

SAMSUNG

SAMSUNG MEDISON
DIAGNOSTIC ULTRASOUND SYSTEM

HS50/HS60 User Manual

Volume 2



SAMSUNG MEDISON
DIAGNOSTIC ULTRASOUND SYSTEM

Version 1.00

HS50/HS60

User Manual

English

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****Reference Manual**

Samsung Medison is providing an additional HS50/HS60 Reference Manual (English version).

Chapter 6

Starting Diagnosis

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:: 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:

- ▶ The product should turn on about 10 seconds after the power switch at the back of the product is turned on.
- ▶ During system booting, do not press any key on the keyboard. It may cause product malfunction.
- ▶ If you turn on the power after turning it off suddenly, the system may turn on and off momentarily. This is one of the characteristics of the Intel PC main board, not a system error.

Shutting Down the System

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



CAUTION:

- ▶ When the system is not turned off, holding down the **On/Off** button for five seconds or longer forces the product to power off.
- ▶ If the ultrasound system is unplugged while working or turned off by forcibly shutting down, the files may get corrupted and it may result in system down or data loss.
- ▶ 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.

:: Probes and Applications

Before scanning, select a probe and an application.



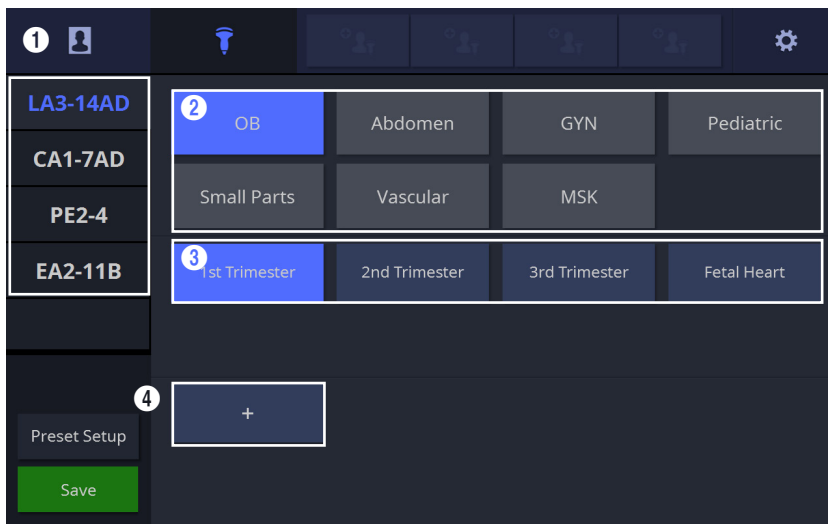
CAUTION: Refer to 'Chapter 5. Probes' for more information on probes and applications supported by the system.

Probe Selection Screen

Press the **Probe** button on the Touch Screen to load the *Probe Selection* screen. In this screen, you can select/change probe or application you want to use and change the probe presets.

The *Probe Selection* screen is divided into four lists.

- ❶ Probe list: Displays a list of probes currently connected to the system.
- ❷ Application list: Displays a list of applications the selected probe supports.
- ❸ Preset list: Display a list of presets the selected application supports.
- ❹ UserPreset list: Displays a list of presets you can configure according to your preferences.



[Figure 6.1 Probe Selection]

Selecting Probes and Applications

The selected probe, preset, or userpreset appear in the screen area of the monitor screen.

1. Select the items in the following order: Probe → Application → Preset/UserPreset.
2. When you select Preset/UserPreset, the system automatically applies your selections and switches to Diagnosis mode. Press the **Probe** button to cancel.

Creating UserPreset

1. Tap **+** on the touch screen to create a UserPreset.
2. The *Preset setup* window will open.
3. Enter the name you want to use and tap **Save**. Tap **Close** to cancel.

Modifying UserPreset

1. Enter the Preset Setup by tapping **Preset Setup** on the touch screen.
2. Select a Preset to rename and press **Rename**.
3. The *Preset setup* window will open.
4. In the *Preset setup* window, enter a new Preset name and press **Save**. To cancel it, tap **Close**.

Deleting UserPreset

1. Enter the Preset Setup by tapping **Preset Setup** on the touch screen.
2. After selecting a preset to delete, tap **Delete**.
3. The *Preset setup* window will open.
4. Tap **Delete** to delete the UserPreset. Tap **Close** to cancel it.

:: Patient Information

Press the **Patient** button on the control panel and the *Patient Information* screen will appear.

In this screen, you can enter, search, or change patient information. Patient information includes basic information such as the patient ID, name, DOB, and gender, as well as additional information for applications.



NOTE: ID is required information.

Basic Patient Information Entry

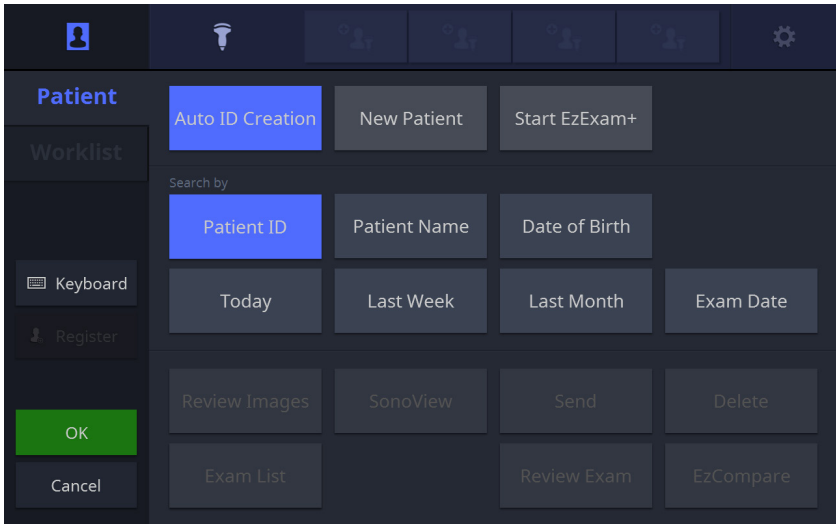
Enter or change general patient information in *General Information*.

Use the trackball to move the pointer to the desired entry field. Tap a button on the touch screen to enter information using the touch screen.

When you are done entering information, click **OK** on the screen or tap **OK** on the touch screen to save. Click **Cancel** or tap **Cancel** on the touch screen to cancel.

The screenshot displays the 'Patient' information entry screen. It features a dark-themed interface with a sidebar on the left containing buttons for 'Patient', 'Worklist', '+ New Patient', 'Start Exam+', and 'Cancel'. The main area is divided into sections: 'General Information' with fields for Patient ID, Last Name, First Name, Middle Name, Date of Birth (Age), Gender, and Indication; 'Study Information' with fields for Height, Weight, BSA, Application (set to 'Cardiac'), Accession Number, Description, and a dropdown for Application; and a 'Search' section with a 'Hide' button, a 'Search by' dropdown (set to 'Patient ID'), and a search input field. Below the search section is a table with columns for Patient ID, Patient Name, Date of Birth, Gender, Exam Date, and Application. At the bottom, there are buttons for 'Register', 'OK', and 'Cancel'.

[Figure 6.2 General Patient Information]



[Figure 6.3 General Patient Information – Touch Screen]

■ **Patient ID**

Enter a patient ID.

■ **Last Name**

Enter the patient’s last name.

■ **First Name**

Enter the patient’s first name.

■ **Middle Name**

Enter the patient’s middle name.



NOTE: The name that you have entered will appear in the title area and reports.

■ **Date of Birth (Age)**

Enter the patient’s date of birth in the specified format.

■ **Gender**

Select the patient's gender.

■ **Accession Number**

When viewing the worklist for a patient via the DICOM server, this information is automatically displayed in the appropriate fields.

■ **Diag. Physician**

Enter the name of the physician who diagnosed the patient.

■ **Ref. Physician**

Enter the name of the referring physician.

■ **Operator**

Enter the name of the operator who scanned the patient. Up to 20 persons may be entered.

■ **Search**

Search through the information stored in the system.

■ **Worklist**

Perform a search by connecting to the DICOM Modality Worklist server in the hospital network.

■ **New**

Enter new patient information.

■ **Auto ID Creation**

Create temporary patient information using a temporary ID.

■ **Keyboard**

Use the keyboard displayed on the touch screen to enter text.

■ **Start Ez Exam+**

This function helps you to link an exam with Ez Exam+ when the exam starts.

Patient Information for Each Application

In Study Information, enter additional patient information or change the existing patient information for each application.

1. Use **Application** on the monitor to select an application.
2. Enter additional information required for diagnosis.

OB

Select **OB** from **Application**. Enter the additional obstetrical information.

■ **LMP**

Enter the last menstrual period for a patient.

■ **DOC**

Indicates the patient's date of conception.

■ **EDD**

Indicates the patient's expected date of delivery.

■ **GA (LMP)**

Indicates the gestational age of a patient.

■ **Ovulation Date**

Enter expected ovulation date in accordance with defined format

■ **Day of Cycle**

Enter length of menstrual cycle in days (Date).

■ **Fetuses No.**

Enter the number of fetuses. Up to four may be entered.

■ **Gravida**

Enter the number of pregnancies.

■ Para

Enter the number of deliveries.

■ Aborta

Enter the number of miscarriages.

■ Ectopic

Enter the number of ectopic pregnancies.

■ Description

Enter a description of the diagnosis.



NOTE:

- ▶ Refer to 'Chapter 3. Utilities' Setup > System > Patient > User Defined List.
- ▶ Up to 20 persons may be entered per application.

Study Information					Application	OB
☒ LMP YYYY-MM-DD		☐ DOC YYYY-MM-DD		Ovulation Date YYYY-MM-DD		Accession Number _____
☐ EDD(LMP) _____		☐ GA(LMP) _____ w _____ d		Day of Cycle _____		Diag. Physician _____
Fetuses No. 1	Gravida _____	Para _____	Aborta _____	Ectopic _____	Ref. Physician _____	
Description _____					Operator _____	

[Figure 6.4 Study Information – OB]

GYN

Select **GYN** from **Application**. Enter additional information for Gyn. This is the same information as for OB.

Study Information

ApplicationGYN

LMP

YYYY-MM-DD

Ovulation Date

YYYY-MM-DD

Accession Number

Gravida

Para

Aborta

Ectopic

Diag. Physician

Description

Ref. Physician

Operator

[Figure 6.5 Study Information – GYN]

Urology

Select **Urology** from **Application**. Enter urological information.

PSA

Enter the Prostate Specific Antigen (PSA) value.

PPSA Coefficient 1

Enter predicted PSA coefficient 1.

PPSA Coefficient 2

Enter predicted PSA coefficient 2.

Study Information

ApplicationUrology

PSA

PPSA Coefficient 1

PPSA Coefficient 2

Accession Number

Description

Diag. Physician

Ref. Physician

Operator

[Figure 6.6 Study Information – Urology]

Vascular

Select **Vascular** from **Application**. Enter vascular-related information.

■ Left Systole

Enter left systole blood pressure.

■ Left Diastole

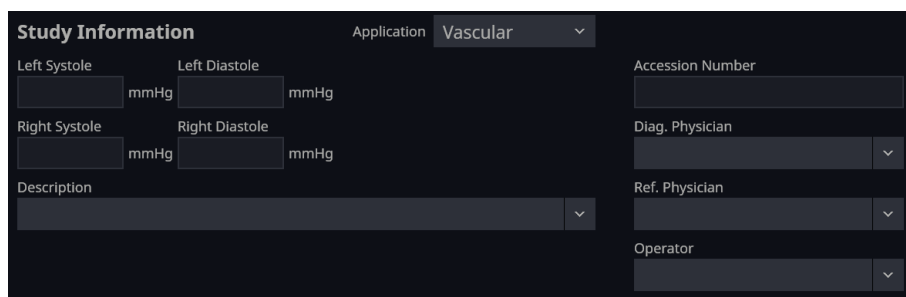
Enter left diastole blood pressure.

■ Right Systole

Enter right systole blood pressure.

■ Right Diastole

Enter right diastole blood pressure.

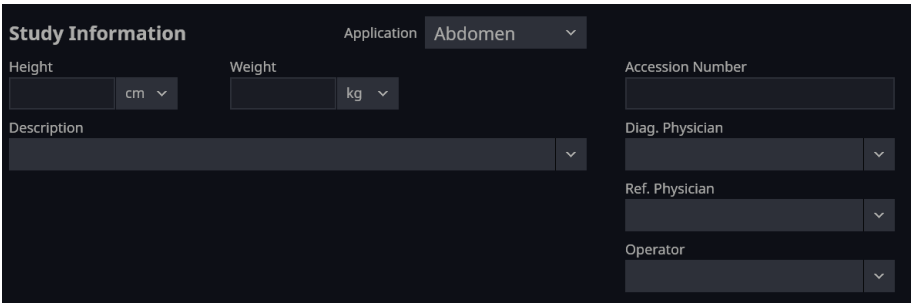


The screenshot shows a dark-themed form titled "Study Information". At the top right, there is a dropdown menu labeled "Application" with "Vascular" selected. The form is divided into two main columns. The left column contains four input fields for blood pressure: "Left Systole" (mmHg), "Left Diastole" (mmHg), "Right Systole" (mmHg), and "Right Diastole" (mmHg). Below these is a "Description" field with a dropdown arrow. The right column contains three input fields: "Accession Number", "Diag. Physician" (with a dropdown arrow), and "Ref. Physician" (with a dropdown arrow). At the bottom right is an "Operator" field with a dropdown arrow.

[Figure 6.7 Study Information – Vascular]

 Abdomen

Select **Abdomen** from **Application**.



The screenshot shows a 'Study Information' form. At the top, the 'Application' dropdown is set to 'Abdomen'. Below this, there are input fields for 'Height' (with a unit dropdown set to 'cm') and 'Weight' (with a unit dropdown set to 'kg'). To the right of these are fields for 'Accession Number', 'Diag. Physician', 'Ref. Physician', and 'Operator', each with a dropdown arrow. A 'Description' field with a dropdown arrow is located below the height and weight fields.

[Figure 6.8 Study Information – Abdomen]

■ **Height**

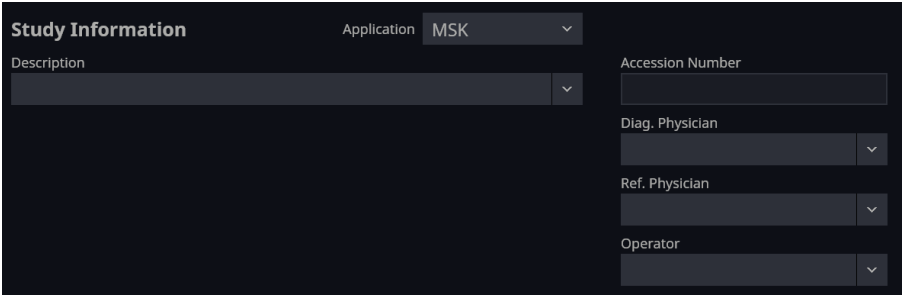
Enter the patient’s height. Enter height in cm, ft, or in.

■ **Weight**

Enter the patient’s weight. Enter weight in kg, lb, or oz.

 MSK

Select **MSK** from **Application**.

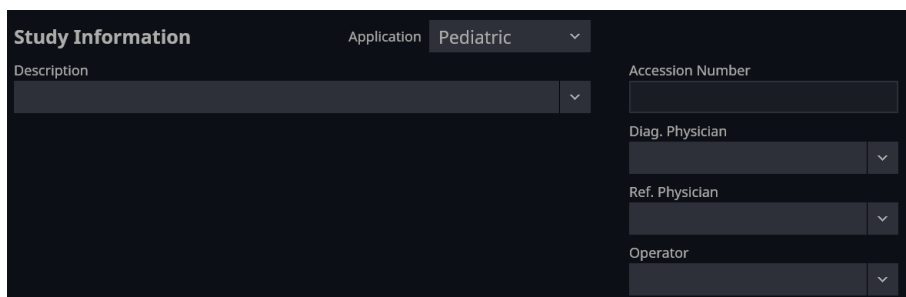


The screenshot shows the 'Study Information' form with the 'Application' dropdown set to 'MSK'. The 'Height' and 'Weight' fields are no longer visible. The 'Description' field is now the first input field on the left. The 'Accession Number', 'Diag. Physician', 'Ref. Physician', and 'Operator' fields remain on the right.

[Figure 6.9 Study Information – MSK]

Pediatric

Select **Pediatric** from **Application**.

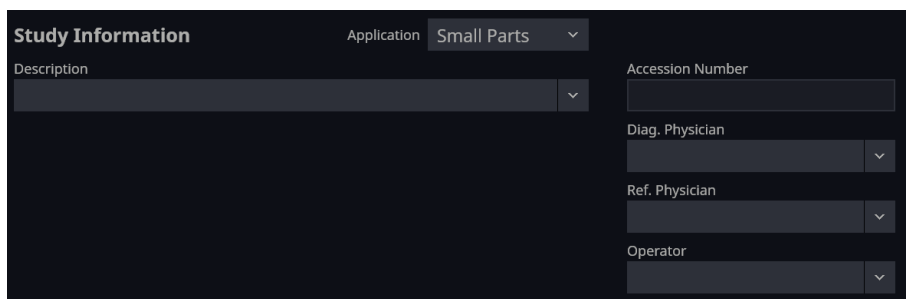


The screenshot shows the 'Study Information' form. At the top, the 'Application' dropdown menu is set to 'Pediatric'. Below this, there is a 'Description' field with a dropdown arrow. To the right of the description field, there are four input fields: 'Accession Number', 'Diag. Physician', 'Ref. Physician', and 'Operator'. Each of these fields has a dropdown arrow on its right side.

[Figure 6.10 Study Information – Pediatric]

Small Parts

Select **Small Parts** from **Application**.

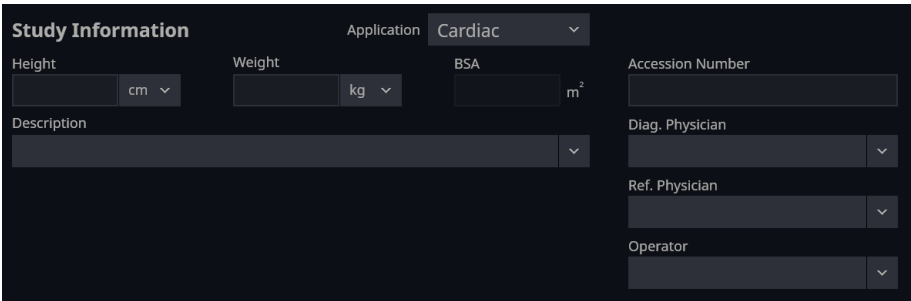


The screenshot shows the 'Study Information' form. At the top, the 'Application' dropdown menu is set to 'Small Parts'. Below this, there is a 'Description' field with a dropdown arrow. To the right of the description field, there are four input fields: 'Accession Number', 'Diag. Physician', 'Ref. Physician', and 'Operator'. Each of these fields has a dropdown arrow on its right side.

[Figure 6.11 Study Information – Small Parts]

 Cardiac

Select **Cardiac** in **Application**.



The screenshot shows a 'Study Information' form. At the top, 'Application' is set to 'Cardiac'. Below this, there are input fields for 'Height' (with a unit dropdown set to 'cm'), 'Weight' (with a unit dropdown set to 'kg'), and 'BSA' (with a unit dropdown set to 'm²'). To the right of these is an 'Accession Number' field. Below the height and weight fields is a 'Description' field with a dropdown arrow. To the right of the description field are three more dropdown fields: 'Diag. Physician', 'Ref. Physician', and 'Operator'.

[Figure 6.12 Study Information – Cardiac]

■ **Height**

Enter the patient’s height in cm, ft and in.

■ **Weight**

Enter the patient’s body weight in kg, lb and oz.

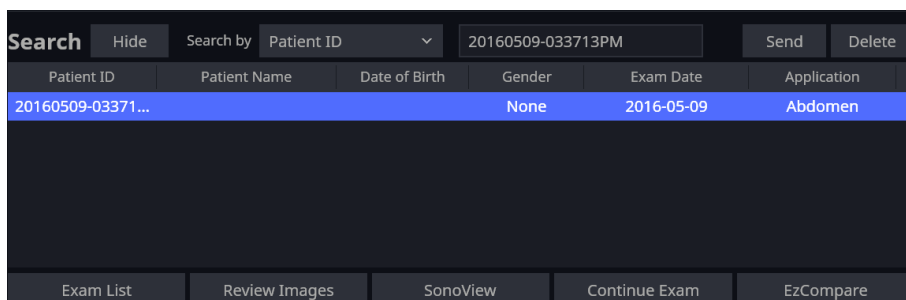
■ **BSA**

When the height and weight are entered, the BSA (Body Surface Area) is automatically calculated and displayed.

Searching Patient Information

Search

Search through the information stored in the system.



Patient ID	Patient Name	Date of Birth	Gender	Exam Date	Application
20160509-03371...			None	2016-05-09	Abdomen

Buttons at the bottom: Exam List, Review Images, SonoView, Continue Exam, EzCompare

[Figure 6.13 Search]

1. When a search term is entered in the search field, the list of patients who match the criteria will be displayed. Click the **Search By** button to search patients by condition.
2. Double click a list where a desirable patient list is selected. The selected patient information will be applied to the system.

Show/Hide

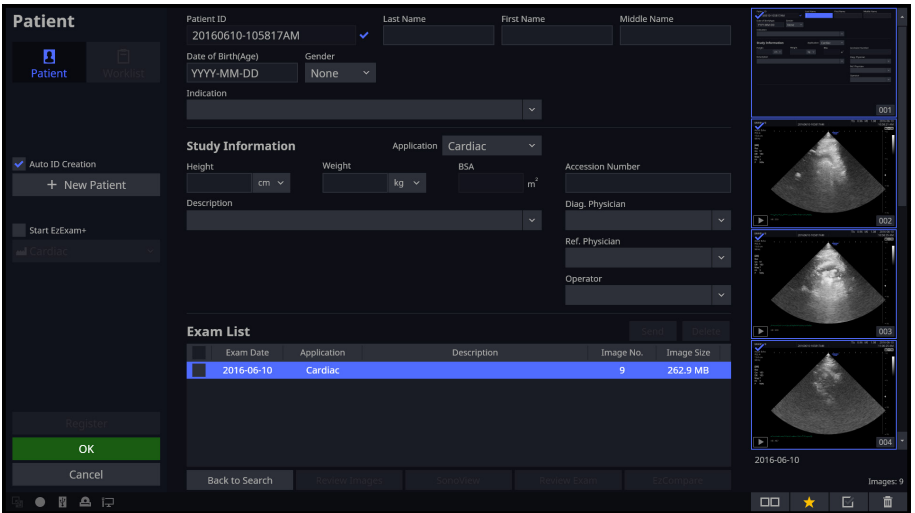
Show/Hide buttons or lists in the search area.

Search by

User can enter a search criteria.

Exam List

Show the exam list for a patient selected from the patient list.



[Figure 6.14 Exam List]

■ Back to Search

Return to the search area.

■ Review Images

Show the image of a selected exam on *Review Images* screen.



[Figure 6.15 Review Images]

- ❶ **Continue Exam:** This is activated when an exam that is less than 24 hours old is selected. The page moves to 2D image screen of the selected exam.
- ❷ **Hide Annotation:** Hide any annotations made to an image.
- ❸ **View Scale:** Set the image size for review. Select either the **Small**, **Mid**, or **Large** buttons.
- ❹  **Favorite:** Add/remove a selected image from Favorites.
- ❺  **Select/Deselect All:** Select/deselect all images regardless of the exam date.

■ **SonoView**

You can review a selected exam from SonoView.

■ **Review Exam**

The exams that were performed more than 24 hours before present, and their images, are displayed. When an exam is selected, the button is activated. When enabled, you can continue to view the exam images.

■ **Continue Exam**

Exams that were performed more than 24 hours ago can be edited. When an exam is selected, the button is activated. You can use this button to go to the edit exam page.

■ **EzCompare**

Press this button to view dual image of a selected exam image and a live scan image currently filming.

■ **Send**

Send images to the DICOM server.

■ **Delete**

Delete the exam.

Worklist Search

Perform a search by connecting to the DICOM Modality Worklist server in the hospital network.



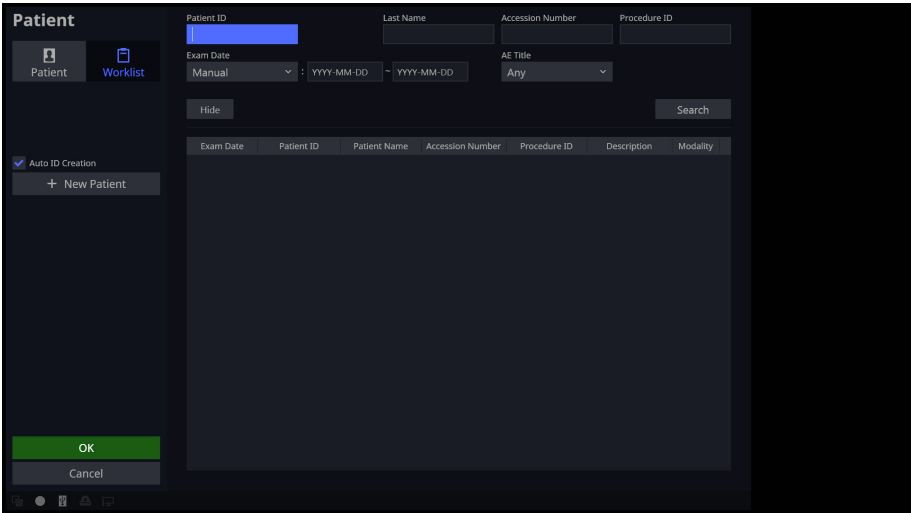
NOTE: A worklist search is available only when DICOM is enabled. You can select the worklist server in Setup > Connectivity > DICOM. Refer to the ‘DICOM Settings’ section of ‘Chapter 3. Utilities’

- 1. Select **Worklist** from **Patient** on the monitor or touch screen.
- 2. After entering at least one item out of Patient ID, Last Name, Worklist Number (Accession Number), Procedure ID, Exam Date, and/or name of the equipment being used for exam (AE Title), click **Search**. The list of patients who match the criteria will be displayed.



Clicking items such as Date/Time or Patient Name sorts entries into alphabetical or numerical order for the selected criteria.
Select Today, Last Week, Last Month, or Manual as Exam Date.
After running a search, the date of the last update is displayed in the bottom right corner.

- 3. Double click on the desired patient list. This applies the selected patient information to the system.



[Figure 6.16 Search – Worklist]

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:: Information

Types of Diagnosis Modes

This product supports a variety of diagnosis modes including Basic Mode, Combined Mode, Multi-Image Mode, and 3D/4D Mode.

- ▶ Basic Mode: Consists of different modes, each of which has a specific usage and function. By default, 2D Mode is applied together with another mode.
- ▶ Combined Mode: For an image, two or three Basic Modes are applied at the same time. By default, 2D Mode is applied together with another mode. An image is viewed in a single screen.
- ▶ Multi-Image Mode: The screen is divided into two (dual) or four (quad) sub screens, each of which is used to view an image. Since each sub screen can display a different image, it can be a very useful feature, allowing multilateral views of an organ.
- ▶ 3D/4D Mode: 3D and 4D images can be obtained.

The types of diagnosis mode that are available with the product are shown below:

Mode	Type
Basic Mode	2D Mode Color Doppler Mode Power Doppler Mode M Mode PW Spectral Doppler Mode CW Spectral Doppler Mode TDI (Tissue Doppler Imaging) Mode TDW (Tissue Doppler Wave) Mode ElastoScan Mode
Combined Mode	2D/C/PW Mode 2D/PD/PW Mode 2D/C/CW Mode 2D/PD/CW Mode 2D/C/M Mode 2D/TDI/TDW Mode Dual Live Mode
Multi-Image Mode	Dual Mode Quad Mode
3D/4D Mode	3D Mode 4D Mode



NOTE: The functionalities for each mode may be restricted by the selected probe.

Basic Use

The items that are commonly used in each diagnosis mode are shown below:

■ Using the Control Panel

The items that can be used in each diagnosis mode are provided as menu items. You can change the image format or optimize an image to facilitate your diagnosis.

■ Gain

Use the dial-button on the control panel. The **Gain** button appears differently depending on the diagnosis mode, but it is usually in the form of a dial-button used to select a diagnosis mode.

You can adjust the brightness of an image. If you rotate the **Gain** dial-button clockwise, its value increases.

■ TGC (Time Gain Compensation)

Tap the **TGC** button on the touch screen to open the *TGC* window for use.

In general, ultrasound penetration gets weaker with depth. TGC can be used to compensate for this effect.

The product provides eight TGC sliders for varying depths, allowing you to adjust Gain by area. Among the eight sliders, the top slider represents the shallowest area, while the lower sliders represent the deeper ones.

Move the slider to the right to increase Gain, brightening the image.

When the TGC preset is selected, the TGC preset is applied to the system and then the system is switched to diagnosis mode. The user can adjust TGC as needed, and press **Save** to save it for use.

■ Focus

Use the **Focus** switch on the control panel to adjust the location of the focus.

■ Depth

Use the **Depth** switch on the control panel to adjust the image scanning depth. The allowable range for adjustment varies depending on the probe type.

■ Zoom

Use the **Zoom** dial-button on the control panel.

You can magnify an image. An image can be magnified by either Read Zoom or Write Zoom.

- ▶ Read Zoom: This function is used for zooming in on images that are stored on the hard disk.
 1. Rotate the **Zoom** dial-button on the control panel.
 2. Adjust the position of the zoomed-in screen with the trackball.
 3. Observe the magnified image.
- ▶ Write Zoom: This function allows you to magnify and scan an image in real time.
 1. Press the **Zoom** dial-button on the control panel. The Write Zoom box will appear on the screen.
 2. Use the **Change** button to move and resize the Zoom box.
 3. To finish Zoom mode, press the **Zoom** dial-button once again. Or press the **Exit** button on the control panel.

■ Quick Scan



NOTE: The Quick Scan function is available in all probes' applications.

Use the **Q Scan** button on the control panel. The 'Q Scan'  mark will appear at the top of an image.

In 2D Mode, it is used to optimize the contrast and brightness of an image by adjusting Gain and TGC automatically. In PW Spectral Doppler Mode, it is used to optimize the spectrum by adjusting Scale and Baseline automatically.

To finish QuickScan mode, press the **Exit** button on the control panel.

Using Touch Screen Menus

The items that can be used in each diagnosis mode are provided as touch screen menu items. You can change the image format or optimize an image to facilitate your diagnosis.

1. In diagnosis mode, the menu for the diagnosis mode currently being used is displayed on the touch screen.

In a combined mode that uses more than one diagnosis mode, tap the relevant tab on the touch screen to specify settings for each mode.

2. Select a value by pressing a button or by rotating the dial-button on the control panel.

:: Basic Mode

2D Mode

This basic mode, also referred to as B Mode (Brightness mode), provides scan planes of organs. This is used to display two-dimensional anatomy images in the direction of scanning in real time.

✦ Entering 2D Mode

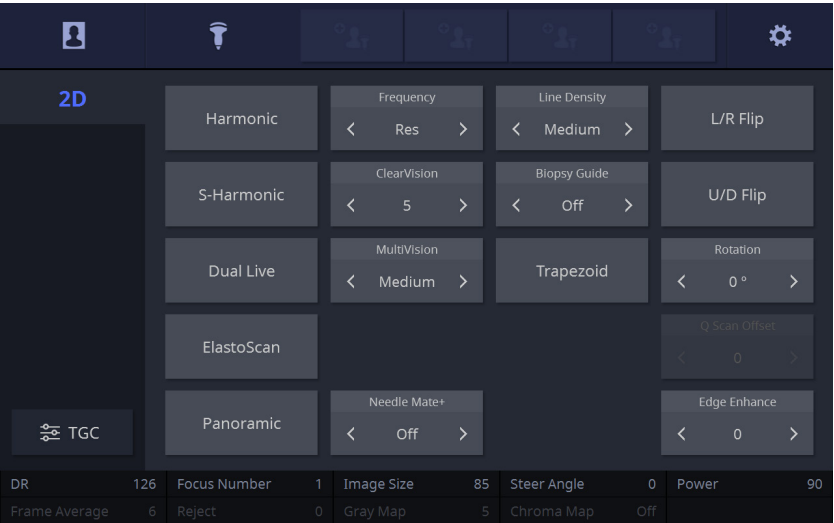


NOTE: Because 2D Mode is applied by default for all diagnosis modes, it cannot be terminated.

Press the **2D** dial-button on the control panel.

If you press the **2D** dial-button in other diagnosis modes, it will switch to the basic 2D Mode.

✦ 2D Mode Menu



[Figure 7.1 2D Mode – Touch Screen]

■ Harmonic

Turn this function on or off by tapping **Harmonic** on the touch screen. The image information will show the 'Har' mark **HAF**. This product provides the OHI (Optimal Harmonic Imaging) high frequency function to optimize images.



NOTE: The Harmonic function only works with certain probes.

■ Frequency

Tap **Frequency** on the touch screen. This enables you to configure the probe's frequency.

The selected frequency is displayed in the image area of the monitor, allowing you to easily determine the state of the current frequency.

- ▶ Res2 (Resolution): The highest frequency
- ▶ Res1 (Resolution): High frequency
- ▶ Gen (General): General frequency
- ▶ Pen1 (Penetration): Low frequency
- ▶ Pen2 (Penetration): The lowest frequency

■ Line Density

Tap **Line Density** on the touch screen. Set the scan line density. Select Low, Med, or High by tapping the button.

Selecting High increases the number of scan lines and improves the image resolution. However, the frame rate is reduced.

■ L/R Flip (Left/Right Flip)

Tap **L/R Flip** on the touch screen.

Pressing this button flips the image horizontally (Left/Right Flip). The direction marker on the top of the image indicates the orientation of the current image.

■ S-Harmonic

Turn this function on or off by tapping **S-Harmonic** on the touch screen. The 'S-HAR' mark  will be displayed in the Image Information.

Tap the **S-Harmonic** button on the touch screen. S-Harmonic inverts the pulses to sharpen the displayed image. If it is On, the phrase 'S-Harmonic' will be shown in the image information.



NOTE:

- ▶ The Harmonic and S-Harmonic functions are only available for specific probes.
- ▶ S-Harmonic function may show lines in the near field of certain probes when non-scan mode is used. This is due to the technical features that improve the sensitivity and resolution of the ultrasound images and does not cause any problems in scan mode.

