beam Former Board

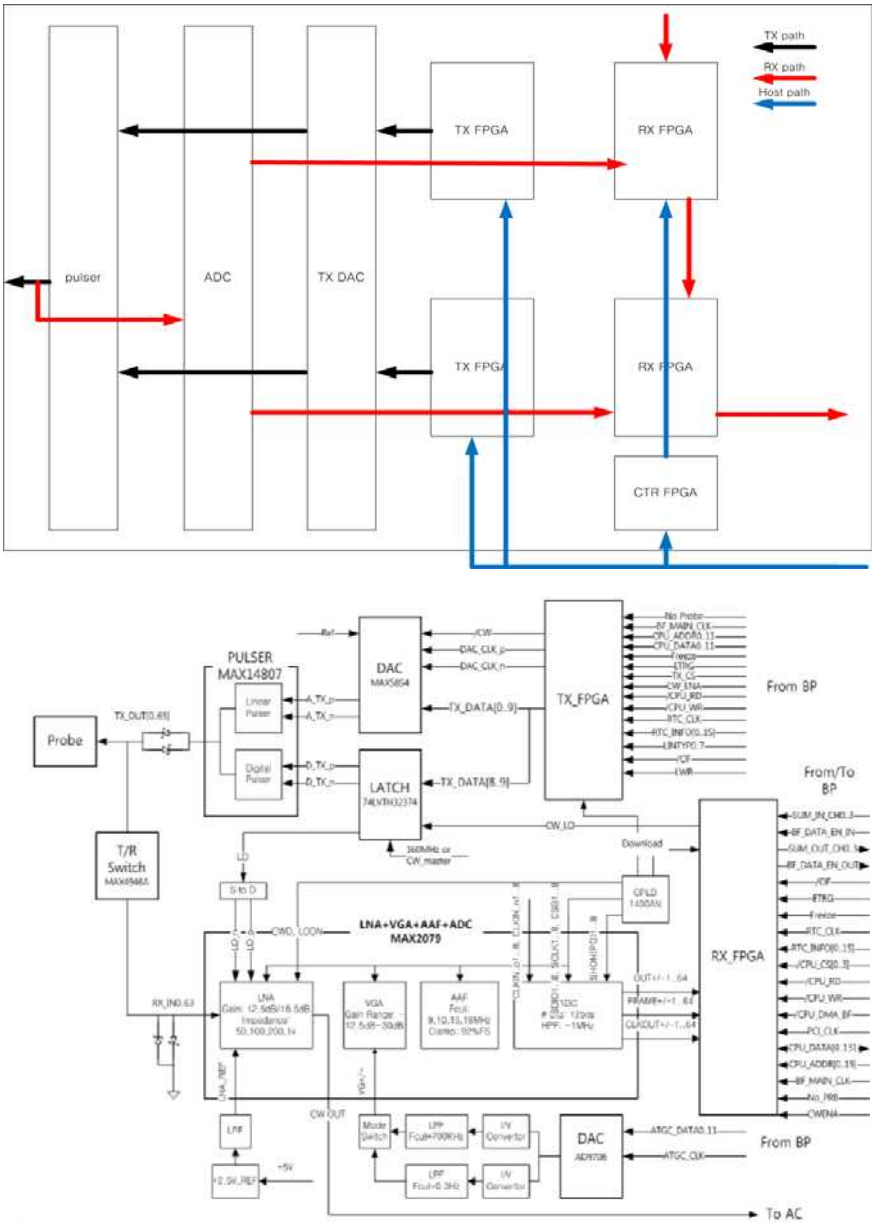
Main Functions

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 Beamforming. BF Board consists of Pulser, TR Switch, DAC, TX FPGA, ADC, RX FPGA, and CTR FPGA.

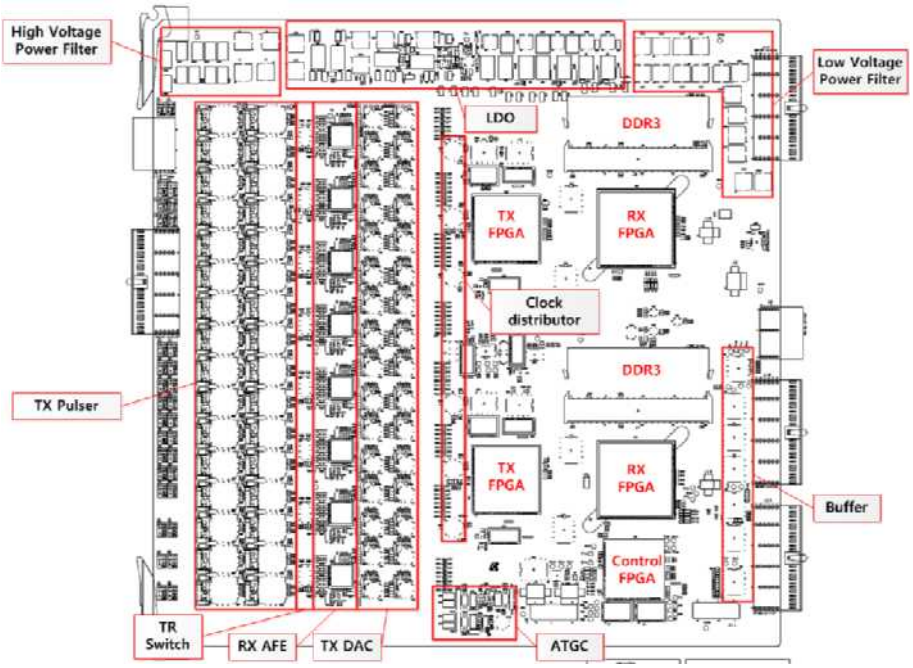
[Figure 5.5 BF Board Image]

- Pulser: It consists of three 64-channel boards, and operates 192 element probes. RS80A's Pulser outputs high-voltage DAC Wave to Linear Pulser.
- TR Switch: It controls the HV element sent from the probe so that it does not flow into ADC.
- ADC: It transforms the echo signals amplified by the internal LNA and TGC and converts them into digital data.

- RX FPGA: One RX FPGA handles Rx Focusing of 32-channel RX echo signals. It sums the RX Focusing Data of each BF Board and sends them to BE Part.
- TX FPGA: One TX FPGA handles 32 channels of TX Channel. Outputs TX focused TX Wave Data.
- DAC: Transforms the TX wave Data outputted by TX FPGA into analog wave and transfers it to the Pulser.



[Figure 5.6 Block Overall Diagram]



[Figure 5.7 PCB Layout]

Specification

- TX Pulser 32 (MAX14807, 2CH), Dual Pulser (Linear Pulser and Digital Pulser)
  - LNA : B & CD mode cover
  - Digital Pulser : PWD & CWD mode cover
- DAC(MAX5854) for Linear Pulser
- T/R switch 64CH + Limiter 64CH
- ALL IN ONE ADC 8(MAX2079, 8CH), LNA+VGA(TGC)+ADC
- TX FPGA (XC65150 2 ea)
- RX FPGA (XC6VLX240T 2ea)
- RX Dynamic Aperture
- RX Apodization
- Synthetic Aperture
- Trapezoidal imaging
- Multi-line receiving
- TX Focal point

Operational Principles

■ Transmit Channel

Transmit Channel handles approving high-voltage signal to probe element to generate ultrasound waves. RS80A uses Linear Pulser for arbitrary signal transmission.
For this purpose, it consists of TX FPGA, DAC, and Linear Pulser.

1) TX FPGA

TX FPGA uses RTC signals to calculate TX focusing and load pulse waveform in order to output waveform data to each TX Channel as DAC at standard time point.

2) DAC

DAC transforms the digital waveform received from TX FPGA into analog signal and transfers it to the Pulser.

3) Pulser

Pulser amplifies the waveform received from DAC and approves each probe element as high-voltage signals and drives them to generate ultrasound waves.

■ Receive Channel

Receive Channel amplifies the echo transmitted into and reflected from the media in human body. This signal is Analog to Digital Converted and Beamformed at RX FPGA. Afterward, it serves the function of sending the summed RF data to BE Board through each RX FPGA's Summing Chain. For this purpose, it consists of TR Switch, ADC, RX FPGA, and CTR FPGA.

1) TR Switch

Each probe element is parallel-connected to the TX Channel and RX Channel. Up to 180 Vpp Tx Pulse and mV-range Echo signals are mixed. However, the RX data actually required is the echo signal in mV range, which is very weak signal. TR Switch prohibits Tx Pulse from flowing into ADC input and permits low-level echo signals to pass.

2) ADC

RS80A uses all-in-one type ADC. One ADC performs the roles that would be performed by LNA, TGC, and ADC in previous systems. ADC amplifies the mV-range input echo signals and performs time-dependent gain compensation. It also sends digitally transformed Rx Data to Rx FPGA.

3) RX FPGA

RX FPGA RX focuses the RX Channel data received from ADC, and sums all channel data. This summed data is sent to the BE Board.

4) CTR FPGA

CTR FPGA downloads from Host the frame-by-frame RX calculation parameters that are required for generating images. It uses the information by the stored RTC to send the necessary calculation parameters for RX FPGA to the RX FPGA. It also servers as the Host Interface within the BF Board.

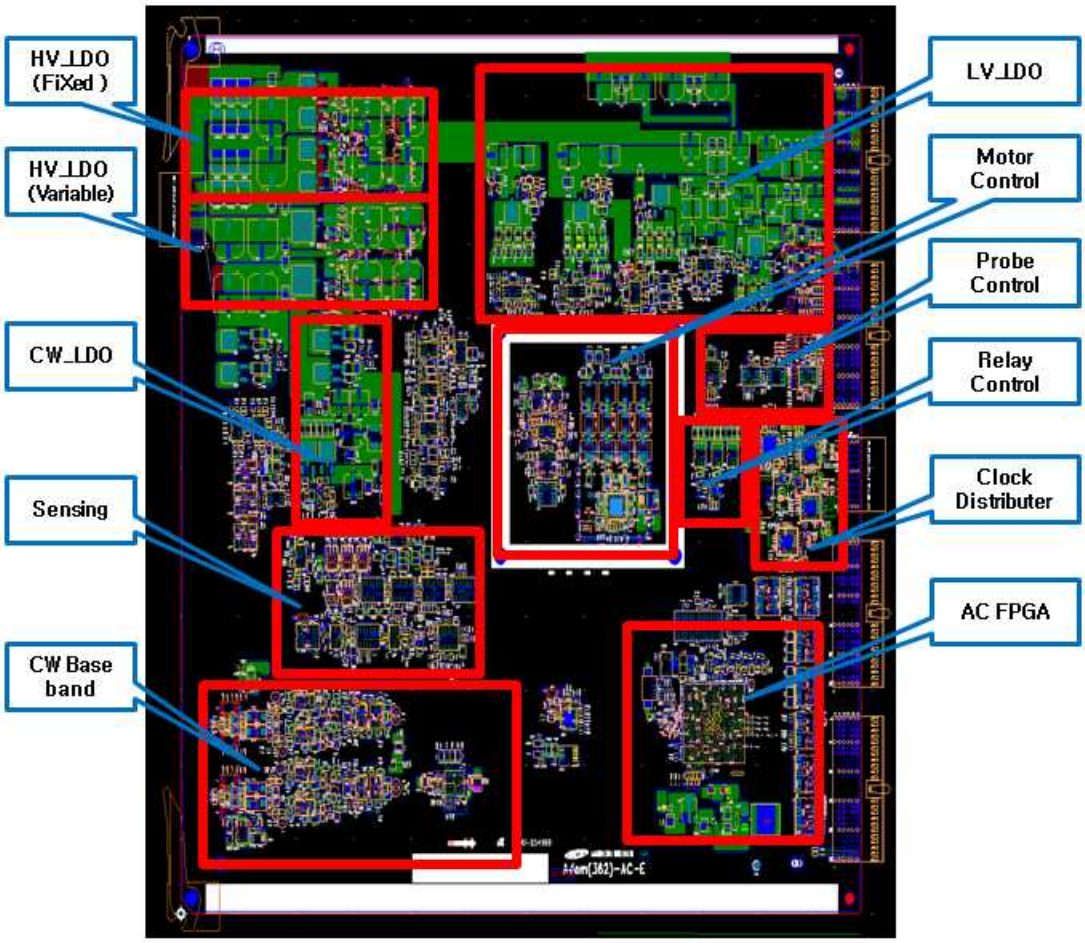
Analog Control

Main Functions

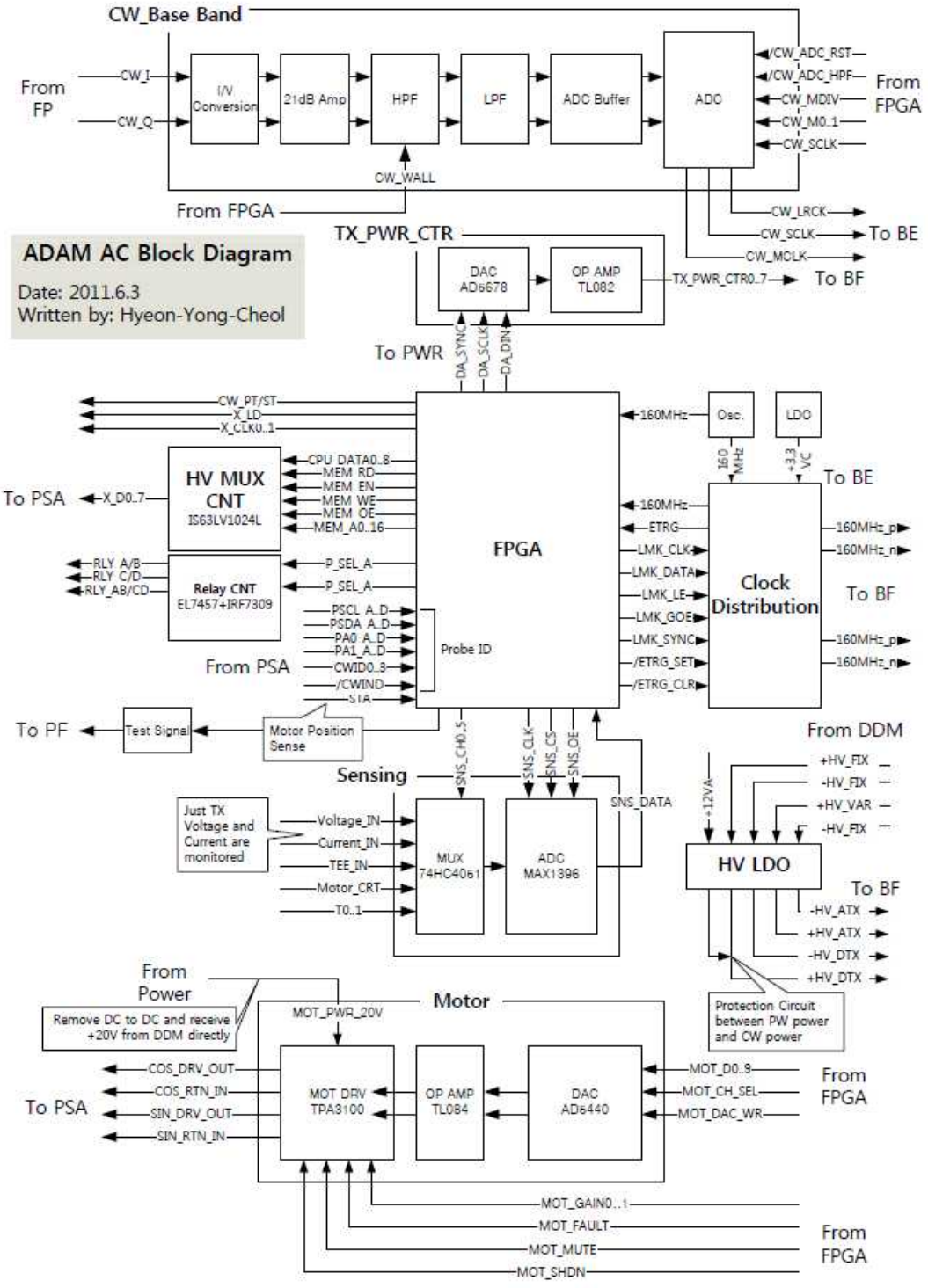
It performs 3D probe drive, Clock Generation, Probe Control, HV Switch Control, HV LDO, HV Control, and power sensing.

- CW Base Band: Check from Mixer to ADC circuit of the existing system
- Master Clock Generation
  - Master Clock 160MHz
  - Trigger Clock 40MHz
- HV MUX Control
  - Only applies to HV MUX in the probe
- HV LDO (Low Dropout Regulator)
  - Applies to ±HV_FIX, ±HV_VAR, CW_TX
  - The single power supply is used for CW_TX
  - Removing Ripple
- Sensing
  - Monitoring the High Voltage and current of BF board
- TX Power Control
  - TX Power Control Signal 16bit
- Motor
  - Motor control for 3D/4D movement
- Probe ID Read (Port Select)

[Figure 5.8 AC Board Image]



[Figure 5.9 AC Board Layout]



[Figure 5.10 AC Board Block Diagram]

Specification

- Master Clock Generation
- PSA Control
- Probe ID read(Port Selection)
- Probe HV MUX Control
- High voltage regulation & Control
- CW base-band Module
- Motor control
- System Diagnostic

Operational Principles

Master Clock Generation

AC Board provides standard clock (160Mhz, 40Mhz) that is needed by the ultrasound system in order to work through the Clock Buffer to each Board

Probe ID Read, PSA Control, Probe HV Mux Control

AC Board checks the status and ID of the Probes mounted to each probe port of the PSA and conveys them to SW. It controls the PSA Relay selected by the user and mounts it so that it can be used.

If the useable probe is a Mux probe, it controls the Mux probe by outputting the Mux data table for each scanline in order to connect the element that matches each scanline.

High Voltage Regulation, Control

AC Board configures LDO to each High Voltage Channel to supply noiseless high voltage to the BF Board. It also comprises the circuits for turning high voltage on/off and for Level Control.

CW Base Band Module

CW Analog Process receives Summing electricity sent through Wired Sum Path which is the signal outputted as electricity by the BF Board after performing LNA and Phase Shift. Afterward, the configuration transfers the data ADC'ed through LPF and HPF to BE.

■ Motor Cotrol

RS80's AC Board has Step Motor Control circuit to actuate a 3D probe and the Motor Drive circuit to drive it. When 3D is activated, the Motor drive actuates the probe motor through SIN, COS, and the Return Path of this signal to move the probe head.

As the probe head moves, the One Frame Trigger signal that matches the defined frame are provided to the BE Board to generate the 3D image.

Back End Board

Main functions

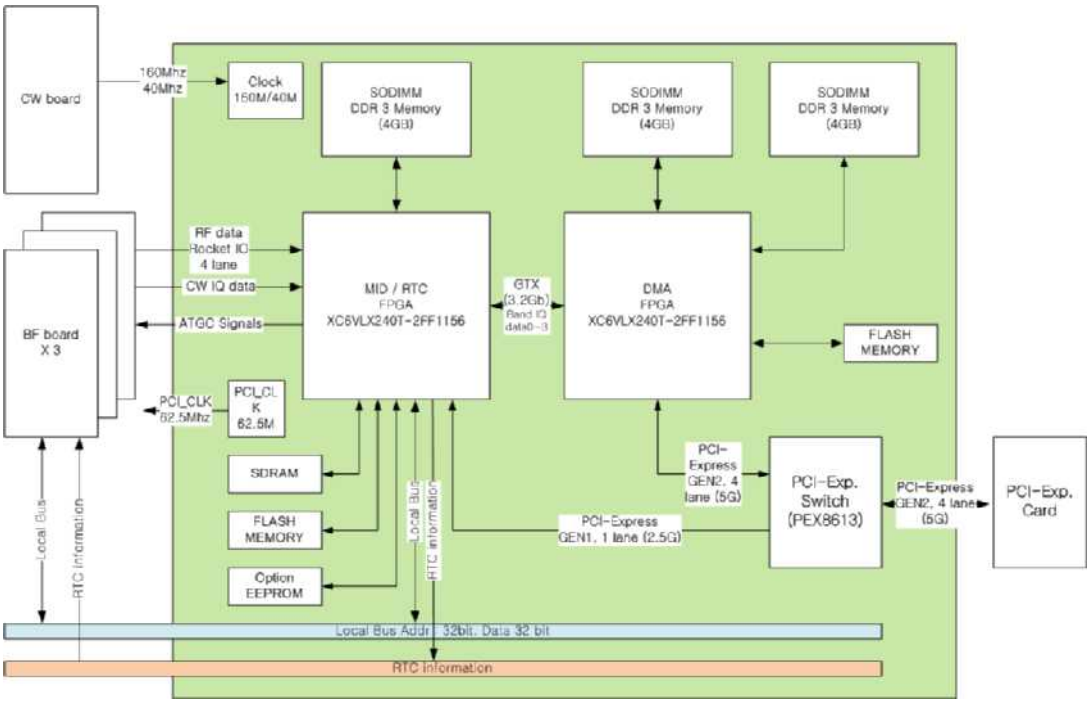
Back End Board (hereafter referred to as BE Board) includes the three key features as follows.

- RTC (Real Time Controller) / Host Interface
- DMA (Direct Memory Access) Control
- IQ Digital Signal Processing

RTC generates the control signals of the system and goes through RF data entered in BF board, and then transfers DMA through path.

Digital Signal Processing implements some functions of Mid Processor that is present in previous systems and transfer data to SW DSC via DMA. The data reconfiguration for the image implementation is handled by FPGA and the image implementation is handled by SW DSC.