■ ClearVision

Tap **ClearVision** on the touch screen. When turned on, ClearVision removes noise from the image and enhances outlines to help show the image more clearly. The 'ClearVision' mark  will be displayed in the Image Information.

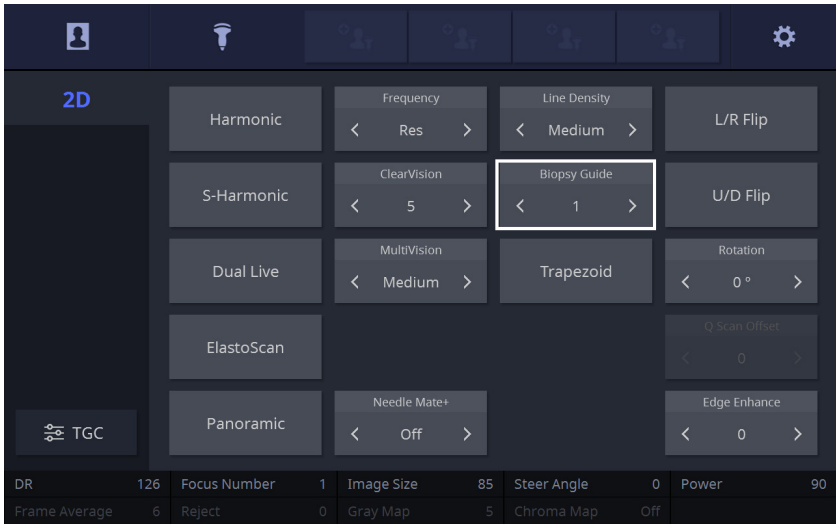
Tap the touch screen button to select an Index between 1 and 5. Select Off to turn off the feature.

■ Biopsy Guide

Tap **Biopsy Guide** on the touch screen.



NOTE: Make sure to adjust the biopsy guideline before using the biopsy feature.



[Figure 7.2 Biopsy]

Tips!

Setting the Biopsy Guideline



NOTE:

- ▶ If the system is rebooted, the biopsy guideline settings are restored to the default.
- ▶ Make sure to adjust the biopsy guideline before using the biopsy feature.

▶ **Support for Multiple Guidelines**

If the probe supports multiple biopsy angles, the user may select the biopsy guide angle as desired.

▶ **Starting and Finishing a Biopsy**

1. Tap **Biopsy Guide** on the touch screen.
2. Insert the needle along the guideline. And then perform the biopsy as desired.
3. When all procedures are complete, tap **Biopsy Guide** again to turn this Off. Biopsy will end.

Biopsy Guide Edit Mode



NOTE:

- ▶ Only available in 2D mode and Single mode.
- ▶ Not available in Dual Live or Freeze state.
- ▶ Not available in Write Zoom or Read Zoom state.

▶ **Starting and Ending Biopsy Guide Edit Mode**

1. Tap **Biopsy Guide** on the touch screen.
2. Use the Angle dial-button on the control panel to enter Biopsy Guide Edit mode.
3. When you enter Biopsy Guide Edit mode, Angle Offset appears.
4. Rotate the Angle dial-button to select Angle Offset or Lateral Offset.
 - Angle Offset: This is the angle for the currently selected biopsy guide; the maximum adjustable offset is the guideline's outer line angle. Adjustments can be made in 0.1° increments.
 - Lateral Offset: This is the lateral direction for the currently selected biopsy guide. Adjustments can be made in 0.1 mm increments.
5. Press the **Angle** dial-button to exit Biopsy Guide Edit mode.

■ U/D Flip (Up/Down Flip)

Tap **U/D Flip** on the touch screen.

Each press of the button flips the image vertically.

■ Dual Live

Tap **Dual Live** on the touch screen and select On or Off.

View the 2D/Color Doppler images of the scanned area simultaneously in real time.

When viewing Cine images in Dual Live mode, various settings are applied only to the Cine image on the right side, allowing you to compare it with the unaffected Cine image on the left side.

■ MultiVision

Tap **MultiVision** on the touch screen. MultiVision uses a multi-beam to improve the image quality displayed on the screen. When this feature is turned on, the 'MultiVision'  mark will be displayed in the image information. Tap the button on the touch screen to set MultiVision to Low, Med, or High. Note that MultiVision can only be set to Low in 2D/C Mode. Select Off to turn off the feature.



NOTE: This feature only works with certain probes. For more information, refer to 'Probe List' in 'Chapter 5. Probes'.

■ Trapezoid

Tap **Trapezoidal** on the touch screen to turn it on or off.

The rectangular frame provided by a Linear Probe is changed to a trapezoidal shape. This allows a wider view of an image.



NOTE: Trapezoid function only works with Linear probes.

■ Rotation

Tap **Rotation** on the touch screen to rotate a 2D image. Select a rotation angle to either 0°, 90°, 180°, or 270°.

■ ElastoScan

Tap **ElastoScan** on the touch screen. For more information, please refer to 'ElastoScan Mode' in this chapter.



NOTE:

- ▶ ElastoScan is an optional feature of this product.
- ▶ This feature only works with certain probes. For more information, refer to 'Probe List' in 'Chapter 5. Probes'.

■ Panoramic

Tap **Panoramic** on the touch screen. For more information, please refer to 'Panoramic' in this chapter.



NOTE:

- ▶ Panoramic is an optional feature of this product.
- ▶ This feature only works with certain probes. For more information, refer to 'Probe List' in 'Chapter 5. Probes'.

■ Needle Mate+

Tap **Needle Mate+** on the touch screen. Needle Mate+ is a feature that helps visualize the biopsy needle clearly in an ultrasound image. Choose the direction to optimize the image between From Left and From Right. Select Off to turn off the feature.

	From Left	From Right
Description	From the upper left to lower right or from the lower right to upper left.	From the upper right to lower left or from the lower left to upper right.
Purpose	Select this if the needle is being inserted from the upper left to lower right or from the lower right to upper left.	Select this if the needle is being inserted from the upper right to lower left or from the lower left to upper right.

When turned on, **Needle Enhance** and **Needle Angle** are enabled.



NOTE:

- ▶ Needle Mate+ is an optional feature of this product.
- ▶ This feature only works with certain probes. For more information, refer to 'Probe List' in 'Chapter 5. Probes'.

■ Needle Enhance

This feature only works when Needle Mate+ is on. Select 1, 2, 3, or 4 by tapping the button on the touch screen to select the degree of needle enhancement.

- ▶ 1: The needle is thin with weak enhancement.
- ▶ 2: The needle is thin with strong enhancement.
- ▶ 3: The needle is thick with weak enhancement.
- ▶ 4: The needle is thick with strong enhancement.

■ Needle Angle

Needle Angle is a function to set the needle injection angle for efficient beam steering and needle enhancement. Select one from either Shallow, Medium, or Steep.

■ DR (Dynamic Range)

Select a value between 30 and 256 by using the **DR** dial-button on the touch screen. The Dynamic Range function adjusts contrast by changing the ratio of the minimum and maximum values of the input signals. When this value increases, the image is displayed more smoothly.

■ Frame Average

Tap the **Frame Average** dial-button on the touch screen. Select a value between 0 and 9 by using the dial-button on the touch screen. Use this to minimize the appearance of speckles in updated images when the same location is scanned repeatedly.

■ Focus Number

Change the number of focus points at the target location you wish to study. Select a value between 1 and 4 by using the dial-button on the touch screen.

■ Reject

Use the **Reject** dial-button on the touch screen to select a value between 0 and 30.

This function is used to eliminate noise or low level echo for clearer signals.

■ Image Size

Select a value between 70 and 100 by tapping the **Image Size** button on the touch screen. Used to specify 2D image size.

■ **Gray Map**

Select a value between 1 and 12 by tapping the **Gray Map** dial-button on the touch screen. This changes the 2D Post Curve.

■ **Chroma Map**

Use the **Chroma Map** dial-button on the touch screen to select either Off or a value between 1 and 11.

■ **Edge Enhance**

Allows you to view more accurate images of organ or tissue boundaries. A higher value provides more accurate images of boundaries.

Select a value between -3 and 3 by tapping the touch screen button or using the Soft Menu dial-button on the control panel.

■ **Power**

Use the **Power** dial-button on the touch screen to select a value between 2 and 100 for the power of the ultrasound output.

■ **Scan Area**

Use the **Scan Area** dial-button on the touch screen to select a value between 40 and 100 as the image width (%). Increasing the image width reduces the frame rate. You may also press the **Change** button on the control panel to change the trackball state to ROI Size and then use the trackball to adjust the view area.

■ **Steer Angle**

You can adjust the angle of the ultrasound beam without moving the probe by using the **Steer Angle** dial-button.



NOTE: The Steer function only appears on the soft menu when a linear probe is used.

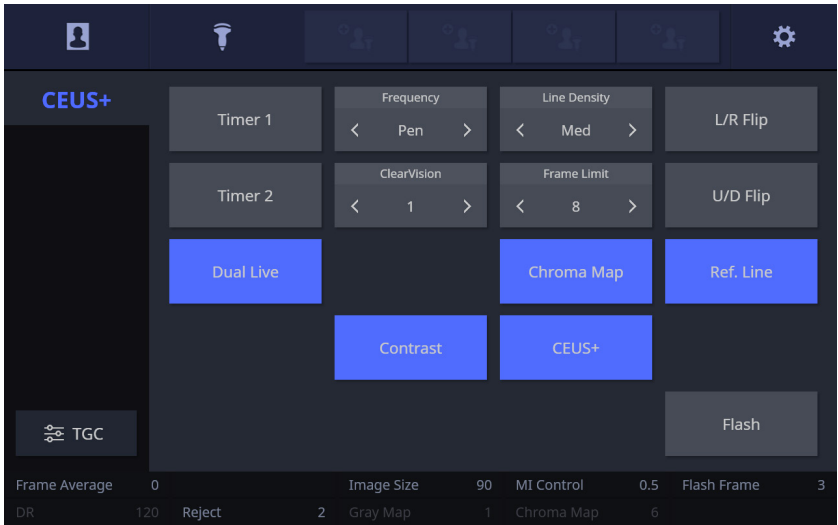
CEUS+

This mode is used for imaging the contrasting effect within blood vessels by infusing an ultrasound contrast agent.



NOTE:

- ▶ CEUS+ is supported in all countries except the USA.
- ▶ CEUS+ is an optional feature of this product.



[Figure 7.3 CEUS+ – Touch Screen]

Tap **CEUS+** on the touch screen to select on or off. When 'On' is selected, the touch screen is switched to the *CEUS+* screen.



CEUS+ Mode

- ▶ CEUS stands for Contrast Enhanced Ultrasound, and aids the diagnosis by enhancing the contrast on the ultrasound image.
- ▶ When entering CEUS+ mode, Dual mode is displayed by default.
- ▶ Functions such as Harmonic and S-Harmonic are not available.

■ **Timer 1/Timer 2**

Starts or resets the timer.

Press the button to start the timer. When the button is re-tapped, the timer stops and the time is reset. If you don't tap the button again, the timer will keep running even when the CEUS+ On/Off state is changed.

■ **Dual Live**

Tap **Dual Live** on the touch screen and select On or Off. When 'On' is selected, Dual Live mode is activated to display both Contrast and 2D images side-by-side. When 'Off' is selected, Single mode is activated.

■ **Ref. Line**

This option displays the Ref. Line on an image. Select On or Off by tapping **Ref. Line** on the touch screen. The Ref. Line in CEUS+ mode is used to indicate the same location on the Agent and Tissue images in Dual Live mode.

■ **Contrast**

Select a CEUS+ type. Tap the button on the touch screen to select either Contrast or 2D.

- ▶ Contrast: It displays contrast-applied images.
- ▶ 2D: Displays image in 2D Mode.

■ **Flash**

Tap the button on the touch screen and select On or Off. For the defined frames in **Frame**, brighter images are produced.

■ **Flash Frame**

Set a value between 3 and 100 frames to specify the period of time during which the Flash function will operate.

■ **MI Control**

Select a value for the mechanical index by tapping the touch screen button or by using the Soft Menu dial-button on the control panel.

■ **Frame Average**

Frame Avg averages the present image and the previous image when an image is updated. Select a value between 0 and 9 by tapping the touch screen button or using the Soft Menu dial-button on the control panel.

■ **Reject**

This function reduces noises or echoes from an image in order to make the image clearer. Select a value between 0 and 30 by tapping a button on the touch screen or using the dial-button.

■ **Cine Play**

Play or stop Cine images.

■ **Trim Start**

After specifying the position of the first frame by rotating the dial-button or using the trackball, tap the dial-button to save it.

■ **Trim End**

After specifying the position of the last frame by rotating the dial-button or using the trackball, press the dial-button to save it.

■ **Cine Speed**

Rotate the dial-button to adjust the auto playback speed.



NOTE: For more information on other touch screen items, refer to the '2D Mode'. (The setting values may vary depending on the selected probe type, application, and other settings.)

Panoramic



NOTE: This feature only works with certain probes. For more information, refer to 'Probe List' in 'Chapter 5. Probes'.

Panoramic Imaging is the function that acquires images over a wider range by using continuous ultrasonographic images. Up to 1,000 frames can be used.

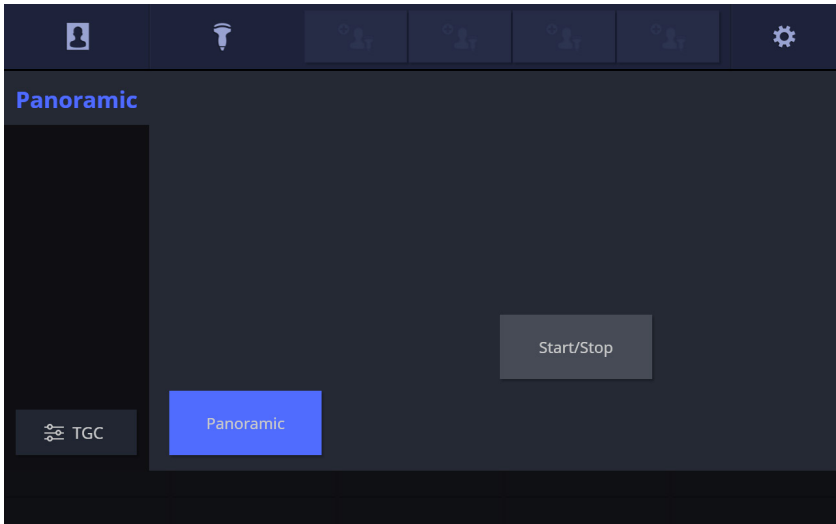
■ Acquiring a Panoramic Image

1. Tap **Panoramic** on the touch screen. The touch screen will be switched to the *Panoramic Ready* screen.
2. Tap **Start/Stop** on the touch screen. The system will begin to acquire a panoramic image.
3. Press **Start/Stop** to finish acquiring the panoramic image. The touch screen will switch to the *Panoramic Review* screen.



Things to remember when acquiring a Panoramic image

- ▶ When scanning a curved surface, ensure that the scan surface and the contact surface of the probe are always at right angles.
- ▶ Moving in the opposite direction while acquiring an image erases the previously saved frames and saves new frames.
- ▶ The image quality may deteriorate if the contact surface of the probe loses contact with the scan surface.
- ▶ If the scan speed is fast or the angle of the contact surface of the probe changes, artifacts may occur.

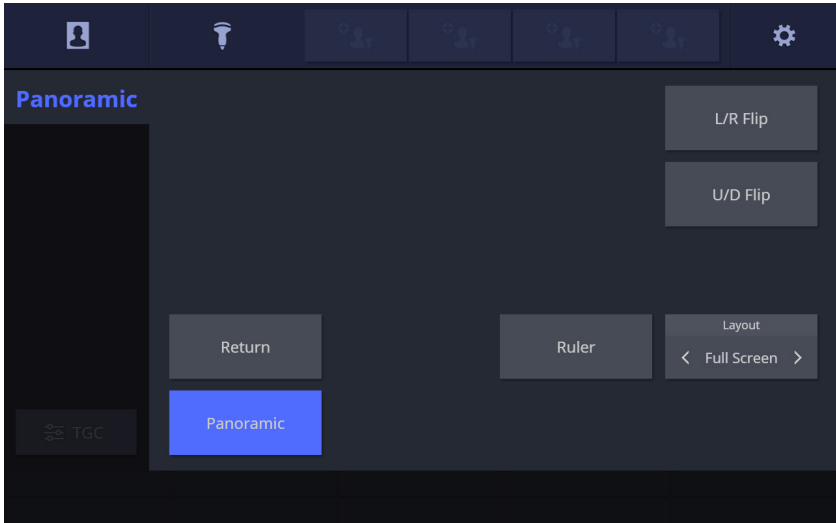


[Figure 7.4 Panoramic Ready – Touch Screen]

■ **Reviewing a Panoramic Image**



NOTE: L/R Flip, U/D Flip, and **Zoom** are available only when the **Layout** is set to Full Screen.



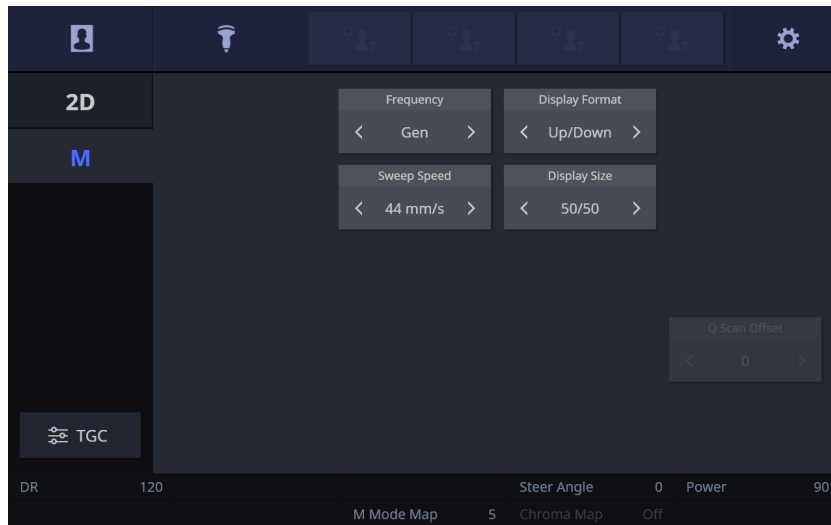
[Figure 7.5 Panoramic Review – Touch Screen]

- ▶ L/R Flip: Flip the panoramic image horizontally.
- ▶ U/D Flip: Flip the panoramic image vertically.
- ▶ Ruler: Press this button to turn this option on or off. When turned on, a ruler is displayed on the panoramic image.
- ▶ Layout: Specify how the panoramic image will be displayed on the screen.
 - Full Screen: Display the panoramic image in full screen mode.
 - Up/Down: Display the 2D and panoramic images at the top and bottom of the screen, respectively.
 - Side by side: Display the 2D and panoramic images on the left and right of the screen, respectively.
- ▶ Return: Return to the *Panoramic Ready* screen.
- ▶ Tap the **Panoramic** button again on the touch screen to exit Panoramic Imaging.

M Mode

The M Mode is used to specify an observation area in a 2D image with the M Line, and display changes over time.

This mode is appropriate for the observation of organs with a lot of movement, such as cardiac valves. The 2D Mode image is also shown, allowing the marking and adjustment of an observation area within the entire image.



[Figure 7.6 M Mode – Touch Screen]

Entering & Exiting M Mode

■ Entering M Mode

1. Press the **M** dial-button on the control panel.
2. Configure settings relating to M image acquisition on the touch screen.
3. Press the **M** dial-button again to enter M Mode and display the M image on the screen.

■ Exiting M Mode

Press the **M** dial-button while the M image is being displayed. You can also press the **2D** dial-button to exit M Mode.

❏ M Mode Screen

■ M Line

Use the trackball on the control panel to move the line to the right or left. The M Line indicates the relative position of the M Mode image in the 2D image. Therefore, you can move the M Line to change the observation area.

❏ M Mode Menu

■ Anatomical M



NOTE: Available only with the phased array probe or the cardiac application.

Tap the **Anatomical M** dial-button on the touch screen to turn it on or off. If it is 'On', position and angle of AMM Line can be adjusted.

- ▶ **AMM Angle:** Use the touch screen dial-button to rotate the cursor line for Anatomical M. You can select an angle from 0 to 179.

■ Sweep Speed

Tap **Sweep Speed** on the touch screen. Allows the user to adjust the sweep speed so that he can view various spectrums in a screen.

■ Display Format

Tap **Display Format** on the touch screen. Select either Up/Down, Side by Side, or M Only using the touch screen button.

■ Display Size

The display size can be changed to a range of values between 30/70, 50/50, 70/30 tapping the relevant button on the touch screen. This option is not enabled if Display Format is set to M Only.

■ M Mode Map

Used to configure the post curve in M. Select a value between 1 and 12 by using the dial-button.

■ Steer Angle

Adjust the angle of the ultrasound beam. Steered M line can be selected by rotating **Steer Angle** dial-button.



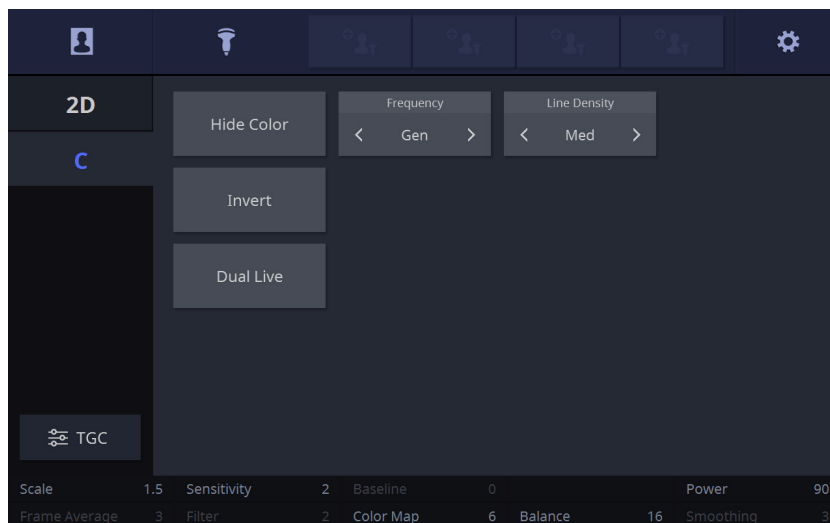
NOTE: The Steer function appears on the soft menu only when a linear probe is used.



NOTE: For more information on other soft menu options and functions, refer to the '2D Mode' section.

Color Doppler Mode

This mode displays the colored blood flow pattern of the ROI (Region of Interest) within the 2D image. It is appropriate for examining the presence of blood flow, its average speed, and its direction. The 2D Mode image is also shown, allowing the marking and adjustment of the ROI within the entire image.



[Figure 7.7 Color Doppler Mode – Touch Screen]

Entering & Exiting C Mode

Press the **Color** dial-button on the control panel. Press this button again to exit Color Doppler mode and return to 2D mode.

❏ C Mode Screen

■ ROI Box

ROI stands for Region of Interest. The ROI Box outlines the area of the 2D image where color (blood flow) information is displayed in Color Doppler Mode.

Use the **Change** button to reposition or resize the ROI box. Each time you press the **Change** button, the current state of the ROI box is displayed in the lower middle of the screen.

- ▶ ROI Position: In this state, the position of the ROI box can be changed. Use the trackball to move and position the ROI Box.
- ▶ ROI Size: In this state, the size of the ROI box can be changed. Use the trackball to move the ROI Box and specify its size.

■ Color Bar

In Color Doppler mode, the color bar indicates the direction and speed of blood flow. Based on the Baseline at the middle, red indicates the direction and speed of blood flow toward the probe. By contrast, the blue color indicates the direction and speed of blood flow away from the probe.

- ▶ Adjusting the color bar baseline: Use the **Baseline** dial-button on the touch screen. If you rotate the **Baseline** dial-button clockwise, the baseline on the color bar rises.

❏ C Mode Menu

■ Hide Color

Select C mode to use. If you tap **Hide Color** on the touch screen, the Color mode image will not be displayed in the Color ROI area, and only the B mode image will be displayed. Tap this button again to cancel the selection and return to Color + B/W mode.

■ Frequency

Tap **Frequency** on the touch screen. This enables you to configure the probe's frequency.

The selected frequency is displayed in the title area, allowing you to determine the state of the current frequency easily.

■ Line Density

Select the density of the scan line. Select Low, Med, or High by tapping the button on the touch screen or using the dial-button.

Selecting High increases the number of scan lines and improves the image resolution. However, the frame rate is reduced.

■ Invert

Tap **Invert** on the touch screen. The color bar is inverted each time this button is tapped. When the color bar is inverted, the color displayed on the image is also inverted.

■ Vel + Var

Tap **Vel + Var** on the touch screen to turn it on or off. It expresses the blood flow velocity in green on the Color Bar. Vel and Var stand for Velocity and Variance respectively.



NOTE: Vel + Var feature is available in the following applications and presets:

- ▶ Cardiac - Adult Echo, Ped Echo, Aortic Arch
- ▶ OB - Fetal Heart
- ▶ Vascular - Carotid, Arterial, Venous

■ TDI

Change to TDI mode. TDI stands for Tissue Doppler Imaging.



NOTE:

- ▶ This can only be used when the cardiac application is selected in Phased Array Probe.
- ▶ For more information on TDI, refer to 'TDI Mode'.

■ Auto Gain

Tap **Auto Gain** on the touch screen to turn it on or off. If it is turned on, the brightness of an image will be adjusted automatically.



NOTE: Auto Gain is applied only when the mode is live for the Carotid and Arterial presets of the linear probe.

■ Steer Invert

Tap **Steer Invert** on the touch screen. Tapping the button inverts the angle of the Sample Volume.



NOTE: Steer Invert is only enabled when using a linear probe.

■ Scale

Use by rotating the **Scale** dial-button on the touch screen. Rotating **Scale** dial-button clockwise increases the scale, extending the range of blood flow speed. Rotating the dial-button in the counter-clockwise decreases the scale, displaying a narrower range of blood flow speed.

■ Sensitivity

It enhances sensitivity and accuracy or frame rate of color images.

Adjust the Sensitivity value between 0 and 5 by using the **Sensitivity** dial-button on the touch screen.

■ Filter

Select **Filter** on the touch screen or use the dial-button on the control panel to select a value between 1 and 4.

This is an electric filter to remove the low-frequency doppler signals generated by the movement of blood vessel walls. Adjust the Cutoff Frequency to remove doppler signals whose frequency is lower than the cutoff frequency.

■ BaseLine

Rotating the dial-button clockwise increases the Baseline. In Color Doppler mode, the color bar indicates the direction and speed of blood flow. Based on the Baseline at the middle, red indicates the direction and speed of blood flow toward the probe. By contrast, the blue color indicates the direction and speed of blood flow away from the probe.

■ Color Map

Used to configure the post curve in a color image. Select a value between 1 and 12 by using the **Color Map** dial-button on the touch screen. This can help to display blood flow with greater clarity.

■ Steer Angle

Adjust the angle of the ultrasound beam. Loss of color information resulting from the angle of the ultrasound beam is minimized. You can adjust the angle of the ultrasound beam by using the **Steer Angle** dial-button on the touch screen.



NOTE: The Steer function only appears on the soft menu when a linear probe is used.

■ Balance

Select a balance value from 0 to 16 by using the **Balance** dial-button on the touch screen. The range of a color image is adjusted by comparing the gray levels of 2D images with the doppler signal values of color images. When the Balance value increases, the color image also appears in the part where the gray level of a 2D image is high (the bright part), increasing the range of the color image.

■ Smoothing (Spatial Filter)

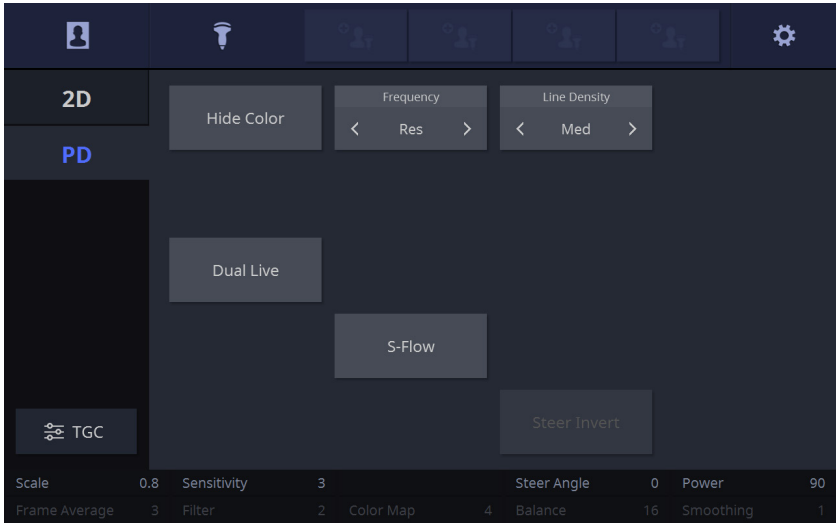
Select a smoothing value between 0 and 5 by using the **Smoothing** dial-button. This allows smoother display of color images.



NOTE: For more information on other touch screen items, refer to the '2D Mode'. (Different values can be selected.)

Power Doppler Mode

This mode displays the color intensity of blood flow within the ROI in the 2D image. It is appropriate for examining the presence and amount of blood flow. The 2D Mode image is also shown, allowing the marking and adjustment of the ROI within the entire image.



[Figure 7.8 Power Doppler Mode – Touch Screen]

❏ Entering & Exiting PD Mode

Press the **PD** button on the control panel to enter PD mode. Press this button again. PD Mode will be terminated and the mode will switch to 2D.

❏ PD Mode Screen

■ Color Bar

In PD mode, the color bar displayed varies depending on the Power Doppler mode display method that is in use. The color bar indicates the presence of blood flow and its amount. The top of the color bar is the brightest section, where the amount of blood flow is at its highest.

■ ROI Box

The ROI (Region of Interest) outlines the area of the 2D image where color (blood flow) information is displayed in Power Doppler Mode.

PD Mode Menu

S-Flow

Tap **S-Flow** on the touch screen. The direction of the blood flow will be displayed.

Auto Gain

Tap **Auto Gain** on the touch screen to turn it on or off. If it is turned on, the brightness of an image will be adjusted automatically.



NOTE: Auto Gain is applied only when the mode is in live for the Carotid and Arterial presets of the linear probe.

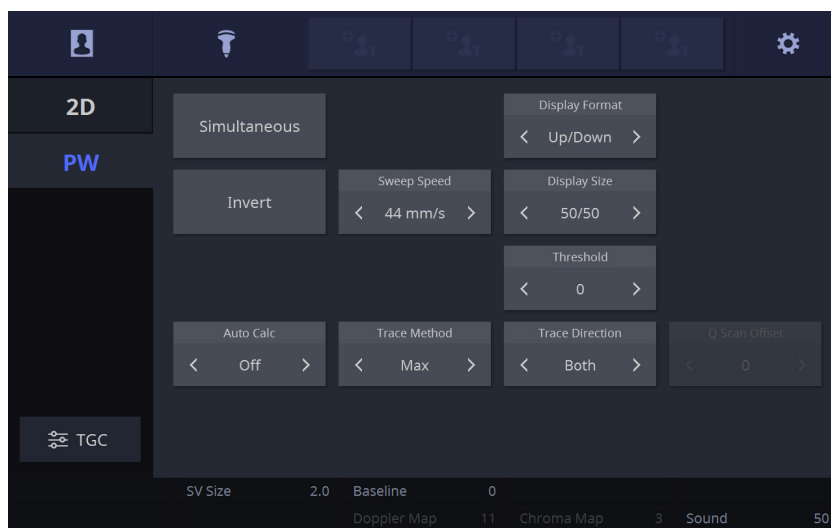


NOTE: The description of touch screen menu items is the same as for 'Color Doppler Mode'.

PW Spectral Doppler Mode

PW stands for Pulse Wave. This mode displays the blood flow speed at a specific blood vessel location within a specific time frame. Distance (depth) information can also be obtained by transmitting pulses over particular time frames.

This mode is useful for measuring low-speed blood flow, such as in the abdomen and peripheral vessels. The 2D Mode image is also shown, allowing the marking and adjustment of an observation area within the entire image.



[Figure 7.9 PW Spectral Doppler Mode – Touch Screen]

Entering & Exiting PW Spectral Doppler Mode

■ Entering PW Spectral Doppler Mode

1. Press the **PW** button on the control panel to enter PW Spectral Doppler Mode.
2. Configure settings relating to Doppler image acquisition on the touch screen.
3. Press the **PW** dial-button again to enter PW Spectral Doppler Mode and display the Doppler image on the screen.

■ Exiting PW Spectral Doppler Mode

Press the **PW** dial-button while the Doppler image is being displayed. You can also press the **2D** dial-button to exit PW Spectral Doppler Mode.

Press the **Set** button on the control panel to obtain a spectral doppler image.



NOTE: The doppler image can only be obtained in the D Only or Simultaneous states.

■ PW Spectral Doppler Mode Screen Sample Volume

The doppler spectrum is displayed when the Sample Volume is located above the blood flow on the 2D image. The size of the Sample Volume is displayed in **mm** units. Use the trackball to adjust the position of the Sample Volume.

- ▶ Moving Sample Volume: Use the trackball on the control panel.
- ▶ Resizing Sample Volume: Using the touch screen: Select the **SV Size** dial-button on the touch screen.
- ▶ Adjusting Sample Volume Angle: Rotate the **Angle** dial-button on the control panel to select a value between -80-80 degrees. Press the **Angle** dial-button to select either -60, 0, or 60 degrees.

■ Adjusting Doppler Baseline

Adjust the **Baseline** by rotating the dial-button on the touch screen.

■ HPRF (High PRF) Function

Adjust the blood flow above the speed limit at a specific depth. The scale is increased; this can only be used in PW Spectral Doppler mode (D Only).



NOTE: Setup > Imaging > Common > HPRF

▶ Activating HPRF

Increasing the scale at a specific depth to a certain point automatically activates HPRF. The Phantom Gate will appear on the D Line at a position higher than the sample volume. Once HPRF starts, PRF does not increase even if you increase the scale value.

► **Finishing HPRF**

While HPRF is in use, decrease the scale value by one step to finish HPRF. Here, the PRF value becomes the maximum value in the current PW Spectral Doppler mode.

► **Moving Sample Volume**

To move the Sample Volume position in the D Only state, the system calculates PRF values and the Phantom Gate position, and updates them on the PW Spectral Doppler image. HPRF is terminated when HPRF cannot be activated.

When Sample Volume is moved in the 2D Only state, the PRF values don't change.



CAUTION:

- The Phantom Gate position can be located outside the 2D image area in Zoom Mode.
- Make sure that sample volume and Phantom Gate are not placed together in the measuring area. If more than two Sample Volumes are located in the vessels, all Doppler components will appear in the spectrum, causing noise.

PW Spectral Doppler Mode Menu

■ **Simultaneous**

Tap **Simultaneous** on the touch screen. Each time you tap the button, the Simultaneous function turns on or off. If the Simultaneous option is turned on, you can view real-time 2D and spectral Doppler images at the same time. If the option is not turned on, however, you will only be able to view the image from one of the modes. The Simultaneous function decreases Doppler PRF, thus decreasing the measurable speed range.

■ **Invert**

Tap **Invert** on the touch screen. Each time the button is tapped, the speed indicator (+/-) for a spectrum is inverted.

■ **Auto Calc**

Tap **Auto Calc** on the touch screen to select Off, Live, or Frozen.

- Live setting: The PS, ED, MD, PI, RI, PS/ED, ED/PS, HR, TAmx, and TAmx are calculated after acquiring the Doppler Trace.
- Frozen setting: The PS, ED, MD, PI, RI, PS/ED, ED/PS, HR, TAmx, and TAmx are calculated when the image is frozen.

Values that are displayed on screen are selected at Setup > Measurement > AutoCalc. For selecting displayed values, refer to the measurement settings in 'Chapter 3. Utilities'.



CAUTION: The measurements carried out by Auto Trace under Measure and Real Time Automatic Doppler Trace (Automatic Calculator) may be different from each other. This is because the algorithms for these two methods are different. It is recommended that you use Auto Trace under Measure for more accurate measurement.



Tips!

Things to Consider when using Real Time Automatic Doppler Trace

1. Aliasing occurs because PRF is too low in comparison to the image speed, or the spectrum is clustered around the baseline because PRF is too high.
2. Peak is indistinctive or intermittent such as in Spectral waveforms for veins.
3. Meaningful spectrum distinction becomes difficult because Doppler Gain is set too high or too low.
4. An index is displayed during the transition time after Sample Volume is moved with the trackball.
5. The major spectral signals are cut off because Doppler Wall Filter is set too high.
6. Peak Trace is interrupted due to abnormal Doppler noise or artifact, and the heart rate is above approximately 140 bpm.

If any of the above apply, Real Time Automatic Doppler Trace may not produce an accurate trace or results. In addition, during auto calculation, results will not be displayed if the Freeze function is run against inaccurate values.

■ Threshold

Specify the minimum range of Threshold. It can be adjusted between 0 and 10 by using the touch screen button.



Tips!

Threshold

Threshold is a function to adjust Trace Line in the Auto Trace or Limited Trace. Increase the value to capture a wider area, use a smaller value to make the waveform clearer.

■ Trace Method

Tap **Trace Method** on the touch screen. Max or Mean Trace for the selected spectrum is performed. It will not be performed if set to Off.

■ Trace Direction

Tap **Trace Direction** on the touch screen. Select the part of the spectrum to calculate with AutoCalc from Both, Above, or Below.

■ Sound

Adjusts the doppler volume. Select a value between 0 and 100 by rotating the **Sound** dial-button.

■ Display Format

Tap **Display Format** on the touch screen. Select either Up/Down, Side by Side, or Doppler Only by using the button on the touch screen.

■ Doppler Map

Used to configure the post curve in doppler mode. Select a value between 1 and 12 by using the **Doppler Map** dial-button on the touch screen.

■ TDW

Switches to TDW Mode. TDW stands for Tissue Doppler Wave.



NOTE: This can only be used when the cardiac application is selected in Phased Array Probe.



NOTE: For more information on other touch screen menu items, refer to '2D Mode' and 'Color Doppler Mode' sections.

CW Spectral Doppler Mode

CW stands for Continuous Wave. This mode displays the blood flow speed and direction at a specific blood vessel location within a specific time frame. Unlike PW Spectral Doppler Mode, it does not provide Sample Volume.



NOTE:

- ▶ CW Spectral Doppler mode is an optional feature of this product.
- ▶ This dial-button can be used with the Phased Array or Static CW probes.

■ Steered CW Spectral Doppler Mode

This mode can only be used if the Phased Array probe is used. The 2D Mode image is also shown, allowing the marking and adjusting of an observation area within the entire image.

■ Static CW Spectral Doppler Mode

This mode is only available with a Static CW Probe. The 2D image is not displayed.

■ Entering & Exiting CW Spectral Doppler Mode

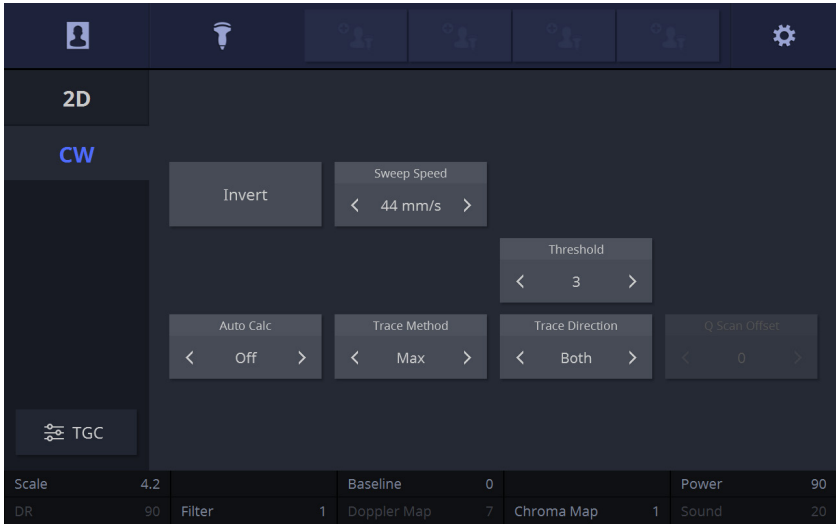
■ Entering CW Spectral Doppler Mode

1. Press the **CW** button on the control panel to enter CW Spectral Doppler Mode.
2. Configure settings relating to Doppler image acquisition on the touch screen.
3. Press the **CW** dial-button again to enter CW Spectral Doppler Mode and display the Doppler image on the screen.

■ Exiting CW Spectral Doppler Mode

Press the **CW** dial-button while the Doppler image is being displayed. You can also press the **2D** dial-button to exit CW Spectral Doppler Mode.

CW Spectral Doppler Mode Menu



[Figure 7.10 CW Spectral Doppler Mode – Touch Screen]



NOTE: The menu for CW Spectral Doppler Mode is identical to that of PW Spectral Doppler Mode.

TDI Mode



NOTE: Appears on the Soft Menu only when using the phased array probe and the cardiac application.

TDI stands for Tissue Doppler Imaging. It visualizes the movement of rapidly moving tissues such as the heart.

It is available in Color Doppler Mode. In Color Doppler Mode, TDI provides color information for cardiac tissues.

Starting and Ending TDI Mode

In Color Doppler Mode, tap **TDI** on the touch screen. Pressing the button once more switches the mode from TDI to C.



NOTE: For information about the touch screen menu, refer to 'Color Doppler Mode'.

TDW Mode

TDW stands for Tissue Doppler Wave. It visualizes the movement of rapidly moving tissues such as the heart. TDW Mode is available in the PW Spectral Doppler Mode. If it is used in Spectral Doppler Mode along with Color Doppler mode, changes in cardiac tissues over time can be observed.



NOTE: This can only be used when the cardiac application is selected in Phased Array Probe.

Starting and Ending TDW Mode

Tap **TDW** on the touch screen in PW Spectral Doppler Mode to run it. Pressing the button once more switches the mode from TDW to PW Spectral Doppler.



NOTE: For information about the touch screen menu, refer to the 'PW Spectral Mode' section.

ElastoScan Mode

The elasticity of ROI in a 2D image is shown in color. The 2D Mode image is also shown, allowing the marking and adjustment of the ROI within the scanned image.

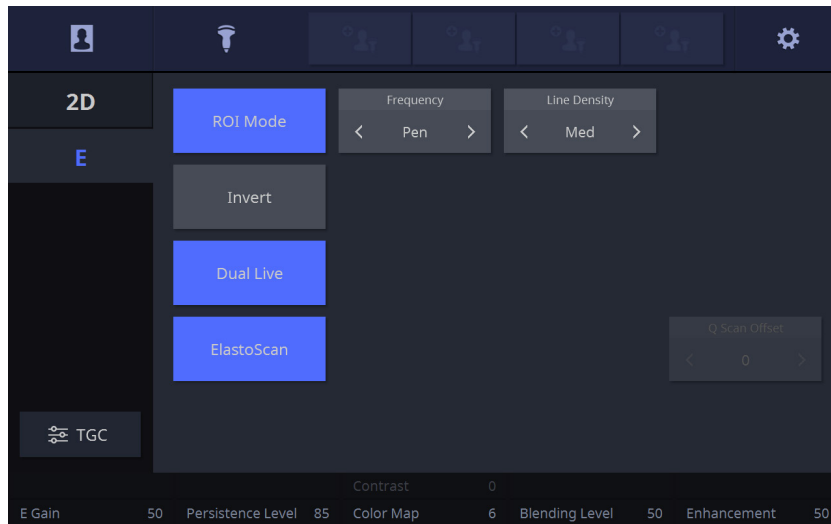


NOTE:

- ElastoScan mode is an optional feature of this product.
- The probes, applications, and presets that support ElastoScan are as follows:

Probe	Application	Preset
LA3-14AD	MSK	General
	Smallparts	Breast, Thyroid
LA4-18BD	MSK	General
	Smallparts	Breast, Thyroid
EA2-11B	GYN	Uterus, Adnexa
	Urology	Prostate
ER4-9	GYN	Uterus, Adnexa
	Urology	Prostate
V5-9	GYN	Uterus, Adnexa
	Urology	Prostate
LA3-16A	MSK	General
	Smallparts	Breast, Thyroid

- This function is not available in E mode. Angle, View Area, ECG



[Figure 7.11 ElastoScan Mode]

Tips!**ElastoScan**

An elastogram is the elasticity imaging of an object, based on continuous ultrasound images. The function that measures the elasticity of an object and converts it to images is called ElastoScan. ElastoScan visualizes the presence of a solid mass or stiffness in tissue.

It is already well known that lesions such as tumors are different from healthy tissue in terms of their stiffness. Up until now, palpation has been used for examination, but this method has certain depth limitations.

■ E Dual Mode

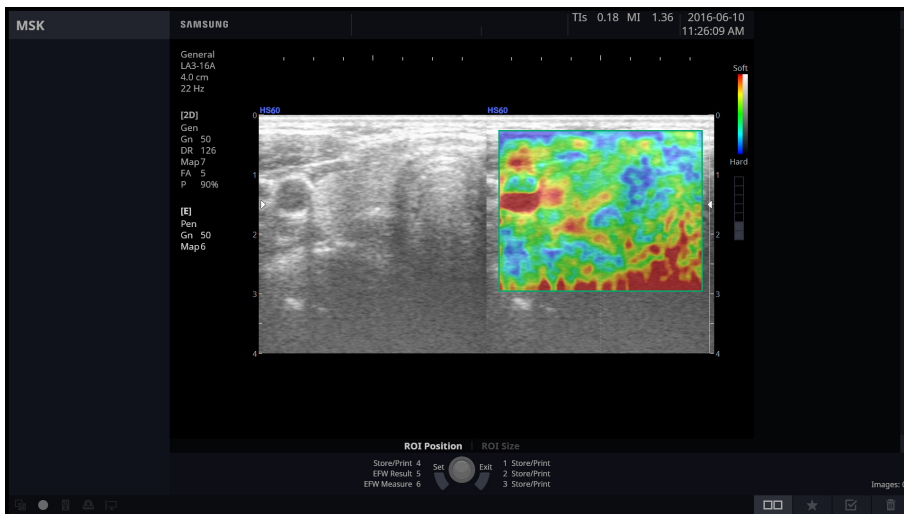
In this mode, the elastogram and the 2D image are displayed together on the screen. It can be selected by tapping **Single** on the control panel and **Dual** on the touch screen.

To facilitate comparative observation, the 2D image is shown on the left and an E image is shown on the right.



NOTE:

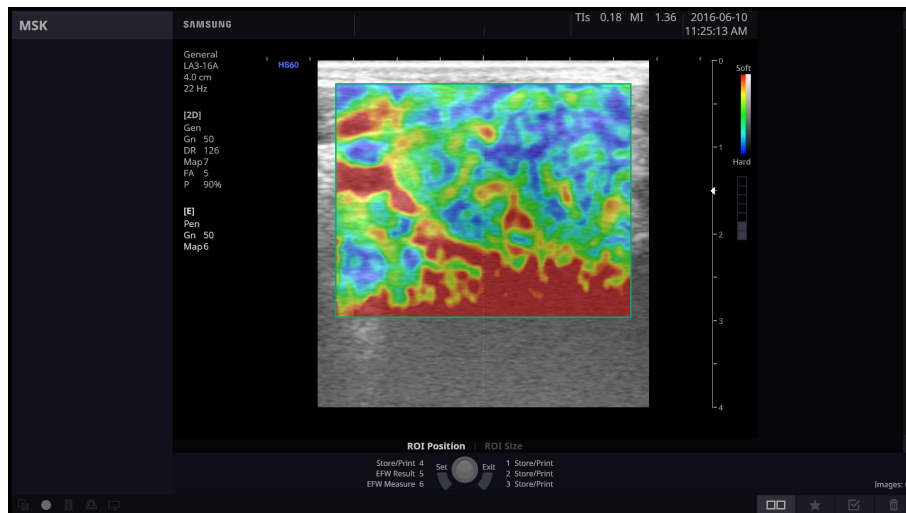
- ▶ For ElastoScan, Wide Dual View is set as default.
- ▶ For details about Wide Dual View setting, refer to Setup > Imaging > Display Settings in the 'Chapter 3. Utilities'.



[Figure 7.12 E Dual Mode]

■ E Single Mode

In E Single Mode, only an E image is displayed in the screen. It can be selected by pressing the **Single** button on the control panel.



[Figure 7.13 E Single Mode]

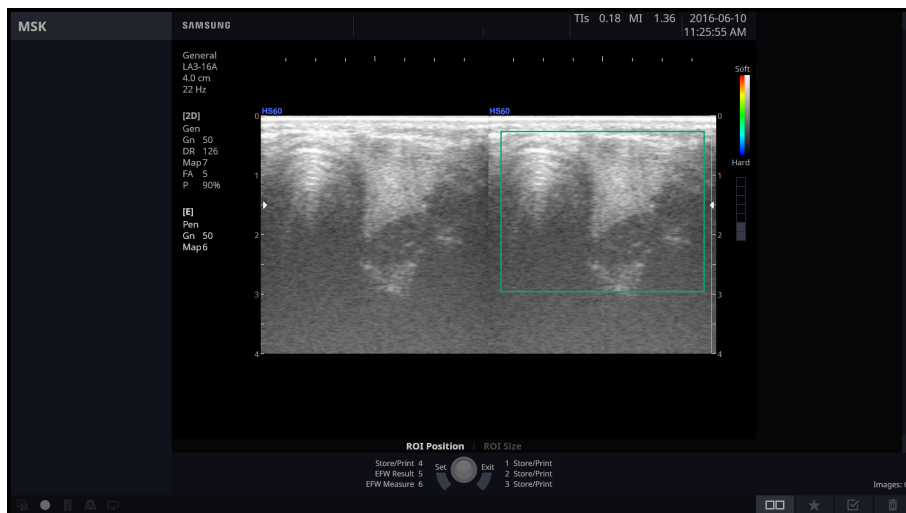
■ ROI Mode

ROI stands for Region of Interest. In E Mode, the ROI Box represents the area where elasticity information is processed and shown. Tap **ROI Mode** on the touch screen to turn ROI Mode on or off.

It is important that only the effective tissues are included in ROI by avoiding ineffective components such as bone and air to obtain a good elasticity image. If a ratio of effective image is insufficient, no elasticity image can be displayed even when tissues are pressured. To scan the breast, it is best to set as wide as possible in the lateral direction and to include subcutaneous layer and muscle in the axial direction to obtain a good-quality elasticity image, but it can be flexible to adjust the real situation.

You can adjust the position and size of the ROI box by using the **Change** button on the control panel. Each time the **Change** button is pressed, the current status of the ROI Box is shown in the User Information area of the screen.

- ▶ ROI Position: The position of the ROI Box can be changed. Move the ROI Box with the trackball to confirm the new position.
- ▶ ROI Size: The size of the ROI Box can be changed. Resize the ROI Box with the trackball and press the **Change** button to confirm the new size.



[Figure 7.14 ROI Mode]



NOTE: ROI Mode is available in E Single Mode as well as in E Dual Mode.

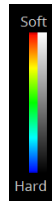
Starting and Closing E Mode

In 2D Mode, tap **ElastoScan** on the touch screen. Press the button again to return to 2D Mode.

E Mode Screen

Color Bar

In E Mode, the color bar indicates the stiffness of a tissue. Regardless of the color, the lower section of the bar indicates that the target area is stiffer than the surrounding tissues and the upper section indicates that the target area is less stiff than the surrounding tissues.



Compression Guide Bar

The strength and status of compression are shown in different number of blocks and colors between Steps 0 and 7. All blocks are empty at Step 0 which appears when the probe is almost stationary, the ROI has insufficient region, or matching between images is poor. Step 1 – Step 2 (in grey) mean inadequate compression and Step 3 – Step 7 (in blue or green) mean adequate compression; the number of blocks filled represents the number of step level.



Performing a Scan

When using E mode, place a probe onto the surface of an area to observe and position the ROI appropriately on a lesion to observe. Then use the probe to periodically compress the region. When the compression guide is supported, refer to this guide to adjust the size of the compression. If the region being examined is quite deep, it is best to increase the compression.

Tips!

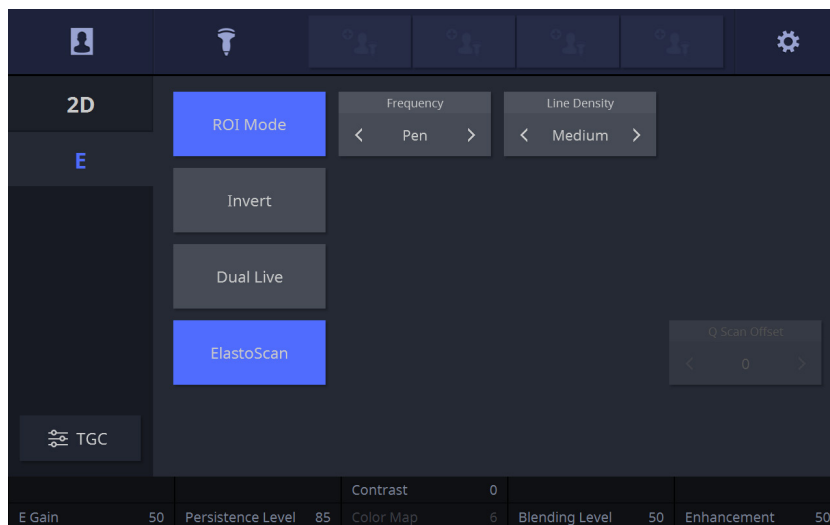
Precautions for Scanning

To closely observe the location of the lesion, minimize the movement of tissues.

A breast is a complex organ which consists of lactiferous ducts, lactiferous glands, fatty tissue, fibrous tissue, and chest muscles. An axial movement of the probe may cause an unintended movement of the tissues.

The prostate and the thyroid consist of tissues that are simpler than those of a breast and there are relatively fewer unintended movements.

E Mode Menu



[Figure 7.15 ElastoScan Mode – Touch Screen]

Invert

Tap this button on the touch screen to invert the Color Bar. Inverting the color bar also inverts the color displayed on the image.

Dual Live

The elastogram and the 2D image are displayed together on the screen. Pressing **Single** on the control panel displays the E image only on the screen.

E Gain

Adjust the brightness of the elastogram image. Use the dial-button to select a setting between 0 and 100%.

Persistence Level

Specify the speed of change between frames. Use the dial-button to select a setting between 0 and 100%. Selecting a higher value increases the rate of frame change.



■ **Contrast**

Adjust the contrast of the elastogram. Use the dial-button to select a setting between 0 and 100%.

■ **Color Map**

Select the color of the elastogram. Select a value between 1 and 6 by using the dial-button on the touch screen. If you change the Color Map, the color bar will also change accordingly.

■ **Blending Level**

Select the ratio of Alpha Blending. Use the dial-button to select a setting between 0 and 100%. Setting the value to 0% shows an E image only and setting it to 100% shows a 2D image only.

■ **Enhancement**

Adjusts the enhancement of the image. Use the dial-button to select a setting between 0 and 100%. A higher setting provides more clearly defined boundaries, at the expense of increased noise.

E-Strain

This function assists with the examination of breast lesions. It calculates the strain ratio between the area of the suspected lesion (ROI) and normal breast fat and displays the results.



NOTE:

- ▶ E-Strain is an optional feature of this product.
- ▶ E-Strain is supported in countries except the USA and Canada.
- ▶ The **E-Strain** button is only activated on the touch screen when the following conditions are satisfied:
 - Application: Breast, Thyroid
 - Freeze state

■ E-Strain

1. Press the **Freeze** button on the control panel and then press the **E-Strain** button.
2. Specify the position and size of the ROI in the area of suspected lesion.
 - Make sure that the fat tissue is visible at the same level as, or above, the ROI.
 - Adjust the size of the ROI by using the trackball and the **Change** button.
3. Press the **Set** button. The calculation is automatically performed and the results will be displayed on the screen.
 - Target Strain: Mean strain value inside the ROI (Supported in all countries except the USA and Canada)
 - Ref. Strain: Mean strain value of areas considered normal outside the ROI (supported in all countries except the U.S.A. and Canada).
 - Strain Ratio: Ratio of Strain values (Target Strain/Ref. Strain)

■ E- Strain Reset

When you tap this button on the touch screen, the E-Strain measurements will be reset.

:: Combined Mode

In Combined Mode, three different modes are combined, including the default 2D Mode. Note that, in 2D/C Live Mode, only two modes are combined: 2D and Color Doppler Modes.

2D/C/PW Mode

Color Doppler Mode and PW Spectral Doppler Mode are displayed simultaneously.

In Color Doppler Mode, press the **PW** dial-button on the control panel. Or, in PW Spectral Doppler Mode, press the **C** dial-button on the control panel.

2D/PD/PW Mode

Power Doppler Mode and PW Spectral Doppler Mode are displayed simultaneously.

In Power Doppler Mode, press the **PW** dial-button on the control panel. Or, in PW Spectral Doppler Mode, press the **PD** button on the control panel.

2D/C/CW Mode

Color Doppler Mode and CW Spectral Doppler Mode are displayed simultaneously. This mode is available only with certain probes.

In Color Doppler Mode, press the **CW** dial-button on the control panel. Or, in CW Spectral Doppler Mode, press the **C/Z** dial-button on the control panel.

2D/C/M Mode

Color Doppler Mode and M Mode are displayed simultaneously.

2D/TDI/TDW Mode



NOTE: This can only be used when the cardiac application is selected in Phased Array Probe.

TDI Mode and TDW Mode are displayed simultaneously. In PD mode or Color Doppler mode, press the **TDI**, and then press the **PW** dial-button.

Dual Live Mode

2D Mode and Color Doppler Mode are displayed simultaneously. In either 2D mode or C mode, select **Dual Live** on the touch screen.

❏ Changing Combined Mode Format

■ Changing Trackball State

In Combined Mode, more than two image modes are used at the same time.

Depending on the trackball's state, you can change the position or size of: ROI on the active image; the Sample Volume; M line, etc. Press the **Change** button on the control panel to change the state of the trackball.

Note that when frozen, you can press the **Change** button to select the type of Cine image.

■ Changing the Menu

You can change the menu and touch screen menu items without changing the active image mode. The functions of the buttons on the control panel vary depending on the active image mode.

For example, when the touch screen menu for 2D mode is displayed on the screen in 2D/C/PW mode, you can select another mode from the touch screen menu to switch to that mode.



NOTE: For information on optimizing an image in Combined Mode, please refer to 'Basic Mode'.

:: Multi-Image Mode

The product supports Dual Mode and Quad Mode.

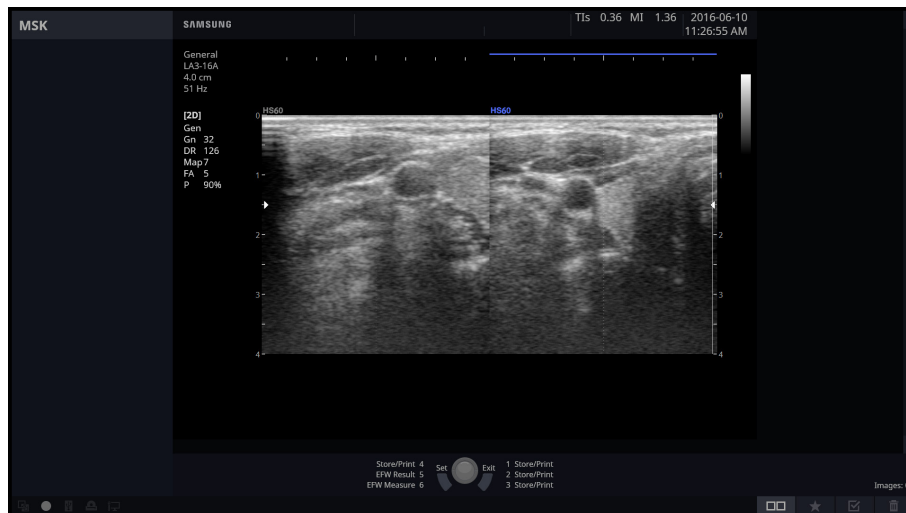
In Multi-Image Mode, an image can be displayed in different combined modes. Button operations in an active area are the same as in Combined Mode.

Dual Mode

Press the **L** or **R** button on the control panel.

You can compare two independent images with each other. Each time you press the **L** or **R** button, one of the two images is selected. The currently active image mode is indicated by a blue marker at the top of the image. The buttons and menu operate according to the image mode that is currently in use.

To exit from Dual mode, press the **2D** dial-button.



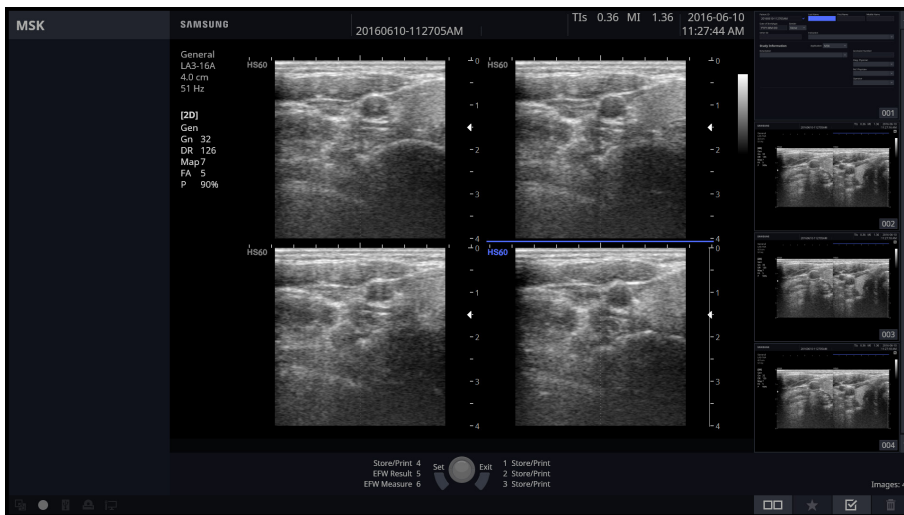
[Figure 7.16 Dual Mode]

Quad Mode

Press the **Quad** button on the control panel to enter Quad Mode.

You can compare four different images at the same time. Each time you tap the **Quad** or **Set** button, one of the four images is selected. The currently active image mode is indicated by a blue marker at the top of the image. The buttons and menu operate according to the image mode that is currently in use.

To exit Quad mode, press the **Single** button or the **2D** dial-button on the control panel.



[Figure 7.17 Quad Mode]



NOTE: For information on optimizing an image in Multi-image mode, please refer to 'Basic Mode'.

:: 3D/4D Mode

These modes show 3D images of the region being examined. HS50/HS60 provides 3D Mode, 4D Mode (optional) and XI STIC (optional).



NOTE: Standard probes cannot be used for 3D/4D Modes.

❏ Entering and Exiting 3D/4D Mode

Press the **3D/4D** button on the control panel. Press the button again to exit 3D/4D mode and return to 2D mode.

❏ 3D/4D Mode Screen

■ ROI Box

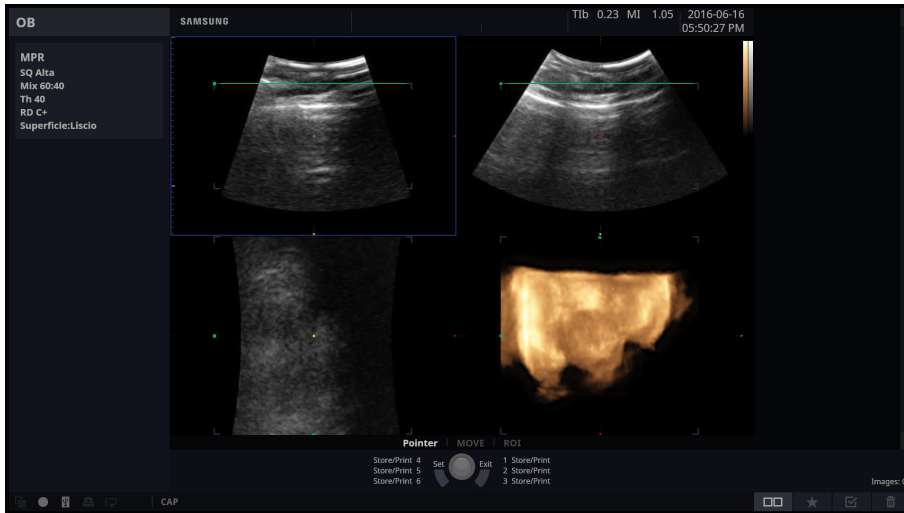
In 3D/4D mode, the ROI box is also referred to as the volume box. The box is used to indicate 3D/4D conversion areas.

You can adjust the position and size of the ROI box by using the **Change** button on the control panel. Each time the **Change** button is pressed, the state of the ROI box is displayed in the lower middle part of the screen as follows:

- ▶ ROI Position: In this state, the position of the ROI box can be changed. You can move the ROI box by using the trackball.
- ▶ ROI Size: In this state, the size of the ROI box can be changed. After resizing the ROI box with the trackball, press the **Change** button to confirm the new size.

3D Mode

The product uses the 3D probe to provide 3D mode and XI STIC.



[Figure 7.18 3D Mode]

3D

In this mode, you can obtain 3D images by using a 3D probe.

XI STIC

In this mode, fetal cardiac cycle and STIC volume data can be obtained with 3D probes. For more information, please refer to 'XI STIC' in this chapter.



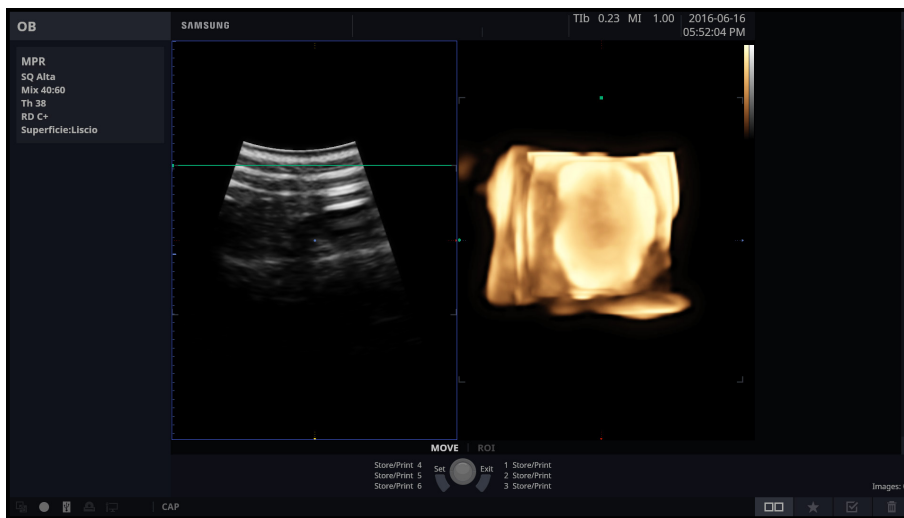
NOTE: XI STIC is an option of this product.

4D Mode

In 4D Mode, 3D images can be obtained in real time with 3D probes. This mode is also called Live 3D Mode.



NOTE: 4D Mode is an optional feature of this product.



[Figure 7.19 4D Mode]

❏ Acquiring 3D/4D Images

1. Specify the location and size of the ROI Box as desired.
2. Set the required parameters in the *3D StandBy* screen on the touch screen.
 - ▶ Select the menu tab for 3D/4D mode, and configure in the following order: View Mode → Rendering Preset → Other Items.
3. Press the **Freeze** or **Set** button on the control panel. The system will start acquiring 3D images.
4. Once 3D image acquisition is complete, the *3D View* screen will be shown (if configured to do so).
5. You can perform diagnosis by optimizing images. Press the **3D/4D** button to acquire 3D images again.

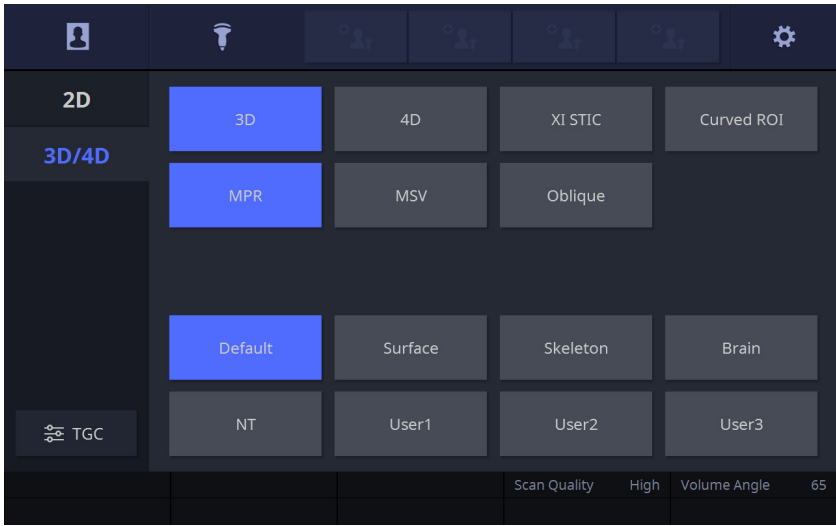
Tips!