[Figure 5.11 Back End Board Top Side]



[Figure 5.12 Back End Board Block Diagram]

Specification

- Focused RF Data Interface
- CW IQ data Interface(CWD)
- Host interface
- RTC(Real Time Controller)
- PCI-express Interface
- IQ Digital Signal Processing(DSP)
- Direct Memory Access

Operational principle of Digital Signal Processing (DSP) Part

Back End Board's MID FPGA comprises the Digital Signal Processing Part, which transforms the Focused RF Data inputted by the BF Board to Base-Band IQ Data.

The inputted RF Data goes through Gain Control, High-Pass Filtering, Quadrature Demodulation, and Decimation processes, and then sent to the DMA FPGA so that Base-Band IQ Data can be transmitted to the PC SW Module.

Operational principle of Host Interface & RTC Part

- **Host Interface**

  The Host Interface integrated into the MID FPGA is connected via PCI-Express Switch to the PC via PCI-Express 1Lane. The Host Interface part transforms the Host Command received from the PC to Local Bus to provide interface with each board of the Ultrasound System. Also, it provides to the PC the Probe Insert and Reject signals and the V-Sync for Image Update Sync as Interrupt.

- **RTC Part**

  The RTC (Real Time Controller), which is integrated into the MID FPGA, controls the operation of the system by generating the standard signals that are needed for the operation of the entire system in real time. 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.

  RS80A's RTC is built in such a way that it latches the RTC information through the RTC Decoder within each board as packet-structured RTC.

Operational Principles of DMA Part

The Direct Memory Access (DMA) Part, which consists of Back End Board's DMA FPGA, consists of PCI-Express Gen2 4Lane to transfer large-capacity Base-Band IQ Data in high speed, and performs the role of PCI-Express Interface within the FPGA.

It has DDR3 SODIMM (4Gbyte) external memory in order to save large capacity Base-Band IQ Data by frame.

PC Part

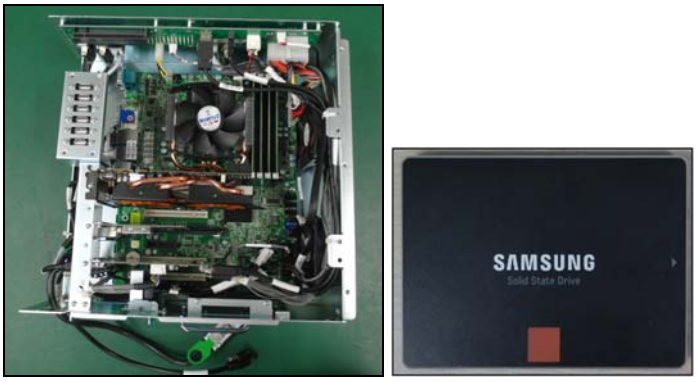
PC Module

Main functions

Certain functions of Digital Signal Processing, previously handled by hardware, are handled by Software Program; provides various peripheral ports for connecting the PCI-Express 4Lane and user interface for controlling the Ultrasound System and receiving Base-Band IQ Data. Consists of the Dual Port VGA Card for Main Monitor and Touch Panel, and DVI Board and Rear Module for various external video output.

Specification

- PC : ATX Industrial PC (Portwell, C206 Chipset)
- CPU : Intel Xeon E3-1275(3.4G, 8M cache, 4 core)
- RAM : DDR3 16GB Memory
- Storage : SATA SSD 512GB
- OS : WES(Windows Embedded Standard) 7
- VGA : General VGA Card(Nvidia GTX750Ti)
- PCI-Express 4Lane
- VHS, S-VHS, DVI output
- MIC input

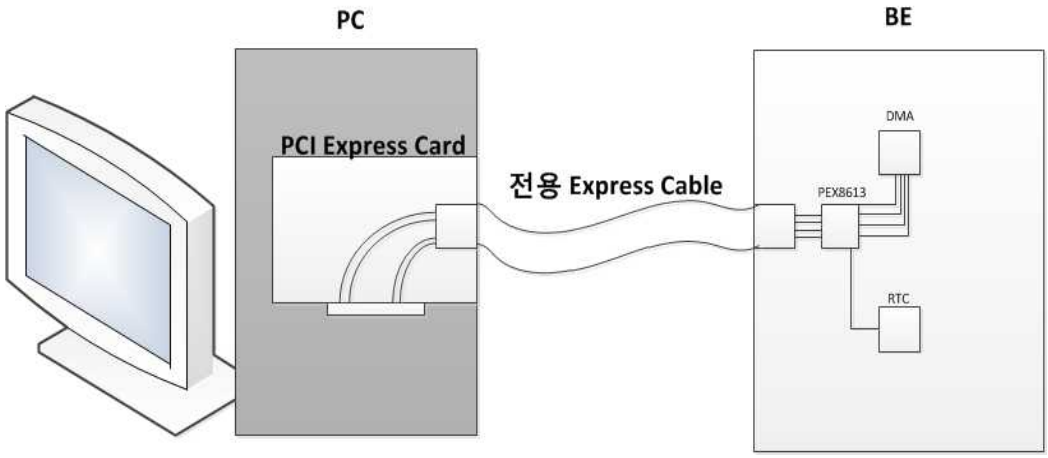


[Figure 5.13 PC Module & Storage]

PCIE(Peripheral Component Interconnect Express)

Main functions

It connects PC to BE with dedicated Express Cable.



[Figure 5.14 PCIE]

[Figure 5.15 PCIE Board Image]

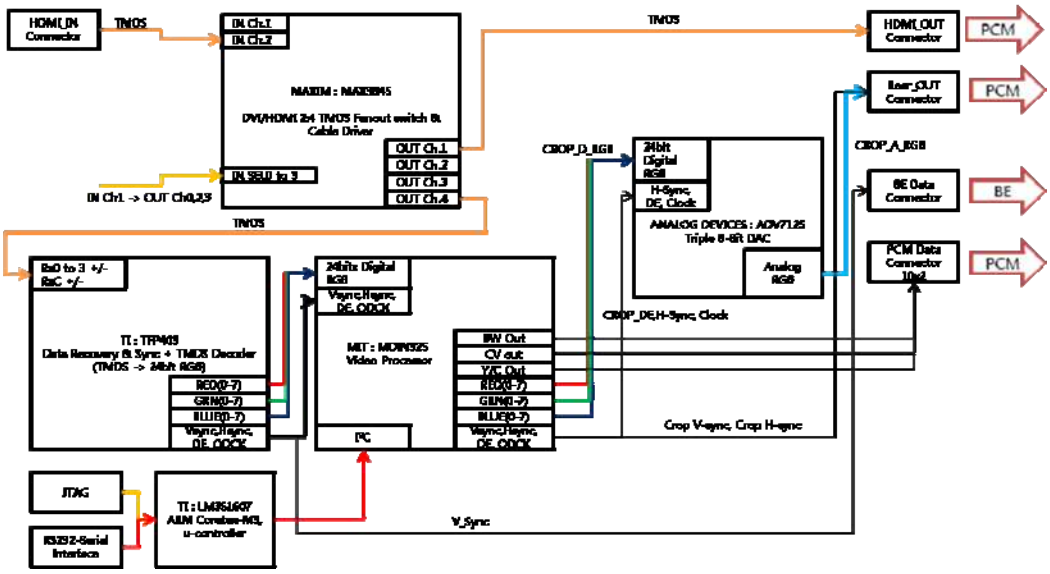
Specification

- Support PCI-Express Gen2 X4 communication
- Receiving COM equalization up to 36 dB gain.
- 12dB sending De-Amphasis
- Interface Between PC and BE for DMA data

DVI (Digital Video Interactive)

Main functions

It sends image signals from VGA Card to the main monitor. Using TMDS Detector, it provides BE Board with standard signals (V-Sync). Using MDIN325, it generates signals of VHS, S-VHS, B/W and Analog RGB.



[Figure 5.16 DVI Board Block Diagram]

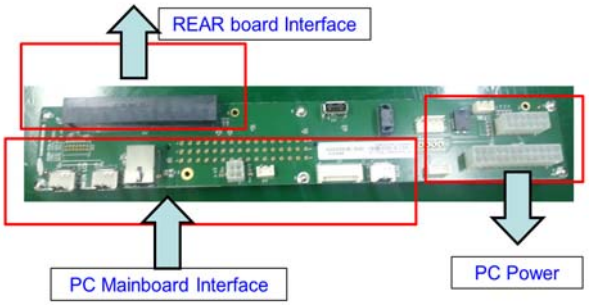
Specification

- VHS, S-VHS
- DVI
- MIC Input Path
- Main Monitor, Touch Screen HDMI Port

PC Module

Main functions

PCM Board supplies power for PC and connects Rear Module to PC I/O. It sends image signals to Main Monitor and Touch Screen.

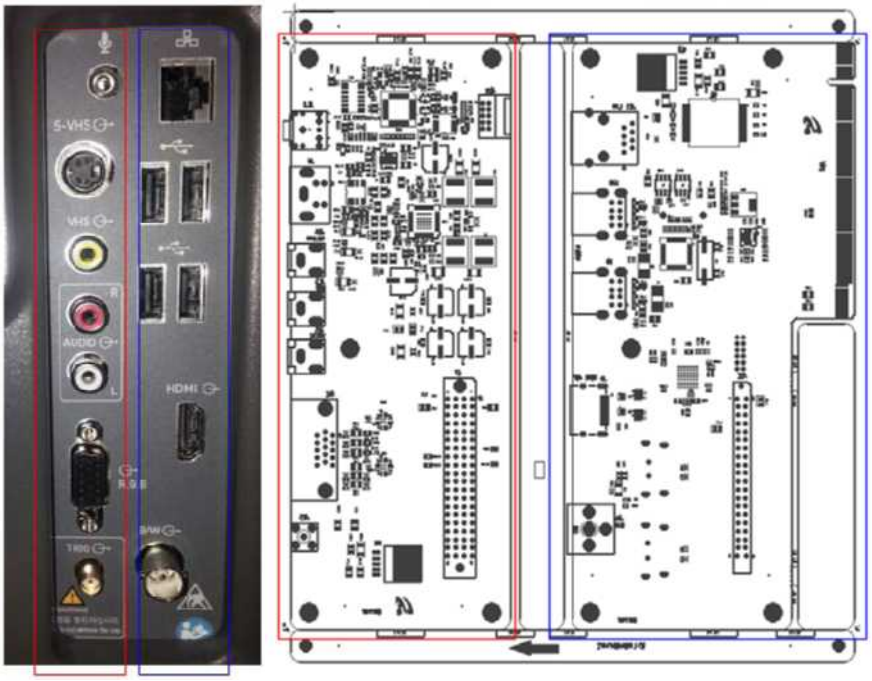


[Figure 5.17 PCM Board Image]

Rear Board

Main functions

It serves as In/Out Interface for external devices and data interface with the control panel. It displays images on the screen and touch screen. Provides VHS, S-VHS, and DVI Ports to support various external video storage.



[Figure 5.18 Rear Board & Lay Out]

Specification

- Rear Left
  - MIC
  - S-VHS Out
  - VHS
  - RGB Out
  - Ext. Trigger Out
- Rear Right
  - LAN Port
  - USB Port X4
  - HDMI Port
  - B/W Out Port

User Interface Part

PTM (Potentiometer)

Main functions

It controls location of the automatic lift.

[Figure 5.19 Potentiometer Board]

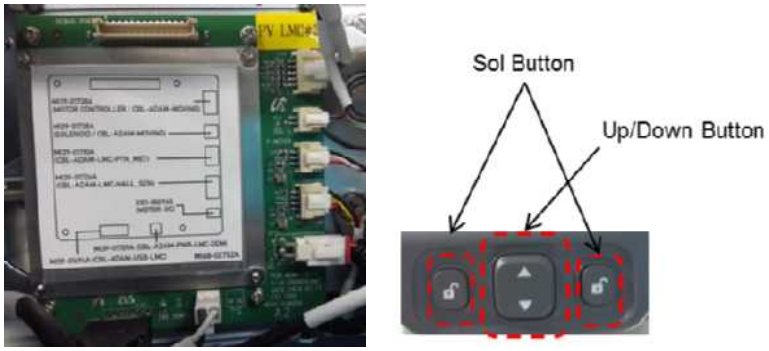
Specification

- **Output part**
  - 0 ~ 5V
  - 1K to 100 K ohms

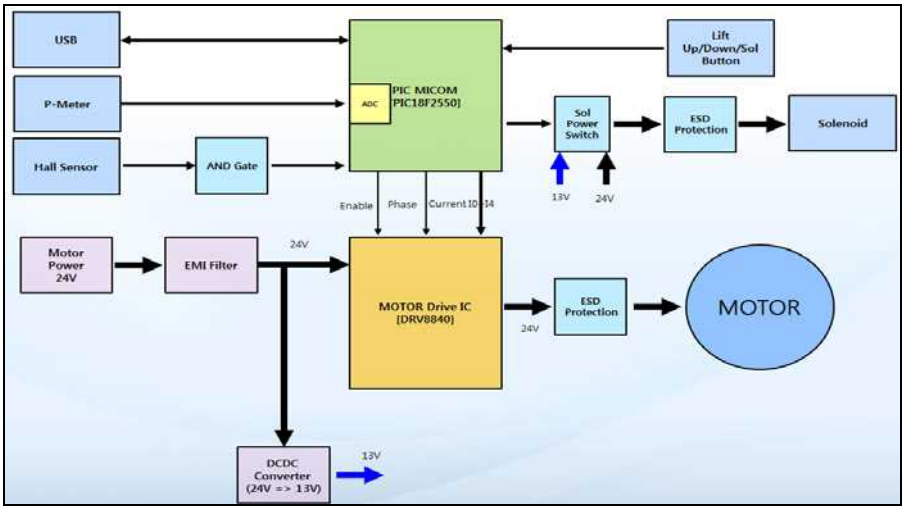
LMC (Lift Motor Control)

Main functions

It controls the automatic lifts. It uses USB CDC communication to control via COM port in the main board.



[Figure 5.20 LMC Board & Lift Button]



[Figure 5.21 LMC Block Diagram]

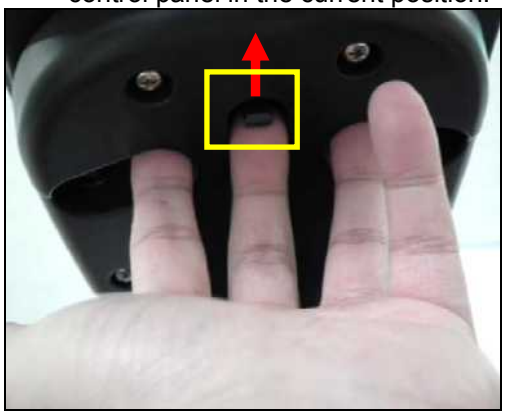
Specification

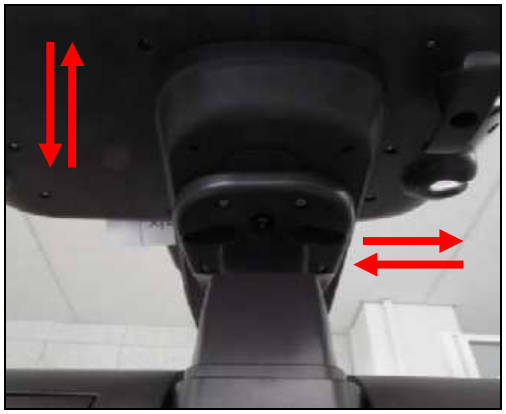
- **Control part**
  1) PIC18F2550 (USB Controller)
     - USB CDC interface
     - Motor Drive IC Control
  2) DRV8840(Motor Drive IC)
     - Control motor through current control
- **Input part**
  - Up/Down, Sol Button Input
  - Potentiometer input(0 ~ 5V ADC)
  - Hall Sensor input
- **Output part**
  - 24V/12V Solenoid Out(1A)
  - 24V Motor Out (rated 1A, Max 5A)

LMC (manual operation of control panel lift)

Adjusting Left-Right/Forward-Back

1. Press and hold the manually operated lever at the center of the control panel handle, and move carefully to the left or right to adjust the position. Release the lever to fix the control panel in the current position.





Moving Up and Down

1. Press and hold the manual operation lever on the top of rear ventilation and move carefully upward and downward to adjust the position. Release the button to fix the control panel in the current position.

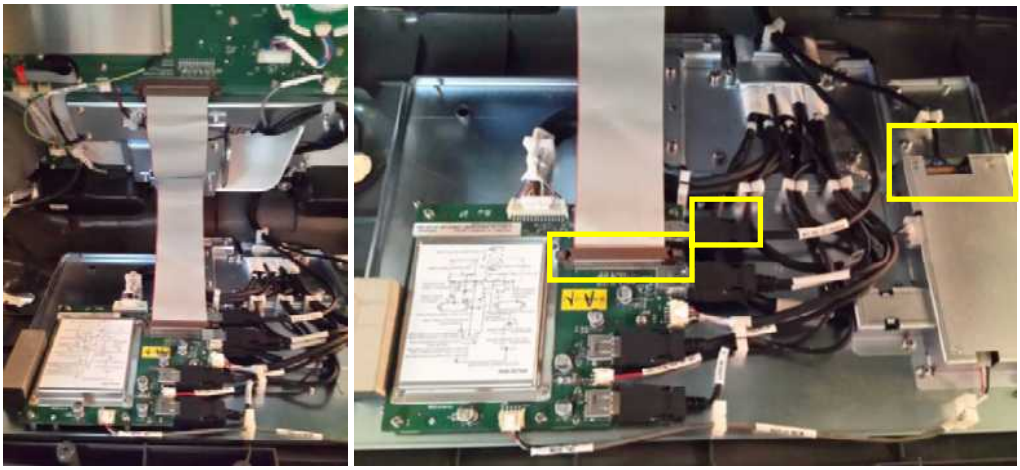
Control Panel

Main functions

It serves as the interface between the user and the system. It connects to the Key Matrix Board, Touch-Screen, and Trackball via USB hub, and operates by following the user's commands.

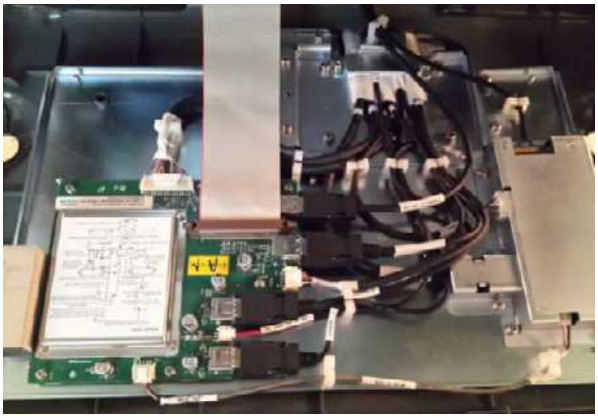
Control Panel Module

[Figure 5.22 Control Panel Module Top Board]



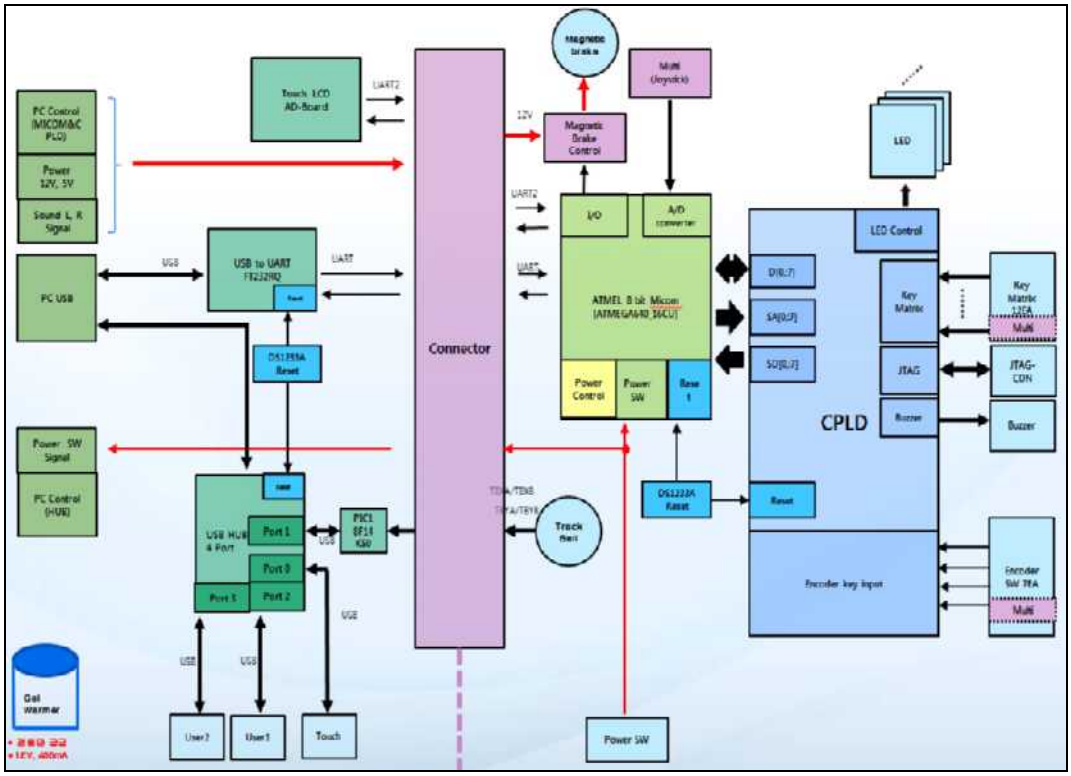
[Figure 5.23 Control Panel Top & Bottom Connection]

[Figure 5.24 Track Ball]



[Figure 5.25 Control Panel USB Board]

[Figure 5.26 Touch-Screen Tilting Control]



[Figure 5.27 Touch-Screen Control]