How to Improve 3D Image Quality

- ▶ Consider the direction, size and section of the viewpoint as well as the visibility of an object.
- ▶ Before acquiring 3D images, adjust the contrast in 2D Mode.
- ▶ The bigger the ROI box, the slower the rendering speed. Therefore, set an appropriate ROI box size.
- ▶ To see the 3D image of a fetus in frontal view, position the fetal head in the direction of the Direction Mark, putting it in the coronal plane. Then scan the fetus from back to abdomen.
- ▶ To determine surface contour, subjects such as amniotic fluid that do not generate echoes should be insulated with hypo-echoic textures.
- ▶ Once 3D image acquisition is complete, you can adjust the low-threshold level to clean up the image. The general rule is not to adjust High Threshold; set it to the maximum value of 255.

3D Stand By

This screen is displayed on the touch screen when 3D/4D Modes are entered. Set the required parameters to specify how 3D images are acquired.



[Figure 7.20 3D StandBy – Touch Screen]

Menu Tab

Select a tab for 3D/4D Modes. Different tabs are displayed on the touch screen depending on the probe currently being used.



Adjusting 2D Images in 3D/4D Modes

Tap the **2D Menu** tab on the touch screen to optimize a 2D image before acquiring the corresponding 3D image.

Once the 2D image is optimized, tap **3D Menu** on the touch screen to return to 3D StandBy mode.

View Mode

Select a view mode to use after 3D images are acquired.

3D View

The standard view mode for 3D image review. Press **MPR** to select.

❏ Rendering Preset

Selects a Preset for 3D images. For more information, refer to the preset information contained in the '3D View-MPR Mode' section.

❏ Scan Quality

Selects the quality of 3D images. Select Low, Med, or High by tapping the button on the touch screen or using the dial-button.

- ▶ High: Image quality is high, but the speed of capturing (or rendering) 3D image is low.
- ▶ Med2: Provides better image capturing speed and lower image quality than the High setting.
- ▶ Med1: Provides better image capturing speed and lower image quality than the Med2 setting.
- ▶ Low: Provides the highest 3D image capturing speed and the lowest image quality.



NOTE: Scan Quality is not available in the XI STIC menu tab.

❏ Volume Angle

Set the scan angle by tapping the touch screen or using the dial-button. The setting range varies depending on the selected probe.



NOTE: In XI STIC, set the scan angle between 10° and 60°.

3D View – MPR

This view mode is enabled upon acquisition of images when **MPR** is selected in *3D StandBy*.

You can optimize 3D images, perform diagnosis, and take measurements.

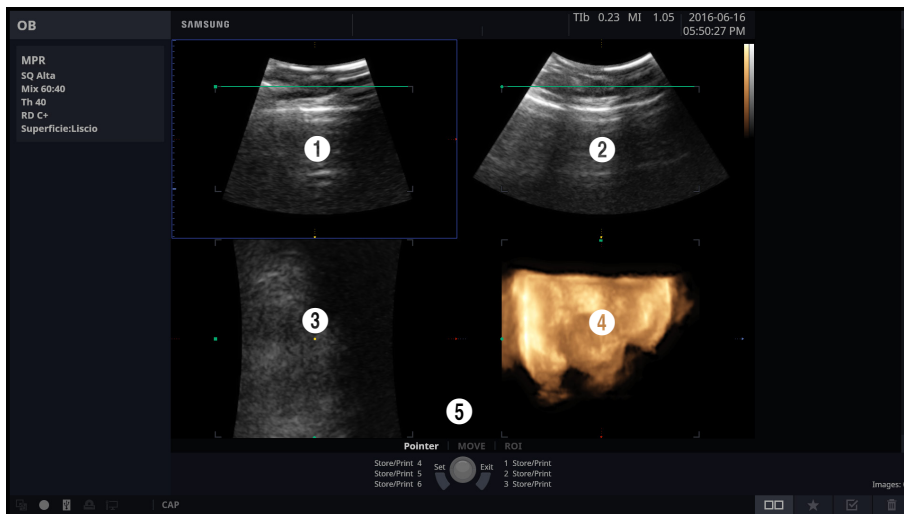


Changing View Mode

Select the 3D Menu tab on the touch screen to change the view mode.

The Basics of 3D View Mode

Screen Layout



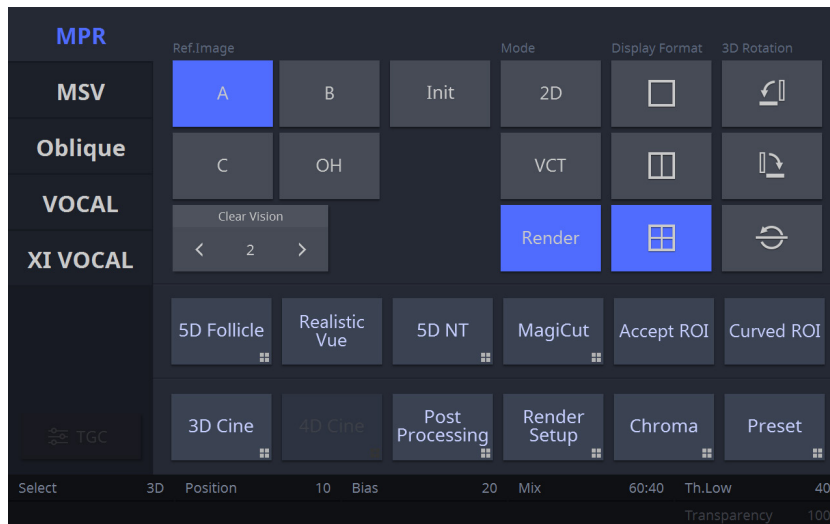
[Figure 7.21 3D View]

- ❶ A Plane: The slice image of the axial section.
- ❷ B Plane: The slice image of the sagittal section.
- ❸ C Plane: The slice image of the coronal section.
- ❹ 3D Image

- ⑤ **Trackball state indication:** The current state of the trackball is displayed at the bottom of the monitor screen. You can select Pointer, Move, or ROI for trackball. Press the **Change** button on the control panel to change the trackball state. The trackball state changes sequentially each time the button is pressed.
- **Pointer:** Re-adjusts the position of ROI Box. Pressing the **Pointer** button on the control panel switches to Pointer state. You can rotate the ROI box around the image axis by using the pointer while pressing the **Set** button. Press the **Change** button again to switch to another state.
 - **Move:** Moves the 3D image with the trackball. The acquired 3D image moves as you move the trackball.
 - **ROI:** You can resize the ROI box with the trackball. The ROI box on the 3D image is resized as you move the trackball.

■ Touch Screen Layout

Only those buttons that are available in the current mode are enabled.



[Figure 7.22 3D View Menu]

■ Post Gain

Works independently from 2D Gain, with a separate value. The initial value is 0, but this value can be set to any value from -255 to 255. In 4D mode, Post Gain works during Freeze.

■ Zooming In to/Out of Images

Turn the **Zoom** dial-button on the control panel to zoom in to/out of images. The current zoom factor appears at the bottom of the screen.

■ VCT Zoom



NOTE: This option is available with VCT.

After tapping VCT Zoom on the touch screen, press the **Zoom** dial-button on the control panel to convert it to VCT Zoom function. Turn the dial-button to zoom in to/out of VCT images. The current VCT Zoom factor appears at the bottom of the screen.

■ Rotating Image around X Axis

Use the **M/x** dial-button on the control panel.

■ Rotating Image around Y Axis

Use the **PW/y** dial-button on the control panel.

■ Rotating Image around Z Axis

Use the **Color/z** dial-button on the control panel.

■ Calculations by Application



NOTE:

- ▶ In the 4D mode, measurements of XI STIC and VOCAL are not available.
- ▶ In MSV mode, measurement is not available if the display format is 2x3 or higher.

Press the **Calculator** button on the control panel. Measurement methods are identical to those described in 'Chapter 8. Measurements and Calculations'.

■ Basic Measurement

Press the **Calculator** button on the control panel. For more information, refer to 'Basic Measurement' in 'Chapter 8. Measurements and Calculations'.

Tap **Save** on the touch screen to finish saving. To cancel it, press the **Exit** button on the control panel.

■ Saving Images



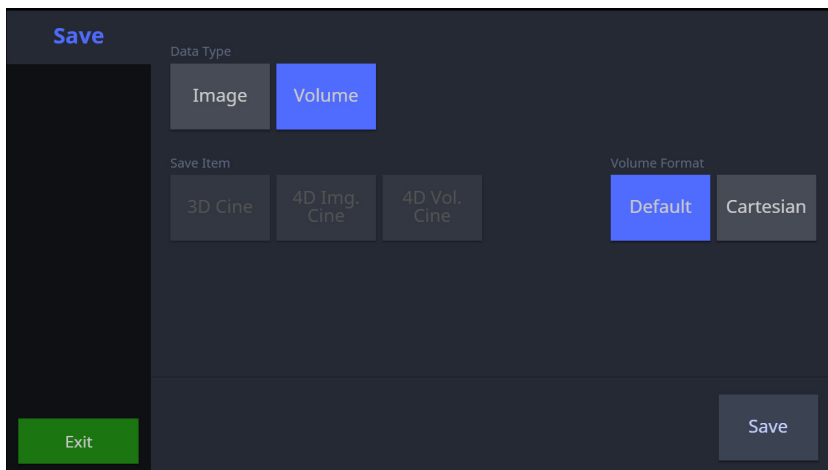
NOTE: If volume data contains both 4D and 3D Cine images, choose either 4D or 3D for saving.

1. Press the **Store/Print** mapping button on the control panel. The touch screen will show the *3D Data Save* screen.
2. Specify settings such as Data Type, Save Item, and Volume Format.
3. Tap **Save** on the touch screen to finish saving. To cancel it, press the **Exit** button on the control panel.



Volume Data

1. If volume data contains a Cine image, it is saved at the same time.
2. If images are saved with volume data, they can be converted to new 3D rendering images with SonoView.



[Figure 7.23 3D Data Save]

■ Printing Images

Go to Set up > Customize > Buttons and customize **U1**, **U2**, **U3**, **U4**, **U5**, and **U6** buttons as you want.

❏ Mode

Select the display format in which 3D images are presented.

■ Render

Axial, Sagittal, or Coronal plane images are displayed together with the 3D image.

■ 2D

Axial, Sagittal and Coronal plane images, along with OH (Orientation Help), are displayed on the screen. OH indicates the relative position of the currently selected plane in regard to volume data.



Tap **Single** on the touch screen for a more detailed view.

■ VCT

Axial, Sagittal and Coronal plane images and combinations of them are displayed. Each plane is displayed with a different colored frame. VCT is an abbreviation for Volume CT.



NOTE: Accept ROI is available in Render. Tap the touch screen to turn it on or off. If it is turned on, ROI is not shown.

❏ Display Format

You can change the display format by using the touch screen. The display format varies for each mode.

- ▶ **Single:** Switches to Full screen.
- ▶ **Dual:** Switches to 2D/3D screen.
- ▶ **Quad:** Switches to ROI 3D screen.



NOTE: In 2D or VCT mode, only Single or Quad Format can be used.

❏ Ref. Image

Tap the corresponding button on the touch screen to select a reference image from among A, B, and C. The selected image will be highlighted with blue borders.

- ▶ A: Axial Section
- ▶ B: Sagittal Section
- ▶ C: Coronal Section

■ OH (Orientation Help)



NOTE: This option may be used in **2D** and **Render**.

Tap the corresponding button on the touch screen to turn it on or off. If it is turned on, a 3D image will be displayed along with OH.

■ ClearVision

ClearVision removes noise from the image and enhances outlines to help show the image more clearly. You can select off or adjust the index between 1 and 5 by tapping the touch screen.

❏ 3D Rotation



NOTE: Mix, Th.Low, and Transparency are available in **Render** mode.

Select -90°, 90°, or 180° by tapping the button on the touch screen. The coordinate system rotates based on the current 3D image.

❏ Init

When you tap the touch screen, the position information of the 3D image is initialized.

Mix

Configure the mix of Render modes 1 and 2. Use the dial-button to select a ratio between 0:100(%) and 100:0(%).



NOTE: For details on Render mode, refer to 'Render Setup' in '3D Utility Menu'.

Th. Low

Specify the minimum range of Threshold. Use the dial-button to select a value between 0 and 254.



Threshold

This option allows you to adjust the threshold value in order to eliminate unnecessary data from images. As the number increases, cyst elements become more apparent. As the number decreases, bone elements become more apparent.

Select

Select Post Curve. Use the dial-button to select 2D, 3D, 2D Color, or 3D Color.

Position

Set the position of the post curve selected under **Select**. Use the dial-button to select a value between 0 and 100.

Bias

Set the bias of the post curve selected under **Select**. Use the dial-button to select a value between -100 and 100.

Transparency

Set the transparency of a 3D image. Use the dial-button to select a value between 20 and 250.

The lowest value (20) is for complete transparency, and the highest value (250) is for complete opacity.

HDVI



NOTE: HDVI is an optional feature of this product.

Filters 3D images to express outlines more vividly and improve images. Five predefined indices are available.

HDVI Index

Tap HDVI Index on the touch screen. Select an index between 1 and 5 by tapping the button on the touch screen .

HDVI Type

Tap the touchscreen button or use the dial-button to select the part to measure among Face, Brain, Early OB, Heart, Spine, Gyn, Breast, Thyroid, Carotid, Abdomen, Kidney, and Surface and adjust the image.



NOTE: The ClearVision and HDVI options are enabled in MPR, MSV, Oblique View mode.



NOTE: The following are enable MPR mode: MagiCut, Realistic Vue, 3D Cine, 4D Cine, Render Setup, Preset, Post Processing, Curved ROI, Chroma.

Geometry

Move, magnify, or rotate an image rendered in 3D Mode.

- ▶ Rotation: Use the X/Y/Z button to rotate the rendered image.
- ▶ Magnification: Use the Zoom button to magnify the rendered image.
- ▶ Move: Use the trackball to move the rendered image.

5D Follicle

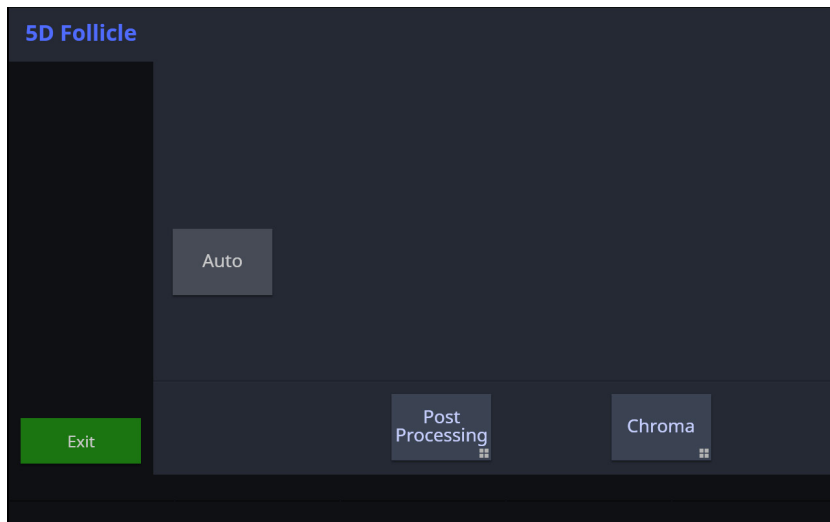


NOTE: 5D Follicle is an optional feature of this product.

This feature assists with diagnosis by estimating the size and volume of a follicle in the ovary. Tap this button on the touch screen to switch to the **5D Follicle** screen. Press **Exit** to finish 5D Follicle.

Run 5D Follicle, and the touch screen will switch to the 5D Follicle screen.

1. Specify the position of scanning. Use the **Position** dial-button on the touch screen to select between Left Ovary and Right Ovary.
2. Select a measurement method.
 - ▶ Auto: The follicle is located and measured automatically.
3. When the measurement is finished, its result is shown on the screen. The scanned parts are color-coded and numbered.



[Figure 7.24 5D Follicle – Touch Screen]

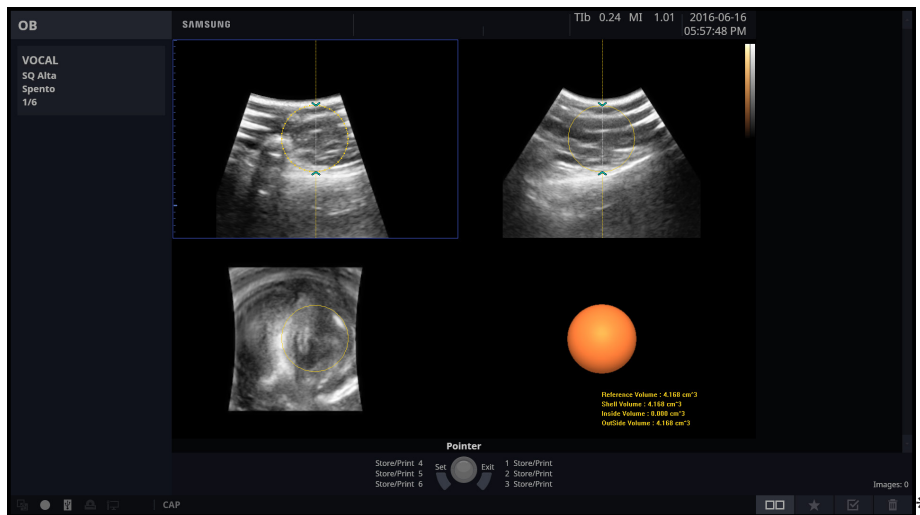


[Figure 7.25 5D Follicle]

VOCAL

Measure the volume of tissues within the human body. VOCAL is an abbreviation for Virtual Organ Computer Aided Analysis.

VOCAL can be performed in the following order: VOCAL Define → VOCAL Edit → VOCAL



[Figure 7.26 VOCAL]

VOCAL Define

Specify the settings required for VOCAL execution.

■ Contour Type

Select the contour line type. A contour line is automatically created for all types except **Manual**.

■ Solid

Used for object data with many echoes.

■ General

Draw a contour line based on a typical object. This is faster than other automatic contour types but less accurate.

■ Prostate

Used for prostate data.

■ **Cystic**

Used for object data with fewer echoes.

■ **Sphere**

After creating a spherical object, edit its contour to make it into the desired shape.

■ **Manual**

Create the desired shape of an object manually.

❏ **Ref. Image**

Tap the corresponding button on the touch screen to select a reference image from among A, B, and C. The selected image will be highlighted with blue borders.

❏ **Step Angle**

Set the rotation angle. Select **12**, **18** or **30** by tapping the corresponding button on the touch screen.

❏ **Moving Pole Points by Using the Trackball**

Set the range to perform VOCAL in a reference image. In a reference image, Pole 1 indicates the position of the upper arrow and Pole 2 indicates the position of the lower arrow. Adjust by using either the trackball and **Set** button on the control panel or the dial-button on the touch screen.

❏ **Init**

When you tap the touch screen, the position information of the 3D image is initialized.

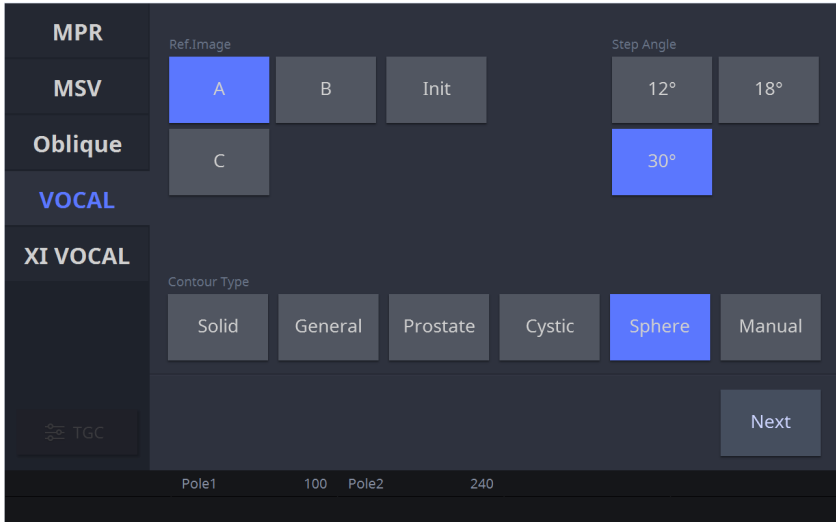
Next

Tap the touch screen to begin creation of VOCAL data.



When Contour Type is set to Manual

- 1. Tap **Next** on the touch screen. The *Image Position* screen will be displayed on the touch screen.
- 2. After tapping the **Set** button over an image, move the trackball to contour.
 - ▶ Tap **Next** to move to the next frame.
 - ▶ Tap **Previous** to move to the previous frame.
- 3. Tap **Done** on the touch screen. Start VOCAL.
If you tap **Done** without contouring, VOCAL is performed over a sphere.



[Figure 7.27 VOCAL Define – Touch Screen]

VOCAL Edit

Once VOCAL data is created, volume information will be displayed on the screen. In VOCAL Edit Mode, you can modify or redo the existing contour lines.

❏ Shell Mode

Set the shell of an object based on its contour line.

■ Off

Do not use Shell Mode. The created contour and the shell overlap.

■ Inside

The shell is drawn inside the contour generated by the Shell Thick. specified.

■ Outside

The shell is drawn outside the contour generated by the Shell Thick. specified.

■ Symmetric

Half the shell is drawn inside the contour and the other half of the shell is drawn outside the contour, with each drawn at half of the Shell Thick. specified.

❏ Shell Thick.

Set the shell thickness of an object. Use the dial-button to select a value between 1 and 20mm. This option appears on the touch screen only when Shell Mode is used.

❏ Image Position

Review contour lines for each frame. Use **Previous** and **Next** to move through frames.

❏ Multi Edit

Modify more than one contour line at once. Tap this button on the touch screen to turn this feature on or off. If it is turned on, up to 6 contour lines can be displayed simultaneously on the screen. When there are more than 6 lines, use the **MEV Page** dial-button to navigate through pages. MEV is an abbreviation for Multi Edit View.

Use **Pole 1** and **Pole 2** to edit contour lines. You can also use the trackball and the Set button on the control panel to edit contour lines. Once editing is complete, tap **Exit Multi Edit** again to turn it off.

❏ Clear Contour

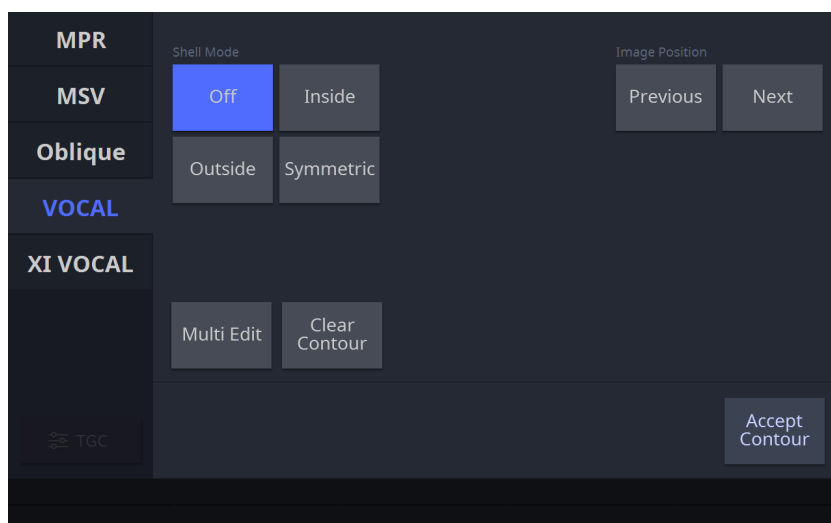
When you tap this button on the touch screen, the VOCAL data are deleted, the settings are maintained, and the system returns to the VOCAL Define step.

❏ New Contour

Tap the button on the touch screen to move from VOCAL Manual page to VOCAL Setup page. This button only appears if Contour Type is set to Manual.

❏ Accept Contour

Tap the button on the touch screen to apply changes. The screen will switch to the VOCAL data review screen.



[Figure 7.28 VOCAL Edit – Touch Screen]

VOCAL

Optimizes VOCAL data for review.

❏ VOCAL Mode

Specify how VOCAL data are presented.

■ ROI 3D

Shows images in the Axial, Sagittal and Coronal planes, together with VOCAL data.

■ Fixed 3D

Shows images in the Axial, Sagittal and Coronal planes, together with 3D images for VOCAL data.

■ VCT

Shows actual combinations of images in the Axial, Sagittal and Coronal planes and VOCAL data. Use the **VCT Type** dial-button to select one from Type 1-Type 8.

❏ Display Format

When you tap this button on the touch screen and select **Single** or **Quad**, the VOCAL data are displayed in full screen. This can be used in every mode. When you press this button again, the display returns to the previous screen.

❏ Ref. Image

Tap the corresponding button on the touch screen to select a reference image from among A, B, and C. The selected image will be highlighted with blue borders

❏ VOCAL Edit

Tap the corresponding button on the touch screen to return to the VOCAL Edit stage.

❏ Init

When you tap the touch screen, the position information of the 3D image is initialized.

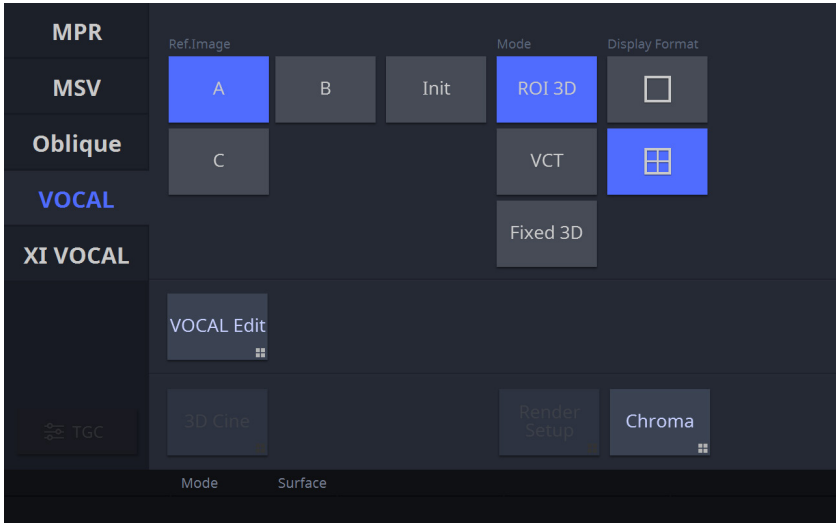
 Mode



NOTE: This option is available with **ROI 3D**.

Specify how the surface of VOCAL data is presented. Use the dial-button to select Surface or Wireframe.

- ▶ Surface: VOCAL data are represented using the method of expressing the exterior of images by curves.
- ▶ Wireframe: VOCAL data are represented by dots and lines.



[Figure 7.29 VOCAL – Touch Screen]

3D XI



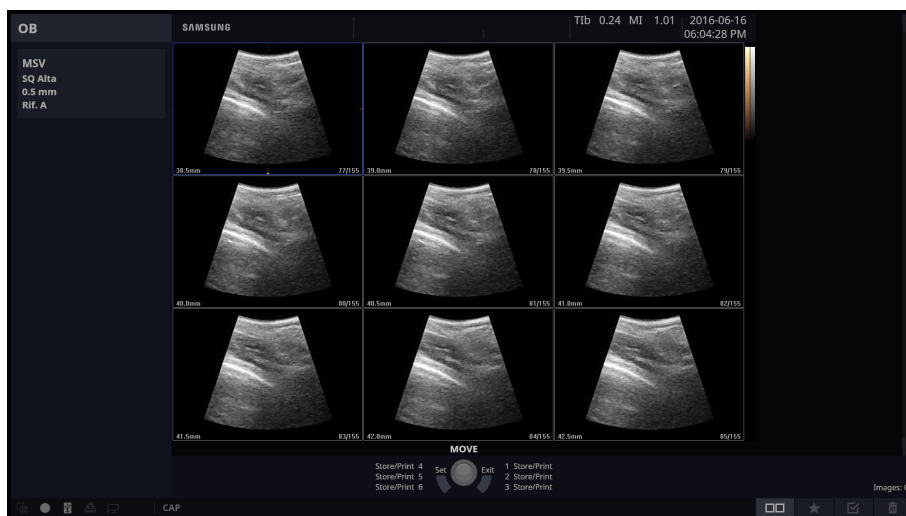
NOTE:

- ▶ 3D XI is an optional feature of this product.
- ▶ 3D XI is available only when 3D probes are used.

This view mode is enabled if 3D image acquisition is completed when **MSV** or **Oblique View** is selected in *3D StandBy*. An image can be viewed in multiple slices.

MSV

An image can be viewed in multiple slices. MSV is an abbreviation for Multi-Slice View.



[Figure 7.30 Multi Slice View]



NOTE: Available options are **Calculator**, **Caliper**, **Text** and **Arrow**.

MSV Screen

The images sliced at the thickness set in **Slice Thick.** are displayed on the screen. Slice Number/ Total Number of Slices is shown at the bottom of each slice image. The currently selected slice image is indicated by an blue contour.

The image information displays the current mode, Ref. Image, and Slice Thick.

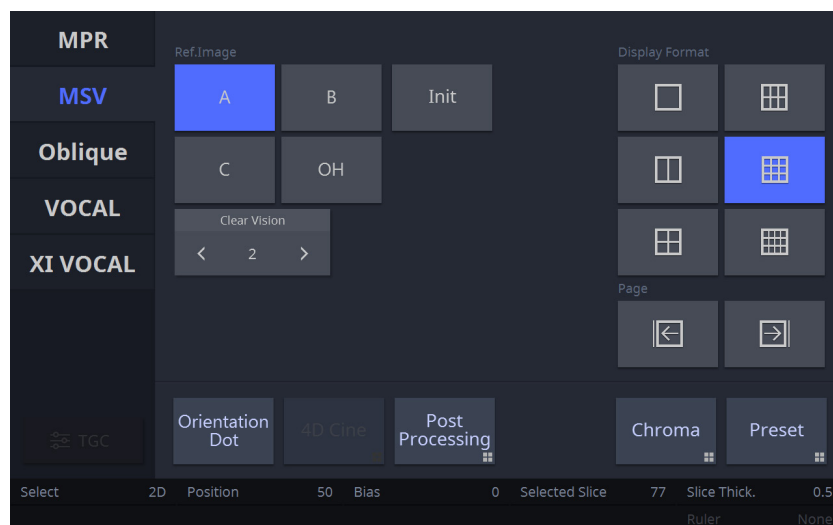
Rotating Image

Rotating the reference plane affects all other planes.

- ▶ X-axis Rotation: Use the **M/X** dial-button on the control panel. If the trackball is in Pointer mode, place the Pointer near the X-axis in an image and then move the trackball while pressing the **Set** button.
- ▶ Y-axis Rotation: Use the **PW/Y** dial-button on the control panel. If the trackball is in Pointer mode, place the Pointer near the Y-axis in an image and then move the trackball while pressing the **Set** button.
- ▶ Z-axis Rotation: Use the **Color/Z** dial-button on the control panel. If the trackball is in Pointer mode, place the Pointer near the Z-axis in an image and then move the trackball while pressing the **Set** button.

Moving Image

Set the trackball in Move Mode, and then move it up/down/left/right. The image will move along the X and Y axes.



[Figure 7.31 Multi Slice View – Touch Screen]

Display Format

Set the layout of slice images. Select from 1*1, 2*1, 2*2, 3*2, 3*3 or 4*3 by tapping the corresponding button on the touch screen. The number of indices that can be displayed simultaneously on the screen varies depending on this setting. If the layout is changed, the selected slice image moves to the first position on the screen.

Ref. Image

Tap the corresponding button on the touch screen to select a reference image from among A, B, and C.

MSV OH

Tap the **ON** button on the touch screen button to turn it on or off. If this function is turned on, the A, B, and C planes of the selected slice image will be displayed on the screen. The selected slice and reference images will be highlighted with blue borders.

ClearVision

ClearVision removes noise from the image and enhances outlines to help show the image more clearly. You can select off or adjust the index between 1 and 5 by tapping the touch screen.

Page

Change the page on the screen. This option can be useful when the total number of slice images exceeds what is specified in **Display Format**. Select a page by tapping the **Previous** and **Next** buttons on the touch screen.

Selected Slice

Select a slice image to observe. Use the dial-button to select an Index. The selected index will be highlighted with blue borders.

Slice Thick.



NOTE: The Slice Thick. represents the slice width in volume data, rather than the actual anatomical position.

Set the cut depth of images. Use the dial-button to select 0.5, 1.0, 2.0, 3.0, 4.0, 5.0, or 10.0mm. Depending on your selection, the number of indices and pages will vary.

Position

Set the position of the post curve. Use the dial-button to select a value between 0 and 100.

Bias

Set the bias of the post curve. Use the dial-button to select a value between -100 and 100.

Ruler

Set the position of the ruler. Use the dial-button to select None, Right, Left, Top, Bottom or All.

Select

Select Post Curve. Use the dial-button to select 2D or 2D Color.



NOTE:

The following 3D Utility Menu items are enabled in MSV mode: Orientation Dot, Chroma, 4D Cine, Post Processing, Preset

For more information on 3D Utility, see '3D Utility Menu'.

Oblique View

After drawing a straight or curved line in the selected image in MSV Mode, you can study the related oblique image. To do this, follow the procedure below:

1. Select **Display Format** and then specify the number of oblique images to study.
2. Set the **Cut Type**.
3. Draw a straight or curved line in a reference image by using the trackball and the **Set** button.
An oblique image will appear with the start (S) and end (E) points shown.

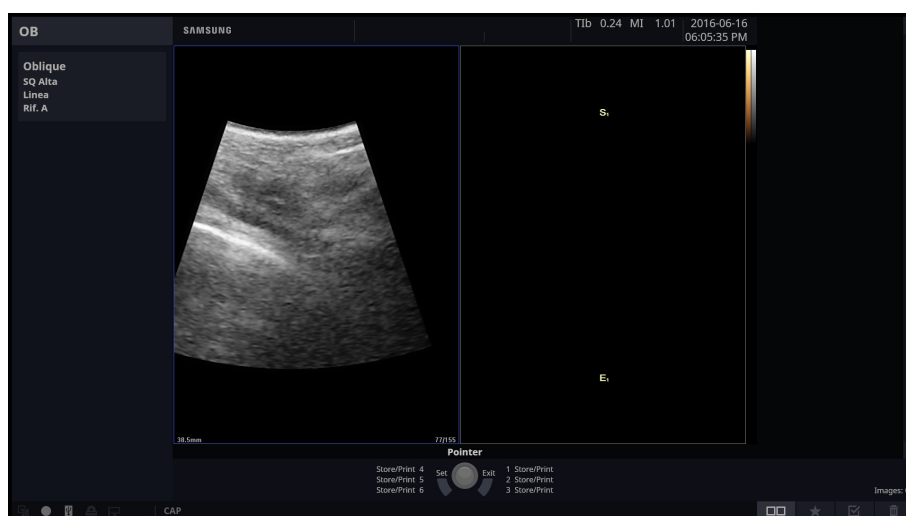
If the trackball is in Move state, the position of the line can be changed.

4. Optimize the image for observation by using other buttons on the touch screen.



NOTE:

- ▶ Functions such as **Text** and **Arrow** can be used.
- ▶ When Display Format is 2*1, measurement functions such as **Calculator** and **Caliper** can be used.



[Figure 7.32 Oblique View]

❏ Oblique View Screen

The reference image that is selected in MSV Mode is displayed on the screen. The reference image is highlighted with blue borders and always placed in the top left corner of the screen.

When more than one line is used for observation, each line is indicated by a different color and number.

The image information displays the current mode, Ref.Image, Oblique Cut Type, and Plumb Size (or Slice Thick.).

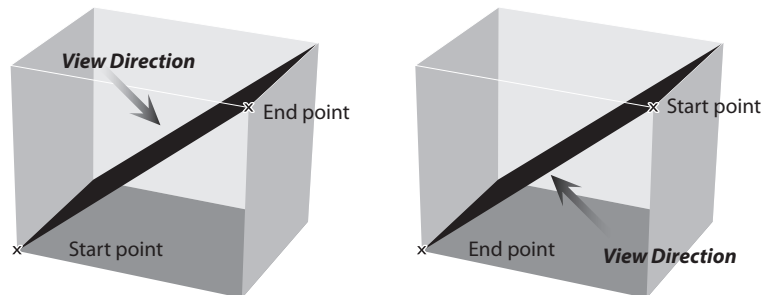


NOTE: When **OVIX** is used, the image information also displays OVIX Line Offset, Mix, Threshold Low, and Render Mode 1, 2.



Direction of View of Oblique Image

The observer is located perpendicular to the section of a reference image. Please see the view direction below:



❏ Display Format

Set the layout of oblique images. Select 2*1, 3*2 or 3*3 by tapping the corresponding button on the touch screen. Depending on this setting, the number of oblique images and the Oblique Cut Type will vary.

Cut Type

Specify how images are cut by tapping the corresponding button on the touch screen.

■ Line

The oblique image of a straight line can be studied.

■ Contour

The oblique image of a curved line or contour line can be studied.



Multi Line & Multi Contour

If **Display Format** is set to 3*2 or 3*3, enable **Auto Increment** to draw more than one line.

■ Parallel



NOTE: This cannot be used when **Display Format** is 2*1.

The oblique image of a straight line and its parallel lines can be studied. If a straight line is drawn, its parallel lines are automatically shown on the screen.

■ Plumb



NOTE: This cannot be used when **Display Format** is 2*1.

The oblique image of a straight line and its perpendicular lines can be observed. If a straight line is drawn, its perpendicular lines are automatically shown on the screen.

■ ClearVision

ClearVision removes noise from the image and enhances outlines to help show the image more clearly. You can select off or adjust the index between 1 and 5 by tapping the touch screen.

❖ Image Rotation

Specify the direction of an oblique image. Select 90°, 180° or -90°, by tapping the button on the screen. Select the oblique image that you wish to change the direction of from **Selected Slice**.

❖ Clear Line

Tap the touch screen to delete an oblique image.

❖ Selected Slice



NOTE: This cannot be used when **Display Format** is 2*1.

Use the dial-button to select a line. The oblique image of the selected line is indicated by white contour.

❖ Plumb Size



NOTE: This is used only when **Cut Type** is Plumb.

Use the dial-button to adjust the length of the perpendicular line. The length of the centermost line may be adjusted by 1 mm; its current length is displayed in image information.

❖ Slice Thick.



NOTE: This is used only when **Oblique Cut Type** is Parallel.

Use the dial-button to adjust the interval between the perpendicular lines. The length of the centermost line may be adjusted by 1 mm; its current length is displayed in image information.

❏ Rotate Line



NOTE: This cannot be used when:

- ▶ **Cut Type** is Contour; or
- ▶ When the **Selected Slice** is Selected Slice Select All.

Use the dial-button to rotate a line. When the line is rotated, the oblique image is also changed accordingly.

❏ OVIX



NOTE: This cannot be used when **Cut Type** is Contour.

OVIX is the abbreviation for Oblique View eXtended, which sets the cross-sectional thickness of an oblique image and shows the image in 3D.

Tap the corresponding button on the touch screen to turn it on or off. When this is on, an OVIX Line appears in the reference image, which indicates the cross-sectional thickness of the oblique image of the reference image.

The thickness of the OVIX Line can be adjusted with **OVIX Thick..** To change the 3D image settings, select and adjust **Setting** or OVIX Post Curve from the 3D Utility Menu.

❏ OVIX Thick.

Use the dial-button to adjust the thickness of OVIX. The 3D image for the set thickness appears.

❏ Select

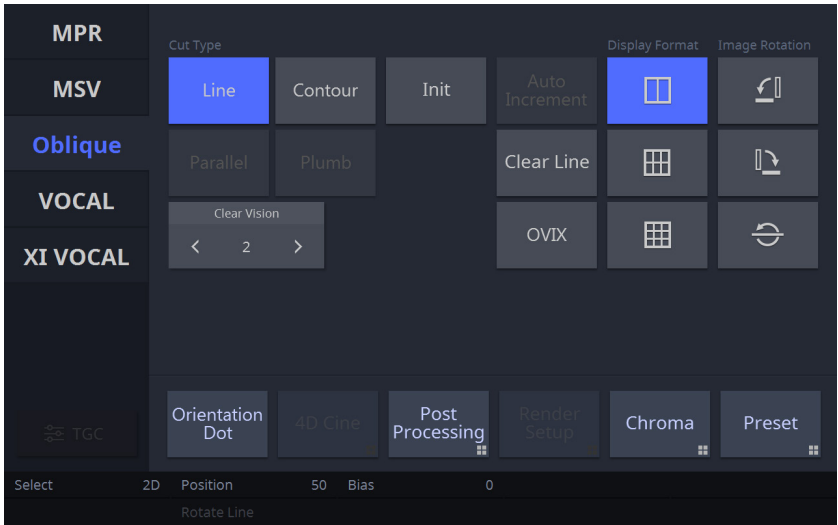
Select Post Curve. Use the dial-button to select 2D, OVIX, 2D Color, or OVIX Color.

 Init

Tap the touch screen to delete the Oblique image and reset the position information for Ref. Image.



NOTE: The following 3D utility menu items are enabled in Oblique View mode: Orientation Dot, 4D Cine, Post Processing, Render Setup, Chroma, Preset
For more information on 3D Utility, refer to '3D Utility Menu'.



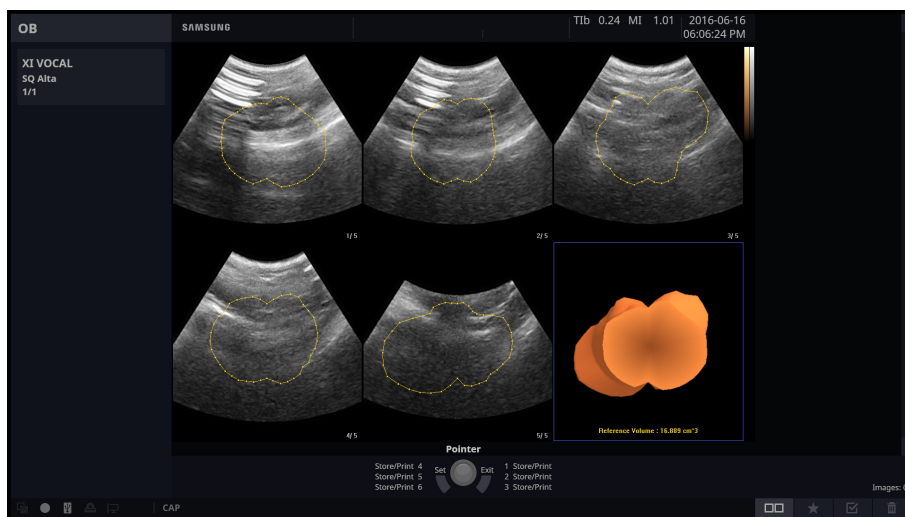
[Figure 7.33 Oblique View – Touch Screen]

XI VOCAL



NOTE: XI VOCAL is one of the 3D XI features. It is available as an optional feature of this product.

Measure the volume of tissues in 3D XI Mode.



[Figure 7.34 XI VOCAL]

Tips!

VOCAL vs XI VOCAL

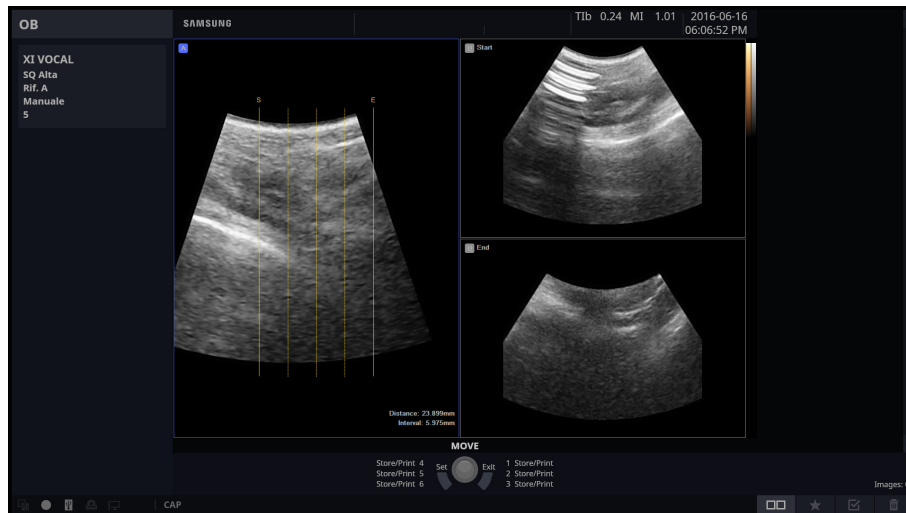
- ▶ VOCAL: Measures the volume of an object in a general 3D image. Uses rotating slices.
- ▶ XI VOCAL: Measures the volume of an object in the selected reference image in MSV Mode by using parallel slices. Uses parallel slices. Calculates the volume of an object by cutting it into multiple slices.

XI VOCAL is performed in the following order: XI VOCAL Define → XI VOCAL Edit → XI VOCAL

XI VOCAL Define

Specify how slice and contour lines are extracted.

Reference images and slice lines are displayed on the left side of the screen. Slice images with the start (S) and end (E) points of a slice line are displayed on the right side of the screen.



[Figure 7.35 XI VOCAL Define]

Contour Type

Select the contour line type. A contour line is automatically created for all types except **Manual**.

■ Solid

Used for object data with many echoes.

■ Cystic

Used for object data with fewer echoes.

■ General

Draw a contour line based on a typical object. This is faster than other automatic contour types but less accurate.

■ Manual

Create the desired shape of an object manually. A contour line can be specified in the *XI VOCAL Edit* screen.

❏ Ref. Image

Tap the corresponding button on the touch screen to select a reference image from among A, B, and C. The selected image will be highlighted with blue borders.

■ Ref. Contour

Tap this button on the touch screen to turn this feature on or off. If it is turned on, a contour line can be drawn by using the trackball and the **Set** button.

❏ Slice Direction

Set the direction of a slice line. Select from Vertical or Horizontal by tapping the corresponding button on the touch screen. Changing the direction of a slice line also changes the slice image displayed on the screen.

❏ Init

When you tap the touch screen, the position information of the 3D image is initialized.

❏ Next

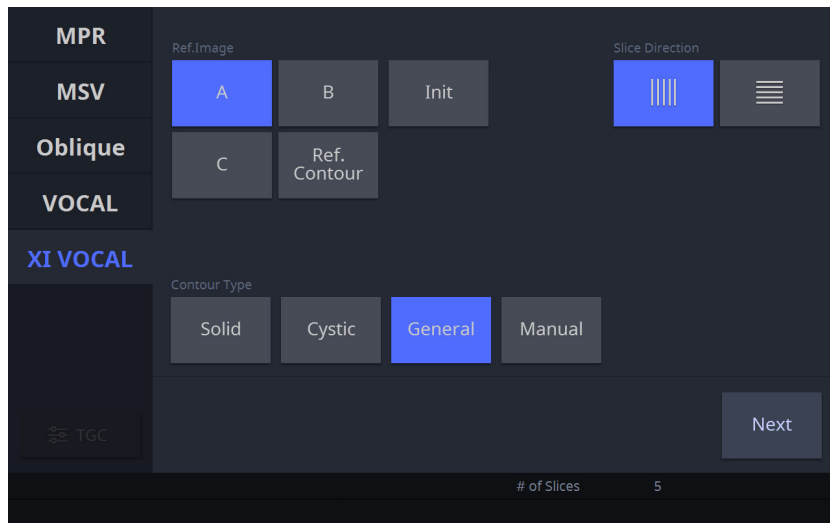
Tap the touch screen to switch to the *XI VOCAL Edit* screen.



NOTE: If **Contour Type** is set to Manual, the system switches to the *XI VOCAL* screen when **Next** is pressed.

of Slices

Specify the number of slice images. Use the dial-button to select 5, 10, 15, or 20. Depending on the selected number of images, the interval between slices will vary.



[Figure 7.36 XI VOCAL Define – Touch Screen]

XI VOCAL Edit

Specify the contour extraction range or run XI VOCAL.

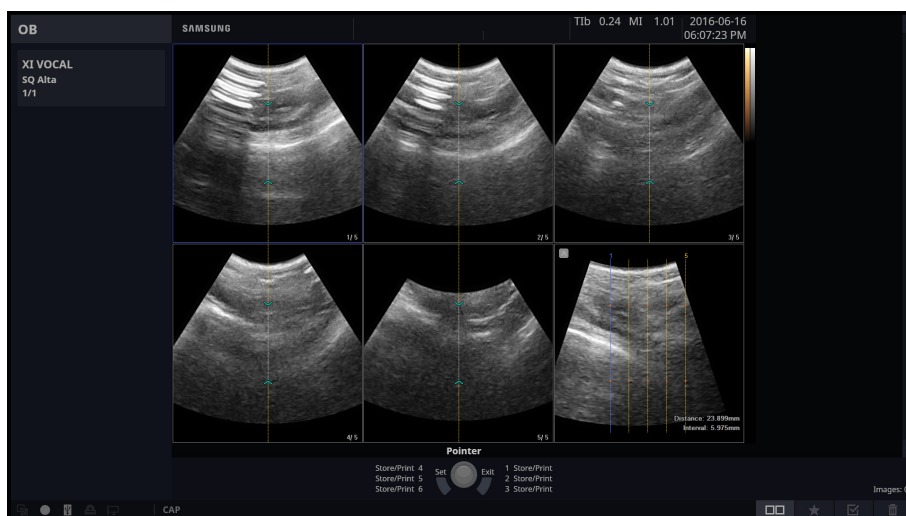
Based on slice lines, slice images and pole points will be displayed on the screen. A pole point is a reference point against which an object contour is extracted. Two pole points appear in each slice image.

The selected slice image is highlighted with blue borders. 'The image number/the total number of slice images' is shown at the bottom of each image.



Reference Image and Slice Line

These always appear in the bottom right corner of the *XI VOCAL Edit* screen. They can be useful when the position of a slice image needs to be considered.



[Figure 7.37 XI VOCAL Edit]

Ref. Page

Use the dial-button to change the screen page.

New Contour

Tap the corresponding button on the touch screen to delete the current data and return to the *XI VOCAL Define* stage.

Accept Contour

Tap the button on the touch screen to apply changes and run XI VOCAL. The system will switch to the *XI VOCAL* screen.

Tips!

When Contour Type is set to Manual

Use the **Set** button and the trackball to draw a contour line before pressing **Accept Contour**. If you press **Accept Contour** without drawing a contour line, a general type contour line will be extracted.



[Figure 7.38 XI VOCAL Edit – Touch Screen]

XI VOCAL

Optimize XI VOCAL data for review.

Slice images with their contour line shown and 3D reference images are displayed. The 3D reference image is highlighted with blue borders, and the calculated volume is shown at the bottom of the image.



3D Reference Image

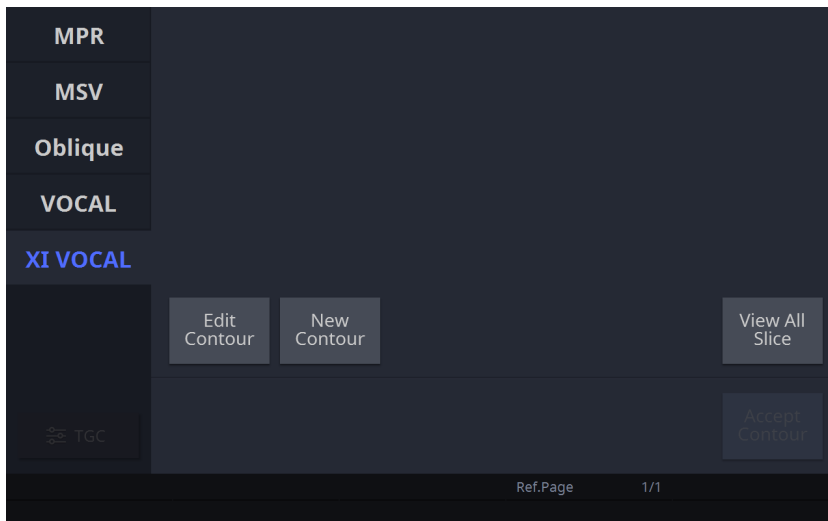
Use XI VOCAL to display an object for which volume has been obtained in 3D. Use the **Zoom, M/x, PW/y** or **Color/z** dial-buttons on the control panel to zoom or rotate for observation.

View All Slices

Tap this button on the touch screen to turn this feature on or off. If it is turned on, all XI VOCAL data – including reference image, slice line and slice image – will be displayed simultaneously on the screen.

Edit Contour

Tap the touch screen to return to the *XI VOCAL Edit* screen. You can edit the contour line by using the trackball and the **Set** button.



[Figure 7.39 XI VOCAL – Touch Screen]

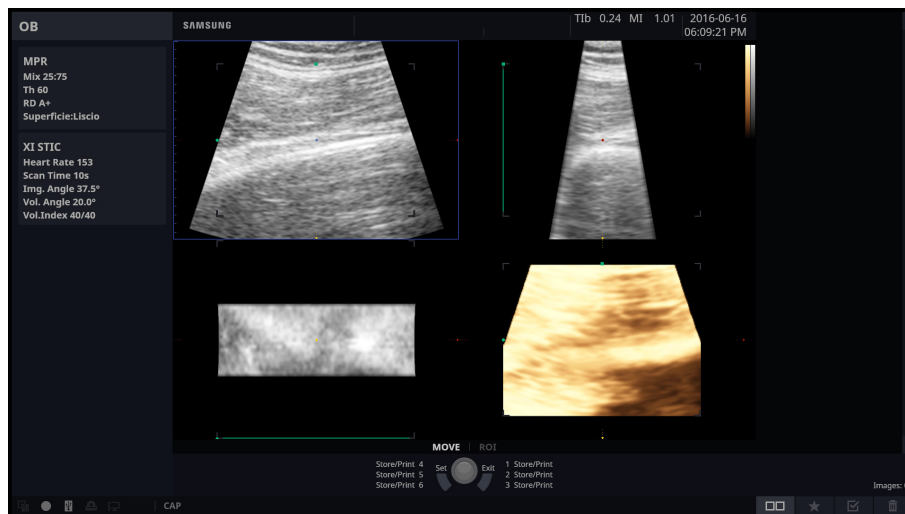
XI STIC



NOTE:

- ▶ XI STIC is an optional feature of this product.
- ▶ XI STIC is only available when 3D probes are used.
- ▶ This only appears when the Application is set to **OB**.
- ▶ When you enter 3D Standby in Fetal Heart Preset, the system will automatically switch to STIC.

This option can be used to obtain the fetal cardiac cycle with volume data on the fetal cardiac area, and to recompile the volume data for display. STIC is an abbreviation for Spatio-Temporal Image Correlation.



[Figure 7.40 XI STIC]

Acquiring XI STIC Images



NOTE: If the motion artifacting is severe, data does not contain the cardiac cycle, or the heart rate cannot be calculated for any other reason, you will be returned to the XI STIC image preparation screen.

1. Select the **XI STIC** tab in the *3D Stand By* screen on the touch screen.
2. Set the various parameters as you would for acquisition of standard 3D images.
3. Press the **Freeze** or **Set** button on the control panel. The system will begin acquiring 3D images.
4. When image acquisition is complete, XI STIC is displayed on the monitor screen and the *XI STIC Confirm* screen appears on the touch screen. Check the fetal cardiac cycle calculated.

5. Tap **Yes** on the touch screen to continue. Tap **No** to cancel and acquire the images again.

6. You can perform diagnosis by optimizing images.

Tips!

To Obtain Superior STIC Volume Data

- ▶ Volume Angle: If the size of the fetal heart is small, use a smaller Volume Angle.
- ▶ ROI Position: Adjust the scan position so that the center of the Volume Angle and the fetal heart are aligned properly.
- ▶ ROI Box: Adjust the size of the volume box so that it nearly fits the size of the fetal heart.

❏ Volume Angle

Set the scan angle. Select a value between 10 and 60 by using the dial-button.

❏ Scan Time

Set the image acquisition time. Use the dial-button to select between 7 and 15 seconds.

❏ Trimester

Set the pregnancy trimester. Use the dial-button to select 1st, 2nd, or 3rd.

Tips!

Trimester

If 1st-3rd are selected, the recommended scan time and STIC angle are automatically set for the specified trimester. Please see the following table:

Trimester	1 st	2 nd	3 rd
Scan Time	10 seconds	12 seconds	15 seconds
Volume Angle	20°	25°	30°

If a scan time and Volume Angle other than those in the above table are set, the trimester is displayed as User Set.



NOTE: For information on other usage, please refer to "3D Stand By" section.

❏ **Reviewing XI STIC Image**

XI STIC image is played as a Volume Cine; on the left side of the screen XI STIC information including HR, Scan Time, Img. Angle, Vol. Angle, and Volume Index are displayed.



NOTE: During Volume Cine, only MPR, MSV, and Oblique View Modes are available.

Press the **Freeze** button on the control panel to stop Volume Cine playback.

❏ **Speed**

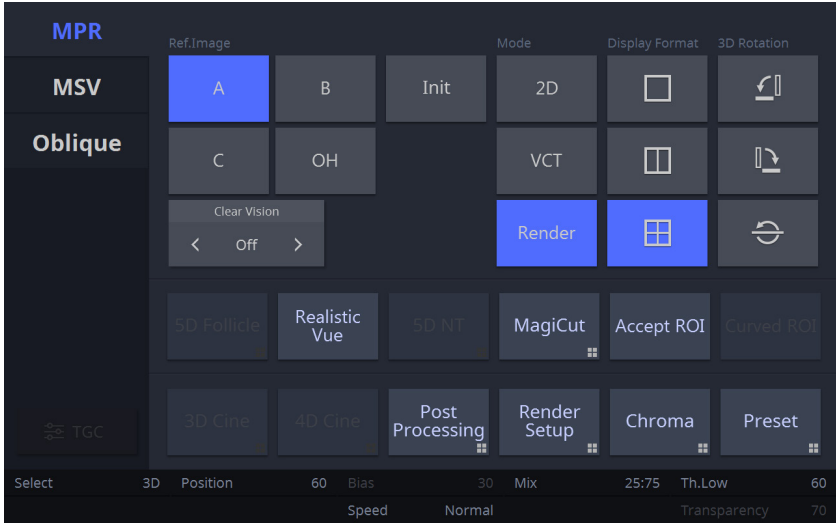
Select the playback speed for XI STIC images. Use the dial-button to select Very Slow, Slow, Normal, Fast, or Fastest. This rate is based on the fetal heart rate (100%).

❏ **Vol. Index**

Use the dial-button to select an Index.



- NOTE:**
- ▶ This option is only available when Freeze is enabled.
 - ▶ Refer to 3D View-MPR and 3D XI for further information on its use.



[Figure 7.41 XI STIC – Touch Screen]

4D



NOTE:

- ▶ 4D Mode is an optional feature of this product.
- ▶ 4D Mode is available only when 3D probes are used.

In 4D Mode, 3D images can be obtained in real time with 3D probes. This mode is also called Live 3D Mode.

Images can be acquired in the same way as for standard 3D images.

4D Mode Screen

Press the **Freeze** button on the control panel to switch to the *4D Cine* screen.



NOTE: In 4D state, only **MPR**, **MSV**, and **Oblique View** modes are available. For more information, see 3D View-MPR and 3D XI.

3D Utility Menu

3D Cine

The 3D images saved temporarily in the system can be reviewed. The *3D Cine Define* screen is displayed on the touch screen.

3D Cine Define

Specify the settings needed for creation of a Cine image.

■ Rotate Angle

Set the overall rotation angle by tapping the corresponding button on the touch screen. Select a value from 30, 45, 60, 90, 180 or 360°.

■ Step Angle

Set the rotation angle for a single step in an image by tapping the corresponding button on the touch screen. Select a value from 1, 3, 5, or 15°.



The Difference between Rotate Angle and Step Angle

A Cine image rotates to the angle specified under Rotate Angle. During this process, each rotational step is equivalent to the angle specified under Step Angle. For example, if Rotate Angle is set to 360° and Step Angle is set to 15°, a 3D Cine image rotates to 360° in 25 steps, each of which involves a rotation of 15°.

■ Rotate Axis

Set the rotational axis by tapping the corresponding button on the touch screen.

■ Generate

Cine images are generated by applying the current settings. Once the images are generated, the touch screen switches to *3D Cine Review*.

■ Review

Review Cine images generated previously. The touch screen switches to *3D Cine Review*.

■ Start Angle

Use the dial-button to set the start angle of a Cine image. When **Start Angle** is set, Rotate Angle is cancelled.

■ End Angle

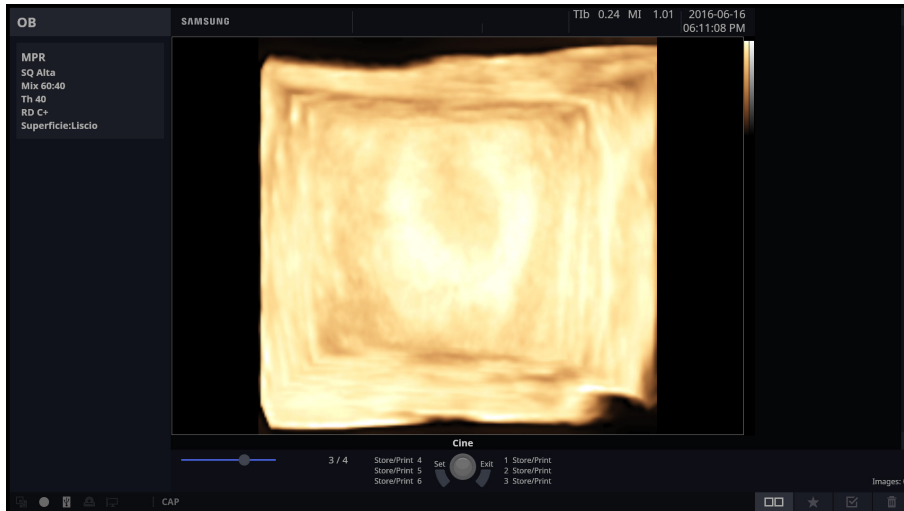
Use the dial-button to set the end angle of a Cine image. When **End Angle** is set, **Rotate Angle** is cancelled.



[Figure 7.42 3D Cine Define – Touch Screen]

3D Cine Review

Specify the settings needed for review of a Cine image.



[Figure 7.43 3D Cine Review]

■ Play Mode

Select the play mode for Cine images. Select from Loop or Yoyo by using knob button.

- ▶ Loop: Repeats playback in one direction.
- ▶ Yoyo: Plays until the end in one direction, and then plays in the reverse direction.

■ Cine Play

Tap this button on the touch screen to turn this feature on or off. Cine images are played when this is on. If it is turned off, **Cine Frame** will appear on the touch screen.

■ New Cine

Clears the current Cine image and creates a new one. The system switches to the *3D Cine Define* screen.

■ Speed

Use the dial-button to select the playback speed of a Cine image. Select from Very Slow, Slow, Normal, Fast, or Fastest.

■ Trim Start

After specifying the position of the first frame by using the dial-button, tap the dial-button to save it.

■ Trim End

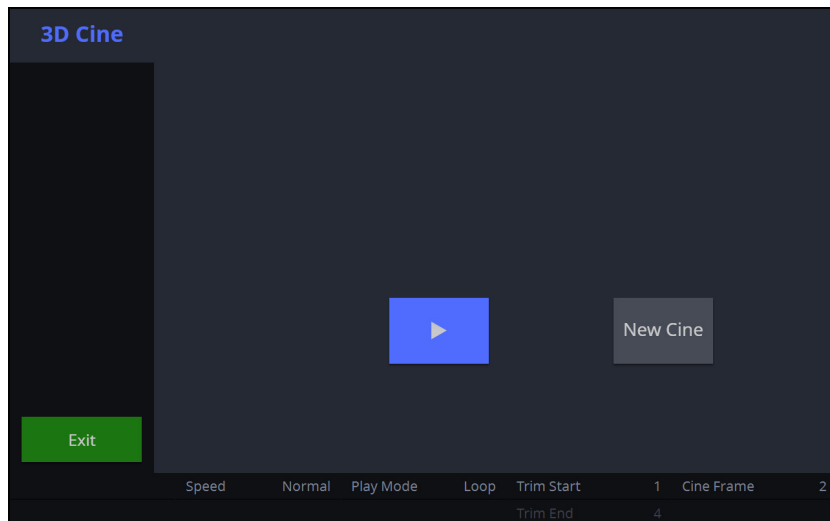
After specifying the position of the last frame by using the dial-button, tap the dial-button to save it.

■ Cine Frame



NOTE: This option is available when **Play** is turned off. It can be adjusted by as many as the total number of Cine frames by using the knob button with the 'current Cine frame number' being shown on the monitor screen.

Select a Cine frame to review. Use the dial-button or move the trackball left or right to select.



[Figure 7.44 3D Cine Review – Touch Screen]

MagiCut



NOTE:

- ▶ Select this in MPR mode.
- ▶ If MagiCut is enabled, **Accept ROI** is turned on automatically.
- ▶ After MagiCut is enabled, if the system is switched to a mode other than MPR Mode, MagiCut is disabled.

The *MagiCut* screen is displayed on the touch screen. You can cut the parts that are not relevant to diagnosis away from 3D images. Set the area to cut by using the trackball and the **Set** button.

■ Mode

Set how parts are cut by tapping the corresponding button on the touch screen.

- ▶ Inside Contour: Cuts the inside of the selected area.
- ▶ Outside Contour: Cuts the outside of the selected area.
- ▶ Inside Box: Cuts the inside of the box.
- ▶ Outside Box: Cuts the outside of the box.
- ▶ Small Eraser: Cuts the selected contour line.
- ▶ Big Eraser: Cuts the selected contour line. This uses a thicker contour line than Small Eraser.

■ Full Depth

Tap the corresponding button on the touch screen to turn Full Depth on or off. If it is turned on, the entire area will be cut. If it is turned off, **Depth** will appear on the touch screen.

■ Depth

Set the cut depth. Use the dial-button to select a value between 1 and 100.

■ Undo

Cancel the previous task(s).

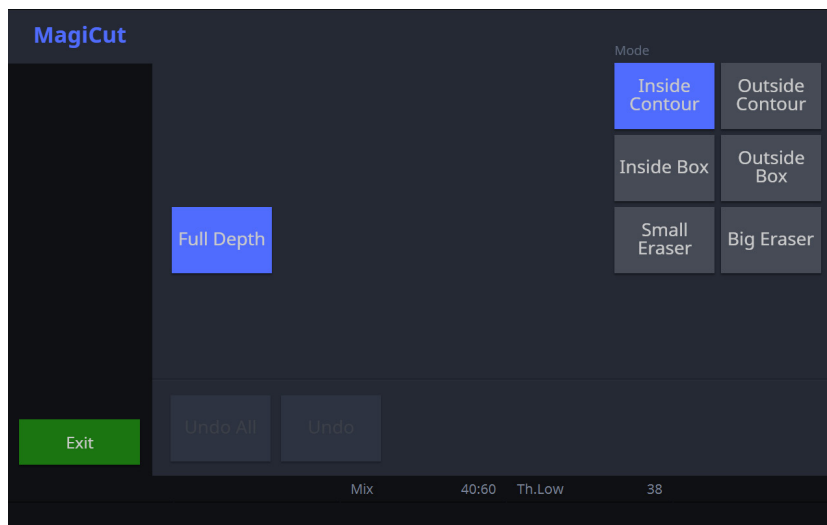
- ▶ Undo: Cancel the last task.
- ▶ Undo All: Cancel all tasks that have been done so far.

■ Mix

Configure the mix of Render modes 1 and 2. Use the dial-button to select a ratio between 0:100(%) and 100:0(%).

■ Th.Low

Specify the minimum range of Threshold. Use the dial-button to select a value between 0 and 254.



[Figure 7.45 MagiCut – Touch Screen]

❏ **Orientation Dot**

Tap the corresponding button on the touch screen to turn the Orientation Dot on or off. When this is on, a dot appears at the center of the reference image.