Specification

- **Input part**
  - It consists of Switch, Encoder and Trackball.
- **Control part**

  1) ATMEGA640(8bit Microcontroller)

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

  2) MAX II EPM1270 (Altera CPLD)
  - Touch Panel power on/off Control
  - LED outputs / Knob control
  - Trackball power on/off control

  3) PIC18F14K50 (USB Mouse Controller)
  - Track ball interface

  4) Touch Tilt Control
  - Magnetic brake power for touch tilt on/off control

5) Lift Up/Down, Sol Control

- On/Off control for lift movement up/down and swivel

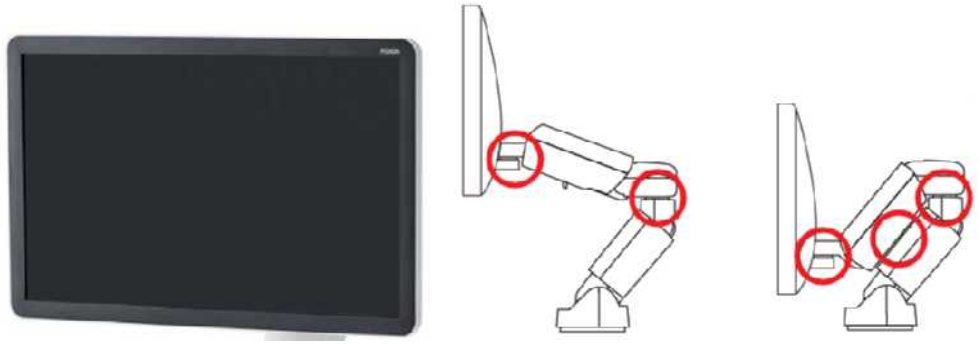
• **CP_USB Part(Bottom Board)**

- supplies power and transfers signals to the CP Board
- connects PC to each I/O module (Touch, Track Ball, USB 2Port)
- sends CP control signals to the PC

Monitor

Main functions

23 Inch Samsung Full-HD Wide LED Panel is applied. Monitor height and position can be adjusted.



[Figure 5.28 Monitor& Monitor Arm]

Specification

ITEM	SPECIFICATION	UNIT
Display area	23” Inch Samsung Display	Inch
Number of Pixels	1920 x 1080 RGB stripe arrangement	Pixels
Pixel Pitch	0.2475 (H) × 0.2475 (V)	mm
Electrical Interface	LCD Panel Input: HDMI	
Display colors	16.7M(8 bit/color)18.5	
Viewing angle	89°/89°/89°/89° (CR≥10)	
Display mode	Normally Black	

Touch-Screen

Main functions

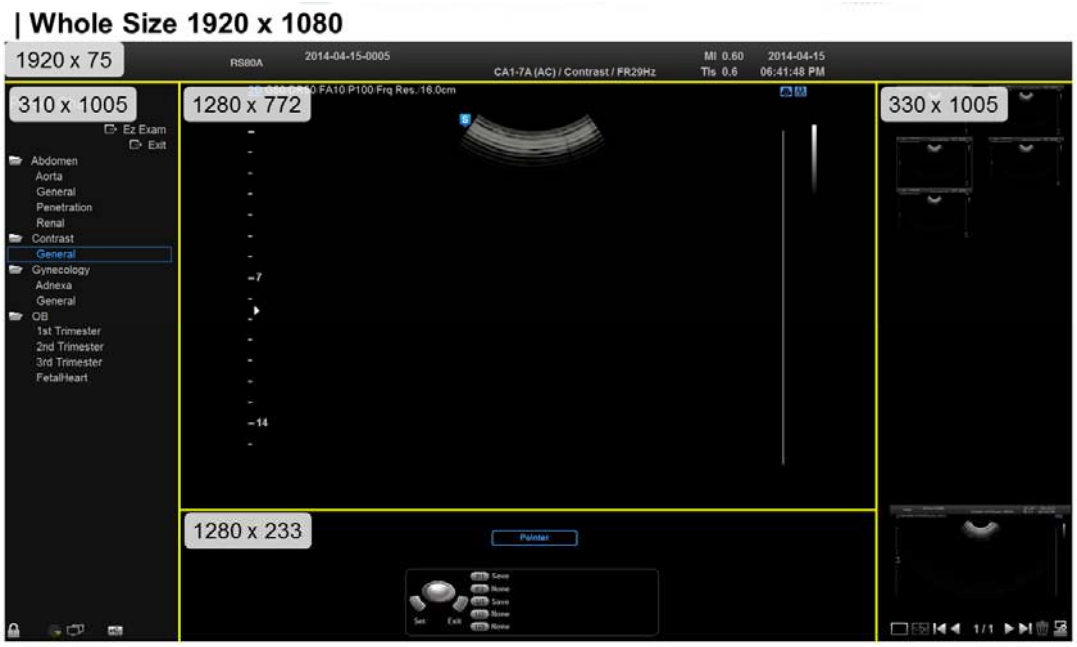
Full HD LED Panel is applied. It controls the angles between 35° and 65°.

Touch 5.29 Touch-Screen

Specification

ITEM	SPECIFICATION	UNIT
Display Size	13.3 Inch	mm
Display colors	16,777,216	colors
Number of pixel	1920 x R.G.B x 1080	pixel
Pixel arrangements	RGB vertical stripe	
Pixel pitch	0.1529 (H) x 0.1529 (V)	Mm
Display Mode	Normally Black	
Surface treatment	Hard coating (3H), Anti-Glare	

Display Layout



[Figure 5.30 Display Layout]

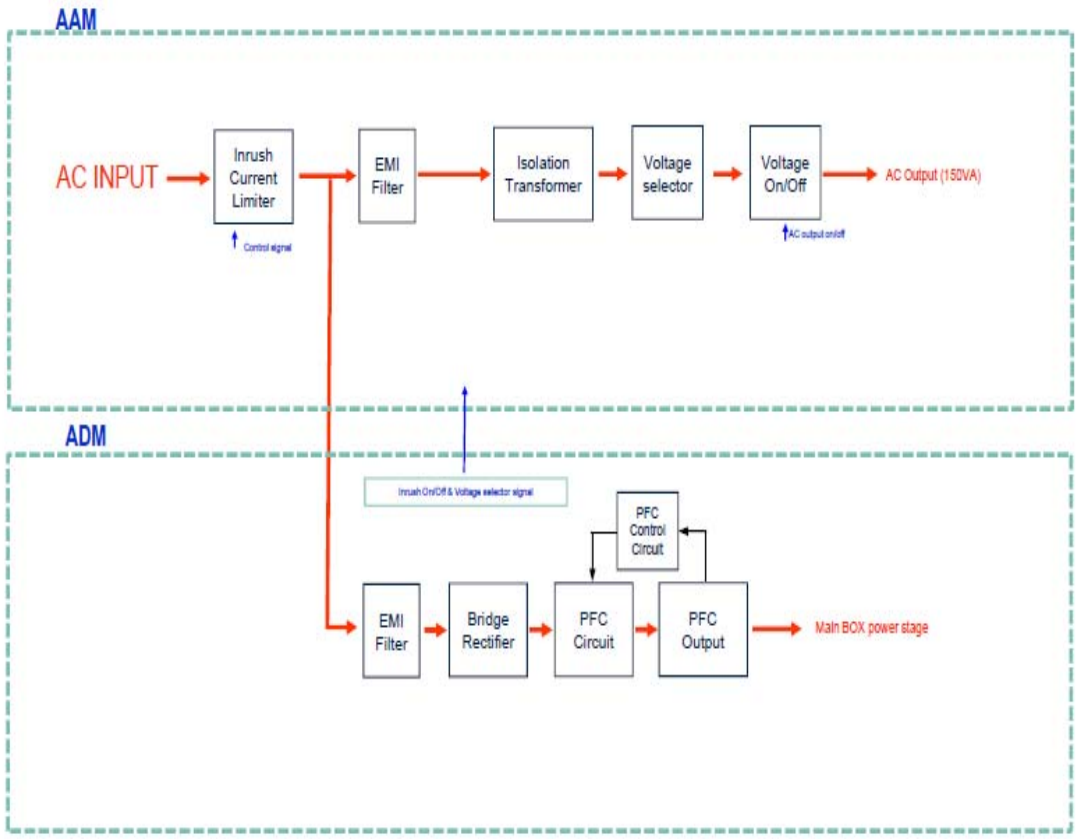
Power Part

AIM + ADM

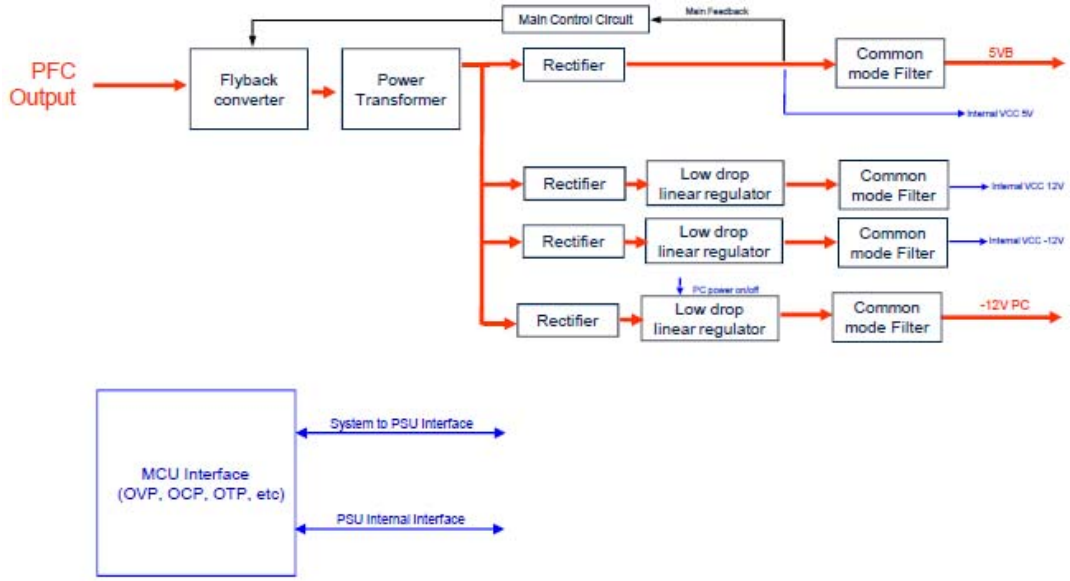
AC Input Module(AIM)

AC to DC Module(ADM)

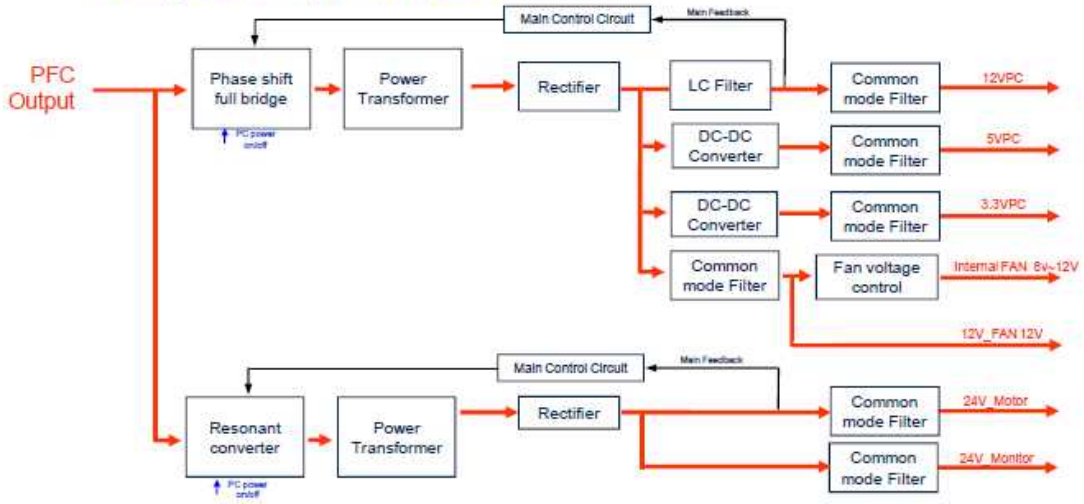
Power Block Diagram



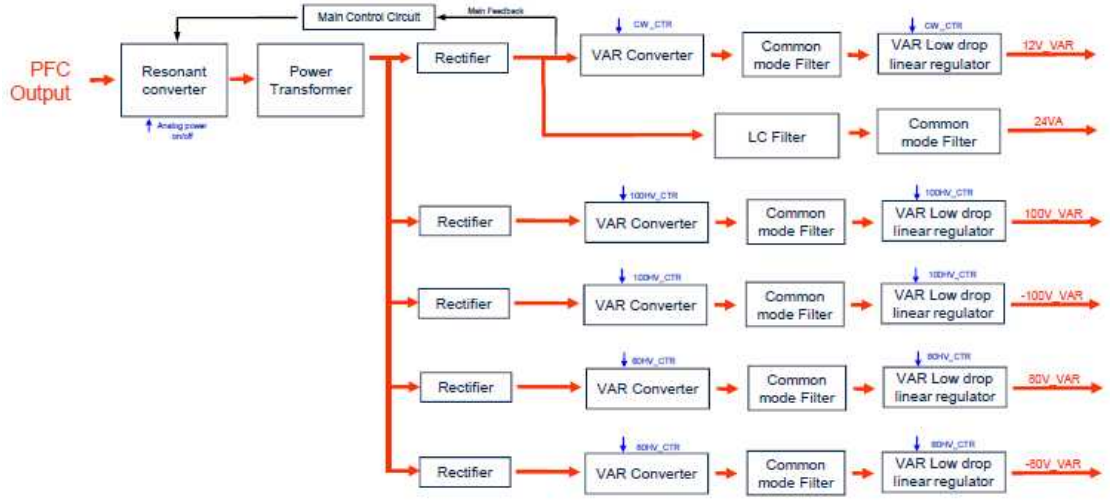
Stand by power in ADM

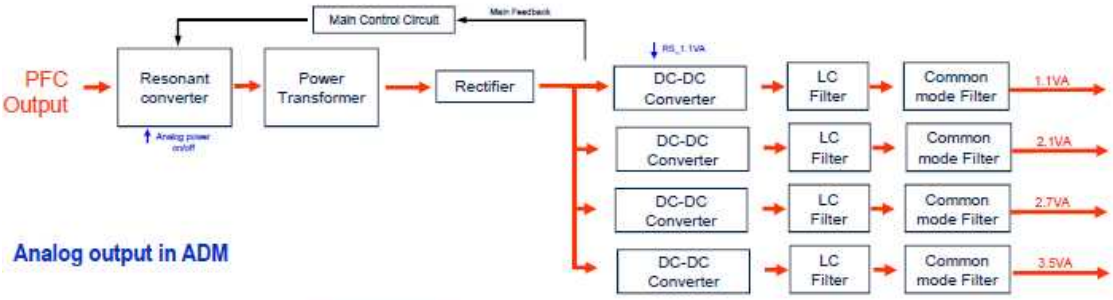


PC output and Motor, Monitor in ADM

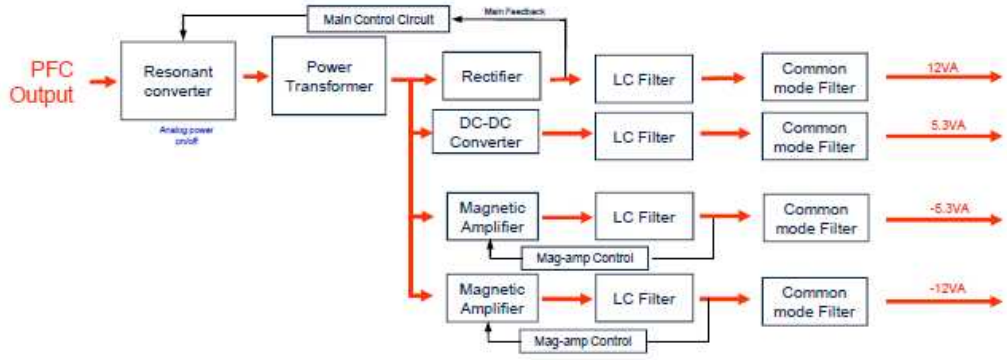


Analog VAR output in ADM





Analog output in ADM



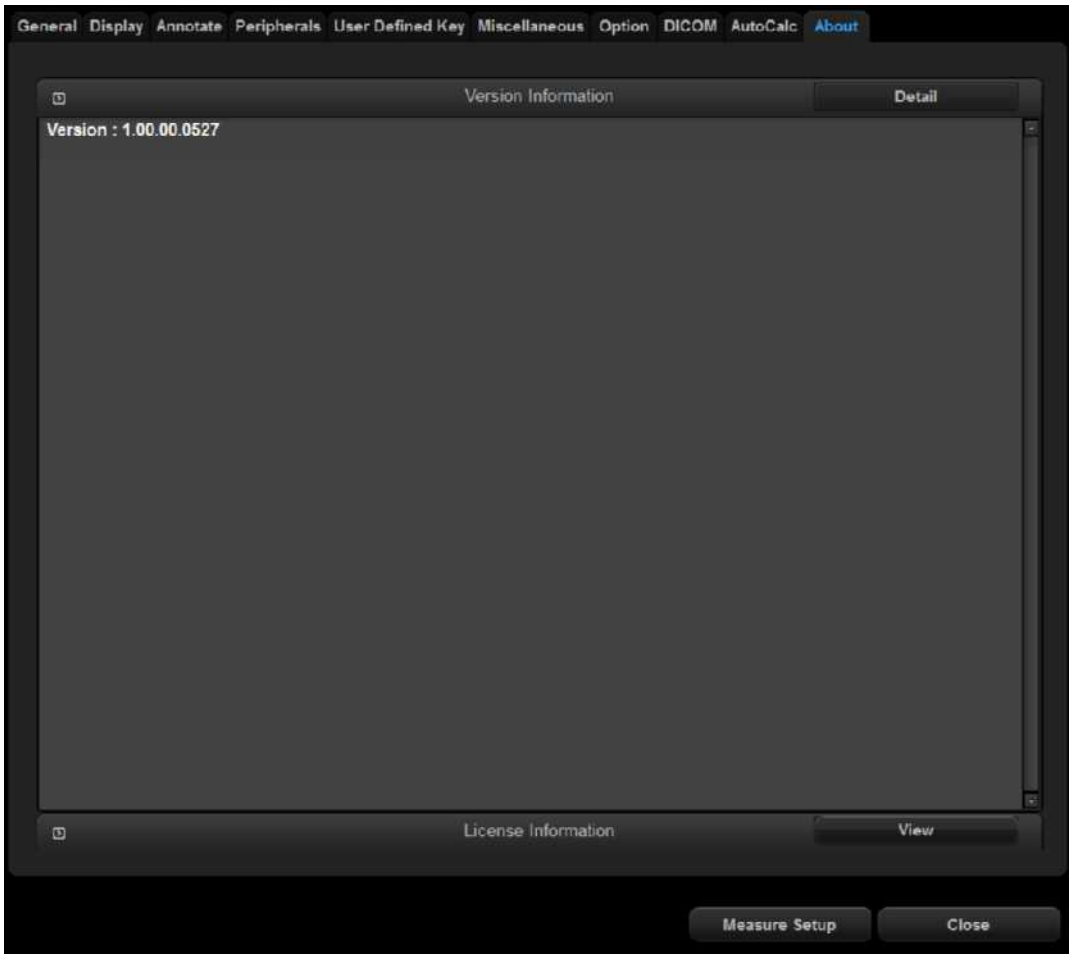
Chapter 6

Service Mode

System Information

Select the **About** tab in the *Setup* screen. Or tap **About** on the touch screen. It displays the software version of the product.

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



[Figure 6.1 Setup - 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.

Entering the Mode

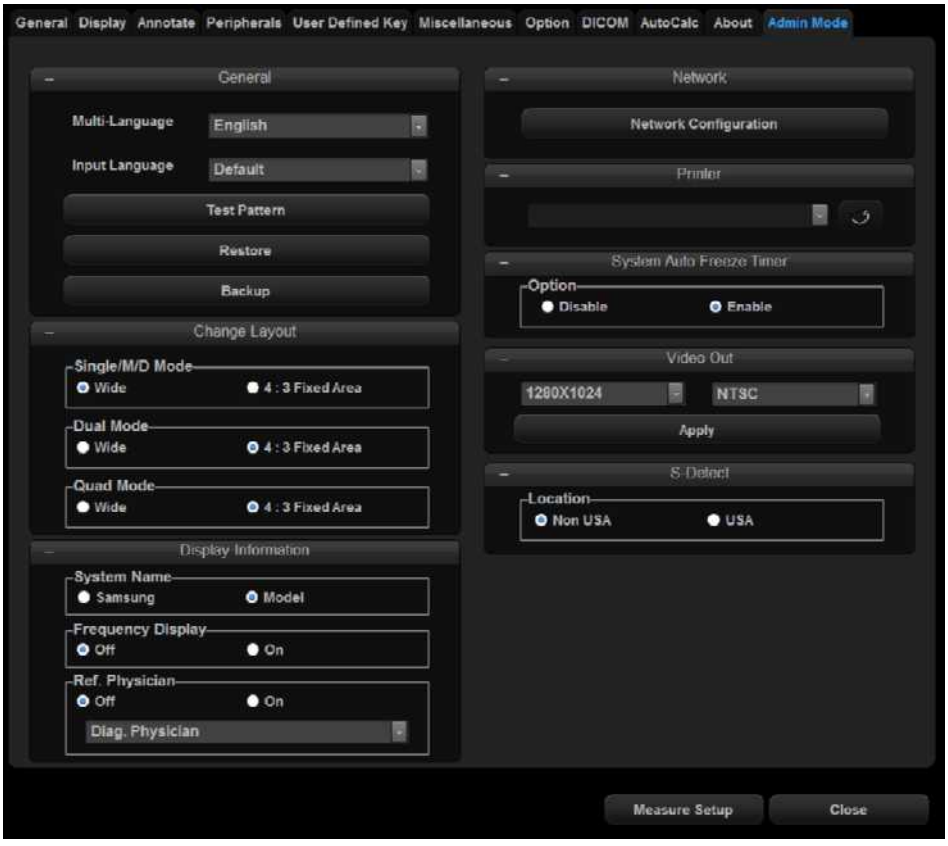
1. Press ******* + ******* + ******* at the same time on the keyboard.
2. When the Windows or Password window opens, enter "**********" and then press Enter.
3. When you press **Shift + Ctrl + Esc**, "Windows Task Manager" will open.

Admin Mode

Admin mode, also called Service mode, provides various functions, which are explained here. These include important settings and the functions needed for Back up, Restore, adding and deleting Options, and Printer setting.

Entering the Mode

1. Press *** + *** + *** at the same time on the keyboard.
2. When the Windows or Password window opens, enter "**********" and then press Enter.
3. If the password is correct, the 'Admin Mode' tab will be created in Setup mode.
4. Select 'Admin Mode' tab.



[Figure 6.2 Admin Mode]

Admin Mode Functions

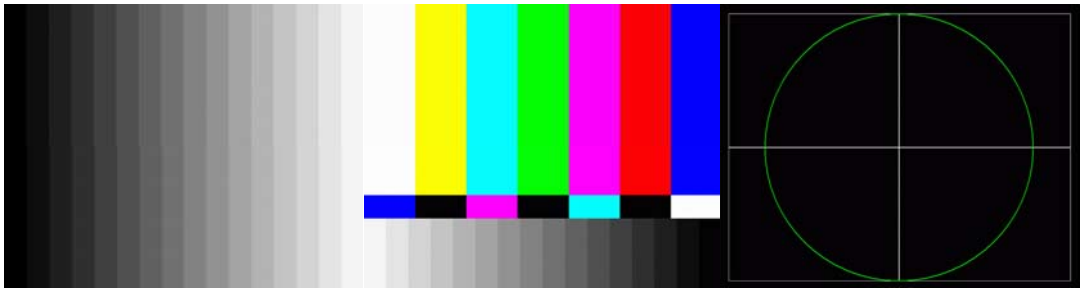
General

- **Multi-Language**

  Select the language to be used by the product. Use the filter to select the language. You may select one of the following seven languages: English, German, French, Spanish, Italian, Russian, and Chinese. The selected language will be applied after the system reboots.

- **Test Pattern**

  You can test the properties of the monitor. Select **Test Pattern**, and press the **Set** button on the control panel to cycle through three different test patterns to test the monitor, as shown below in [Figure 6.3 Test Pattern].

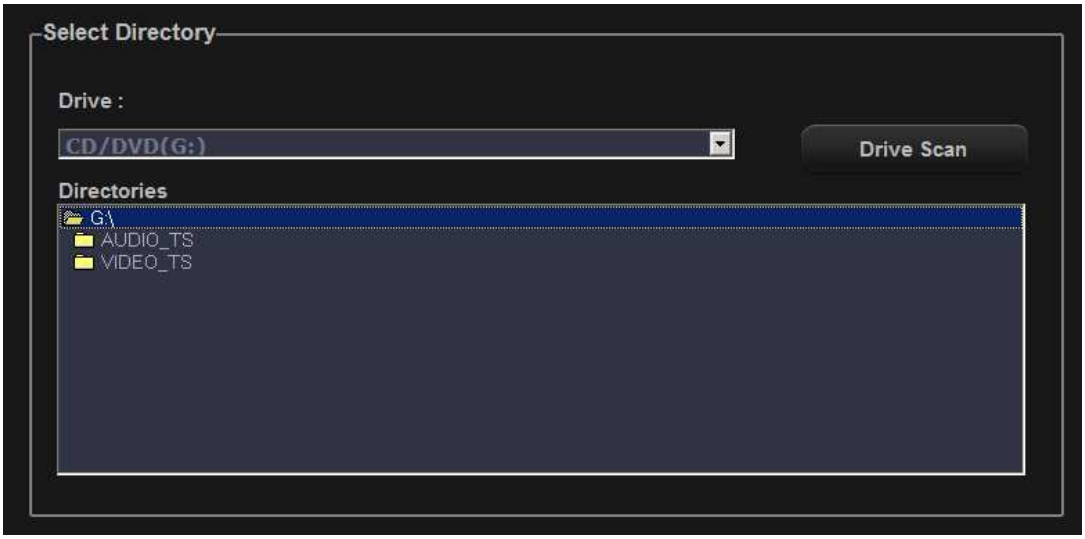


[Figure 6.3 Test Pattern]

- **Restore**

  This function restores the system with backed-up user settings, and can only be performed in Admin mode.

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 **Restore** screen, you may select the user setting item and the media to use for restoration.
3. Press **Next** to perform the Restore function.
4. The system will reboot when the restoration is complete.

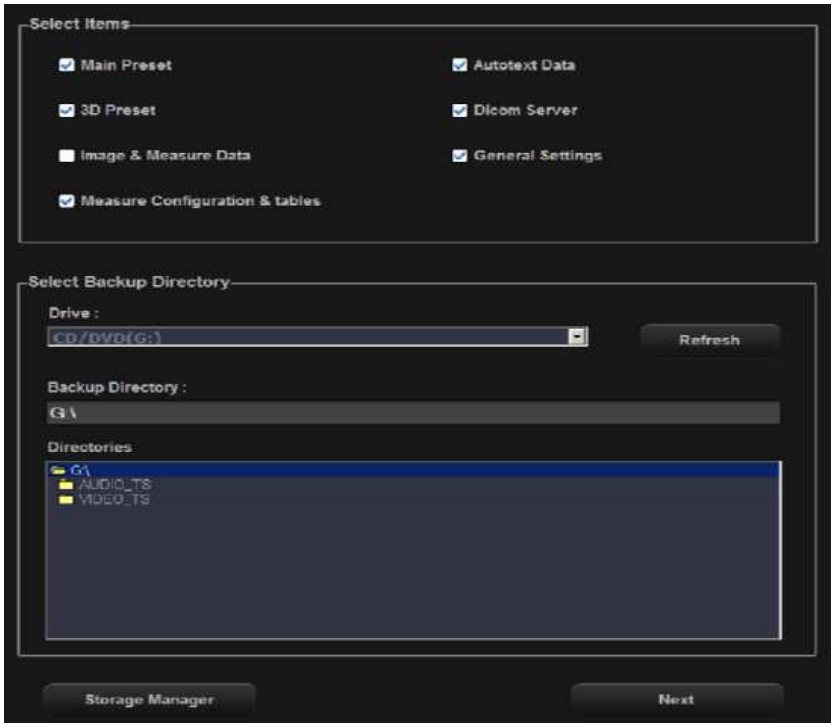


[Figure 6.4 Restore]

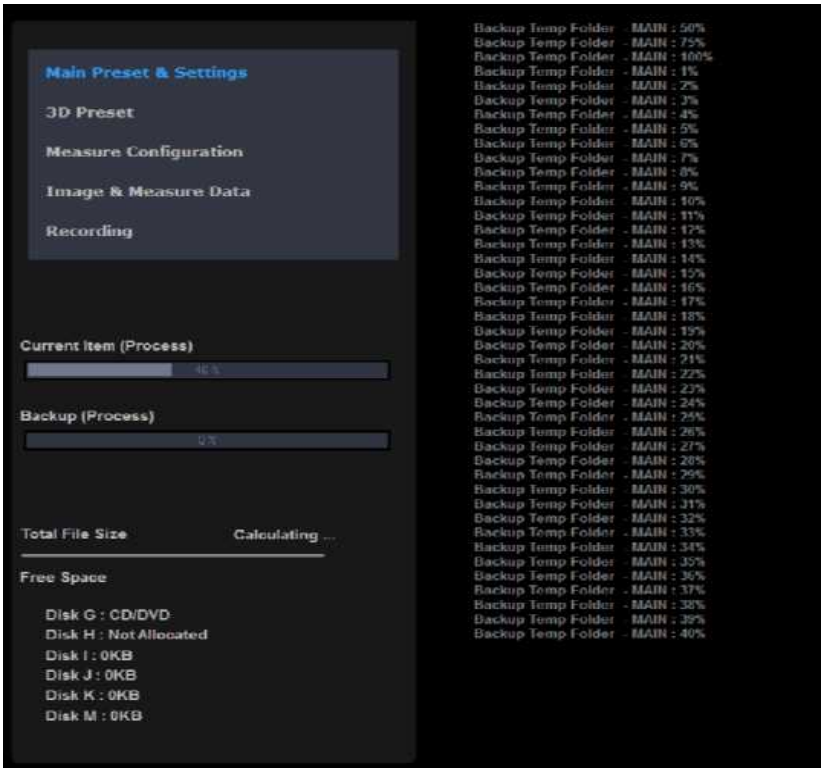
■ **Backup**

This function backs up the user settings to external media, and can only be performed in Admin mode. Backing up the system on one or more DVD is not recommended. USB storage media is recommended for large-sized backup.

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 user setting items and backup media.
3. Press **Next** to perform the Backup function.
4. The system will reboot when the backup is complete.



[Figure 6.5 Backup]



[Figure 6.6 Performing Backup]

Change Layout

This function allows you to set up the screen ratio of the layout for each Diagnosis mode; you need to be in Admin mode to use this function.

Select either Wide, 4:3, or Fixed Area as the layout for Single / M / D Mode, Dual Mode, and Quad Mode.

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.

- **Ref. Physician**

  Turn on/off the Ref. Physician displayed in the title area of the screen. If turned 'On', you may select between Diag. Physician, Ref. Physician, and Sonographer.

Network

- **Network Configuration**

  Configure the network for DICOM connection. Press **Network Configuration** to go to the Network Configuration screen of Windows.

[Figure 6.7 Network Configuration]

Printer

When a printer is connected, the  button will be enabled. Select the printer you wish to connect. Press  to configure settings for the selected printer.

The following products are recommended:

■ **USB Video Printer**

- BW: Mitsubishi P-95DE, Sony UP-D897, Samsung ML-2955DW
- Color: Mitsubishi CP-30DW, Sony UP-D25MD, Samsung CLP-615ND

You need to select the paper size on this system and the printer.

1. Select the paper size on the Sony UP-D25MD printer.
2. Connect the printer to the product. Press the enabled  button.
3. Select a paper size, and select **OK**.
   - UPC-21S/UPC-24**S**A : S Size
   - UPC-21L/UPC-24**L**A : L Size
4. Once configuration is complete, reboot the system.

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.

Video Out

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.

S-Detect

This is the configuration for using S-Detect, which is an optional feature of this product.
Select between Non USA and USA.

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 RS80A includes the following:

- Smart 4D
- Cardiac Measurement
- XI STIC
- ElastoScan
- Panoramic
- HDVI
- ADVR
- E-Thyroid
- Realistic Vue
- S-Detect
- Clear Track
- Auto IMT+
- E-Breast

Status

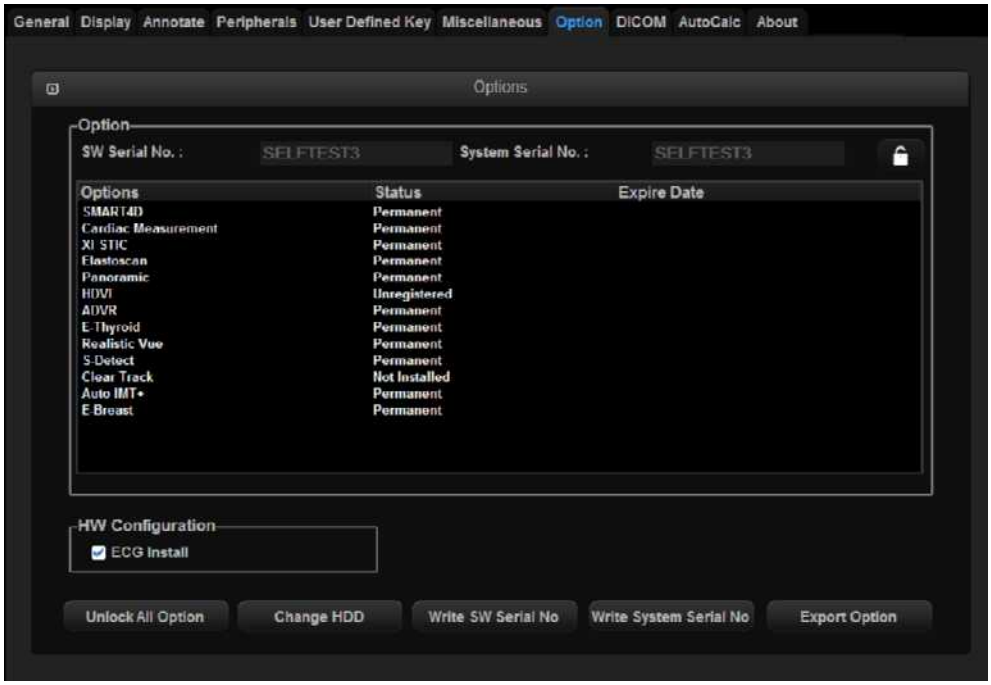
Status: Shows the current status of optional software.
Lock_Not Installed: Hardware is not connected.
Lock_Unregistered: The software license has not been registered yet.
Lock_Installed: Hardware is installed but cannot be used yet.
Unlock_Permanent: The hardware or software can be used for an unlimited period.
Unlock_Restricted: The hardware or software can be used only for a certain period of time.

Adding and Deleting Options

Entering Option Password

Enter password to add (unlock) or delete options.

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 when this button is enabled.
3. Select the option you wish to add or delete, press the key-shaped button, and enter the password.
4. If the password is correct, press **OK** button and reboot the system.



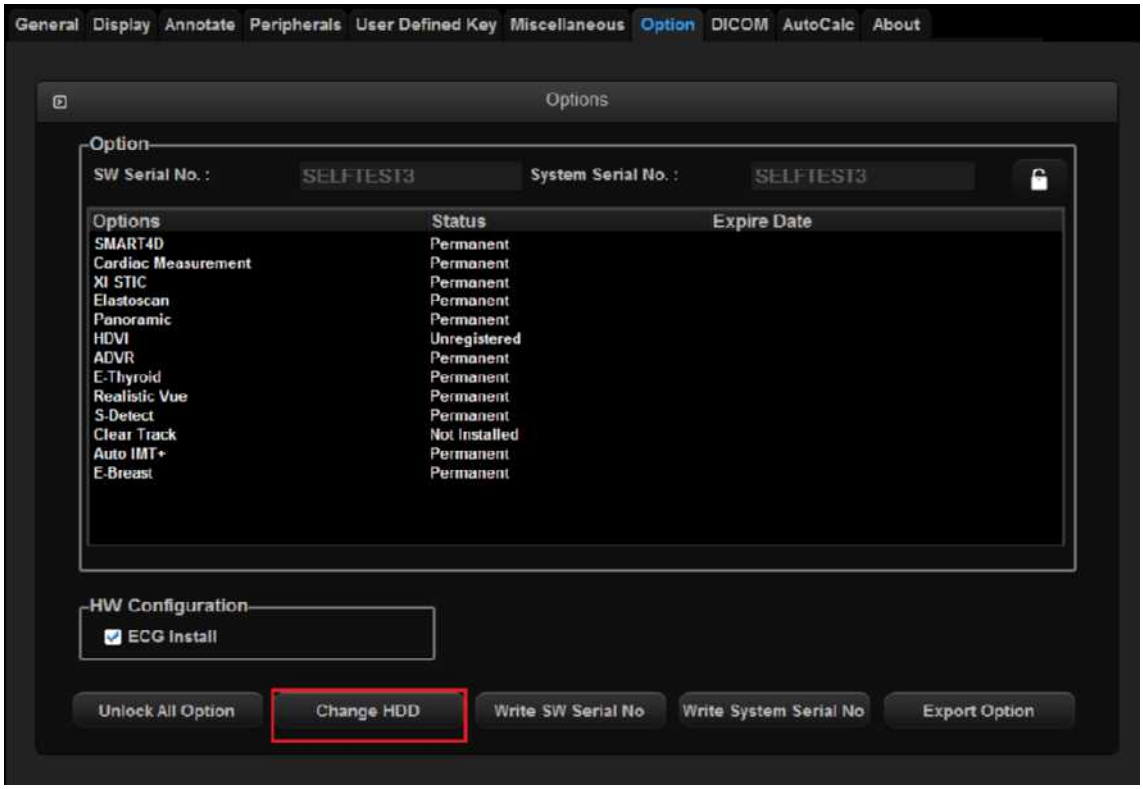
[Figure 6.8 Options]

Adding Option Password after Replacing HDD

RS80A is designed to preserve the option password even if the HDD fails and is replaced. After replacing the HDD, enter the Option Password (Unlock).

1. Switch to Admin mode. Please refer to ‘Entering Admin Mode’.
2. The **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).

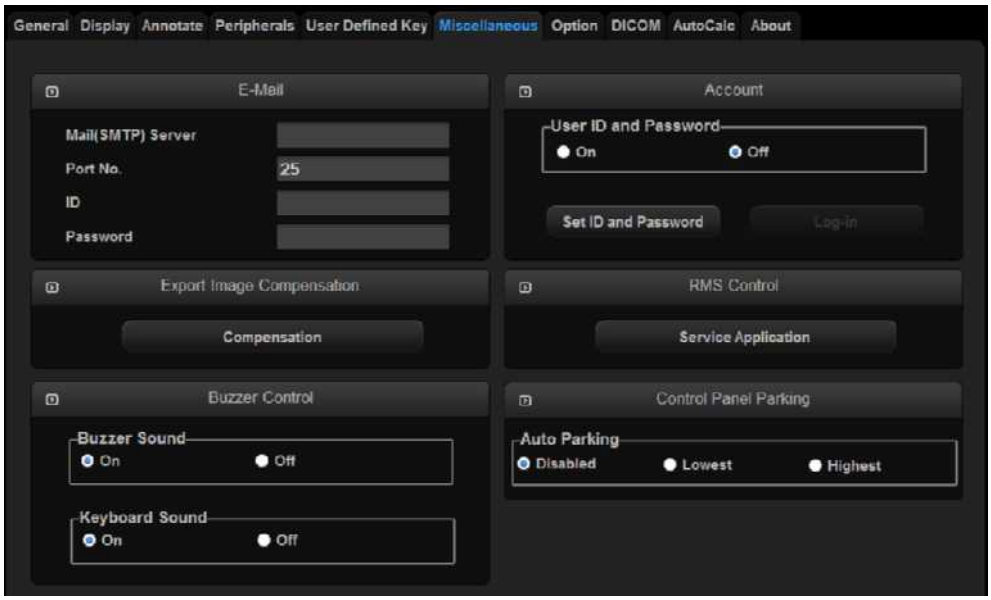
4. Verify that the option is unlocked, and reboot the system.
5. Select the option that you want to add, and press the key-shaped button to enter the password.
6. If the password is correct, press **OK** button and reboot the system.



[Figure 6.9 Change HDD]

RMS Control

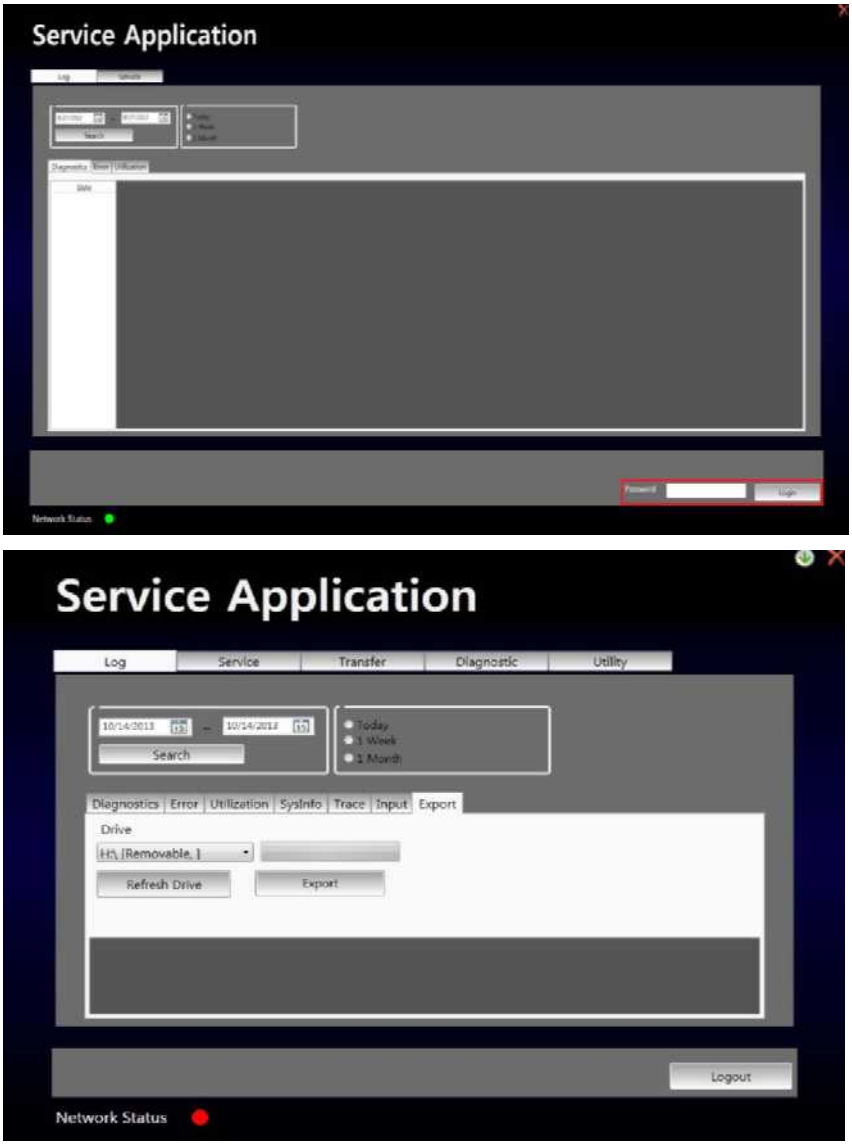
RMS stands for Remote Maintenance Service. You can use this function to back up the Log file of this product. If you are experiencing a technical problem with the product, this feature remotely access the system and collects data to help solve the problem.