❏ **Render Setup**

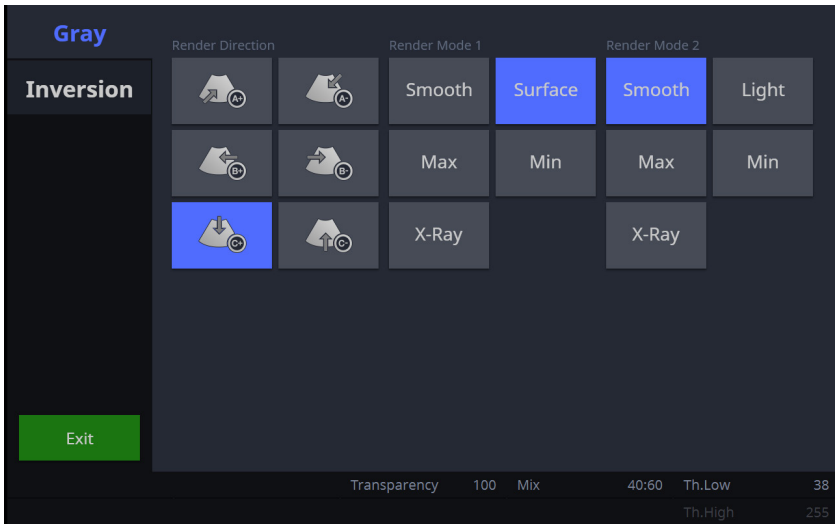


NOTE: In **Oblique View** Mode, this option is available only when **OVIX** is On.

The *Settings* screen appears on the touch screen. Specify the image rendering method.

After selecting the rendering mode tab on the touch screen, specify the required settings including Render Direction and Render Mode. The specified settings will be displayed in the image information area.

This product provides four Render modes – Gray, Inversion, Color, and SeeThru.



[Figure 7.46 Render Setup – Touch Screen]

Gray

Specify how volume data acquired with the gray method should be rendered into 3D images.

■ Render Direction

Set the rendering direction by clicking the corresponding button on the touch screen.

■ Render Mode 1, 2

Enter Render Modes 1 and 2 by tapping the corresponding buttons on the touch screen.

- ▶ Surface: Represents 3D images in the Ray-Casting method, which shows the shell of an image with curved surfaces.
- ▶ Smooth: Represents 3D images that are smoother than those created by the **Surface** method.
- ▶ Max: Represents 3D images at maximum intensity. It can be useful for the observation of bone structures in a human body.
- ▶ Min: Represents 3D images at minimum intensity. It can be useful for observation of vessels or hollow parts in a human body.
- ▶ Light: Represents the depth of 3D images in terms of brightness.
- ▶ X-Ray: Represents 3D images in terms of average intensity. This shows images that are similar to X-ray images.



NOTE: For descriptions of other menu items, see 'Render Setup'.

■ Mix

Configure the mix of Render modes 1 and 2. Use the dial-button to select a value between 0 and 100.

■ Th.High

Used to specify the maximum threshold range. Use the dial-button to select a value between 1 and 255.

■ Th.Low

Specify the minimum range of Threshold. Use the dial-button to select a value between 0 and 254.



Threshold

This option allows you to adjust the threshold value in order to eliminate unnecessary data from images. As the number increases, cyst elements become more apparent. As the number decreases, bone elements become more apparent.

■ Th.Power

Specify the Threshold for color. Use the dial-button to select a value between 0 and 255. As this value increases, more color is removed from an image.

Color

Specify how the volume data acquired with the Angio/CFM method are rendered into 3D images. Other settings are configured in the same way as Gray Render Mode.

See Thru

Set the method for rendering the data from Gray+Angio, Gray+CFM combinations as a 3D image. Settings other than Render Mode 1 and 2 are configured in the same way as Gray Render Mode.

■ Transparent-Transparent

Adjust the transparencies of both Gray and Color data, so that the Color data inside the Gray data may be studied. The parts that are obscured by the Gray data are displayed slightly darker.

■ Transparent-Surface

Adjust the transparency of Gray data, so that the Color data inside the Gray data may be studied. The parts that are obscured by the Gray data are displayed slightly darker.

■ Max-Transparent

Set Gray data to 'Max', and Color data to 'Transp', to study Color data. The parts that are obscured by the Gray data are displayed slightly lighter.

■ Max-Surface

Set Gray data to 'Max', and Color data to 'Surface', to study Color data. The parts that are obscured by the Gray data are displayed slightly lighter.

■ Inversion

This option shows inverted images when the volume data acquired by the gray method is rendered into 3D images. Other settings can be specified in the same way as with Gray Render Mode.

■ Realistic Vue

Semi-translucent rendering is used for a realistic display of fetal images. When you press the Realistic Vue button, Clear SFVI, HDVI, and VC are turned on.



NOTE:

- ▶ Realistic Vue is an optional feature of this product.
- ▶ HDVI is an optional feature of this product and only available for HS60.

■ Light Direction

Use the touch screen or the trackball to reposition the direction of the light that is applied to volume.



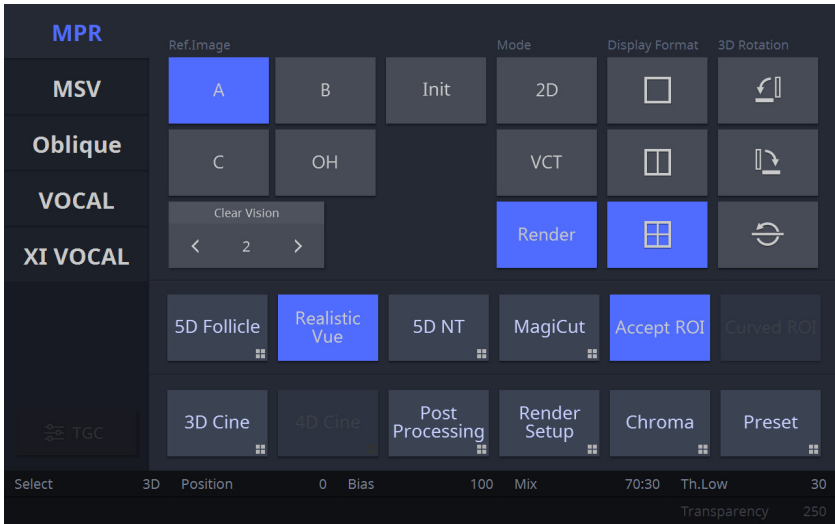
NOTE: You need to press the **Move Light** button to enter trackball mode.

■ Set Color

Use the dial-button to select the Set Color applied to Realistic Vue.



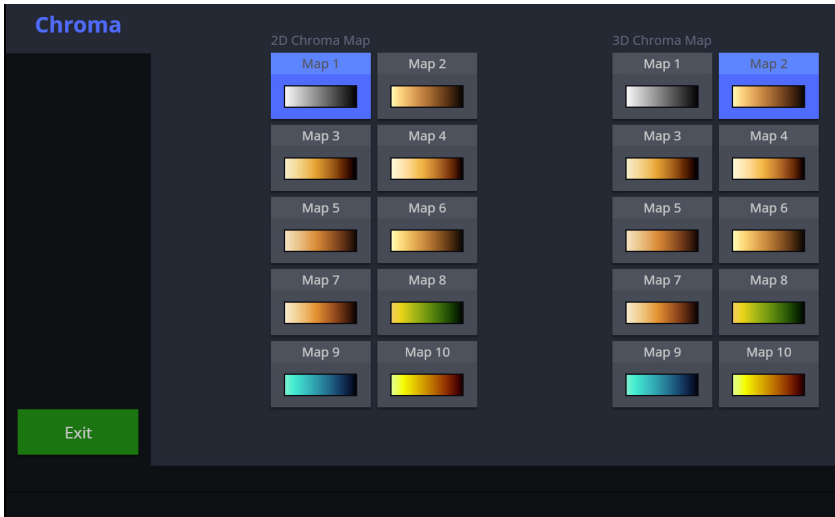
NOTE: You can set color by using the **Hue**, **Saturation**, and **Lightness** dial-buttons



[Figure 7.47 Realistic Vue – Touch Screen]

 Chroma

The *Chroma Map* screen is displayed on the touch screen. Set the color of 2D and 3D images by tapping the corresponding button on the touch screen.



[Figure 7.48 Chroma Map – Touch Screen]

❏ Post Processing

The *Post Processing* screen is displayed on the touch screen.



[Figure 7.49 Post Processing – Touch Screen]

■ Gradient Mask

Adjust the brightness of a specific area in an image. Make a selection by tapping the corresponding button on the touch screen.

■ Flip Image

Inverts the position of an image.



NOTE: This option is only available in **MSV** Mode.

Tap the image on the touch screen and flip the image left and right or up and down.

■ Negative

Tap this button on the touch screen to turn this feature on or off. If it is turned on, the brightness of an image will be inverted.

■ **Auto Contrast**

Tap this button on the touch screen to turn this feature on or off. If it is turned on, the contrast of an image will be adjusted automatically.

■ **Threshold**

Tap this button on the touch screen to turn this feature on or off. If it is turned on, the **Th.Low** or **Th.High** dial-buttons can be used to adjust the threshold.

■ **Sharpen**

Tap this button on the touch screen to turn this feature on or off. If it is turned on, the boundary of an image will become more apparent. Select a value between 100 and 400 by using the **Sharp** dial-button.

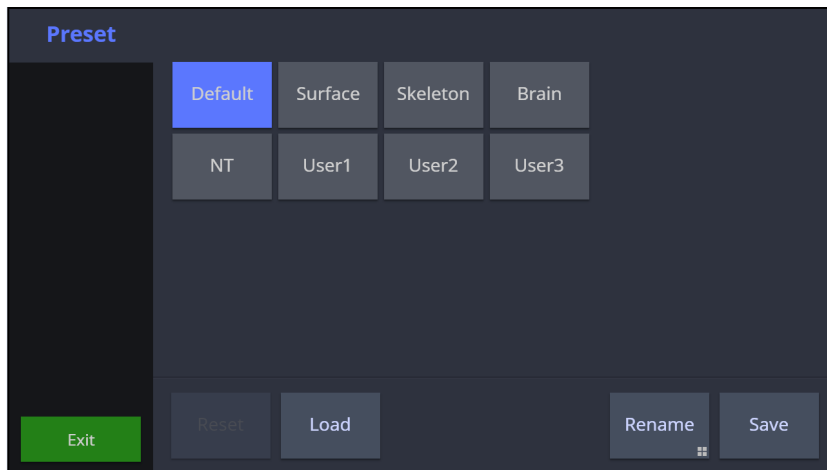
■ **3D CI**

Tap this button on the touch screen to turn this feature on or off. 3D CI is an abbreviation for 3D Compound Imaging.

If set to On, images are compounded to reduce noise and enhance image quality. Use the **3D CI Offset** dial-button to select a value between 1–10 as the distance between images used for 3D CI.

Preset

The *Preset* screen appears on the touch screen. You can set the currently selected Preset or rename the Rendering Preset. **Default** is the default value of the system.



[Figure 7.50 Preset – Touch Screen]

Default

Use the default setting (General Preset) for the probe.

Load

When you tap this button on the touch screen, the currently selected Preset is applied to the system. Then the *Preset* screen is closed.

Save

Tap **Save**. When you tap this button on the touch screen, the current Preset is saved.

Rename

Change the name of the selected Rendering Preset. When you tap this button on the touch screen, the *Name* screen appears. After changing the name, tap **Save** to save the changed name. Tap **Close** to cancel the change.

Reset

When you tap this button on the touch screen, the Preset is reset to its default value.

4D Cine

The 4D images saved temporarily in the system can be reviewed. The *4D Cine* screen is displayed on the touch screen.



NOTE: You can also press the **Freeze** button in 4D Mode to execute 4D Cine.

■ Play Mode

Select the play mode for Cine images. Use the touch screen to select either Loop or Yoyo.

- ▶ Loop: Repeats playback in one direction.
- ▶ Yoyo: Plays until the end in one direction, and then plays in the reverse direction.

■ Cine Type

Select the Cine image type by tapping the corresponding button on the touch screen.

- ▶ Volume: This button appears when Cine images are played. The **MPR**, **MSV**, or **Oblique** buttons are enabled, depending on the state before the 4D Cine was started. Cine images can be played by changing Display Format, etc.
- ▶ Image: This is the general Cine playing method.

■ Cine Play

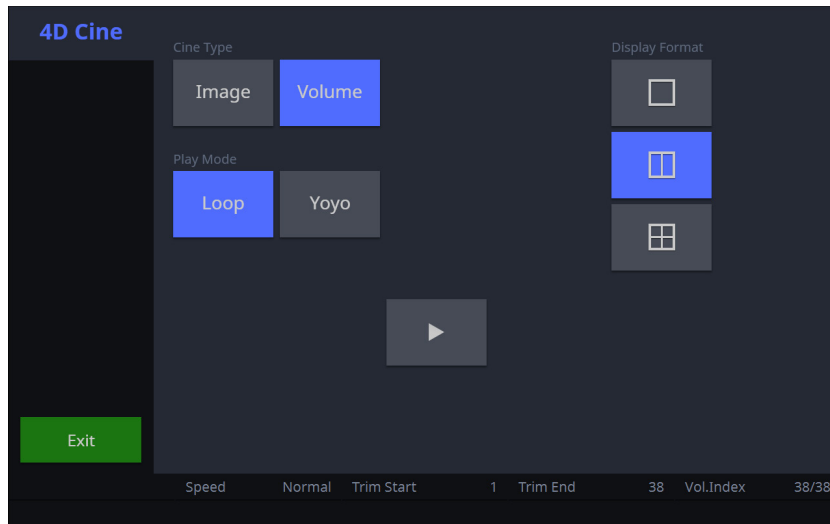
- ▶ Volume: Tap the **Play** button on the touch screen to play; tap the **Freeze** button to freeze.
- ▶ Image: Tap the **Play** button on the touch screen to play; tap **Play** again to freeze.

■ Cine Speed

Set the speed at which Cine images are played. Use the dial-button to select Very Slow, Slow, Normal, Fast, or Fastest.

■ Vol.Index

Move the trackball or use the dial-button to select an Index. 'The current volume data number/total number of volume data' is displayed.



[Figure 7.51 4D Cine – Touch Screen]

5D NT



NOTE:

- ▶ 5D NT is an optional feature of this product.
- ▶ These options are only available in MPR mode.

This feature locates the Mid-Sagittal View and measures the thickness of the nuchal translucency (NT) of the fetus. The *5D NT* window appears on the touch screen.

Use the trackball to place NT Seed in NT area, and press the **Set** button to display the NT measurement on the A Plane.

Tips!

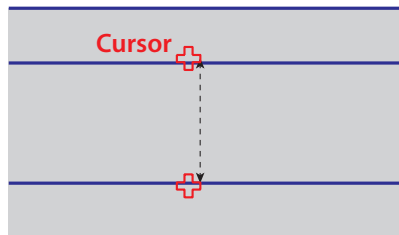
How To get good results

- ▶ You can get better results when the Sagittal View of the fetus is captured as accurately as possible.
- ▶ The higher the contrast between the fetus's palate and nasal bone, the better.
- ▶ It is preferable to have the lateral direction of the probe be parallel to the body orientation of the fetus.
- ▶ It is preferable to have the probe's angle to the fetus's nasal bone as close to 30 degrees as possible.

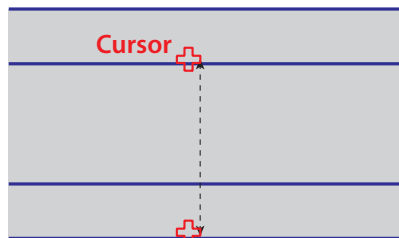
■ NT Caliper Placement

Tap the touch screen to select the NT measurement type.

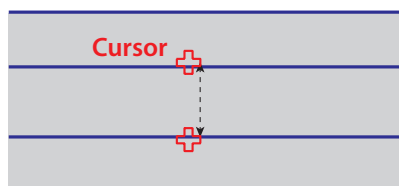
- ▶ On to On: Measure by placing the cursor on the NT's inner-inner.



- ▶ On to Max Brightness: One side of the cursor is placed on the outside of the NT, and measurement is taken with inner-outer. This method is used when Harmonic is used and one side of the nuchal translucency is blurred.



- ▶ In to In: Similar to On to On, this method takes measurement with inner-inner, albeit with a narrower cursor interval.



■ Items

- ▶ NT: The acquired A, B, and C plane images and the automatically measured NT are displayed in the 3D View screen.
- ▶ IT: Locates mid-sagittal view and tests the fetus for spina bifida.

■ Assign

Tap the touch screen to include the selected items in the OB report.

■ **5D NT**

This function helps the user to easily see the NT measurement process. This assigns a certain thickness to A, B and C sections of the image and displays 3D Rendering image.

■ **Init**

The image's position information is reset.

■ **Hide All**

Pressing this button will hide the marker and the measurements for NT and IT from the screen.

■ **Auto**

Tap the corresponding button on the touch screen to turn this feature on or off. If set to On, automatically locates Mid-Sagittal View. To calculate NT, place the cursor on NT area and press the Set button on the control panel.

■ **Edit**

Edit markers for each item that is displayed as a result.

If the trackball's state is Cursor, move the cursor near a + marker.

Press the **Set** button and move the trackball to edit the marker as desired.

■ **ROI Height**

Use the dial-button to adjust the ROI Line's Height to define the scope of the application. The ROI Height may be adjusted while measurements are being taken or in Edit mode.

■ **Marker Size**

Tap on the touch screen or use the dial-button to select Small, Medium, or Large.

Chapter 8

Measurements and Calculations

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:: Measurement Accuracy

Measurement values can vary depending on the nature of the ultrasound wave, the body's response to ultrasound waves, the measurement tools, algorithms, product settings, probe type, and the actions performed by the user.

Before using this product, make sure to read and understand the following information regarding the causes of measurement errors, and measurement optimization.

Causes of Measurement Errors

■ Image Resolution

The resolution of an ultrasound image may be limited by spatial causes.

- ▶ Errors caused by signal range may be minimized by adjusting the focus settings. Optimizing the focus settings increases the resolution of the measurement area.
- ▶ In general, the lateral resolution is lower than the axial resolution. Therefore, measurements should be performed along the axis of the ultrasound beam to obtain accurate values.
- ▶ Gain has a direct impact on the resolution. Gain can be adjusted by using the Gain button for each mode.
- ▶ In general, increasing the frequency of ultrasound enhances resolution.

■ Pixel Size

- ▶ This product's ultrasound images consist of pixels.
- ▶ Since a single pixel represents the basic unit of an image, a measurement error may result in the displacement of approximately ± 1 pixel when compared to the original image size.
- ▶ However, this error becomes significant only when a narrow area in an image is measured.

✦ Ultrasound Velocity

- ▶ The average velocity of ultrasound used for measurement is usually 1,540 m/s.
- ▶ The velocity of ultrasound used varies depending on the cell type.
- ▶ The possible range of error is approximately 2-5% depending on the structure of cells (about 2% for typical cells and about 5% for fatty cells).

✦ Doppler Signal Adjustment

- ▶ During velocity measurement, an error may occur, depending on the cosine angle between the blood flow and the ultrasound beam.
- ▶ For Doppler velocity measurements, the most accurate results can be ensured by aligning the ultrasound beam in parallel with the blood flow.
- ▶ If that is not possible, the angle between them should be adjusted by using the **Angle** option.

✦ Aliasing

- ▶ PW Spectral Doppler Mode uses a signal sampling technique to calculate the frequency (or velocity) spectrum.
- ▶ Adjust the baseline or the velocity scale to minimize aliasing. A lower frequency probe can also be used to reduce aliasing.

✦ Calculation Equation

- ▶ Some of the calculation equations used for clinical purposes originate from hypotheses and approximation.
- ▶ All calculation equations are based on medical reports and articles.

✦ Human Error

- ▶ Human error may occur due to inappropriate use or lack of experience.
- ▶ This can be minimized through compliance with and thorough understanding of the manuals.

Optimization of Measurement Accuracy

❑ 2D Mode

- ▶ Resolution is in proportion to the frequency of the probe.
- ▶ Penetration is inversely proportional to the frequency of the probe.
- ▶ The highest resolution can be obtained at the focus of the probe where the ultrasound beam is narrowest.
- ▶ The most accurate measurements can be obtained at the focus depth. As the distance from the focus increases, the beam width increases, which results in lower accuracy.
- ▶ Using the zoom function or minimizing the depth display makes distance or area measurements more accurate.

❑ M Mode

- ▶ The accuracy of time measurements can be increased by setting the sweep velocity and the display format to higher values.
- ▶ The accuracy of distance measurements can be increased by setting the display format to a higher value.

❑ Doppler Mode

- ▶ Using lower frequency ultrasound is recommended for measurement of faster blood flows.
- ▶ The size of the sample volume is limited by the axial direction of the ultrasound.
- ▶ Using lower frequency ultrasound increases penetration.
- ▶ The accuracy of time measurements can be increased when the sweep velocity is increased.
- ▶ The accuracy of velocity measurements can be increased when the vertical scale is set to smaller values.
- ▶ It is most important to use an optimal Doppler angle to enhance the accuracy of velocity measurements.

Color/Power Doppler Mode

- ▶ A protocol has not been specified for images in Color Doppler Mode or Power Doppler Mode. Therefore, the same limitations imposed on measurements taken in B/W images also apply to the accuracy of measurements taken in Color Doppler and Power Doppler Modes.
- ▶ Using Color/Power Doppler Mode images to measure accurate blood flow velocity is not recommended.
- ▶ The amount of blood flow is calculated based on the average velocity rather than the peak velocity.
- ▶ In all applications, the amount of blood flow is measured in PW Spectral Doppler mode.

Cursor Position

- ▶ All measurements are affected by input data.
- ▶ Adjust the images on the screen so that they are displayed at maximum granularity.
- ▶ Use the front edge or boundary point of a probe to make the start and end points of a measurement object more distinct.
- ▶ Make sure that the probe direction remains aligned during measurement.

Measurement Accuracy Table

The following tables show the accuracy of the measurements that can be taken using this product. Ensure that the results of measurement accuracy checks are kept within the ranges specified in the table. Except for certain applications or probes, the following accuracy ranges should be maintained for measurement of distance on a straight line.



NOTE: In case of doubt in the measurements then an accuracy test can be requested via your local Samsung Medison Service Department.

2D Mode

Measurements	Accuracy (Whichever is greater)	Test Methodology	Accuracy Based on	Range
Axial Distance	$< \pm 4\%$ or 1 mm	Phantom	Acquisition	Full Screen
Lateral Distance	$< \pm 4\%$ or 2 mm	Phantom	Acquisition	Full Screen
Area	$< \pm 8\%$ or 4 mm ²	Calculation	Equation	Full Screen
Volume	$< \pm 12\%$ or 8 mm ³	Calculation	Equation	Full Screen
Angle	$< \pm 4\%$ or 1°	Calculation	Equation	Full Screen

M Mode

Measurements	Accuracy (Whichever is greater)	Test Methodology	Accuracy Based on	Range
Time	$< \pm 5\%$ or 1 ms	Signal Generator	Acquisition	0.01 – 11.3 sec
Slope	$< \pm 8\%$ or 4 mm/ms	Calculation	Equation	Full Screen

PW/CW Spectral Doppler Mode

Doppler Measurements	Accuracy (Whichever is greater)	Test Methodology	Accuracy Based on	Range
Velocity	$< \pm 15\%$	Phantom	Acquisition	0.1 cm/s – 8.8 m/s
Time	$< \pm 5\%$	Signal Generator	Acquisition	10 ms – 9.44 s
Heart Rate	$< \pm 5\%$ or 1 bpm	Calculation	Equation	1 – 43,200 bpm

:: Basic Measurements

Press the **Caliper** button on the control panel.



NOTE: Take basic measurements of distance and area regardless of the application. For information on measurements for each application, please refer to the 'Measurements by Application' section of this chapter.

The available measurement methods vary depending on the current diagnosis mode. Please refer to the following table:

Measurement Category	Diagnosis Modes	Measurement Method
Distance measurement	2D, M, D	Distance Trace Length Open Spline 3 Points Angle 2 Lines Angle %Stenosis(D)
	M	Distance(M) Slope HR(M) Time(M)
	D	Velocity Accel RI Manual Trace Limited Trace HR(D) VolumeFlow(D) VolumeFlow(A) Time(D) Auto Trace S/D Ratio D/S Ratio

Measurement Category	Diagnosis Modes	Measurement Method
Circumference and Area measurement	2D, M, D	Ellipse Trace Closed Spline %Stenosis(A)
Volume measurement	2D, M, D	1 Dist. Volume 2 Dist. Volume 3 Dist. Volume Ellipse Volume Ellipse + Dist.Vol Disk Volume

[Table 8.1 Basic Measurements by Diagnosis Mode]

Basic Measurement Operations

The following is the information on common button operations for basic measurements:

Selecting/Changing Measurement Method

Select a measurement method using the touch screen. The menu items that can be selected on the touch screen vary according to the diagnosis mode. The selected measurement method is displayed in the User Information area.

Adjusting Font Size

Go to Setup > Measurement > General > Result > Font Size and either enter the font size to be used in the measurement results, or use the 'Font Size' knob button to select a desirable size from 8 to 20.

Canceling Measurement Results

Delete Last: Tap **Delete Last** on the touch screen to delete the last measurement taken. The value displayed on the corresponding application report will also be deleted.

Specifying the Measurement Result Position

Place the pointer over the measurement and press the **Set** button. Use the trackball to move the measurement to the desired location, and press the **Set** button to place the movement at that location.

■ Resetting Measurement Result Position

Go to Setup > Measurement > General Page, and change the value for Position on 2D Mode or Position On M/D in Result to reset the position of the measurement results as desired.



NOTE: You may select **Left-Top**, **Left-Bottom**, **Right-Bottom**, **Right-Top**, or **Custom**.

■ Deleting Measurement Results

Clear: Tap **Clear** on the control panel or the touch screen to delete the measurement.

■ Printing Measurement Results

Press the established U Key with the **Store/Print** button on the control panel.



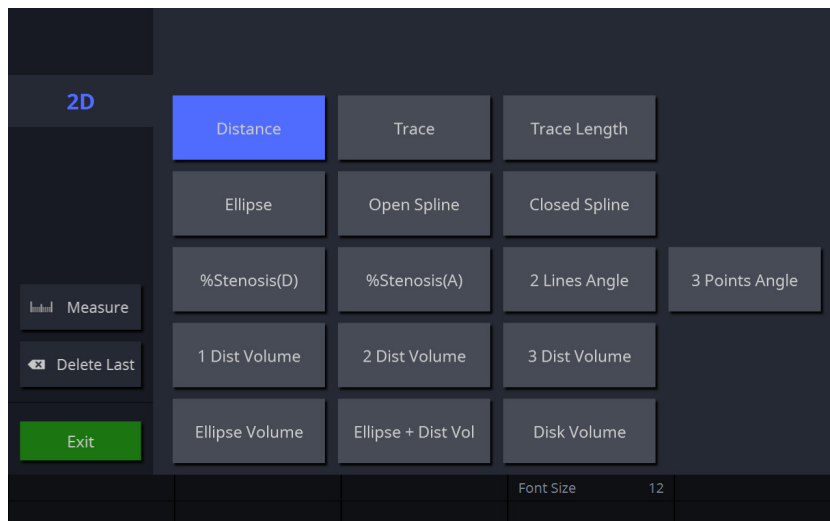
NOTE: Go to Setup > Customize > Buttons and choose a button to set as **Store/Print** from the **U1** **U2** **U3** **U4** **U5** and **U6** buttons.

■ Exiting Basic Measurement

After completing (or canceling) all in-progress measurements, press the **Exit** button on the control panel.



NOTE: To change measurement units and other settings, select Setup > Measurement > General on the keyboard. For more information, refer to 'Chapter 3. Utilities' in this manual.



[Figure 8.1 Caliper]

Distance Measurement

Distance

This is a basic measurement that is available in all diagnosis modes. Specify two points on a 2D image and measure the length of the straight line between the points.

1. Select **Distance** on the monitor or touch screen. Use the trackball and the **Set** button on the control panel to specify the end points of the measurement.

Use the trackball to place the cursor at the desired position and then press the **Set** button.



Tips!

Repositioning a Point

Instead of pressing the **Set** button to confirm the point position, you can press the **Change** button to reset it.

2. Specify both end points and then the distance between them will be measured.
3. When the distance has been measured, the result is shown on the screen.

Trace Length

This is a basic measurement that is available in all diagnosis modes. Specify a point on a 2D image and trace a curve from that point to measure its length.

1. Select **Trace Length** on the monitor or touch screen. Use the trackball and the **Set** button on the control panel to specify the start point of the measurement.

Use the trackball to place the cursor at the desired position and then press the **Set** button.

2. Use the trackball to draw the desired curve and then press the **Set** button to set the end point.
3. Specify both end points and then the length of the curve will be measured.



Tips!

Editing Curves

Before specifying the end point by pressing the **Set** button, you can delete part of the curve being traced by rotating the soft menu dial-button **5** counter-clockwise. To restore the deleted curve, rotate the dial-button clockwise.

❏ Open Spline

This is a basic measurement that is available in all diagnosis modes. Specify multiple points on a 2D image to measure the length of the resulting Open Spline curve.

1. Select **Open Spline** on the monitor or touch screen. Use the trackball and the **Set** button on the control panel to specify as many points as desired. After specifying the last point of the Open Spline, press the **Set** button twice to finish measuring the Open Spline.

At least two points must be specified before the Open Spline can be measured.

2. The length of the Open Spline curve created with the points you have specified will be calculated and displayed on screen.

❏ 3 Points Angle

This is a basic measurement that is available in all diagnosis modes. Place three points on a 2D image and measure the angle formed by the points.

1. Tap **3 Points Angle** on the touch screen.
2. Specify three points.
3. The angle formed by the three points will be calculated and displayed on the screen.

❏ 2 Lines Angle

This is a basic measurement that is available in all diagnosis modes. Specify two straight lines on a 2D image to measure the angle between the two lines.

1. Tap **2 Lines Angle** on the touch screen.
2. Draw two straight lines. Refer to 'Distance' for instructions on how to draw a straight line.
3. The angle between two lines will be calculated and displayed on the screen.

When two angles are calculated, the smaller angle is displayed.

%Stenosis(D)

StD stands for Stenosis Distance, which is a basic measurement available in all diagnosis modes. The diameter of a blood vessel is measured on a 2D image to calculate its stenosis ratio (%).

1. Select **%Stenosis (D)** on the monitor or touch screen.
2. Measure the total diameter of a blood vessel using the Distance measurement method.
3. When the second cursor appears, measure the diameter of the vessel's inner wall under stenosis.
4. Calculate %StD using the following equation:

$$\text{\%Stenosis (D)} = (\text{Outer Distance} - \text{Inner Distance}) / \text{Outer Distance} \times 100$$

Distance(M)

This is a basic measurement that is only available in M mode. Specify two points on an M image, and measure the distance between the two points

1. Select **Distance (M)** on the monitor or touch screen. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
2. When the distance has been measured, the result is shown on the screen.

Slope

This is a basic measurement that is only available in M mode. Specify two points on an M image, and measure the velocity between the two points

1. Select **Slope** on the monitor or touch screen.
2. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
3. When the distance has been measured, the result is shown on the screen.

HR(M)

This is a basic measurement that is only available in M mode. Specify two bars on an image and measure the heart rate between the two bars.

1. Select **HR(M)** on the monitor or touch screen.
2. Use the trackball and the **Set** button on the control panel to select two bars.
3. When the measurement has been taken, the result is shown on the screen.

Time(M)

This is a basic measurement that is only available in M mode. Specify two bars on an M image and measure the time between the two bars.

1. Select **Time(M)** on the monitor or touch screen.
2. Use the trackball and the **Set** button on the control panel to select two bars.
3. When the measurement has been taken, the result is shown on the screen.

Velocity

This is a basic measurement that is only available in Spectral Doppler mode. Specify one point on a Spectral Doppler image to measure the velocity.



NOTE: In a Spectral Doppler image, the X- and Y-axes represent time and velocity, respectively.

1. Select **Velocity** on the monitor or touch screen.
2. Specify a point.
3. When the measurement has been taken, the result is shown on the screen.

Accel

This is a basic measurement that is only available in Spectral Doppler mode. Specify two points on a Spectral Doppler image and measure the velocity at each point to calculate the time and acceleration.

1. Select **Accel** on the monitor or touch screen.
2. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
3. When the measurement has been taken, the result is shown on the screen.

The following equation is used for Accel measurement:

$$\blacktriangleright \text{Accel} = \frac{(V_2 - V_1)}{(T_2 - T_1)} = \frac{dV}{dT}$$

RI

This is a basic measurement that is only available in Spectral Doppler mode. Specify two points on a Spectral Doppler image and measure the velocity at each point to calculate the Resistivity Index (RI).

1. Tap **RI** on the touch screen.
2. Specify two points on a Spectral Doppler image, and measure the velocity at each point.
3. When the measurement has been taken, the result is shown on the screen.

The equations used for D RI measurement are as follows:

$$\blacktriangleright RI = \frac{V_1 - V_2}{V_1}$$

Manual Trace

This is a basic measurement that is only available in Spectral Doppler mode. You can specify a point on a Spectral Doppler image and trace a curve from that point to calculate the blood flow velocity, mean velocity, RI and Pulsatility Index(PI).

1. Select **Manual Trace** on the monitor or touch screen.
2. Trace the curve. When the measurement has been taken, the result is shown on the screen. The measurement results displayed will vary, depending on the settings you have selected in Setup > Measurement > Library > Caliper > D > Manual Trace.

- | | |
|------------------------------------|-------------------------|
| ▶ PS: Peak Systolic Velocity | ▶ PI: Pulsatility Index |
| ▶ MD: Min Diastolic Velocity | ▶ RI: Resistivity Index |
| ▶ ED: End Diastolic Velocity | ▶ PS/ED: PS ED Ratio |
| ▶ TAmx: Time Averaged Max Velocity | ▶ ED/PS: ED PS Ratio |

The equations used for Trace measurement are as follows:

$$\text{▶ } V_{mean} = \frac{VTI}{\text{Duration of flow}}$$

$$\text{▶ } RI = \frac{PS - ED}{PS}$$

$$\text{▶ } PI = \frac{PS - ED}{V_{mean}}$$

❏ Limited Trace

This is a basic measurement that is only available in Spectral Doppler mode. Specify two bars on a Spectral Doppler image to calculate the mean velocity between the bars, RI and Pulsatility Index(PI).

1. Select **Limited Trace** on the monitor or touch screen. Use the trackball and the **Set** button on the control panel to select two bars.
2. When the measurement has been taken, the result is shown on the screen.

▶ PS: Peak Systolic Velocity	▶ PI: Pulsatility Index
▶ MD: Min Diastolic Velocity	▶ RI: Resistivity Index
▶ ED: End Diastolic Velocity	▶ PS/ED: PS ED Ratio
▶ TAmx: Time Averaged Max Velocity	▶ ED/PS: ED PS Ratio
▶ TAMEAN: Time Average Mean Velocity	▶ HR

The equations used for D Limited Trace measurement are as follows:

$$\text{▶ } V_{mean} = \frac{VTI}{\text{Duration of flow}}$$

$$\text{▶ } RI = \frac{PS - ED}{PS}$$

$$\text{▶ } PI = \frac{PS - ED}{V_{mean}}$$

$$\text{▶ } V_1/V_2 = \frac{V_1}{V_2}$$

VolumeFlow(D)

This is a basic measurement that is only available in Spectral Doppler mode and 2D Image Mode. Specify two bars on a Spectral Doppler image, and specify two points in 2D Image mode, to calculate the VolumeFlow.

1. Select **VolumeFlow(D)** on the monitor or touch screen.
2. Use the trackball and the **Set** button on the control panel to select two bars. This measurement is taken in the same way as 'M Time'. This can only be done in the Loop area.
3. Use the trackball and the **Set** button on the control panel to select two points. 2D Image Mode will activate automatically so that you can measure the distance. This measurement is taken in the same way as 'Distance'.
4. When the measurement has been taken, the result is shown on the screen.

Time(D)

This is a basic measurement that is only available in Spectral Doppler mode. Place two bars on a Spectral Doppler image to calculate the time between the bars.

1. Tap **D Time** on the touch screen.
2. Set two bars on the spectrum with the trackball and the **Set** button.
3. When the measurement has been taken, the result is shown on the screen.

HR(D)

This is a basic measurement that is only available in Spectral Doppler mode. Place two bars on an image and measure the heart rate between the two bars.

1. Select **HR(D)** on the monitor or touch screen.
2. Use the trackball and the **Set** button on the control panel to select two bars.
3. When the measurement has been taken, the result is shown on the screen.

Auto Trace

Spectrum is traced automatically. This can be enabled in the measurement menu in Spectral Doppler mode.

1. Press **Auto Trace** in the Measurement menu.
2. The system traces the spectrum automatically.
3. When the Trace is complete, the measurement results are displayed on the screen.

Tips!

Things to Consider when using Doppler Spectrum Auto Trace

The state of a Doppler Spectrum may affect the measurement results. Please pay attention to the following:

► Causes for Trace Failure

- If the Gain is changed while a Doppler image is in Freeze state, Contour Trace and Peak Trace will not work.
- If there is little or no noise in an image without a spectrum, Contour Trace will not work.
- If there is severe noise in an image, Contour Trace will not work.
- If the Clutter Filter is set too high, Auto Trace and Limited Trace may not work.

► Possible Causes of Inaccurate Peak Trace

- If the PRF (Pulse Repetition Frequency) is lower than the velocity at the site being examined, aliasing may occur. If the original signals are separated from aliasing, a Trace can be carried out, but the peak measurement may not be accurate.
- If the peak of a spectral waveform is not clear or occurs intermittently, a Trace can be carried out, but the peak measurement may not be accurate.
- If the Doppler Gain is set too high or too low, it becomes difficult to distinguish spectra. This may result in measurement error.
- If the Wall Filter is set too high, the spectrum will only be partially displayed. In this case, a Trace can be carried out, but Peak measurement may not be accurate.
- If abnormal noise or artifacts occurs, a Trace can be carried out, but Peak measurement may not be accurate.

► Other

- Use of the CW Probe may result in measurement error(s).
- Limited Trace is supported only for two-peak spectrums, such as Mitral Valve Inflow and Tricuspid Valve Inflow in the cardiology application.

S/D Ratio, D/S Ratio

This is a basic measurement that is only available in Spectral Doppler mode. After designating two points in a Spectral Doppler image, calculate the velocity ratio by measuring the velocity at each point.



NOTE: In a Spectral Doppler image, the X- and Y-axes represent time and velocity, respectively.

1. Tap the **S/D** button on the touch screen.
2. After designating two points, measure the velocity at each point. The measurement method is same as 'RI'.
3. When the measurement has been taken, the result is shown on the screen.

Circumference and Area measurement

❖ Ellipse

This is a basic measurement that is available in all diagnosis modes. Measure the circumference and area of circle (ellipse)-shaped objects on a 2D image.

1. Click **Ellipse** on the monitor or tap **Ellipse** on the touch screen.
2. Use the trackball and the **Set** button on the control panel to specify the diameter (axis) of the measurement area.

Use the trackball to place the cursor at the desired position and then press the **Set** button.

Tips!

Repositioning Point

Before pressing the **Set** button to confirm the position, you can press the **Change** button to reset the position of the point.

3. Specify the size of the circle (ellipse).
Adjust the size using the trackball and then press the **Set** button.
4. When the measurement has been taken, the result is shown on the screen.

The following equation is used for Ellipse measurement:

$$\blacktriangleright \text{Circ} = \pi(a+b) \cdot \left(1 + \frac{3\left(\frac{a-b}{a+b}\right)^2}{10 + \sqrt{4 - 3\left(\frac{a-b}{a+b}\right)^2}} \right), \text{ (a: Half Long axis, b: Half Short axis)}$$

$$\blacktriangleright \text{Area} = \pi \times a \times b, \text{ (a, b: Axis)}$$

Trace

This is a basic measurement that is available in all diagnosis modes. Measure the circumference and area of an irregularly shaped object on a 2D image.

1. Select **Trace** on the monitor or touch screen.
2. Use the trackball and the **Set** button on the control panel to specify the start point for tracing over the contour of the measurement area.

Use the trackball to place the cursor at the desired position and then press the **Set** button.

3. Trace the curve so that the measurement cursor returns to the start point, and then press the **Set** button.



NOTE: The Trace Line must be a closed curve. If you press the **Set** button before tracing is complete, a straight line will be traced between the current position and the start point, resulting in a significant error.

4. When the measurement has been taken, the result is shown on the screen.

The equations used for Trace measurement are as follows:

$$\blacktriangleright \text{Circ} = \text{sum} \sqrt{\{X(n) - X(n-1)\}^2 + \{Y(n) - Y(n-1)\}^2}, (N = 1, 2 \dots \text{last point})$$

$$\blacktriangleright \text{Area} = \text{sum} \left[\sqrt{X(n-1) \times Y(n) - X(n) \times Y(n-1)} \right], (N = 1, 2 \dots \text{last point})$$

Tips!

Editing Curves

Before specifying the end point by pressing the **Set** button, you can delete part of the curve being traced by rotating the soft menu dial-button **5** clockwise. To restore the deleted curve, rotate it counter-clockwise.

❑ Closed Spline

This is a basic measurement that is available in all diagnosis modes. Specify multiple points on a 2D image to measure the circumference and area of the resulting closed spline.

1. Select **Closed Spline** on the monitor or touch screen. Use the trackball and the **Set** button on the control panel to specify as many points as desired. After specifying the last point of the Spline, press the **Set** button twice to finish measuring the Spline.

At least three points must be specified before spline can be measured.

2. The circumference and area of the closed spline created with the points you have specified will be calculated and displayed on screen.

❑ %Stenosis(A)

StA stands for Stenosis Area, which is a basic measurement available in all diagnosis modes. The area of a blood vessel is measured on a 2D image to calculate its stenosis ratio (%).

1. Select **%Stenosis(A)** on the monitor or touch screen. Measure the area of the vessel outer wall using the 'Ellipse' measurement method.
2. When the second cursor appears, measure the area of the stenosed vessel's inner wall. This measurement is taken in the same way as 'Trace'.
3. Calculate %Stenosis (A) with the following equation:

$$\% \text{Stenosis (A)} = (\text{Outer Area} - \text{Inner Area}) / \text{Outer Area} \times 100$$

❑ VolumeFlow(A)

This is a basic measurement that is only available in Spectral Doppler mode and 2D Image mode. Specify two bars on a Spectral Doppler image and specify an ellipse in 2D Image mode to calculate the VolumeFlow.

1. Select **VolumeFlow(A)** on the monitor or touch screen. Use the trackball and the Set button on the control panel to select two bars. This measurement is taken in the same way as 'M Time'. This can only be done in the Loop area.
2. Use the trackball and the **Set** button on the control panel to select an ellipse. 2D Image Mode will activate automatically so that you can measure the ellipse. This measurement is taken in the same way as 'Ellipse'.
3. When the measurement has been taken, the result is shown on the screen.

Volume Measurement



NOTE: Since Dual Mode simultaneously displays two images on the screen, you don't have to return to the diagnosis mode to measure volume in Dual Mode.

1 Distance Volume

This is a basic measurement that is available in all diagnosis modes. Measure the volume of an object by using only one straight line on a 2D image.

1. Select **1 Distance Volume** on the monitor or touch screen. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
2. When the measurement has been taken, the result is shown on the screen. The volume (Vol.) will be calculated along with the length of the line.

The equations used for 1 Distance measurement are as follows:

$$Vol = \frac{4}{3} \pi \cdot \left(\frac{D}{2} \right)^3, (D: \text{distance})$$

2 Distance Volume

This is a basic measurement that is available in all diagnosis modes. Measure the volume of an object by using two straight lines on a 2D image.

1. Select **2 Distance Volume** on the monitor or touch screen. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
2. Measure the length of the last remaining straight line using the same method as above.
3. When the measurement has been taken, the result is shown on the screen. The volume (Vol.) will be calculated along with the length of each line.

The equations used for 2 Distance measurement are as follows:

$$D_1 > D_2, Vol = \frac{\pi}{6} \cdot D_1 \cdot D_2^2, (D: \text{distance})$$

❑ 3 Distance Volume

This is a basic measurement that is available in all diagnosis modes. Measure the volume of an object by using three straight lines on a 2D image.

1. Select **3 Distance Volume** on the monitor or touch screen. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
2. Measure the length of the remaining two straight lines using the same method as above.
3. When the measurement has been taken, the result is shown on the screen. The volume (Vol.) will be calculated along with the length of each line.

The equations used for 3 Distance measurement are as follows:

$$Vol = \frac{4}{3} \pi \cdot \frac{D_1}{2} \cdot \frac{D_2}{2} \cdot \frac{D_3}{2}, (D: \text{distance})$$

❑ Ellipse Volume

This is a basic measurement that is available in all diagnosis modes. Measure the volume of a cone-shaped object by using one circle (ellipse) on a 2D image.

1. Tap **Ellipse Volume** on the touch screen. Specify the size of the circle (ellipse). This measurement is taken in the same way as 'Ellipse'.
2. When the measurement has been taken, the result is shown on the screen.

The following equation is used for Ellipse measurement:

$$Vol. = \frac{4}{3} \pi \cdot \frac{Long}{2} \cdot \frac{Short}{2} \cdot \frac{Short}{2}$$

✦ **Ellipse+Dist Vol.**

This is a basic measurement that is available in all diagnosis modes. Measure the volume of an object by using one straight line and one circle (ellipse) on a 2D image.

1. Tap **Ellipse+Dist Vol.** on the touch screen. Specify the size of the circle (ellipse). This measurement is taken in the same way as 'Ellipse'.
2. Specify two points and measure the length of the straight line between the points. This measurement is taken in the same way as 'Distance'.
3. When the measurement has been taken, the result is shown on the screen.

The equation for measuring Ellipse+Dist Vol. is as follows:

$$Vol = \frac{\pi}{6} \times a \times b \times d, (a : \text{Short axis}, \quad b : \text{Long axis}, \quad d : \text{Distance})$$

✦ **Disk Volume**

This is a basic measurement that is available in all diagnosis modes. Calculate the volume of an irregularly shaped object by measuring the area and the length of its long axis on a 2D image.

1. Select **Disk Volume** on the monitor or touch screen. Draw the contour of the area to be measured. This measurement is taken in the same way as 'Trace'.
2. Measure the length of the long axis. This measurement is taken in the same way as 'Distance'.
3. When the measurement has been taken, the result is shown on the screen.

- ▶ D: The length of a straight line
- ▶ Area: The area of a circle
- ▶ Volume: Volume



Editing Curves

Before specifying the end point by pressing the **Set** button, you can delete part of the curve being traced by rotating the soft menu dial-button **5** counter-clockwise. To restore the deleted curve, rotate it clockwise.

:: Calculations by Application

Press the **Calculator** button on the control panel.

Things to Note

■ Before Starting Measurement

■ Register Patient

- ▶ Make sure the currently registered patient information is correct. If the patient is not registered, press the **Patient** button on the control panel to register the patient.
- ▶ Use the Study Information tab to enter or change a patient's information per diagnosis item.
- ▶ For information on the Patient Information menu and how to enter the information, refer to 'Patient Information' in 'Chapter 6. Starting Diagnosis'.

■ Check the Probe, Application, and Preset

- ▶ Check the name of the probe and the application displayed in Title area. To use a different probe or application, press the **Probe** button on the control panel.
- ▶ In the *Probe Selection* screen, check the Preset settings.

■ Measurement Menu Settings

Set the related menus for convenient measurement. For menus related to measurement and their settings, refer to the 'Measurement Settings' in 'Chapter 3. Utilities' of this manual.

Measurement Operations

The following gives information on the common button operations for measurements:

Select Measurement Item

Select from the measurement item menu on the touch screen.

Change Measurement Method

If the current measurement may be taken in more ways than one, the measurement method may be changed. While taking a measurement, you may rotate the dial-button below the **Change Tool** menu on the touch screen to change the measurement method.

Delete Trace Line

- ▶ While taking **Trace Length** or **Trace** measurements, rotating the touch screen **Undo/Redo** dial-button clockwise will delete the traced curve. To restore the deleted curve, rotate it counter-clockwise.
- ▶ Move the trackball in the opposite direction to delete the traced line. You can only delete the line while you are manually tracing the Doppler Spectrum.

Deleting Measurement Results

Press the **Clear** button on the control panel.



NOTE: The measurement results are deleted from the screen, but still shown on the report for the corresponding application.

Printing Measurement Results

Press the established button with the **Store/Print** button on the control panel.

Exiting Measurement

After completing (or canceling) all in-process measurements, press the **Exit** button on the control panel.

■ End Diagnosis

Press the **End Exam** button on the control panel. The study for the currently registered patient will end, and all measurement results will be saved.

■ Fetus

Either click the **Fetus** button displayed at the top of the left menu, or rotate the dial-button **1** to select the fetus to measure among **A**, **B**, **C**, and **D**.

■ Direction

Either click the **Direction** button displayed at the top of the left-hand menu or rotate the dial-button **2** to select the direction of the object to measure between left and right. This is only displayed in specific packages.

■ Location

Either click the Location button displayed at the top of the left-hand menu or rotate the dial-button 3 to select the location of the object to measure from **Prox**, **Mid**, and **Distal**.

■ Trace Direction

Tap **Trace Direction** on the touch screen to set the trace direction of the Doppler Spectrum. This is activated only after Limited Trace has been performed in Spectral Doppler mode.

- ▶ Above: Only the + part of the Doppler waveform is traced.
- ▶ Below: Only the – part of the Doppler waveform is traced.
- ▶ Both: All parts of the Doppler waveform are traced.

■ Measured Frame

Save the measurement frame. Rotate dial-button **1** to go to the measurement frame.

■ Threshold

Adjust elimination of weak signals at measurement of trace in the Spectral Doppler mode.

■ HR Cycle

Settings may be configured for each application at Setup > Measurement > Applications. In **Heart Rate**, the number of cycles for heart rate (HR) may be specified at Heart Rate Cycle.

■ **Specifying Measurement Result Position**

Place the pointer over the measurement and press the **Set** button. Use the trackball to move the measurement to the desired location, and press the **Set** button to place the movement at that location.

■ **Deleting Recent Measurement Item**

Tap **Delete Latest** on the touch screen to cancel the last measurement taken.

■ **Report**

Press the **Report** button on the control panel to switch to the *Report* screen.

Common Measurement Methods

This section provides information on the common measurement methods used for applications.

❏ Measurements in Spectral Doppler mode

In general, if you trace a Doppler Spectrum, you obtain results for various measurement items automatically. There are 3 ways to trace a Doppler Spectrum.

Also, HS50/HS60 can select a specific item under the measurement menu and take measurements individually without tracing a Doppler Spectrum.

■ Auto Trace

Spectrum is traced automatically. This can be enabled in the measurement menu in Spectral Doppler mode.

1. Press **Auto Trace** in the measurement menu.
2. The system traces the spectrum automatically.
3. When the Trace is complete, the measurement results are displayed on the screen.

■ Limited Trace

Specify a measurement range, and a spectrum will be traced automatically. This can be enabled in the measurement menu in Spectral Doppler mode.

1. Select **Limited Trace** in the measurement menu. A bar will appear, with which you can specify range.
2. Specify the measurement range.
Place the bar at a desired position with the trackball, and press the **Set** button.
3. The system traces spectrums within the specified range automatically.
4. When the Trace is complete, the measurement results are displayed on the screen.

■ Manual Trace

A spectrum is traced manually. This can be enabled in the measurement menu in Spectral Doppler Mode.

1. Select **Manual Trace** in the measurement menu. The measurement cursor will appear over the spectrum.
2. Trace the spectrum.
3. When the Trace is complete, the measurement results are displayed on the screen.

■ Measurement by Item

In the Measurement menu, select an individual item and take a measurement.

1. Press the **Calculator** button on the control panel after obtaining a desired image.
2. Select the item you want from the Measurement menu. The + cursor will appear over the spectral waveform.
3. Position the "+" cursor and press the **Set** button.
4. The measurement results for the selected item are displayed on the screen.

Item	Category	Unit	Formula
PSV (Peak Systolic Velocity)	Velocity	cm/s	
ED (End Diastolic Velocity)	Velocity	cm/s	
MD (Minimum Diastole Velocity)	Velocity	cm/s	
PI (Pulsatility Index)	Calculation	Ratio	(PS-ED)/TAMAX
RI (Resistivity Index)	Calculation	Ratio	(PS-ED)/PS or (PS-MD)/PS
PS/ED (Ratio of PS to ED)	Calculation	Ratio	PS/ED
ED/PS (Ratio of ED to PS)	Calculation	Ratio	ED/PS
TAMAX (Time Average Max Velocity)	Velocity	cm/s	
TAMEAN (Time Average Mean Velocity)	Velocity	cm/s	

Tips!**Taking Measurements via Auto Calc.**

You can use **Auto Calc** to take measurements on predetermined item(s). Measurement items are as follows. For information on setting measurement item(s), please refer to 'Measurement' in 'Chapter 3. Utilities'.

- ▶ Peak Systolic Velocity (PS)
- ▶ End Diastolic Velocity (ED)
- ▶ Min Diastole Velocity (MD)
- ▶ Time Averaged Peak Velocity (TAMAX)
- ▶ Time Averaged Mean Velocity (TAMEAN)
- ▶ Resistive Index (RI)
- ▶ Pulsatility Index (PI)
- ▶ Systole/Diastole Ratio (PS/ED)
- ▶ Diastole/Systole Ratio (ED/PS)
- ▶ Heart Rate (HR)
- ▶ Max Pressure Gradient (PGmax)
- ▶ Mean Pressure Gradient (PGmean)
- ▶ Velocity Time Integral (VTI)
- ▶ Peak A (Peak A)

Volume Flow Measurement

Select **Volume Flow** in the measurement menu.

Volume Flow can be calculated by measuring an area or distance. For information on measuring distance or area, refer to 'Basic Measurement'. TAMEAN (Time Avg. Mean Velocity) value is measured automatically.

■ Vesl. Area (Vessel Area)

Measure the area of a blood vessel to calculate TAMEAN and Volume Flow.

$$\text{▶ } \text{VolumeFlow}(A) = \text{Area} \times \text{TAMEAN} \times 60$$

■ Vesl. Dist. (Vessel Distance)

Measure the width of a blood vessel to calculate TAMEAN and Volume Flow.

$$\text{▶ } \text{VolumeFlow}(D) = \frac{\pi \times d^2}{4} \times \text{TAMEAN} \times 60$$

Stenosis Measurement

You can measure the stenosis of each blood vessel system by measuring and calculating an area or distance.

%Stenosis(A)

Measures the area of the inner wall and the outer wall of the blood vessel. %Stenosis(A) stands for Stenosis Area.

1. Select the **%Stenosis(A)** menu and the first cursor will appear in 2D Mode.
2. Measure the area of the vessel's outer wall using the Circ/Area measurement method.
3. When the second cursor appears, measure the area of the stenosed vessel's inner wall.

$$\text{\%Stenosis (A)} = (\text{Outer Area} - \text{Inner Area}) / \text{Outer Area} \times 100$$

%Stenosis(D)

Measure the diameter of the blood vessel. Stenosis(D) stands for Stenosis Distance.

1. Select the **%Stenosis(D)** menu and the first cursor will appear in 2D Mode.
2. Measure the total diameter of a vessel using the Distance measurement method.
3. When the second cursor appears, measure the diameter of the vessel's inner wall under stenosis.

$$\text{\%Stenosis (D)} = (\text{Outer Distance} - \text{Inner Distance}) / \text{Outer Distance} \times 100$$

Heart Rate Measurement

HR (Heart Rate)

You can calculate heart rates for a certain period of time.

1. Select **HR** from the Measurement menu. A bar will appear, with which you can specify range.
2. Specify the measurement range.

Place the bar at a desired position with the trackball, and press the **Set** button.

3. The system will automatically measure the heart rate within the measurement range. The measurement result is displayed on screen.

OB Calculations



NOTE:

- ▶ Ductus Venosus and Fetal HR can only be measured in Doppler Mode.
- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- ▶ For references on measurement items, see 'Reference Manual Part 1'.

Before Taking OB Measurements

■ OB Basic Information

Enter the information required for OB diagnosis in the *Patient Information* screen. The basic OB information includes LMP (Last Menstrual Period) and Number of Fetuses.

Once LMP is entered, EDD (Estimated Delivery Date) and GA (Gestational Age) are calculated automatically. LMP is required for the calculation of values such as EDD and SD in obstetrics measurement.

- ▶ $EDD (LMP) = LMP + 280 \text{ days}$
- ▶ $GA (LMP) = \text{Current System Date} - LMP$
- ▶ $LMP = \text{Ovul. Date} - 14$

The physician may choose to override the LMP and manually enter the EDD into 'EDD (LMP)'.

Once the expected delivery date is entered, GA (Gestational Age) is automatically calculated and displayed. EDD (LMP) is renamed to EDD, while GA (LMP) is renamed to GA (EDD).

Once DOC is entered, EDD (Estimated Delivery Date) and GA (Gestational Age) are calculated automatically. EDD (LMP) is renamed to EDD (DOC), while GA (LMP) is renamed to GA (DOC).

Once GA is entered, EDD (Estimated Delivery Date) is entered automatically. EDD (LMP) is renamed to EDD (GA), while GA (LMP) is renamed to GA (Clin).

A maximum of four fetuses can be entered as Number of Fetuses. The default value is '1'. In the case of twins, enter '2'.

For further information about patient information menus and how to input patient information, refer to 'Patient Information' of 'Chapter 6. Starting Diagnosis'.

■ OB Measurement Menu Settings

Set up the GA Equation, GA Table, and OB measurement menus that are used in obstetrics measurements. The user can manually write, back up or restore GA Tables. For more information on the GA Equation and Table, refer to the Reference Manual Part 1.



NOTE: For twins, distinguish fetuses by specifying them as Fetus A and Fetus B in the Measurement menu. Either click the **Fetus** button displayed at the top of the left-hand menu or rotate the dial-button 1 to select the fetus to measure among **A**, **B**, **C**, and **D**.

For menus related to measurement and their settings, refer to the 'Measurement Settings' in 'Chapter 3. Utilities' of this manual.

✚ 1 Trim. Measurement Menu

When the measurements for the selected items are complete, the measurements and gestational age are displayed on the screen. The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.

Measurement Menu	Item	Mode	Method	Unit
Fetal Biometry	GS	All	Distance measurement	cm
	YS	All	Distance measurement	cm
	CRL	All	Distance measurement	cm
	BPD	All	Distance measurement	cm
	FL	All	Distance measurement	cm
	AC	All	Circumference measurement	cm
Fetal Cranuim	NT	All	Distance measurement	mm
	IT	All	Distance measurement	mm
	NB	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
Ductus Venosus	S Vmax	PW	Velocity measurement	cm/s
	D Vmax	PW	Velocity measurement	cm/s
	A Vmax	PW	Velocity measurement	cm/s
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–
	Fetal HR	PW	Heart Rate	bpm

Automatic Calculation

Some items in the measurement menu are automatically calculated based on measurements of other items.



NOTE: For reference, the Osaka University/Tokyo University methods are mainly used in Asia, the Merz method in Europe, and the Shepard/ Hadlock methods on the American continent.

2-3 Trim. Measurement Menu

When the measurements for the selected items are complete, the measurements and gestational age are displayed on the screen. The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.

Measurement Menu	Item	Mode	Method	Unit
Fetal Biometry	GS	All	Distance measurement	cm
	CRL	All	Distance measurement	cm
	YS	All	Distance measurement	cm
	BPD, OFD	All	Continuous measurement	
	BPD	All	Distance measurement	cm
	OFD	All	Distance measurement	cm
	HC	All	Circumference measurement	cm
	APAD, TAD	All	Continuous measurement	
	APAD	All	Distance measurement	cm
	TAD	All	Distance measurement	cm
	AC	All	Circumference measurement	cm
	FTA	All	Area measurement	cm ²
	FL	All	Distance measurement	cm
	SL	All	Distance measurement	cm
	APTD, TTD	All	Continuous measurement	
	APTD	All	Distance measurement	cm
	TTD	All	Distance measurement	cm
	ThC	All	Circumference measurement	cm
	EFW	All	–	–

Measurement Menu	Item	Mode	Method	Unit
Fetal Long Bones	HL	All	Distance measurement	cm
	ULNA	All	Distance measurement	cm
	TIB	All	Distance measurement	cm
	RAD	All	Distance measurement	cm
	FIB	All	Distance measurement	cm
	CLAV	All	Distance measurement	cm
	LV	All	Distance measurement	cm
Fetal Cranium	NT	All	Distance measurement	mm
	IT	All	Distance measurement	mm
	NB	All	Distance measurement	cm
	NF	All	Distance measurement	cm
	CEREB	All	Distance measurement	cm
	CM	All	Distance measurement	cm
	Lat Vent	All	Distance measurement	cm
	OOD	All	Distance measurement	cm
	IOD	All	Distance measurement	cm
	HW	All	Distance measurement	cm
	FMF angle	All	Angle calculation	degree
Lt. Fetal Others Rt. Fetal Others	Foot	All	Distance measurement	cm
	Ear	All	Distance measurement	cm
	MP	All	Distance measurement	cm
	Renal L	All	Distance measurement	cm
	Renal AP	All	Distance measurement	cm
	Pelvis	All	Distance measurement	cm
AFI	Q1	All	Distance measurement	cm
	Q2	All	Distance measurement	cm
	Q3	All	Distance measurement	cm
	Q4	All	Distance measurement	cm
	MVP	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
CTAR	ThD ap	All	Distance measurement	cm
	ThD trans	All	Distance measurement	cm
	HrtD ap	All	Distance measurement	cm
	HrtD trans	All	Distance measurement	cm
	ThA	All	Area measurement	cm ²
	HrtA	All	Area measurement	cm ²
Maternal Others	Cervix L	All	Distance measurement	cm
	Placenta Thick	All	Distance measurement	cm
PLI	S Vmax	PW	Velocity measurement	cm/s
	D Vmax	PW	Velocity measurement	cm/s
	A Vmax	PW	Velocity measurement	cm/s
Umbilical A Lt. Mid Cereb A Rt. Mid Cereb A Lt. Uterine A Rt. Uterine A Placenta A Lt. Fetal Carotids Rt. Fetal Carotids Fetal Aorta Lt. Renal A Rt. Renal A	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	VF(D)	PW	Calculate after measuring TAm _{mean} , Vesl., and Dist.	ml/min
	VF(A)	PW	Calculate after measuring TAm _{mean} , Vesl., and Area	ml/min
Fetal HR	Fetal HR	M, PW	Heart Rate	bpm

Measurement Menu	Item	Mode	Method	Unit
Ductus Venosus	S Vmax	PW	Velocity measurement	cm/s
	D Vmax	PW	Velocity measurement	cm/s
	A Vmax	PW	Velocity measurement	cm/s
	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–

❏ AFI (Amniotic Fluid Index)

Measure the amniotic fluid index. Measurements are performed by dividing the pregnant woman's abdomen into four parts. The distance between the fetus and the farthest point of each area is measured. To obtain a specific image from each quadrant plane, press the **Freeze** button to go to the diagnosis mode. After obtaining the image, press the **Freeze** button again to return to the measurement mode.

❏ Calculating Estimated Fetal Weight (EFW)

When measurements for the following items are complete, the system uses the results to calculate the estimated fetal weight automatically. For an equation for calculating fetal weight, please refer to 'Estimated Fetal Weight Formula' in the Reference Manual Part 1.

- ▶ BPD and AC
- ▶ BPD, FL, and FTA
- ▶ BPD, APTD, TTD, and FL
- ▶ BPD, APTD, TTD, and SL
- ▶ BPD and TTD
- ▶ AC and FL
- ▶ BPD, AC, and FL
- ▶ HC, AC, and FL
- ▶ BPD, HC, AC, and FL
- ▶ AC

Continuous Measurement/Review for EFW Calculation

You can measure a series of OB items to calculate the EFW.



Before starting measurement

1. Make sure that the User Key has been set for EFW continuous measurements. You can configure the User Key for EFW continuous measurements at **Setup > Customize > Buttons > User Key > EFW Measure**. For more information, refer to 'Peripheral Device Settings' in 'Chapter 3. Utilities'.
2. Check EFW Reference. If it is not set, or if you want to change it, select it at **Setup > Measurement > Author > Estimated Fetal Weight**.



NOTE: This function is not available in 3D mode.

■ Measurement method

1. Press **User Key 1** (or **User Key 2, 3, 4, 5, 6**) on the control panel. The OB Measurement menu will be displayed on screen.
2. Measure the items for EFW calculation by using the trackball and the **Set** button.
3. Use the trackball and the **Set** button on the control panel again to start the measurement of the following items.
4. Once all measurements have been taken, the EFW is displayed on screen.

The EFW measurements taken and the order in which they are measured are as follows:

Reference	Measure Item (by Order)
Campbell	AC
Hadlock	AC→BPD
Hadlock1	AC→FL
Hadlock2	BPD→AC→FL
Hadlock3	HC→AC→FL
Hadlock4	BPD, HC→AC→FL
Hansmann	BPD→TTD
Merz	BPD→AC
Osaka	BPD→FL→FTA
Persson	BPD→FL→APAD→TAD
Schild	HC→AC→FL
Shepard	AC→BPD
Shinozuka1	BPD→FL→AC
Shinozuka2	BP→APTD, TTD→SL
Shinozuka3	BPD→APTD, TTD→FL
Tokyo	BPD→APTD, TTD→FL

■ Review the Result of EFW Calculation

1. Press **User Key 1** (or **User Key 2, 3, 4, 5, 6**) on the control panel. The measured items taken for calculating EFW will be displayed on screen together with the result.
2. To remove the results from the screen, press the **Clear** button on the control panel.

Fetal Heart Calculations

The measurement method for each item is the same as for basic measurement. In addition, measurement items are similar to those of cardiology measurements (Cardiac Calculations). Measured items are automatically entered into the report.



NOTE:

- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- ▶ For references on measurement items, see 'Reference Manual Part 1'.

Measurement Menu	Item	Mode	Method	Unit
LV Vol. (Simpson)	LVEDV A2C	All	Dist 20	ml
	LVESV A2C	All	Dist 20	ml
	LVEDV A4C	All	Dist 20	ml
	LVESV A4C	All	Dist 20	ml
2D Echo	Asc Ao	All	Distance measurement	cm
	MPA Diam	All	Distance measurement	cm
	Duct Art	All	Distance measurement	cm
	LA Diam	All	Distance measurement	cm
	RA Diam	All	Distance measurement	cm
	RVDd	All	Distance measurement	cm
	IVS	All	Distance measurement	cm
	LVIDd	All	Distance measurement	cm
	LVIDs	All	Distance measurement	cm
	LVPW	All	Distance measurement	cm
	HrtC	All	Circumference measurement	cm
	ThC	All	Circumference measurement	cm

Measurement Menu	Item	Mode	Method	Unit
CTAR	ThD ap	All	Distance measurement	cm
	ThD trans	All	Distance measurement	cm
	HrtD ap	All	Distance measurement	cm
	HrtD trans	All	Distance measurement	cm
	ThA	All	Area measurement	cm ²
	HrtA	All	Area measurement	cm ²
Fetal HR	Fetal HR	M, PW	Heart Rate	bpm
M Echo	IVSd	M	Distance measurement	cm
	LVIDd	M	Distance measurement	cm
	LVIDs	M	Distance measurement	cm
	LVPWd	M	Distance measurement	cm
	IVSs	M	Distance measurement	cm
	LVPWs	M	Distance measurement	cm
	RVDd	M	Distance measurement	cm
MPA Duct Arteriosus IVC Asc Aorta Dsc Aorta	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
Duct Venosus	S Vmax	PW	Velocity measurement	cm/s
	D Vmax	PW	Velocity measurement	cm/s
	A Vmax	PW	Velocity measurement	cm/s

Measurement Menu	Item	Mode	Method	Unit
MV TV	E	PW	Velocity measurement	cm/s
	A	PW	Velocity measurement	cm/s
	Vmax	PW	Velocity measurement	cm/s
PLI	S Vmax	PW	Velocity measurement	cm/s
	D Vmax	PW	Velocity measurement	cm/s
	A Vmax	PW	Velocity measurement	cm/s
TEI	TST	PW	Time measurement	ms
	ET	PW	Time measurement	ms

■ CTAR (Cardio-Thorax Area Ratio)

This measurement compares the size of the fetus' heart in relation to the size of its thorax. ThD ap, ThD trans, HrtD ap, and HrtD trans values are acquired to obtain the comparative value.

$$CTAR = \frac{HrtD\ ap \times HrtD\ trans}{ThD\ ap \times ThD\ trans} \times 100$$

Gynecology Calculations



NOTE:

- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- ▶ For references on measurement items, refer to the Reference Manual Part 2.

Before Taking GYN Measurements

Enter the information required for GYN diagnosis in the *Patient Information* screen. Basic information for gynecology includes Gravida, Para, Aborta, and Ectopic.