[Figure 6.10 Setup - Miscellaneous]

■ **Service Application**

Press the button to display the *Service Application* screen. The Service Application screen consists of Log and Service tabs.



[Figure 6.11 Service Application]

1. In the **Service Application** screen, enter Password ******** and press the **Login** button.
2. In the **Log** tab, select the **Export** tab.
3. Select the storage device to save the Log file to.
4. Select the **Export** button to save the file.

※ 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 errors that may be discovered 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.

Chapter 7

Troubleshooting

Power Issues

Power Does Not Turn On

The power cord may be unplugged, the ADM may have failed to output the necessary voltage, or the power receptacle 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 receptacle 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 caused by some reason other than the power receptacle.
   - If the fan does not work, PC Power has failed.
4. Check the ADM ouput voltage.
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 or 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

Power cord, PC Motherboard, Main board, cable and connector pin short, AIM, and/or ADM PSU 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 receptacle has failed.
   - If the appliance doesn't work, the power outlet has failed.
3. Check the LED status of the ADM.
4. If the problem is not solved by the methods in '1' and '2', it is likely that the PC Motherboard, PCI board, DVI board, LCD IF board, AIM, and/or ADMhave failed.

Monitor

Nothing is Displayed on the Screen

The DVI cable, VGA cable, the monitor, or 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. 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 DVI board and VGA card of the computer.

Screen is Discolored

The DVI cable, the monitor, and/or 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 DVI board and VGA card of the computer.

Error Messages

Error Occurs during Booting

A temporary software error or product failure 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 may have failed.

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 the Main board has failed.

Error Code

Error code	Location of failure	Estimated failure
0	SW	FILE_NOT_FOUND
1	SW	DEMO_PERIOD_EXPIRED_ERROR
2	SW	CRC32DLL_LOAD_FAIL
10	PC	OPEN_DMA_FAIL_IN_HWINIT
22	AC Board	MOTOR_NULL_POSITION_LOST
24	AC Board	GAIAMOT_DLL_LOAD_ERROR
30	BF Board	HV_DATA_DOWNLOAD_ERROR
40	BF Board	FPGA_DOWNLOAD_ERROR_BF_RX_FPGA
41	BF Board	FPGA_DOWNLOAD_ERROR_BF_TX_FPGA
100	BE Board	FPGA_DOWNLOAD_ERROR_MID_FPGA0
101	BE Board	FPGA_DOWNLOAD_ERROR_MID_FPGA1
102	BE Board	FPGA_DOWNLOAD_DONE_BIT_ERROR_DMA
103	BE Board	FPGA_DOWNLOAD_CHECKSUM_ERROR_DMA
104	BE Board	RTC_APNI_COMPARE_CHECKSUM_ERROR
105	BE Board	RTC_APNI_COMPARE_VOLTAGE_ERROR
106	BE Board	RTC_APNI_COMPARE_AVGPRF_ERROR
107	BE Board	RTC_APNI_COMPARE_WAVEFORM_ERROR
160	DVI Board	FPGA_DOWNLOAD_ERROR_DVIIF
163	BE Board	BF_DMA_WRITE_CHECKSUM_ERROR

[Table 7.1 Error Code Table]

Chapter 8

Disassembly and Assembly

Caution

This chapter describes the procedure for disassembling and assembling RS80A. Refer to this chapter when you are upgrading or servicing the system's hardware.

WARNING	■ Samsung Medison Global Technology Support Group or its authorized engineers are allowed to repair or replace the parts of the products. ■ The interior of this product contains dangerous high-voltage electricity. 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.

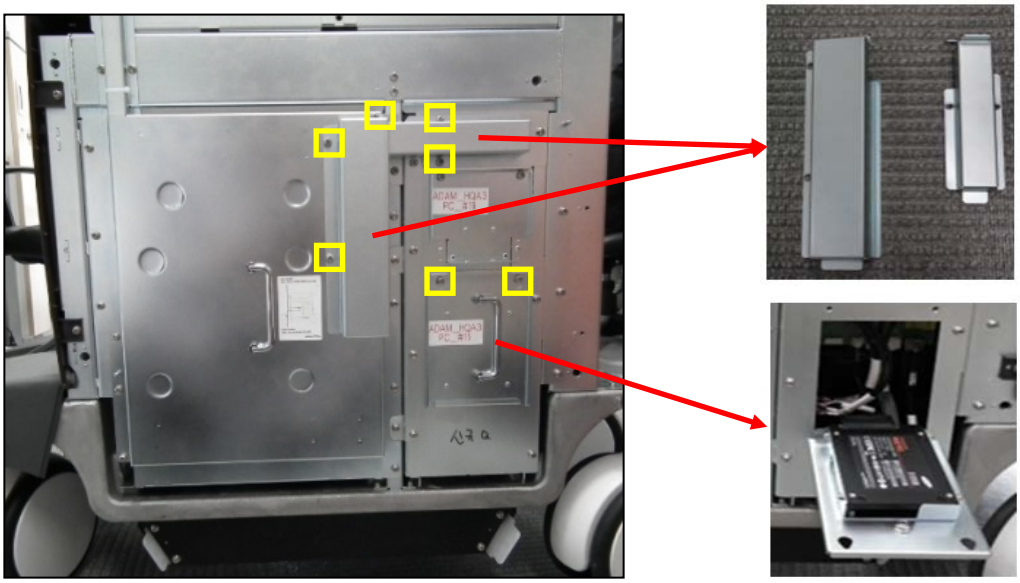
[Figure 8.1 Antistatic Gloves and Wrist Strap]

Disassembling the Product

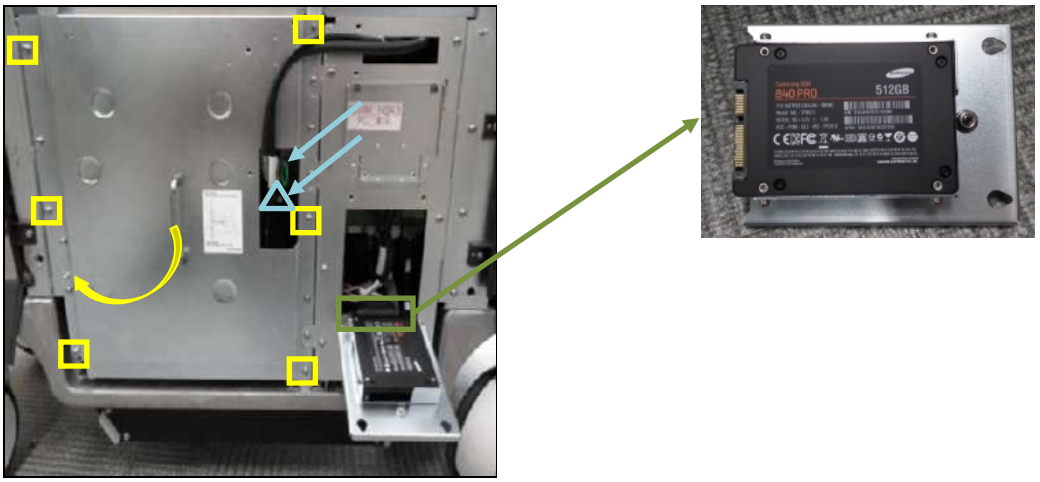
Detaching the Board Box

1. Pull down the locking lever at the bottom right of the product to release the brake. Pull the cover to detach.

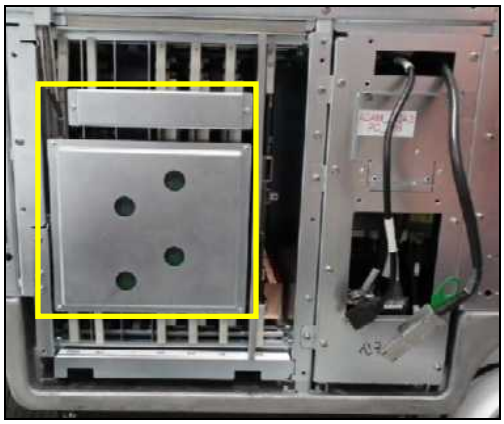
2. Remove 7 screws to detach 2 internal covers and the SSD cover.



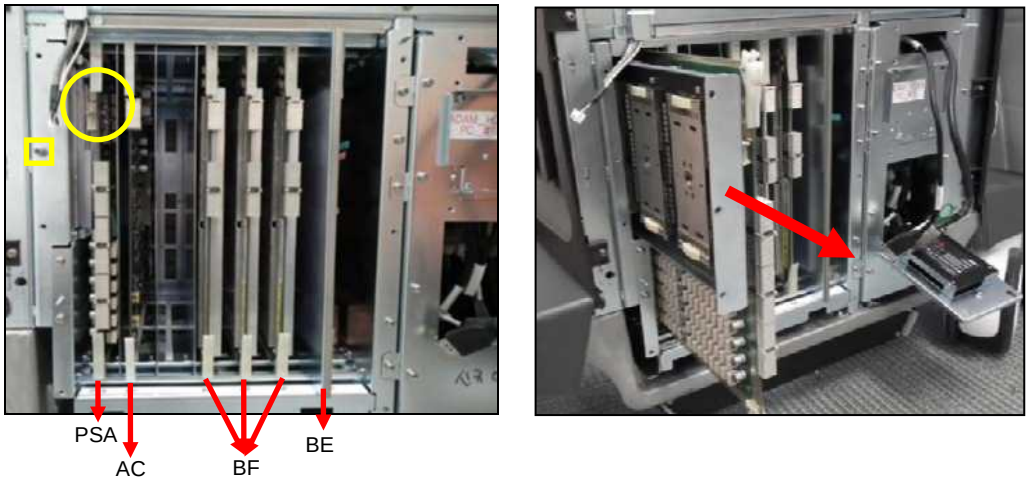
3. Use the green handle to detach the PCIE connector. After releasing the lock using the phillips screwdriver, detach the HDMI connector. Detach the SSD by pulling the handle. Remove 6 screws to detach the cover.



4. Remove the 2 socket boards. Be careful of the sharp sides of the socket boards.

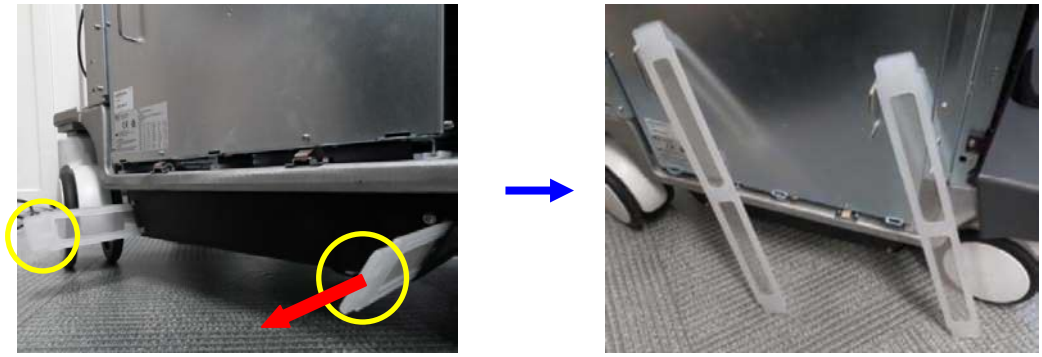


5. Remove the screws and detach the connector. Pull the PSA, AC, BF, and BE boards to detach.

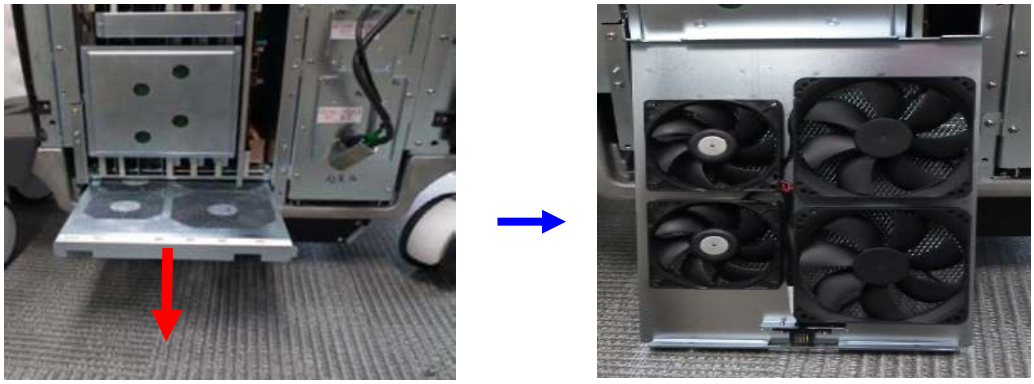


Detaching the Air Filter and Lower Fan

1. Pull the 2 air filters from the product bottom to detach.

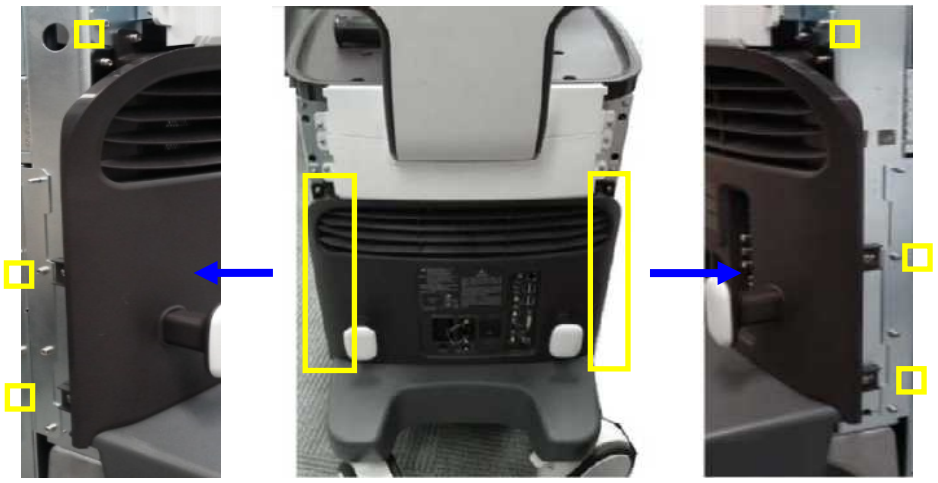


2. Pull the Fan Module from the bottom of the Board Boxto detach.

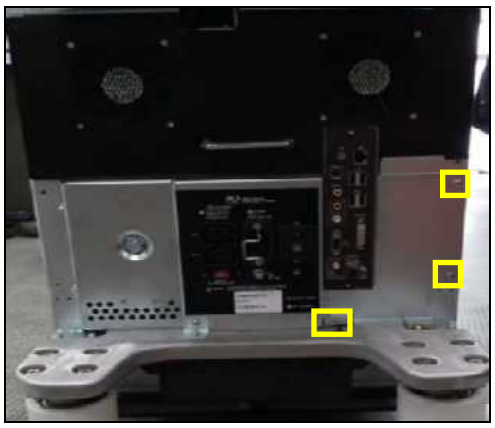


Detaching the Rear Module

1. Remove 6 screws to detach the rear panel.

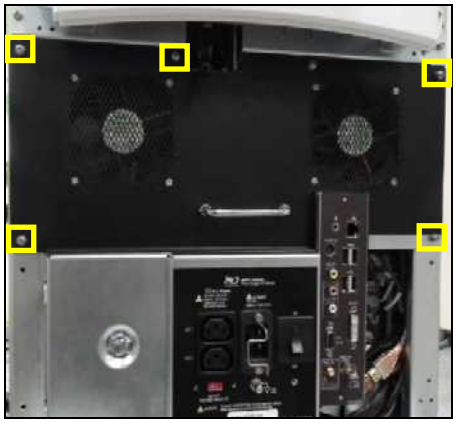


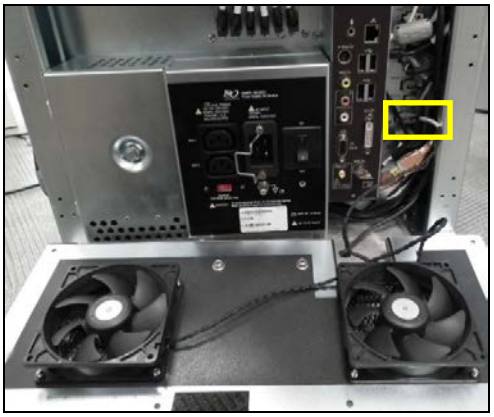
2. Remove 5 screws to detach the foot cover and plate.



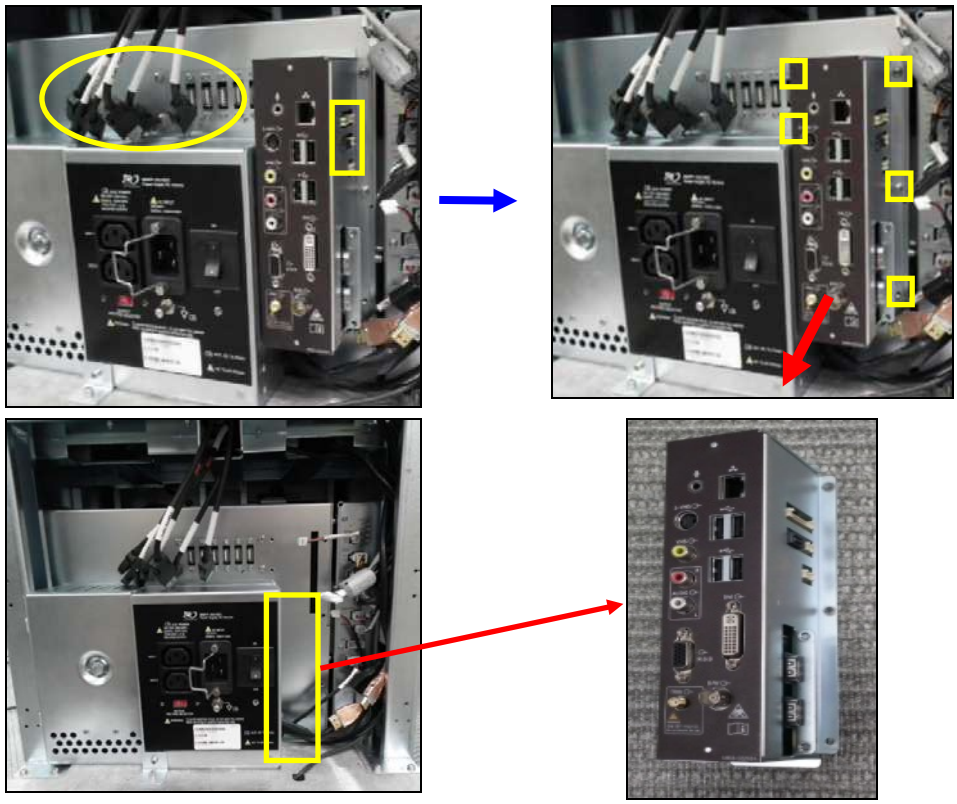
3. Remove 2 screws to detach the cover. Detach the cable.

4. Remove 5 screws to detach the fan module. Detach the cable.





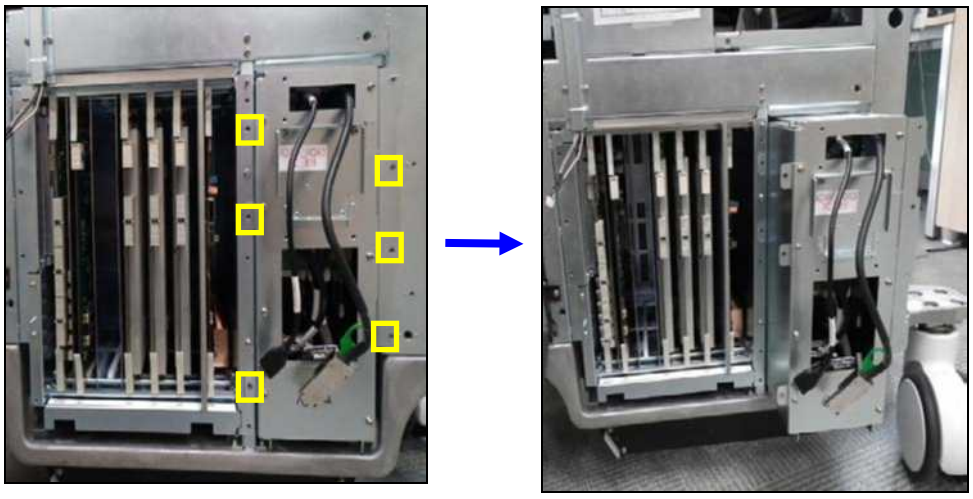
5. Detach the USB port. Detach the rear board connector. Remove 5 screws to detach the rear module.



Detaching the PC Module

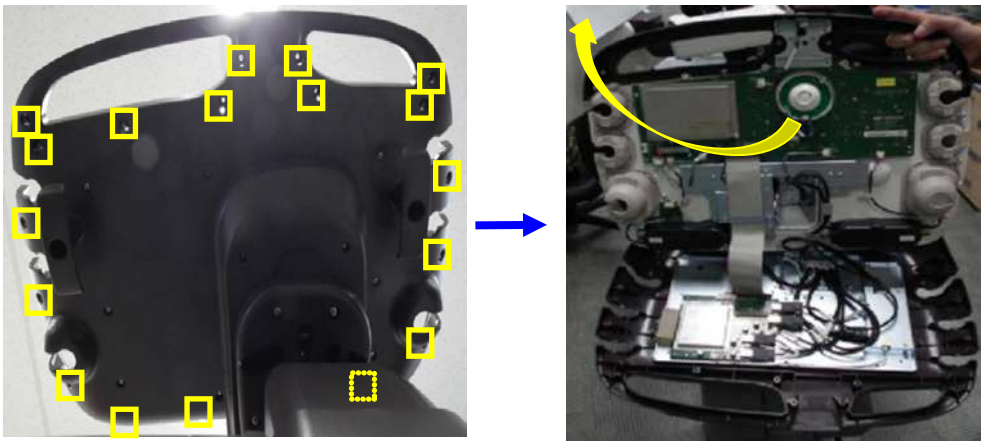
Detach USB port and Rear Module, and then detach PC Module.

1. Remove 5 screws and pull the PC module to detach.

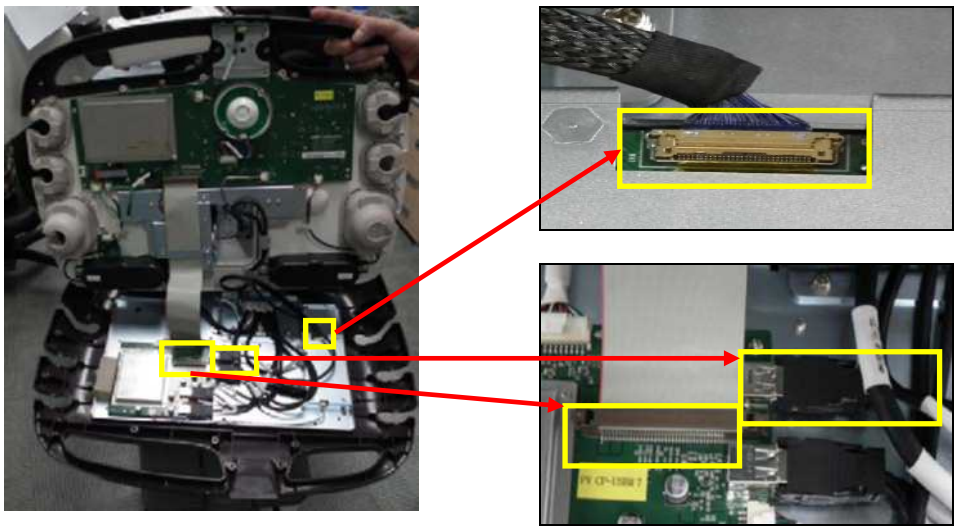


Detaching the Control Panel

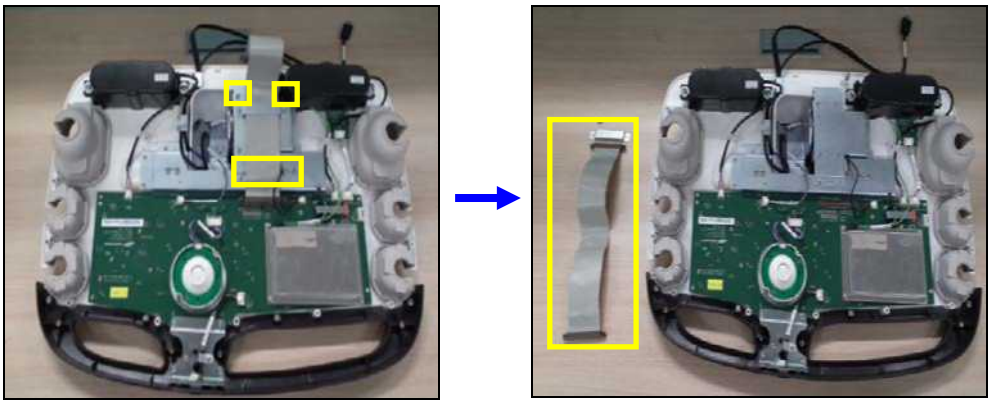
1. Remove the 17 screws from the bottom of the control panel and pull up the cover to detach.



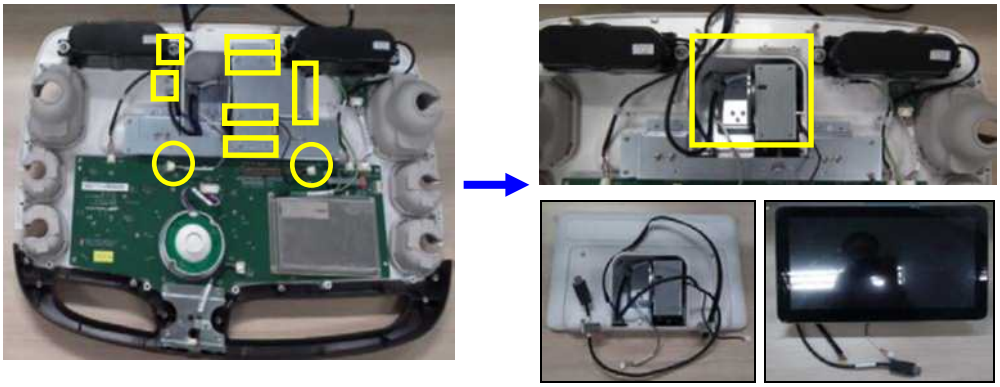
2. Detach the USB cable, data cable, and LVDS connector.



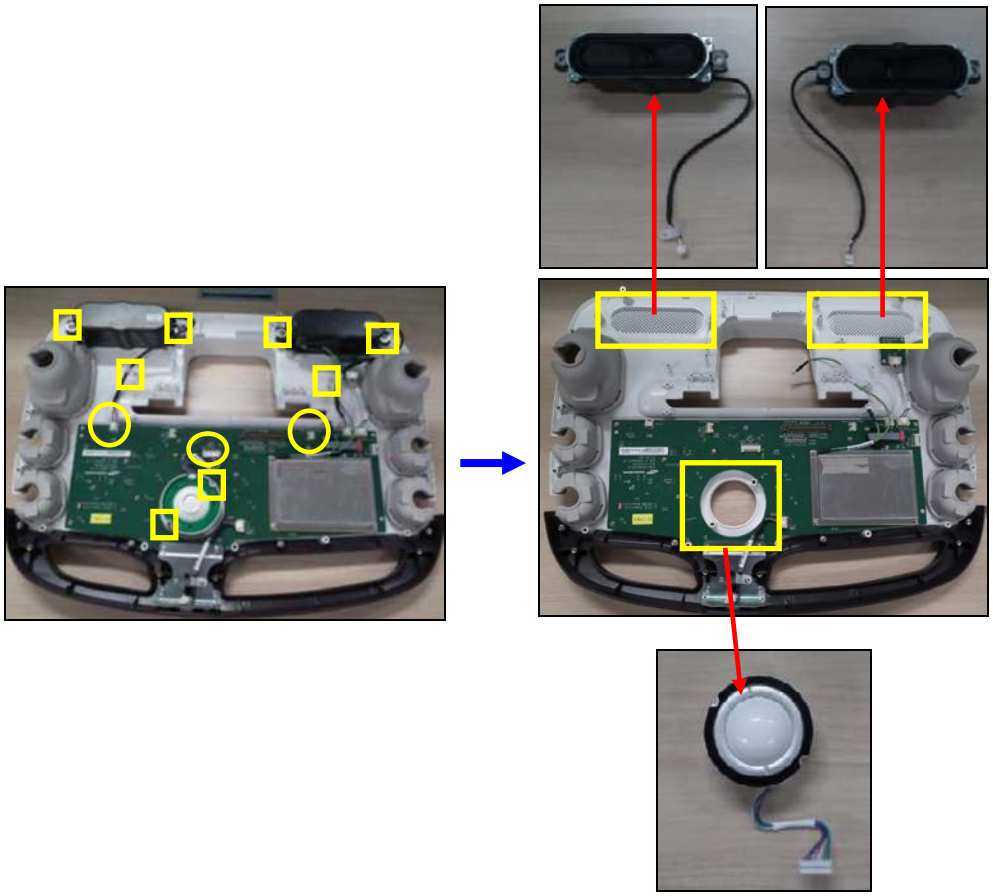
3. Turnover the top of the control panel and remove 2 screws to detach the data cable.



4. Remove 14 screws and detach the 2 connectors. Detach the fixed plate and touch panel.

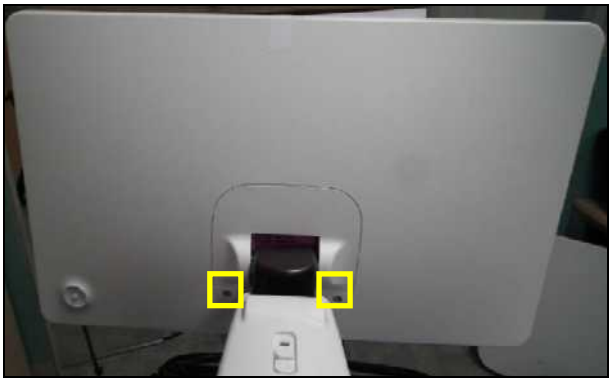


5. Remove 6 screws and detach the 3 cables. Detach the SPK and trackball.

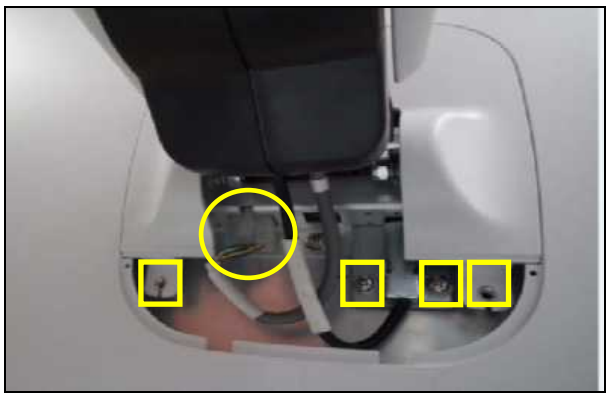


Detaching the Monitor

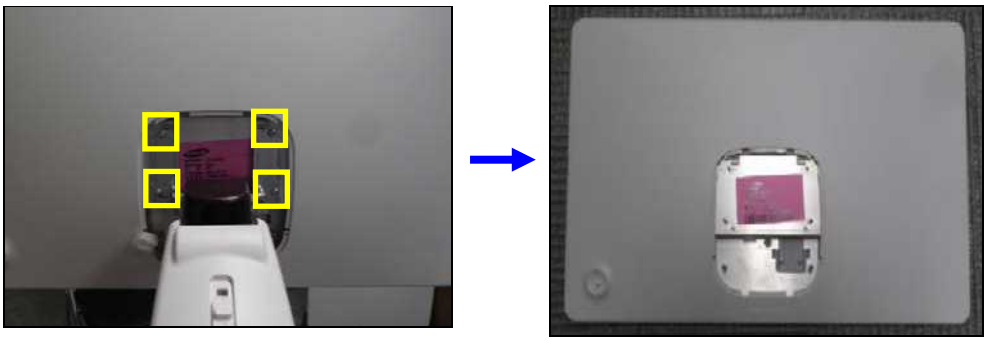
1. Remove 6 screws from the back of the monitor to detach the bottom cover.



2. Remove 4 screws and detach the power connector, top cover, and cable.

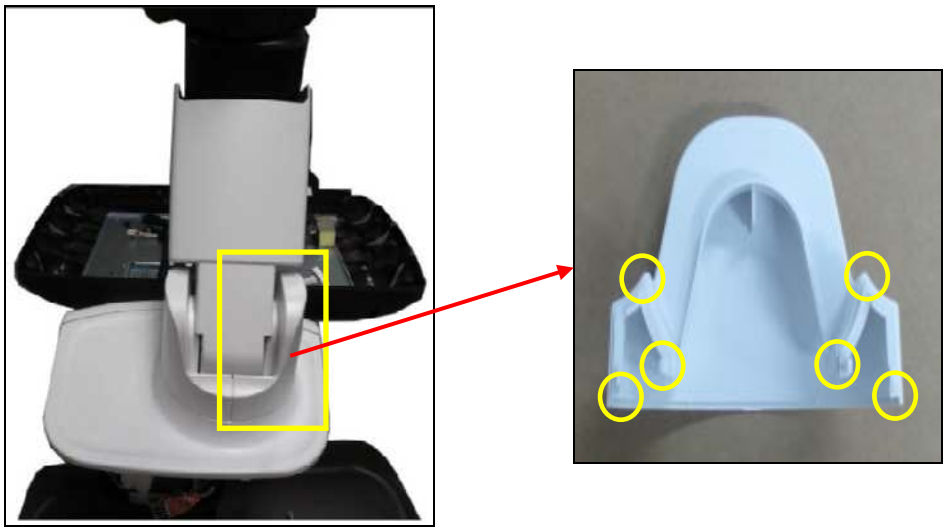


3. Remove 4 screws to detach the monitor from the arm.

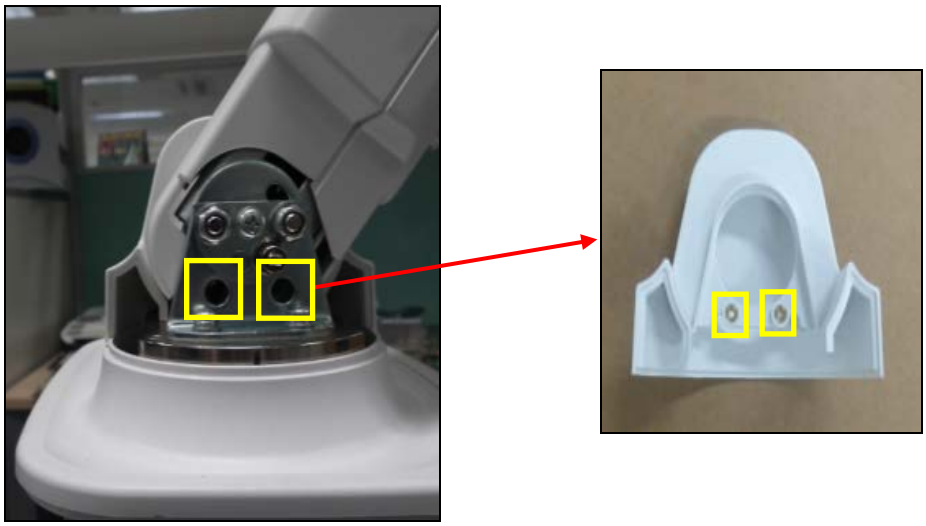


Detaching the Monitor Arm

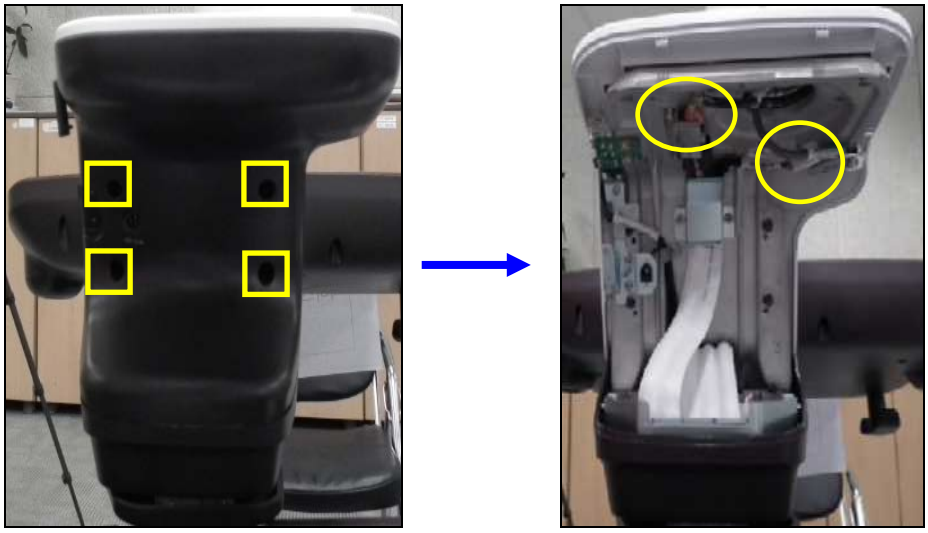
1. Pull the left cap (fixed by 6 hooks) towards the left to detach.



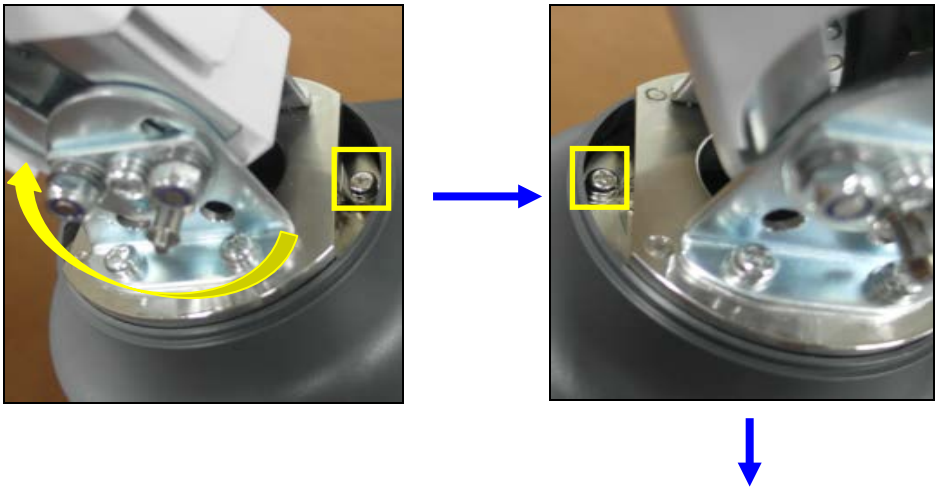
2. Remove 2 screws and detach the left cap.

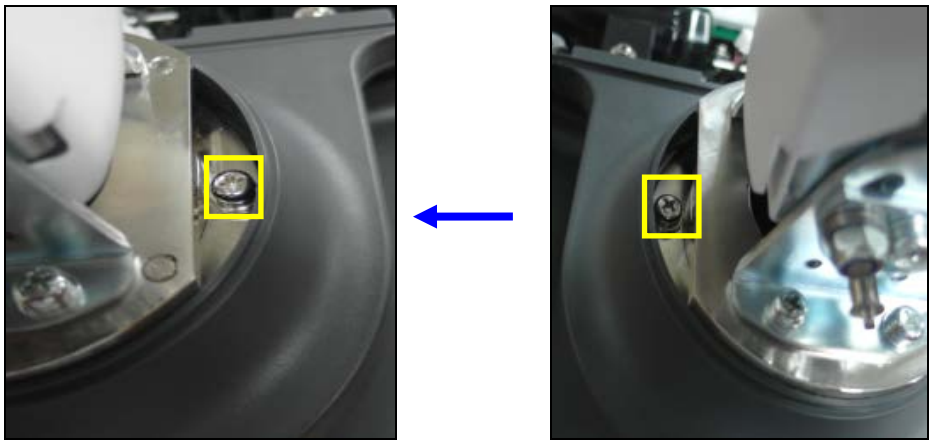


3. Remove 4 screws to detach the cover and cable.



4. Remove 4 screws while turning the arm to detach.





Assembling the Product

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

Chapter 9

Probes

Probes

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

The system limits patient contact temperature to 43 degrees Celsius, and acoustic output values to their respective FDA limits. The power protection fuse protects the product from overvoltage. If the power monitor protection circuit senses an overvoltage condition, then the drive current to the probe is shut off immediately, preventing the probe surfaces from overheating 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 configure the preset with the best settings for the particular organ being scanned.

■ Probe Application and Preset

Probes, applications and presets available for this product are as follows:

Probe	Application	Preset
L3-12A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
L5-13	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
L7-16	Small Parts	Breast, Testicle, Thyroid
	Vascular	Superficial, Carotid
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
LA2-9A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	Abdomen	General
	MSK	General

Probe	Application	Preset
LA3-16A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
LA3-16AI	MSK	General, Superficial
C2-6	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Echo
	Gynecology	General, Adnexa
CA1-7A	Abdomen	Aorta, General, Renal, Penetration
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Echo
	Gynecology	General, Adnexa
	Contrast	General
CA2-8A	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Echo
	Gynecology	General, Adnexa
CF4-9	Pediatric	Abdomen, NeoHead
	Vascular	Arterial, Carotid, Venous
E3-12A	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
V4-8	Abdomen	Aorta, General, Renal
	OB	1st Trimester, 2nd Trimester, 3rd Trimester, Fetal Echo
	Gynecology	General, Adnexa
V5-9	OB	1st Trimester
	Gynecology	General, Adnexa
	Urology	Prostate
LV3-14A	Small Parts	Bowel, Breast, Testicle, Thyroid
	Vascular	Arterial, Carotid, Venous
	MSK	Shoulder/Knee, Hand/Foot, Elbow/Wrist
PE2-4	Abdomen	Aorta, General, Renal
	Cardiac	Aortic Arch, Adult Echo, Ped Echo
	TCD	General

Probe	Application	Preset
PM1-6A	Abdomen	Aorta, General, Renal
	Cardiac	Aortic Arch, Adult Echo, Ped Echo
	TCD	General
CW6.0	Cardiac	Ped Echo
	Vascular	Arterial, Venous

NOTE

- Other than the system-optimized presets, users may configure the usersets to meet specific needs.
- For more information on selecting and configuring a probe, please refer to ‘Chapter 6. Starting Diagnosis’.

■ **Function List**

The functions available in this product for various probes and applications are as follows:

Probe	Application	Har	PI	MultiVision	ClearVision	Q Scan	ECG	Elasto Scan	Low MI
L3-12A	Small Parts	O	O	O	O	O	O	X (Except Breast, Thyroid)	X
	Vascular	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	X	X
L5-13	Small Parts	O	O	O	O	O	O	X (Except Breast, Thyroid	X
	Vascular	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	X	X

Probe	Application	Har	PI	MultiVision	ClearVision	Q Scan	ECG	Elasto Scan	Low MI
L7-16	Small Parts	O	O	O	O	O	O	X	X
	Vascular	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	X	X
LA2-9A	Small Parts	O	O	O	O	O	O	X	X
	Vascular	O	O	O	O	O	O	X	X
	Abdomen	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	X	X
LA3-16A	Small Parts	O	O	O	O	O	O	X (Except Breast, Thyroid)	X
	Vascular	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	X	X
LA3-16AI	MSK	O	O	O	O	O	O	X	X
C2-6	Abdomen	O	O	O	O	O	X	X	X
	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	X	X
CA1-7A	Abdomen	O	O	O	O	O	X	X	X
	Contrast	O	O	O	O	O	X	X	O
	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	X	X
CA2-8A	Abdomen	O	O	O	O	O	X	X	X
	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	X	X
CF4-9	Pediatric	X	X	O	O	O	X	X	X
	Vascular	X	X	O	O	O	O	X	X

Probe	Application	Har	PI	MultiVision	ClearVision	Q Scan	ECG	Elasto Scan	Low MI
E3-12A	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	O	X
	Urology	O	O	O	O	O	X	O	X
V4-8	Abdomen	O	O	O	O	O	X	X	X
	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	X	X
V5-9	OB	O	O	O	O	O	X	X	X
	Gynecology	O	O	O	O	O	X	X	X
	Urology	O	O	O	O	O	X	X	X
LV3-14A	Small Parts	O	O	O	O	O	O	X	X
	Vascular	O	O	O	O	O	O	X	X
	MSK	O	O	O	O	O	O	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
PM1-6A	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
CW6.0	Cardiac	X	X	X	X	X	O	X	X
	Vascular	X	X	X	X	X	O	X	X

Probe	Application	Biopsy	CM	TDI	PD	S-Flow	TDW	CW
L3-12A	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
L5-13	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
L7-16	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
LA2-9A	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	Abdomen	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
LA3-16A	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
LA3-16AI	MSK	X	X	X	O	O	X	X
C2-6	Abdomen	O	X	X	O	O	X	X
	OB	O	X (Except Fetal Echo)	X	O (Except Fetal Echo)	O	X	X
	Gynecology	O	X	X	O	O	X	X

Probe	Application	Biopsy	CM	TDI	PD	S-Flow	TDW	CW
CA1-7A	Abdomen	O	X	X	O	O	X	X
	Contrast	O	X	X	O	O	X	X
	OB	O	X (Except Fetal Echo)	X	O (Except Fetal Echo)	O	X	X
	Gynecology	O	X	X	O	O	X	X
CA2-8A	Abdomen	O	X	X	O	O	X	X
	OB	O	X (Except Fetal Echo)	X	O (Except Fetal Echo)	O	X	X
	Gynecology	O	X	X	O	O	X	X
CF4-9	Pediatric	X	X	X	O	O	X	X
	Vascular	X	X	X	O	O	X	X
E3-12A	OB	O	X	X	O	O	X	X
	Gynecology	O	X	X	O	O	X	X
	Urology	O	X	X	O	O	X	X
V4-8	Abdomen	O	X	X	O	O	X	X
	OB	O	X (Except Fetal Echo)	X	O (Except Fetal Echo)	O	X	X
	Gynecology	O	X	X	O	O	X	X
V5-9	OB	O	X	X	O	O	X	X
	Gynecology	O	X	X	O	O	X	X
	Urology	O	X	X	O	O	X	X

Probe	Application	Biopsy	CM	TDI	PD	S-Flow	TDW	CW
LV3-14A	Small Parts	O	X	X	O	O	X	X
	Vascular	O	X	X	O	O	X	X
	MSK	O	X	X	O	O	X	X
PE2-4	Abdomen	X	X	X	O	O	X	O
	Cardiac	X	O	O	X	X	O	O
	TCD	X	X	X	O	O	X	O
PM1-6A	Abdomen	X	X	X	O	O	X	O
	Cardiac	X	O	O	X	X	O	O
	TCD	X	X	X	O	O	X	O
CW6.0	Cardiac	X	X	X	X	X	X	O
	Vascular	X	X	X	X	X	X	O

NOTE

The significance of each symbol is as follows:

Har: Harmonic imaging

PI: Pulse Inversion

Q Scan: Quick Scan

ECG: Electro Cardio Graph Imaging

CM: Color M

TDI: Tissue Doppler

PD: Power Doppler

S-Flow: Directional Power Doppler Imaging

TDW: Tissue Doppler Wave

CW: Continuous Wave

Thermal Index (TI Table)

The Thermal Index (TI) on the screen title bar can change depending on probes and applications. The following thermal indices are available: soft tissue (TIs), bone (TIb) and cranial bone (TIc). This product automatically displays an appropriate thermal index for the current probe and application. Refer to the following table:

Probe	Application										
	Abdomen	**Obstetrics**	**Gynecology**	**Cardiac**	**Vascular**	**Urology**	**MSK**	**Pediatric**	**Small Parts**	**Contrast Agent**	**TCD**
L3-12A					TIs		TIs		TIs		
L5-13					TIs		TIs		TIs		
L7-16					TIs		TIs		TIs		
LA2-9A	TIs				TIs		TIs		TIs		
LA3-16A					TIs		TIs		TIs		
LA3-16AI							TIs				
C2-6	TIs	TIb	TIs								
CA1-7A	TIs	TIb	TIs							TIs	
CA2-8A	TIs	TIb	TIs								
CF4-9					TIs			TIs			
E3-12A		TIb	TIs			TIs					
V4-8	TIs	TIb	TIs								
V5-9		TIb	TIs			TIs					
LV3-14A					TIs		TIs		TIs		
PE2-4	TIs			TIs							TIc
PM1-6A	TIs			TIs							TIc
CW6.0				TIs	TIs						

Ultrasound Transmission Gel

For proper transmission of the acoustic beam, only use ultrasound transmission gels approved by Samsung Medison.

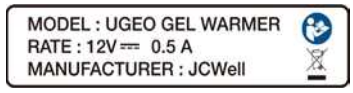
WARNING	■ Using an inappropriate ultrasound gel may damage the probe. Using damaged probes may result in electric shocks and other hazards to the patients and/or users. ■ Do not use ultrasound gels or couplants that contain any of the following agents: – Mineral oil, cooking oil, petroleum, solvents, corrosion inhibitor, lanoline, paraffin grease, ester, excessive silicon release agent and other oil substances – Acetone, methanol, dioctylphtalate and other alcohol or denatured alcohol – Glacial acetic acid, iodine ■ All types of lotion or gel containing aromatic substances

Gel Warmer

The Gel Warmer keeps the ultrasound gel warm. Warming up ultrasound gel takes approximately 5 minutes.

WARNING	■ Always turn the Gel Warmer off when 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.



[Figure 5.1 Example of Gel Warmer Label]

Using Sheaths

Sheaths are recommended for clinical applications of an invasive nature. Using probes prevents contamination from blood or other bodily fluids during operations or biopsy.

Samsung Medison does not supply sheaths, so appropriate sheaths should be purchased separately.

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.

Applying the Sheath

1. Remove the sheath from the packaging, and fill it with ultrasound gel. Be sure to put on sterile gloves.
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 trapped within the ultrasound gel. If necessary, secure the sheath to the probe and the probe cable.
4. Dispose of the sheath after use.

Probe Safety Precautions

CAUTION	■ Do not apply mechanical shock 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 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 operation 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 Customer Service 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 (a critical brain disease caused by a 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 and sheaths.

The ultrasonographic image scanner uses ultrasound, and 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 a surgical procedure.

The most effective method of preventing 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. Accordingly, use sheaths and other protective items and follow all safety instructions in order to minimize the risk of infection among patients.

Risk of 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	■ The product should regularly be checked for short-circuit from the Samsung Medison Customer Service Department. ■ Do not immerse the probe in liquid. ■ Do not drop the probe or subject it to 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 overvoltage. If the power monitoring protection circuit detects overvoltage, 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 product limits the temperature for making contact with patients to below 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 probe.

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

An appropriate detergent, disinfectant, or ultrasound gel should be selected based on the following tables. All probes are tested under IPX 7 Criteria.

Names	Disinfectants																
	T-Spray II	T-Spray	Sani-Cloth HB	Sani-Cloth Plus	Sani-Cloth Active	Septiwipes	Cleanisept Wipes	Ster-Bac Blu	Transeptic Spray	Incidin Foam	Super Sani-Cloth	Sani-Cloth Germicidal	Asepti-Wipes	Asepti-Wipes II	CaviWipes	MetriWipes	Cidex 2%
Type	S	S	W	W	W	W	W	L	S	S	W	W	W	W	W	W	L
Active Ingredient	Quaternary Ammonium (N-Alkyl)								IPA								Glutaraldehyde
L3-12A	●		●														●
L5-13		●							●		●						
L7-16		●							●		●						

Names	Disinfectants																
	T-Spray II	T-Spray	Sani-Cloth HB	Sani-Cloth Plus	Sani-Cloth Active	Septiwipes	Cleanisept Wipes	Ster-Bac Blu	Transeptic Spray	Incidin Foam	Super Sani-Cloth	Sani-Cloth Germicidal	Asepti-Wipes	Asepti-Wipes II	CaviWipes	MetriWipes	Cidex 2%
Type	S	S	W	W	W	W	W	L	S	S	W	W	W	W	W	W	L
Active Ingredient	Quaternary Ammonium (N-Alkyl)								IPA								Glutaraldehyde
LA2-9A	●	●	●					●	●								●
LA3-16A	●		●														●
LA3-16AI		●	●														●
C2-6	●	●	●														
CA1-7A	●		●														●
CA2-8A	●		●														●
CF4-9	◆	◆	◎					▣	▲								▣
E3-12A		●							●		●						
V4-8	◆	◆	◎			▲	▲	▣									▣
V5-9	◆	◆	◎		▲	▲	▲	▣	▲	■		▲	▲			▲	▣
LV3-14A	◆	◆	◎		▲	▲	▲	▣									▣
PE2-4	●	●	●	●													●
PM1-6A		●															●
CW6.0	◆	◆	◎					▣	▲								▣

Names	Disinfectants															
	Cidex OPA [2,3]	Cidex Plus [2]	Metricide [2]	Omnicide (28)	Omnicide 14NS	Omnicide - FG2	Nuclean	Wavicide-01 [3]	Sekusept Extra	Salvanios pH 7	Salvanios pH10	Steranios 2%	Surfaces Hautes	Sekusept Plus	Milton	Bleach 5.25%
Type	L	L	L	L	L	L	L	L	L	L	L	L	S	L	L	L
Active Ingredient	Ortho-phthalaldehyde	Glutaraldehyde												Nonionic surfactant	Sodium Hypochlorite	
L3-12A	●	●				●	●	●							●	
L5-13	●	●													●	
L7-16	●	●													●	
LA2-9A	●	●	●					●								
LA3-16A	●	●				●	●								●	
LA3-16AI	●	●				●	□	□							●	
C2-6	★	●	●	●				●	●						★	
CA1-7A	●	●				●	●								●	
CA2-8A	●	●				□	●								●	
CF4-9	▲	◇	▣					▣								
E3-12A	●	●													●	
V4-8	▲		▣					▣								
V5-9	▲	◇	▣					▣						◎		
LV3-14A	▲		▣					▣								
PE2-4	●	●	●	●	●			●			●	●			●	
PM1-6A	●	●														
CW6.0	▲	◇	▣					▣								

Names	Disinfectants								Cleaner					
	Virkon	Sporox	Sporox II	Gigasept	Gigasept AF [3]	Gigasept FF	Hibitane	PeraSafe	Enzol	Alkazyme	Cidezyme	Klenzyme	Isopropyl alcohol(70%)	Isopropyl alcohol(80%)
Type	L	L	L	L	L	L	L	P			L	L	L	L
Active Ingredient	NA	Hydrogen Peroxide		Succindialdehyde, formaldehyde		Bersteinsaure	Chlorhexidine gluconate solution	Peracetic Acid	Dodecylphenolethoxylate, Sodium Xylene Sulfonate	NA	Proteolytic Enzymes		Alcohol	
L3-12A		□									●	●	●	
L5-13	●		●											
L7-16	●		●											
LA2-9A					●	●	●	●						
LA3-16A		□									●	●	●	
LA3-16AI			●								●	●	●	
C2-6	□		□		□	★			●			●	□	
CA1-7A		●									●	●	●	
CA2-8A		●									●	●	●	
CF4-9					◎	◎	◎	▲						
E3-12A	●		●											
V4-8						◎		▲						
V5-9				◎	◎	◎		▲				◐		
LV3-14A				◎		◎		▲						
PE2-4									●			●	●	

Names	Disinfectants								Cleaner					
	Virkon	Sporox	Sporox II	Gigasept	Gigasept AF [3)]	Gigasept FF	Hibitane	PeraSafe	Enzol	Alkazyme	Cidezyme	Klenzyme	Isopropyl alcohol(70%)	Isopropyl alcohol(80%)
Type	L	L	L	L	L	L	L	P			L	L	L	L
Active Ingredient	NA	Hydrogen Peroxide		Succindialdehyde, formaldehyde		Bersteinsaure	Chlorhexidine gluconate solution	Peracetic Acid	Dodecylphenolethoxylate, Sodium Xylene Sulfonate	NA	Proteolytic Enzymes		Alcohol	
PM1-6A		●											●	
CW6.0					◎	◎	◎	▲						

Names	Cleaner			Gel								Trophon
	Ethanol 75%	Metrizyme	McKesson	Natural Image	Aquasonics 100 [3]	GE Ultrasound Contact Gel	Clear Image	Kendall	Scan	Wavelength	Sonogel	
Type	L	L	L	G	G	G	G	G	G	G	G	
Active Ingredient	Alcohol	Propylene Glycol	PCMX (Chloroxylenol)	Ammonium Chlorides	NA							
L3-12A		●	●		●							
L5-13					●							
L7-16					●							
LA2-9A					●				●		●	
LA3-16A		●	●		●							
LA3-16AI		●	●		●							
C2-6		●			●							□
CA1-7A		●	●		●							
CA2-8A		●	●		●							
CF4-9					●				●		●	●
E3-12A					●							
V4-8					●	●			●		●	●
V5-9					●	●			●		●	●
LV3-14A					●	●			●		●	●
PE2-4		●			●							
PM1-6A		●			●				●			
CW6.0					●				●		●	□

※ Symbols

The significance of each symbol is as follows:

(1)	Compatible but no EPA Registration
(2)	FDA 510(k) qualified
(3)	Has CE mark
(4)	Discontinued
(5)	Under Development
(6)	ANVISA Registered
S	Spray
W	Wipe
L	Liquid
P	Powder
G	Gel
❹	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 longer than 5 minutes.
◐	Must not be used longer than 10 minutes.
▲	Must not be used longer than 15 minutes.
◆	Must not be used longer than 20 minutes.
◇	Must not be used longer than 25 minutes.
◎	Must not be used longer than 30 minutes.
▣	Must not be used longer than 50minutes.
Blank	Untested (DO NOT USE)

The following is information about the manufacturers (or distributors) of detergents, disinfectants, and ultrasound gels.

Product	Manufacturer or Distributor	Telephone number
Aquasonics	Parker Co.	+1-800-631-8888(USA)
Cidex	CIVCO Co.	+1-800-445-6741(USA) +1-319-656-4447(Worldwide)
Enzol	CIVCO Co.	+1-800-445-6741(USA) +1-319-656-4447(Worldwide)
GIgasept AF	S&M(Schulke&Mayr) Co.	+44-114-254-3500(UK)
Gigasept FF	S&M(Schulke&Mayr) Co.	+44-114-254-3500(UK)
Isopropyl alcohol (70%)	Local drugstore	None
Klenzyme	Steris Co.	+1-800-548-4873(USA)
Metricide	CIVCO Co.	+1-800-445-6741(USA) +1-319-656-4447(Worldwide)
Metrizyme	Metrex Research Corp.	+1-800-841-1428(USA)
Milton	Procter & Gamble Australia Pty. Ltd.	+61-1800-028-280(Australia)
Nuclean	National Diagnostics Co.	+1-800-526-3867(USA) +44(0)-148-264-6020(UK)
Omnicide	Cottrell Ltd.	+1-800-843-3343(USA)
Sani-cloth	PDI/Nice-Pak Products Co.	+1-914-365-1602(USA)
Sekusept Extra	Henkel Hygiene GmbH.	+49-0211-797-0(Germany)
Sporox II	Sultan Chemist Inc.	+1-800-637-8582(USA)
T-Spray	CIVCO Co.	+1-800-445-6741(USA) +1-319-656-4447(Worldwide)
Virkon	Antec International LTD.	+1-403-286-1771(USA)
Wavicide	Wave Energy System Inc.	+1-800-252-1125(USA)

Cleaning

Cleaning of probes is an important stage before disinfection. Always clean probes after using them.

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 is wet lower than dry parts until the whole probe is completely dry.

1. Disconnect the probe from the system.
2. Remove any biopsy adapters or needle guides. (Adapter may be reused after disinfection.)
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 contaminants, 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, and wipe with a dry cloth again.

Disinfection

Disinfect the probe using a disinfectant solution recommended by Samsung Medison to reduce pathogens to the level of 10^{-6}.

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 probe. Ensure that the solution strength and duration of contact are appropriate for disinfection.

CAUTION	■ Failing to use a recommended disinfectant or follow the recommended disinfection method may damage and/or discolor the probe. This also voids the product warranty. ■ Do not immerse non-sterilizable probes in disinfectant for more than one hour. ■ Only use liquid solutions to sterilize probes. Do not sterilize by autoclaving or using EtO gas.

1. Please refer to the operation manual of the disinfectant for details of proper storage, use, and disposal of the disinfectant.
2. Mix the disinfectant compatible with your probe according to label instructions for solution strength..
3. Immerse the probe into the disinfectant as shown in the illustration below.
4. Follow the instructions on the disinfectant to complete the immersion procedure of the probe, and rinse the probe afterwards.
5. Allow the probe to air dry or wipe it with a dry cloth.

[Figure 9.2 Disinfecting a Probe]

Chapter 10

Maintenance

Operational Environment

When installing the product, please pay attention to the following:

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 cause 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.
- 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.

Product Maintenance

Cleaning and Disinfecting

Using an inappropriate cleaning or sterilizing agent may damage the product. Pay attention to the following:

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 spray detergent directly onto the product's exterior. Doing so may discolor or crack the surface. ■ 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 the Monitor**
  Wipe the LCD surface with a soft, dry cloth. When the LCD panel has dirt on it, wipe it two to three times or more in one direction.

- **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	During cleaning of the trackball, make sure that any liquid or other substances do not enter the product.

1. Turn the trackball rim counterclockwise to detach it from the control panel.
2. Wipe the trackball with a soft cloth and turn the trackball rim clockwise to reattach.

[Figure 10.1 Detaching the Trackball Rim]

NOTE	■ For information on cleaning and disinfecting the probe, please refer to ‘Chapter 9. Probes’. ■ This image may differ from the actual system.

Disinfection

CAUTION	When disinfecting the surface, be sure to use disinfectants recommended by Samsung Medison.

A disinfectant certified by the U.S. FDA 510(k) process is recommended. For more information, please refer to the information about detergents, disinfectants, and ultrasound gels in ‘Chapter 9. Probes’.

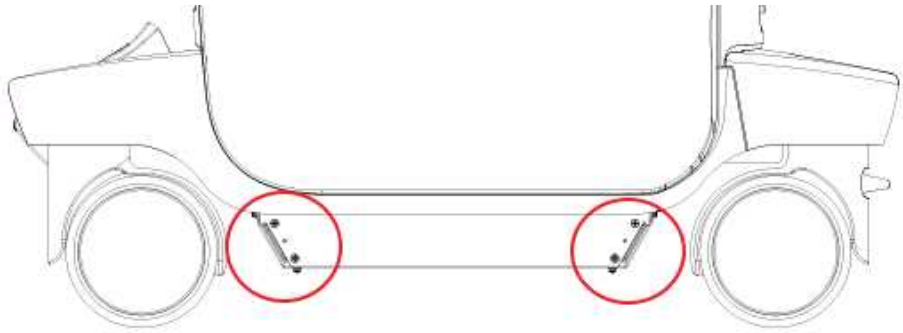
1. Turn off the system and disconnect the power cord from the wall outlet.
2. Mix the disinfectant solution that is compatible with your system to the solution strength specified on the instruction label.
3. Wipe the system surfaces with the disinfectant solution according to the instructions in the disinfectant's user manual.
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. When the air filter is clogged with dust, it may cause the product to overheat and generate noise; it may also reduce the reliability and the system performance.

Clean the filter once every three months to maintain the system in optimal condition.

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 Detaching the Air Filter]

1. Pull out the filter under the front of the console and detach it 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 and 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 Checks

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 operation manual of this product in 'Chapter 9. Probes.

Information Maintenance

CAUTION	Back up the data on the system on a regular basis, since an external shock or an internal error may result in data loss.

Backing up User Settings

Always keep a backup copy of all information related to the user settings in case of data loss. Users cannot back up the user settings of the product on their own. Please contact Customer Service Department of Samsung Medison, so that a staff may perform the backup procedure.

Backing Up Patient Information

You can back up patients' basic information and scanned images. You can save the backup manually. Backups can only be saved externally, either to CDs or DVDs. It is recommended that you back up patients' basic information and scanned images regularly. For more information, please refer to the operation manual of this product, in 'Chapter 6. Starting Diagnosis'. If the system needs to be reinstalled because of product failure, etc., the Samsung Medison Customer Service Department staff will restore the basic information and scanned images that are saved in the system.

Software

The software may be changed to improve the product functionalities. You may not update the software yourself; a staff of the Samsung Medison Customer Service Department will assist you in updating the software.

CAUTION	Minor software updates may be carried out without prior notice from the manufacturer.

If errors occur in the Windows 7 operating system or you desire to upgrade the operating system, please follow the instructions of the operating system manufacturer.

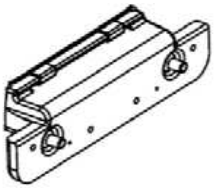
Chapter 11

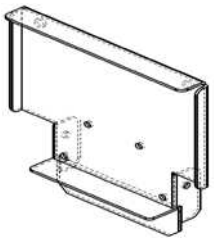
Service Parts List

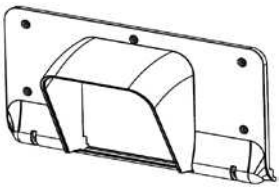
Body Cover Parts

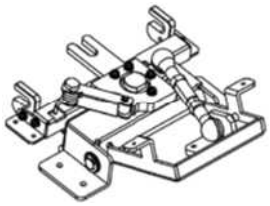
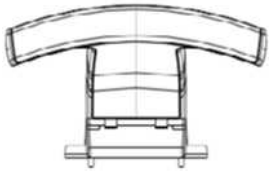
Part Code	Part Name	Part Image
MI63-01981A	COVER-LINK FRONT R	
MI63-01982A	COVER-LINK FRONT L	
MI63-02108A	COVER-BODY-FRONT	
MI63-02109A	COVER-BODY-REAR	
MI63-02112A	COVER-ODD-DOOR	
MI63-02151A	COVER-TOUCH LCD DECO	

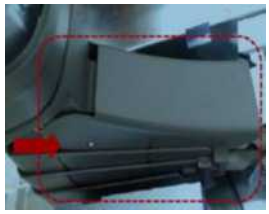
Part Code	Part Name	Part Image
MI63-02152A	COVER-ODD DUMMY	
MI63-02153A	COVER-BASE FRONT	
MI63-02154A	COVER-BASE REAR	
MI63-02157A	COVER-BODY TOP	
MI63-02158A	COVER-BODY REAR HANDLE TOP	
MI63-02159A	COVER-BODY REAR HANDLE BOTTOM	
MI63-02160A	COVER-HANDLE TOP	

Part Code	Part Name	Part Image
MI63-02161A	COVER-HANDLE FRONT	
MI63-02162A	COVER-HANDLE BOTTOM	
MI63-02163A	COVER-PRINTER TRAY	
MI63-02164A	COVER-LIFT BACK	
MI63-02165A	COVER-LIFT BOTTOM	
MI63-02166A	COVER-LIFT MIDDLE LOWER	
MI63-02167A	COVER-LIFT MIDDLE UPPER	

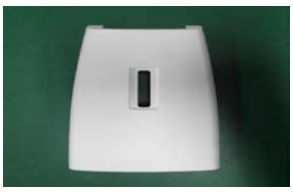
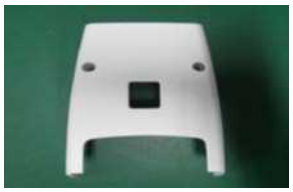
Part Code	Part Name	Part Image
MI63-02168A	COVER-LIFT TOP	
MI63-02169A	COVER-BODY PEDAL	
MI63-02170A	COVER-BODY PEDAL IN	
MI63-02171A	COVER-FILTER	
MI63-02185A	COVER-USB DONGLE	
MI63-02186A	COVER-SSD	

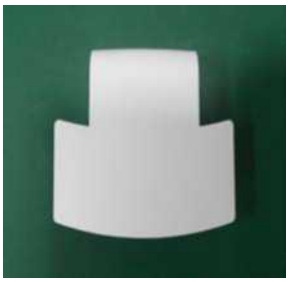
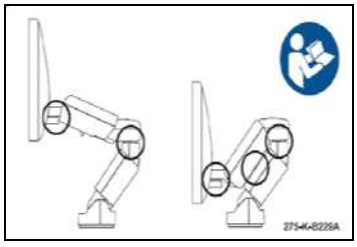
Part Code	Part Name	Part Image
MI63-02193A	COVER-HINGE TOP	
MI63-02199A	COVER-BODY FRONT PRINTER	
MI63-02241A	COVER BASE-LOWER_L	
MI63-02242A	COVER-REAR TOUCH LCD B	
MI64-01945A	KNOB-ODD DOOR	
MI68-02554A	LABEL	
MI97-02709A	ASSY COVER-HANGER	

Part Code	Part Name	Part Image
MI97-02729A	ASSY CASTER-C-LOCK	
MI97-02733A	ASSY COVER-HANDLE BODY	
MI97-02734A	ASSY COVER-BODY FRONT	
MI97-02735A	ASSY COVER-BODY REAR	
MI97-02736A	ASSY COVER-BODY SIDE L	
MI97-02737A	ASSY COVER-BODY SIDE R	

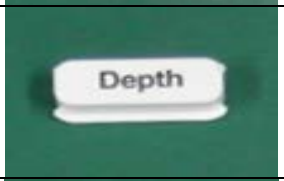
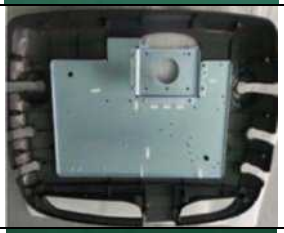
Part Code	Part Name	Part Image
MI97-02738A	ASSY COVER-BODY TOP	
MI97-02739A	ASSY COVER-LIFT	
MI97-02780A	ASSY CASTER-FRONT	
MI97-02781A	ASSY CASTER-REAR	
MI97-02866A	ASSY COVER-BASE LOWER-L	
MI97-02937A	ASSY COVER-PRINTER TRAY	

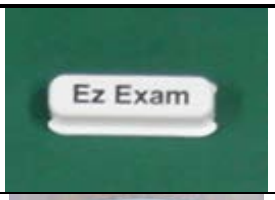
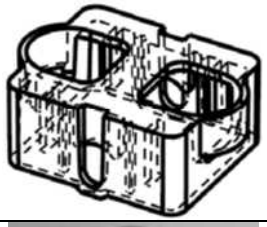
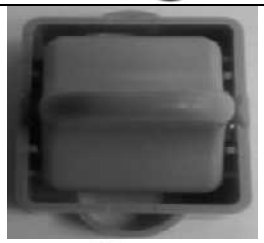
Monitor&Arm Parts

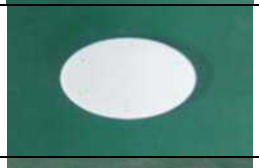
Part Code	Part Name	Part Image
MI63-01634A	COVER-ARM UPPER TOP ADD EUROPA	
MI63-01635C	COVER-ARM UPPER TOP	
MI63-01636C	COVER_ARM UPPER BOTTOM	
MI63-01637C	COVER-ARM LOWER TOP ADD	
MI63-01638A	COVER-ARM UPPER BACK TOP EUROPA	
MI63-01639A	COVER-ARM UPPER BACK BOTTOM EUROPA	
MI63-01640A	COVER_ARM LOWER TOP FRONT	
MI63-01641A	COVER_ARM LOWER TOP BACK	

Part Code	Part Name	Part Image
MI63-01642A	COVER_ARM LOWER TO	
MI63-01643A	COVER_ARM LOWER BOTTOM	
MI63-01646A	COVER-ARM BUTTON EUROPA	
MI63-01647A	COVER-ARM BUTTON GUIDE EUROPA	
MI63-01661A	COVER_ARM UPPER BOTTOM ADDM	
MI63-01662A	COVER-ARM LOWER FRONT ADD EUROPA	
MI68-01977A	LABEL CAUTION	

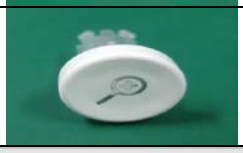
Control Panel Parts

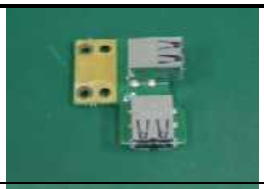
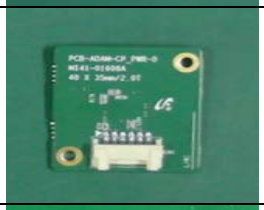
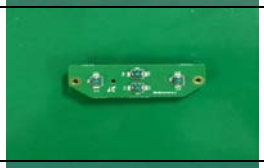
Part Code	Part Name	Part Image
MI61-03520A	HOLDER-PROBE 3D L	
MI61-03521A	HOLDER-PROBE 3D R	
MI61-03522A	HOLDER-PROBE	
MI63-02096A	COVER-CP CAP DEPTH	
MI63-02097A	COVER-CP CAP FOCUS	
MI63-02148A	COVER-CONTROLPANEL BOTTOM	
MI63-02149A	COVER-CONTROL PANEL TOP	
MI63-02150A	COVER-CONTROL PANEL HANDLE	

Part Code	Part Name	Part Image
MI63-02200A	COVER-CP CAP EZ EXAM	
MI64-01911B	KNOB-ENCORDER	
MI64-01913B	BUTTON-TOGGLE LOWER	 
MI64-01914B	BUTTON-TOGGLE UPPER	 
MI64-01917A	BUTTON-CAP KEY CHANGE	

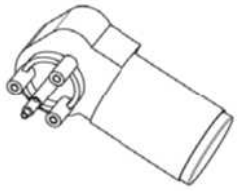
Part Code	Part Name	Part Image
MI64-01918A	BUTTON-FREEZE	
MI64-01926A	BUTTON-CAP KEY Q SCAN	
MI64-01927A	BUTTON-CAP KEY P1	
MI64-01937A	BUTTON-CAP KEY SET L	
MI64-01938A	BUTTON-CAP KEY SET R	
MI64-01942B	BUTTON-ENCORDER 2D	
MI64-01944A	KNOB-MULTI-CP	
MI64-01971A	BUTTON-ENCORDER EZ EXAM	
MI64-01972A	BUTTON-CAP KEY M	

Part Code	Part Name	Part Image
MI64-01973A	BUTTON-CAP KEY PD	
MI64-01974A	BUTTON-CAP KEY ERASE	
MI64-01975A	BUTTON-CAP KEY MEASURE	
MI64-01976A	BUTTON-CAP KEY CALIPER	
MI64-01977A	BUTTON-CAP KEY P2	
MI64-01978A	BUTTON-CAP KEY U1	
MI64-01979A	BUTTON-CAP KEY U2	
MI64-01980A	BUTTON-CAP KEY U3	

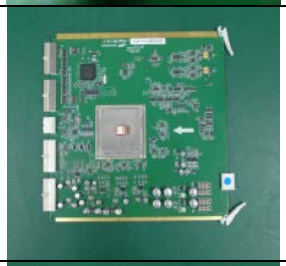
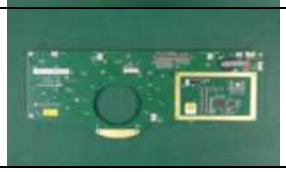
Part Code	Part Name	Part Image
MI64-01981A	BUTTON-CAP KEY SWIVEL R	
MI64-01982A	BUTTON-CAP KEY SWIVEL L	
MI64-01983A	BUTTON-CAP KEY LIFT	
MI64-01984A	BUTTON-ENCORDER COLOR	
MI64-01985A	BUTTON-ENCORDER ANGLE	
MI64-01986A	BUTTON-ENCORDER PW	
MI64-01987A	BUTTON-ENCORDER ZOOM	
MI68-02254A	LABEL-ID	
MI68-02821A	LABEL-TILTING CAUTION	

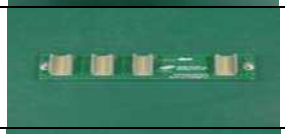
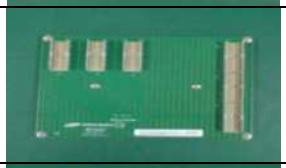
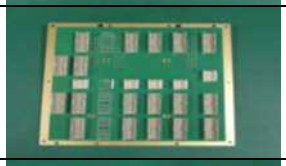
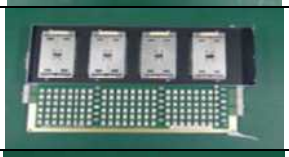
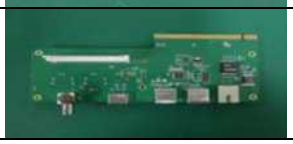
Part Code	Part Name	Part Image
MI92-02249A	ASSY BOARD-SWI_USB	
MI92-02250A	ASSY BOARD-CP_PWR	
MI92-02252A	ASSY BOARD-CP_LMB	
MI92-02297A	ASSY BOARD-CP_USB	
MI95-01304A	ASSY CAP KEY-POWER	
MI95-01310B	ASSY CAP KEY-TOGGLE	
MI97-02562A	ASSY ETC-COVER BRIDGE BACK	
MI97-02563A	ASSY ETC-GELWARMER HOLDER	

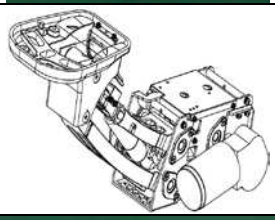
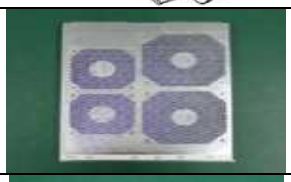
System Parts

Part Code	Part Name	Part Image
0204-005878	SILICAGEL	
1105-002544	IC-DRAM MODULE	
3101-002960	MOTOR-DC_LEFT	
3901-001155	CBF	
5902-005531	CARD VGA	
5903-004793	SSD	
5903-005012	CPU	

Part Code	Part Name	Part Image
5903-005017	ODD	
MI59-01111A	TRACK BALL	
MI59-01118A	BOARD-PC-MOTHER	
MI59-01136A	BOARD-CTSB	
MI59-01137A	BOARD	
MI61-01443A	CLIP	
MI61-01812A	FINGER	 
MI61-02024A	RAIL	
MI63-01453A	GASKET	
MI65-01021A	CLAMP-VELCRO COLOR PRINTER	

Part Code	Part Name	Part Image
MI69-01009A	BAG VINYL	
MI69-01016A	BOX ACCESSORY	
MI80-01001A	WRENCH-HEX	
MI92-01710A	ASSY BOARD_ AC	
MI92-01711A	ASSY BOARD_BE	
MI92-01712A	ASSY BOARD_BF	
MI92-01713A	ASSY BOARD_CONTROL PANEL	

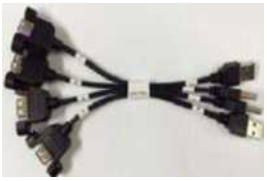
Part Code	Part Name	Part Image
MI92-01714A	ASSY BOARD_DVI	
MI92-01715A	ASSY BOARD_FPP	
MI92-01716A	ASSY BOARD_FPS	
MI92-01717A	ASSY BOARD_BP	
MI92-01718A	ASSY BOARD_PCI EXPRESS	
MI92-01719A	ASSY BOARD_PC MODULE	
MI92-01720A	ASSY BOARD_PSA	
MI92-01721A	ASSY BOARD_REAR LEFT	
MI92-02259A	ASSY BOARD-CW_CON	
MI92-02320A	ASSY BOARD_REAR RIGHT	

Part Code	Part Name	Part Image
MI96-01332A	ASSY MONITOR	
MI96-01344A	ASSY ADM	
MI96-01345A	ASSY TRANS-AIM	
MI96-01350A	ASSY TOUCH PANEL	
MI97-02508A	ASSY LIFT	
MI97-02756A	ASSY RACK-FAN	
MI97-02766A	ASSY BRACKET-REAR FAN	
MI97-02878A	ASSY ARM	

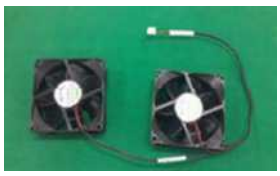
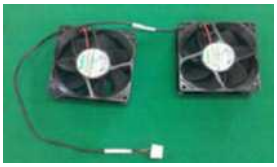
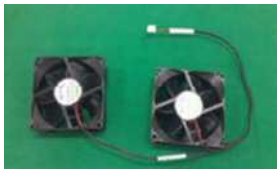
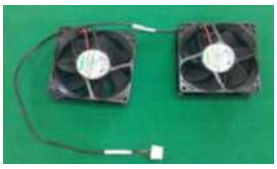
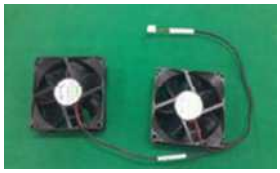
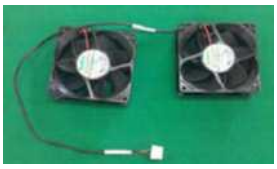
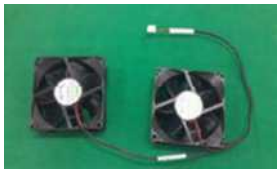
Part Code	Part Name	Part Image
MI97-02924A	ASSY SHIELD-AD BD	
MI96-01205A	ASSY CABLE_Gel_Warmer_Power	
MI92-02251A	ASSY BOARD-LMC_SEN	
MI67-01010A	CAP	
MI67-01039A	CAP	
MI67-01056A	BRUSH	
3706-001798	CONNECTOR-CIRCULAR	

System Cable Parts

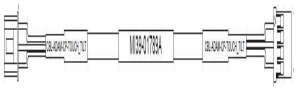
Part Code	Part Name	Part Image
6502-000109	CABLE CLAMP	
MI39-01020A	CBF CABLE	
MI39-01684A	CBF CABLE-HDMI-DVI-BE	
MI39-01685A	CBF CABLE-HDMI-VGA-MAIN	
MI39-01686A	CBF CABLE-HDMI-DVI-MAIN	
MI39-01687A	CBF CABLE-HDMI-VGA-TCH	
MI39-01688A	CBF CABLE-USB-ECG	
MI39-01689A	CBF CABLE-USB-CP-TCH	

Part Code	Part Name	Part Image
MI39-01690A	CBF CABLE-USB-PRINTER	
MI39-01691A	CBF CABLE-USB-DONGLE	
MI39-01692A	CBF CABLE-USB-PC-RACK	
MI39-01693A	CBF CABLE-USB-PC-RACK2	
MI39-01694A	CBF CABLE-USB-LMC	
MI39-01695A	CBF CABLE-USB-NEEDLE	
MI39-01696A	CBF CABLE-HDMI-DVI-PCM	
MI39-01697A	CBF CABLE-USB-CP-USER	

Part Code	Part Name	Part Image
MI39-01698A	CBF CABLE-USB-PC-PCM	
MI39-01699A	CBF CABLE-LAN-PC-PCM	
MI39-01700A	CBF CABLE-SERIAL-PC-DVI	
MI39-01701A	CBF CABLE-SERIAL-PC-PCM	
MI39-01702A	CBF CABLE-PWR-PC-ATX4	
MI39-01703A	CBF CABLE-PWR-PC-ATX24	
MI39-01704A	CBF CABLE-MOVING2	
MI39-01705A	CBF CABLE-PSA-CW	
MI39-01706A	CBF CABLE-CP-TRACKBALL	

Part Code	Part Name	Part Image
MI39-01707A	CBF CABLE-CP-PWR_BTN	
MI39-01709A	CBF CABLE-PWR-LMC-DDM	
MI39-01710A	CBF CABLE-LMC-PTN_MET	
MI39-01711A	CBF CABLE-CP-LIFT_CTL	
MI39-01712A	CBF CABLE-FAN-EXTENSION	
MI39-01713A	CBF CABLE-CP-GND	
MI39-01714A	CBF CABLE-FAN-PC	
MI39-01715A	CBF CABLE-FAN-REAR	
MI39-01716A	CBF CABLE-SATA-PC-SSD	

Part Code	Part Name	Part Image
MI39-01717A	CBF CABLE-SATA-REAR-ODD	
MI39-01718A	CBF CABLE-SPEAKER	
MI39-01719A	CBF CABLE-SPEAKER-WOOFER	
MI39-01721A	CBF CABLE-DATA-DVI-PCM	
MI39-01722A	CBF CABLE-AUDIO-PC-DVI	
MI39-01723A	CBF CABLE-PC-PWR_SW	
MI39-01724A	CBF CABLE-PWR-CP-GEL	

Part Code	Part Name	Part Image
MI39-01725A	CBF CABLE-CP-LCD_CTL	
MI39-01726A	CBF CABLE-LMC-HALL_SEN	
MI39-01727A	CBF CABLE-FAN-RACK	
MI39-01728A	CBF CABLE-MOVING	
MI39-01729A	CBF CABLE-SATA-PC-PCM	
MI39-01787A	CBF CABLE-CP TOP-CP BOTTOM	
MI39-01789A	CBF CABLE-CP-TOUCH_TILT	
MI39-01791A	CBF CABLE-MAGNETIC_BRAKE	
MI39-01792A	CBF CABLE-ARM MAIN_LCD