Measurement Menu

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.

Measurement Menu	Item	Mode	Method	Unit
Uterus	Length	All	Distance measurement	cm
	Width	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Endo.Thick	All	Distance measurement	cm
Cervix Lt. Cyst Rt. Cyst Lt. Ovary Rt. Ovary	Length	All	Distance measurement	cm
	Width	All	Distance measurement	cm
	Height	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
Lt. Follicle Rt. Follicle	Follicle #1	All	Volume measurement	ml
	Follicle #2	All	Volume measurement	ml
	Follicle #3	All	Volume measurement	ml
	Follicle #4	All	Volume measurement	ml
	Follicle #5	All	Volume measurement	ml
	Follicle #6	All	Volume measurement	ml
	Follicle #7	All	Volume measurement	ml
	Follicle #8	All	Volume measurement	ml
	Follicle #9	All	Volume measurement	ml
	Follicle #10	All	Volume measurement	ml
	Follicle #11	All	Volume measurement	ml
	Follicle #12	All	Volume measurement	ml
Lt. Ovarian A Rt. Ovarian A Lt. Uterine A Rt. Uterine A Pericystic Endometrial	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	Vol.Flow(D)	PW	Calculate after measuring T _A mean, Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring T _A mean, Vesl., and Area	ml/min
	S/D	PW	Continuous measurement	–

Measurement Menu	Item	Mode	Method	Unit
Mass1 Mass2 Mass3 Endo. Polyp Lt. Ovarian Mass Rt. Ovarian Mass Uterine Fibroid1 Uterine Fibroid2 Uterine Fibroid3 Cervical Fibroid Ectopic	Length	All	Distance measurement	cm
	Width	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–

Most of the gynecology measurements are distance measurements and volume measurements based on the distance measurement results. If multiple images, such as long axis images and transverse axis images are needed, press the **Freeze** button to switch to Scan Mode and obtain images from another perspective.

Cardiac Calculations



NOTE: Cardiac measurement is an optional item.

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE:

- For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- For references on measurement items, refer to the Reference Manual Part 2.

Measurement Menu	Item	Mode	Method	Unit
LV (2D)	All LV (2D)	All	Continuous measurement	
	All LVd (2D)	All	Continuous measurement	
	IVSd	All	Distance measurement	cm
	LVIDd	All	Distance measurement	cm
	LVPWd	All	Distance measurement	cm
	All LVs (2D)	All	Continuous measurement	
	IVSs	All	Distance measurement	cm
	LVIDs	All	Distance measurement	cm
	LVPWs	All	Distance measurement	cm
	LV(2D)HR	All	Heart Rate	bpm
RV (2D)	RVAWd	All	Distance measurement	cm
	RVIDd	All	Distance measurement	cm
	RVAAd	All	Area measurement	cm ²
	RVAWs	All	Distance measurement	cm
	RVIDs	All	Distance measurement	cm
	RVAAs	All	Area measurement	cm ²
	RV Major	All	Distance measurement	cm
	RV Minor	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
LV (M)	All LV/RV (M)	M	Continuous measurement	
	All LV (M)	M	Continuous measurement	
	LV EF(M)	M	Continuous measurement	
	IVSd	M	Distance measurement	cm
	LVIDd	M	Distance measurement	cm
	LVPWd	M	Distance measurement	cm
	IVSs	M	Distance measurement	cm
	LVIDs	M	Distance measurement	cm
	LVPWs	M	Distance measurement	cm
	LVET	M	Time measurement	ms
	LVPEP	M	Time measurement	ms
	LV(M) HR	M	Heart Rate	bpm
	Time Septal to PW	M	Time measurement	ms
	MAPSE	M	Distance measurement	cm
RV (M)	All RV (M)	M	Continuous measurement	
	RVAWd	M	Distance measurement	cm
	RVIDd	M	Distance measurement	cm
	RVAWs	M	Distance measurement	cm
	RVIDs	M	Distance measurement	cm
	RVPEP	M	Time measurement	ms
	RVET	M	Time measurement	ms
	TAPSE	M	Distance measurement	cm
LV Vol. (Simpson)	LVEDV A2C	All	Dist 20	ml
	LVESV A2C	All	Dist 20	ml
	LVEDV A4C	All	Dist 20	ml
	LVESV A4C	All	Dist 20	ml
	BP HR	All	Heart Rate	bpm

Measurement Menu	Item	Mode	Method	Unit
LV Vol. (A/L)	LVEDV A2C AL	All	Dist 20	ml
	LVESV A2C AL	All	Dist 20	ml
	HR A2C	All	Heart Rate	bpm
	LVEDV A4C AL	All	Dist 20	ml
	LVESV A4C AL	All	Dist 20	ml
	HR A4C	All	Heart Rate	bpm
LV Vol. (Bullet)	LVAd SAX MV	All	Area measurement	cm ²
	LVA _s SAX MV	All	Area measurement	cm ²
	LVLd Apical	All	Distance measurement	cm
	LVL _s Apical	All	Distance measurement	cm
	HR Bullet	All	Heart Rate	bpm
LV Mass	All LV Mass	All	Continuous measurement	-
	LVAd SAX PM Epi	All	Area measurement	cm ²
	LVAd SAX PM	All	Area measurement	cm ²
	LVLd apical	All	Distance measurement	cm
	LV TE a	All	Distance measurement	cm
	LV TE d	All	Distance measurement	cm
Aorta	Ao Diam (2D)	All	Distance measurement	cm
	Ao Diam(M)	M	Distance measurement	cm
	Asc Ao Diam	All	Distance measurement	cm
	Desc Ao Diam	All	Distance measurement	cm
	Ao Arch Diam	All	Distance measurement	cm
	Ao Isth Diam	All	Distance measurement	cm
	Ao ST Junct Diam	All	Distance measurement	cm
	Ao Sinus Diam	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
LA	All LA Vol.	All	Continuous measurement	
	LA/Ao (2D)	All	Distance measurement	cm
	LA Diam (2D)	All	Distance measurement	cm
	LA/Ao(M)	M	Distance measurement	cm
	LA/Diam(M)	M	Distance measurement	cm
	LA Major	All	Distance measurement	cm
	LA Minor	All	Distance measurement	cm
	LAAd A2C	All	Area measurement	cm ²
	LAAs A2C	All	Area measurement	cm ²
	LAAd A4C	All	Area measurement	cm ²
	LAAs A4C	All	Area measurement	cm ²
LA Vol. (Simpson)	LAEDV A2C	All	Dist 20	ml
	LAESV A2C	All	Dist 20	ml
	LAEDV A4C	All	Dist 20	ml
	LAESV A4C	All	Dist 20	ml
RA	RA Diam (2D)	All	Distance measurement	cm
	RA Major	All	Distance measurement	cm
	RA Minor	All	Distance measurement	cm
	RAAd	All	Area measurement	cm ²
	RAAs	All	Area measurement	cm ²
	RAEDV	All	Dist 20	ml
	RAESV	All	Dist 20	ml

Measurement Menu	Item	Mode	Method	Unit
LVOT	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	LVOT Diam	All	Distance measurement	cm
	LVOT Vmax	PW	Velocity measurement	cm/s
	LVOT VTI	PW	Doppler Spectrum trace	cm
	LVOT HR	PW	Heart Rate	bpm
RA Vol. (Simpson)	RAEDV A2C	All	Dist 20	ml
	RAESV A2C	All	Dist 20	ml
	RAEDV A4C	All	Dist 20	ml
	RAESV A4C	All	Dist 20	ml
RVOT	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	RVOT Diam	All	Distance measurement	cm
	RVOT Vmax	PW	Velocity measurement	cm/s
	RVOT VTI	PW	Doppler Spectrum trace	cm
	RVOT HR	PW	Heart Rate	bpm

Measurement Menu	Item	Mode	Method	Unit
AV	AV Auto Trace	PW	Doppler Spectrum trace	
	AV Limited Trace	PW	Doppler Spectrum trace	
	AV Manual Trace	PW	Doppler Spectrum trace	
	AV Cusp	All	Distance measurement	cm
	AV Cusp(M)	M	Distance measurement	cm
	AV Diam	All	Distance measurement	cm
	AVA Planimetry	All	Area measurement	cm ²
	Q to AV Open	M	Time measurement	ms
	R-R Int	M, PW	Heart Rate	bpm
	AV Vmax	PW	Velocity measurement	cm/s
	AV PHT	PW	Time measurement	ms
	AV VTI	PW	Doppler Spectrum trace	cm
	AV AccT	PW	Time measurement	ms
	AV ET	PW	Time measurement	ms
	AV AccT/ET	PW	Continuous measurement	
	AV DecT	PW	Time measurement	ms
	Desc. Ao Vel.	PW	Velocity measurement	cm/s
	AR Auto Trace	PW	Doppler Spectrum trace	
	AR Limited Trace	PW	Doppler Spectrum trace	

Measurement Menu	Item	Mode	Method	Unit
AV	AR Manual Trace	PW	Doppler Spectrum trace	
	AR VCV	All	Distance measurement	cm
	AR Vmax	PW	Velocity measurement	cm/s
	AR ed Vmax	PW	Velocity measurement	cm/s
	AR PHT	PW	Time measurement	ms
	AR VTI	PW	Doppler Spectrum trace	cm
	AR AccT	PW	Time measurement	ms
	AR DecT	PW	Time measurement	ms
	AR PISA Rad	C	PISA-Radius	cm
	AVO	PW	Time measurement	ms
	AVC	PW	Time measurement	ms
	AR Jet Diam	All	Distance measurement	cm
	AR Jet Area	All	Area measurement	cm ²
MV	All MV(M)	M	Continuous measurement	-
	MV D-E Excursion	M	Distance measurement	cm
	MV E-F Slope	M	Velocity measurement	cm/s
	MV A-C Interval	M	Time measurement	ms
	MV EPSS	M	Distance measurement	cm
	MV Vp	M	Velocity measurement	cm/s
	MV Ann Diam	All	Distance measurement	cm
	MV Diam1	All	Distance measurement	cm
	MV Diam2	All	Distance measurement	cm
	MVA Planimetry	All	Area measurement	cm ²
	MV Auto Trace	PW	Doppler Spectrum trace	
	MV Limited Trace	PW	Doppler Spectrum trace	
	MV Manual Trace	PW	Doppler Spectrum trace	

Measurement Menu	Item	Mode	Method	Unit
MV	MV E-DT-A	PW	Continuous measurement	
	MV E/A	PW	Continuous measurement	-
	MV Peak E	PW	Velocity measurement	cm/s
	MV Peak A	PW	Velocity measurement	cm/s
	MV VTI	PW	Distance measurement	cm
	MV Vmax	PW	Velocity measurement	cm/s
	MV PHT	PW	Time measurement	ms
	MV AccT	PW	Time measurement	ms
	MV DecT	PW	Time measurement	ms
	MV A Dur	PW	Time measurement	ms
	MV ET	PW	Time measurement	ms
	R-R Int	M, PW	Heart Rate	bpm
	MR Auto Trace	PW	Doppler Spectrum trace	
	MR Limited Trace	PW	Doppler Spectrum trace	
	MR Manual Trace	PW	Doppler Spectrum trace	
	MR VCW	All	Distance measurement	cm
	MR Vmax	PW	Velocity measurement	cm/s
	MR VTI	PW	Doppler Spectrum trace	cm
	MR dp/dt	PW	Continuous measurement	mmHg/s
	MV IVRT	PW	Time measurement	ms
	MR PISA Rad	C	PISA-Radius	cm
	MV HR	PW	Heart Rate	bpm
	E/E'	PW	Continuous measurement	

Measurement Menu	Item	Mode	Method	Unit
TV	TV D-E Excursion	M	Distance measurement	cm
	TV E-F Slope	M	Velocity measurement	cm/s
	TV A-C Interval	M	Time measurement	ms
	TV Auto Trace	PW	Doppler Spectrum trace	
	TV Limited Trace	PW	Doppler Spectrum trace	
	TV Manual Trace	PW	Doppler Spectrum trace	
	TV Ann Diam	All	Distance measurement	cm, mm
	TV Diam1	All	Distance measurement	cm
	TV Diam2	All	Distance measurement	cm
	TVA Planimetry	All	Area measurement	cm
	Q to TV Open	M	Time measurement	ms
	TV Vmax	PW	Velocity measurement	cm/s
	TV VTI	PW	Doppler Spectrum trace	cm
	TV E/A	PW	Continuous measurement	-
	TV Peak E	PW	Velocity measurement	cm/s
	TV Peak A	PW	Velocity measurement	cm/s
	TV PHT	PW	Time measurement	ms
	TV AccT	PW	Time measurement	ms
	TV DecT	PW	Time measurement	ms
	TV A Dur	PW	Time measurement	ms
	R-R Int	M, PW	Heart Rate	bpm
	TR Auto Trace	PW	Doppler Spectrum trace	
	TR Limited Trace	PW	Doppler Spectrum trace	
	TR Manual Trace	PW	Doppler Spectrum trace	
	TR VCW	All	Distance measurement	cm
	TR Vmax	PW	Velocity measurement	cm/s

Measurement Menu	Item	Mode	Method	Unit
TV	TR VTI	PW	Doppler Spectrum trace	cm
	TR dp/dt	PW	Calculation after time measurement	mmHg/s
	TR PISA Rad	C	PISA-Radius	cm
	RAP	M, PW	RAP	mmHg
	TV HR	PW	Heart Rate	bpm
PV	PV Auto Trace	PW	Doppler Spectrum trace	
	PV Limited Trace	PW	Doppler Spectrum trace	
	PV Manual Trace	PW	Doppler Spectrum trace	
	PV Ann Diam	All	Distance measurement	cm
	PVA Planimetry	All	Area measurement	cm ²
	PV Vmax	PW	Velocity measurement	cm/s, m/s
	PV PHT	PW	Velocity measurement	cm/s
	PV VTI	PW	Doppler Spectrum trace	cm
	PV AccT/ET	PW	Continuous measurement	
	PV AccT	PW	Time measurement	ms
	PV ET	PW	Time measurement	ms
	PV DecT	PW	Time measurement	ms
	R-R Int	M, PW	Heart Rate	bpm
	Q to PV Open	M	Time measurement	ms
	Q to PV Close	M	Time measurement	ms
	PR Auto Trace	PW	Doppler Spectrum trace	
	PR Limited Trace	PW	Doppler Spectrum trace	
	PR Manual Trace	PW	Doppler Spectrum trace	
	MPA Vmax	PW	Velocity measurement	cm/s
	PR VCW	All	Distance measurement	cm
	PR Vmax	PW	Velocity measurement	cm/s

Measurement Menu	Item	Mode	Method	Unit
PV	PR PHT	PW	Time measurement	ms
	PR VTI	PW	Doppler Spectrum trace	cm
	PR AccT	PW	Time measurement	ms
	PR DecT	PW	Time measurement	ms
	PR End Vel.	PW	Velocity measurement	cm/s
	PR PISA Rad	C	PISA-Radius	cm
Tei Index	All LV Tei Index	PW	Continuous measurement	
	LV TST	PW	Time measurement	ms
	MV ET	PW	Time measurement	ms
	LV IVCT	PW	Time measurement	ms
	LV IVRT	PW	Time measurement	ms
	All RV Tei Index	PW	Continuous measurement	
	RV TST	PW	Time measurement	ms
	RV ET	PW	Time measurement	ms
	RV IVCT	PW	Time measurement	ms
	RV IVRT	PW	Time measurement	ms
Pulm. Veins	P Vein S/D	PW	Continuous measurement	
	P Vein S Vmax	PW	Velocity measurement	cm/s
	P Vein D Vmax	PW	Velocity measurement	cm/s
	P Vein A Vmax	PW	Velocity measurement	cm/s
	P Vein A Dur	PW	Time measurement	ms
Hepatic Veins	H Vein S/D	PW	Continuous measurement	
	H Vein S Vmax	PW	Velocity measurement	cm/s
	H Vein D Vmax	PW	Velocity measurement	cm/s
	H Vein A Vmax	PW	Velocity measurement	cm/s
	H Vein A Dur	PW	Time measurement	ms

Measurement Menu	Item	Mode	Method	Unit
Tissue Doppler	LV E'-A'-S'	PW	Continuous measurement	
	LV Peak E'	PW	Velocity measurement	cm/s
	LV Peak A'	PW	Velocity measurement	cm/s
	LV Peak S'	PW	Velocity measurement	cm/s
	LV AccT	PW	Time measurement	ms
	LV DecT	PW	Time measurement	ms
	RV E'-A'-S'	PW	Continuous measurement	
	RV Peak E'	PW	Velocity measurement	cm/s
	RV Peak A'	PW	Velocity measurement	cm/s
	RV Peak S'	PW	Velocity measurement	cm/s
	RV AccT	PW	Time measurement	ms
	RV DecT	PW	Time measurement	ms
	LV Lat E'-A'-S'	PW	Continuous measurement	
	LV Lat Peak E'	PW	Velocity measurement	cm/s
	LV Lat Peak A'	PW	Velocity measurement	cm/s
	LV Lat Peak S'	PW	Velocity measurement	cm/s
	LV Lat AccT	PW	Time measurement	ms
	LV Lat DecT	PW	Time measurement	ms
Qp/Qs	Systemic VTI	PW	Doppler Spectrum trace	cm
	Systemic HR	PW	Heart Rate	bpm
	Pulmonic VTI	PW	Doppler Spectrum trace	cm
	Pulmonic HR	PW	Heart Rate	bpm

Measurement Menu	Item	Mode	Method	Unit
Shunts	MPA Diam	All	Distance measurement	cm
	LPA Diam	All	Distance measurement	cm
	RPA Diam	All	Distance measurement	cm
	SVC Diam, Exp	All	Distance measurement	cm
	SVC Diam, Insp	All	Distance measurement	cm
	SVC S/D	PW	Continuous measurement	
	SVC S Vmax	PW	Velocity measurement	cm/s
	SVC D Vmax	PW	Velocity measurement	cm/s
	SVC A Vmax	PW	Velocity measurement	cm/s
	SVC A Dur	PW	Time measurement	ms
	IVC S/D	PW	Continuous measurement	
	IVC S Vmax	PW	Velocity measurement	cm/s
	IVC D Vmax	PW	Velocity measurement	cm/s
	IVC A Vmax	PW	Velocity measurement	cm/s
	IVC A Dur	PW	Time measurement	ms
	PEd	All	Distance measurement	cm
	PEs	All	Distance measurement	cm
IVC	IVC Diam, Exp	All	Distance measurement	cm
	IVC Diam, Insp	All	Distance measurement	cm
	IVC Diam, Exp(M)	M	Distance measurement	cm
	IVC Diam, Insp(M)	M	Distance measurement	cm

■ Dist 20

Trace the circumference of the heart and then draw the axis of the heart. The system automatically draws 20 lines perpendicular to the axis to calculate the volume.



NOTE:

- ▶ MR dp/dt can be measured only at 1-3 m/s.
- ▶ In Dual 2D Mode, two images can be viewed simultaneously.
- ▶ For **RVAWd**, **RVIDd**, **RVAWs**, and **RVIDs**, see the **LV** measurement method.
- ▶ **MPA Diam**, **RPA Diam**, and **LPA Diam** are measured under Aortic Valve Level in Parasternal Short Axis.
- ▶ C Mode is mainly used for measuring reverse cardiac blood flow.
- ▶ Since velocity data is required for measuring **PISA-Radius** or **PISA-Alias Vel.**, set color display to Velocity or Vel + Var in C mode. For relevant settings, please refer to 'Color Doppler Mode' in 'Chapter 7. Diagnosis Mode'.
- ▶ Tissue Doppler can be measured in TDI Mode.

Abdomen Calculations

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE:

- ▶ It is convenient to calculate each measurement value on the Spectral Doppler image.
- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.

Abdomen Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Gallbladder	CBD	All	Distance measurement	cm
	GB Wall	All	Distance measurement	cm
	Length	All	Distance measurement	cm
	Width	All	Distance measurement	cm
	Height	All	Distance measurement	cm
Pancreas	Head	All	Distance measurement	cm
	Body	All	Distance measurement	cm
	Tail	All	Distance measurement	cm
	Duct	All	Distance measurement	cm
Bowel	Stomach Wall	All	Distance measurement	cm
	Small Bowel Wall	All	Distance measurement	cm
	Large Bowel Wall	All	Distance measurement	cm
Lt. Kidney Vol. Rt. Kidney Vol. Liver Spleen	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm

Measurement Menu	Item	Mode	Method	Unit
Aorta Lt. RA Rt. RA Lt. Seg.A Rt. Seg A Lt. Arc.A Rt. Arc A Celiac A Splenic A C Hepatic A R Hepatic A L Hepatic A SMA IMA	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	Vol.Folw(D)	PW	Calculate after measuring TAm _{ean} , Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring TAm _{ean} , Vesl., and Area	ml/min
IVC Renal V R Potal V M Potal V L Potal V R Hepatic V M Hepatic V L Hepatic V SMV IMV Splenic V	VMax	PW	Velocity measurement	cm/s
	Dur T	PW	Time measurement	ms
	Vesl.Dist.	PW	Distance measurement	cm
	Vesl.Area	PW	Area measurement	cm ²

Pediatric Hips Calculations

Measurement Menu

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE: For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.

Measurement Menu	Item	Mode	Method	Unit
Hip Angle	Type	ALL	Calculation of angle after measurement of three straight lines	degree

Measurement Methods

1. Specify the first straight line by using the trackball and the **Set** button.

Use the trackball to place the cursor at the desired position and then press the **Set** button.



Repositioning a Point

Before pressing the **Set** button to confirm the position, you can press the **Change** button to reset the position of the point.

2. Repeat the above process to specify two other straight lines.
3. The angle between them will be calculated automatically.
 - ▶ α : The angle between the first and the second straight lines
 - ▶ β : The angle between the first and the third straight lines
4. When the measurement has been taken, the result is shown on the screen.

See the table below for Hip Joint Type information:

Type	α	β
1a	$60 \leq \alpha < 90$	$0 < \beta < 55$
1b	$60 \leq \alpha < 90$	$55 \leq \beta < 90$
2a/b	$50 \leq \alpha < 60$	$0 < \beta < 90$
2c	$43 \leq \alpha < 50$	$77 \leq \beta < 90$
d	$43 \leq \alpha < 50$	$0 < \beta < 77$
3/4	$0 < \alpha < 43$	

[Table 8.2 Hip Joint Type Table]

Urology Calculations

Before Taking Urology Measurements

Set the related menus for convenient measurement.

Refer to the 'Setting Measurements' section in 'Chapter 3. Utilities' for additional information.

Measurement Menu

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE:

- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- ▶ For references on measurement items, refer to the Reference Manual Part 2.

3Distance

Calculate a volume by measuring three distances.

Measurement Menu	Item	Mode	Method	Unit
WG Prostate T-Zone Bladder Pre Residual Post Residual	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
Lt. Renal Rt. Renal	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
	Renal Pelvis	All	Distance measurement	cm

Small Parts Calculations

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.


NOTE:

- ▶ It is convenient to calculate each measurement value on the Spectral Doppler image.
- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter..

Thyroid Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. Thyroid Vol. Rt. Thyroid Vol.	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
Lt. Thyroid Flow Rt. Thyroid Flow	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–
	Vol.Flow(D)	PW	Calculate after measuring TAm _{ean} , Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring TAm _{ean} , Vesl., and Area	ml/min
Lt. Mass 1–5 Rt. Mass 1–5	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm

Breast Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. Mass 1–10 Rt. Mass 1–10	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
Lt. Breast Flow Rt. Breast Flow	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–
	Vol.Flow(D)	PW	Calculate after measuring T _A mean, Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring T _A mean, Vesl., and Area	ml/min

Testis Calculations

Measurement Menu	Item	Mode	Method	Unit
Lt. Testis Vol. Rt. Testis Vol.	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
Epididymis	D1	All	Distance measurement	cm
	D2	All	Distance measurement	cm
Lt. Testis Flow Rt. Testis Flow	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–
	Vol.Flow(D)	PW	Calculate after measuring T _A mean, Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring T _A mean, Vesl., and Area	ml/min
Lt. Mass 1–5 Rt. Mass 1–5	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm

Superficial Calculations

Measurement Menu	Item	Mode	Method	Unit
Lt. Superficial Vol. Rt. Superficial Vol.	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm
Lt. Superficial Flow Rt. Superficial Flow	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	–
	Vol.Flow(D)	PW	Calculate after measuring TAm _{ean} , Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring TAm _{ean} , Vesl., and Area	ml/min
	Vel A	PW	Velocity measurement	cm/s
	Vel B	PW	Velocity measurement	cm/s
Lt. Mass 1–5 Rt. Mass 1–5	Length	All	Distance measurement	cm
	Height	All	Distance measurement	cm
	Width	All	Distance measurement	cm

Musculoskeletal Calculations

Measurement Menu

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE: For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.

Measurement Menu	Item	Method	Unit
Lt. Shoulder Rt. Shoulder	#1~#10	Distance measurement	cm
Lt. Wrist Rt. Wrist	#1~#10	Distance measurement	cm
Lt. Knee Rt. Knee	#1~#10	Distance measurement	cm
Lt. Ankle Rt. Ankle	#1~#10	Distance measurement	cm

Vascular Calculations

The measurement method for each item is the same as for basic measurement. Measured items are automatically entered into the report.



NOTE:

- ▶ For information on basic measurement methods, refer to 'Basic Measurements' and 'Common Measurement Methods' in this chapter.
- ▶ For references on measurement items, see 'Reference Manual Part 1'.

Carotid Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. CCA Rt. CCA Lt. Bulb Rt. Bulb Lt. ICA Rt. ICA Lt. ECA Rt. ECA	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	IMT	All	Distance measurement	mm
	IMT Mean	All	Average calculation after distance measurement	mm
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	Vol.Flow(D)	PW	Calculate after measuring T _A mean, Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring T _A mean, Vesl., and Area	ml/min

Measurement Menu	Item	Mode	Method	Unit
Lt. Subclavian A Rt. Subclavian A Lt. Vertebral A Rt. Vertebral A	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler spectrum trace	
	Limited Trace	PW	Doppler spectrum trace	
	Manual Trace	PW	Doppler spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	Vol.Flow(D)	PW	Calculation after measurement of TAm _{mean} , Vesl. Dist	ml/min
	Vol.Flow(A)	PW	Calculation after measurement of TAm _{mean} , Vesl. Area	ml/min

Auto IMT+

This function allows you to take IMT measurements easily and quickly.



NOTE:

- ▶ Auto IMT+ is an optional feature of this product.
- ▶ Auto IMT+ is available only under the following conditions:
 - Probe: Linear Probe
 - Application: Vascular
 - Diagnosis Mode: 2D Freeze Mode

Auto IMT+ Screen



[Figure 8.2 Auto IMT+]

Auto IMT+ Measurement

1. After checking the probe and the application, start a carotid scan.
2. Press **Freeze** to obtain the desired image. Use the trackball to select the image you want to measure the IMT on.
3. Tap **Auto IMT+** on the touch screen. The Auto IMT+ screen will appear.

4. Use the trackball and the **Set** button to set a location for IMT measurement.
 - ▶ Measure the length of a specific section. Press and hold the **Set** button at the starting point and use the trackball to specify the end point.
 - ▶ You can change the Near and Far positions of the measured area by using the **Change** button on the control panel.
5. Once the measurement finishes, measurement values will be listed in a table.
6. Use the touch screen, or the dial-button to select the measurement label, the location of the blood vessel, and the direction of blood flow.

■ Setting Up Measurement Items

On the touch screen menu, you may set up the measurement item, the location of the blood vessel, and the direction of blood flow.

- ▶ Measurement item: Select measurement items among CCA, Bulb, ICA, and ECA. Use the touch screen button.
- ▶ Direction: Select the blood flow direction either left or right. Use dial-button **2**.
- ▶ Location: Select Prox(Proximal), Mid(Middle), or Dist(Distal) as the location of the blood vessel to measure. Use dial-button **3**.



NOTE: Exit Auto IMT+ using following functions:

- ▶ Change Image Mode and Zoom
- ▶ Annotation, BodyMarker, Patient, SonoView, Report, Setup, Help

■ Measurement Result

- ▶ Max: The maximum thickness of the Intima/Adventitia pair.
- ▶ Mean: The average thickness of the Intima/Adventitia pair.
- ▶ SD: Standard Deviation
- ▶ QI: The distance ratio of the measured point in a distance for Quality Index measurement.



NOTE: Location of measurement result window cannot be changed and it is displayed in the position established before Auto IMT+ measurement.

■ Applying to the Report

Auto IMT+ measurement results are automatically applied to the report. Report\Auto IMT+ measurement results can be checked.

■ Auto IMT+ Measurement Analysis

1. Tapping the **Analysis** on the touch screen opens *Analysis* screen.
2. Select the desired analysis from **Framingham/CHD**, **Risk Factor**, **Normal IMT**, or **User Graph** by using the trackball and the **Set** button.
 - ▶ The bar that corresponds to the measurement will be displayed on each graph. However, if the measurement is smaller than Framingham/CHD, or Risk Factor, no bar will be displayed.



User Graph

You can use **User Graph** to adjust the graph and analyze the measurement results as you want.

3. To finish analyzing, tap the **Exit** button on the touch screen.
4. The following materials were referred to when analyzing the measurements of Auto IMT+.

■ Framingham/CHD

Correlation between the Framingham Risk Score and Intima Media Thickness: the Paroi Arterielle et Risque Cardio-vasculaire (PARC) Study.

Pierre-Jean Touboul, EricVicaud, Julien Labreuche, Jean-Pierre Belliard, Serge Cohen, Serge Kownator, Jean-Jacques Portal, Isabelle Pithois-Merli, Pierre Amarenco. On behalf of PARC Study participating physicians.

■ Risk Factor

Mannheim Carotid Intima-Media Thickness Consensus (2004–2006)

P.J. Touboul, M.G. Hennerici, S.Meairs, H.Adams, P.Amarengo, N.Borstein, L.Csiba, M.Desvarieux, S.Ebrahim, M.Fatar, R.Hernandez Hernandez, M.Jaff, S.Kownator, P.Prati, T.Rundek, M.Sitzer, U.Schiminke, J.C. Tardif, A.Taylor, E.Vicaud, K.S.Woo, F.Zannad, M.Zureik

■ Normal IMT

Simon A, Garipey J, Chironi G, Megnien JL, Levenson J: Intima-media thickness: a new tool for diagnosis and treatment of cardiovascular risk. *Journal of Hypertension* 20:159-169, 2002

UE Artery Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. Subclavian A Rt. Subclavian A Lt. Axillary A Rt. Axillary A Lt. Brachial A Rt. Brachial A Lt. Radial A Rt. Radial A Lt. Ulnar A Rt. Ulnar A Lt. SPA Rt. SPA	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	Vol. Flow(D)	PW	Calculate after measuring TAm _{ean} , Vesl., and Dist.	ml/min
	Vol. Flow(A)	PW	Calculate after measuring TAm _{ean} , Vesl., and Area	ml/min

UE Vein Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. Internal Jugular V Rt. Internal Jugular V Lt. Innominate V Rt. Innominate V Lt. Subclavian V Rt. Subclavian V	Vmax	PW	Velocity measurement	cm/s
Lt. Axillary V Rt. Axillary V Lt. Brachial V Rt. Brachial V Lt. Cephalic V Rt. Cephalic V	Dur T	PW	Time measurement	ms
Lt. Basilic V Rt. Basilic V Lt. Radial V Rt. Radial V Lt. Ulnar V Rt. Ulnar V	Vesl. Dist	PW	Distance measurement	cm
	Vesl. Area	PW	Volume measurement	cm ²

LE Artery Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. CIA, Rt. CIA Lt. IIA, Rt. IIA Lt. EIA, Rt. EIA Lt. CFA, Rt. CFA Lt. SFA, Rt. SFA Lt. DF, Rt. DF Lt. Popliteal A Rt. Popliteal A Lt. ATA, Rt. ATA Lt. PTA, Rt. PTA Lt. Peroneal A Rt. Peroneal A Lt. DPA, Rt. DPA Lt. MPA, Rt. MPA Lt. LPA, Rt. LPA Lt. Metatarsal A Rt. Metatarsal A Lt. Digital A Rt. Digital A	%StD	All	Calculation after distance measurement	%
	%StA	All	Calculation after area measurement	%
	Auto Trace	PW	Doppler Spectrum trace	
	Limited Trace	PW	Doppler Spectrum trace	
	Manual Trace	PW	Doppler Spectrum trace	
	PS	PW	Velocity measurement	cm/s
	ED	PW	Velocity measurement	cm/s
	MD	PW	Velocity measurement	cm/s
	PI	PW	Velocity measurement	–
	RI	PW	Velocity measurement	–
	S/D	PW	Continuous measurement	
	Vol.Flow(D)	PW	Calculate after measuring T _A mean, Vesl., and Dist.	ml/min
	Vol.Flow(A)	PW	Calculate after measuring T _A mean, Vesl., and Area	ml/min

LE Vein Measurement Menu

Measurement Menu	Item	Mode	Method	Unit
Lt. CIV, Rt. CIV Lt. IIV, Rt. IIV Lt. EIV, Rt. EIV Lt. CFV, Rt. CFV Lt. PFV, Rt. PFV Lt. SFV, Rt. SFV Lt. GSV, Rt. GSV Lt. Popliteal V Rt. Popliteal V Lt. LSV, Rt. LSV Lt. ATV, Rt. ATV Lt. PTV, Rt. PTV Lt. Peroneal V Rt. Peroneal V Lt. MPV, Rt. MPV Lt. LPV, Rt. LPV Lt. Metatarsal V Rt. Metatarsal V Lt. Digital V Rt. Digital V	Vmax	PW	Velocity measurement	cm/s
	Dur T	PW	Time measurement	ms
	Vesl.Dist	PW	Distance measurement	cm
	Vesl.Area.	PW	Volume measurement	cm ²

:: Reports

The measurement results are summarized by application, and shown on the screen in a report format.

Viewing Reports

Press the **Report** button on the control panel to switch to the *Ultrasound measure Report* screen.

The measurement results are summarized by application, and shown on the screen in a report format.



NOTE: Reports are displayed only for the applications that have measurement results.

■ Page

Pages are divided into Worksheet, Description, Comment, and image for each application; opening a report will show the Preview screen by default. You can go to each section from the Left Menu or Touch; if a section contains large amount of data to display, it will be divided into multiple pages, which you may navigate pages using Touch or dial-button.

Report Preview

It provides report preview before print-out.

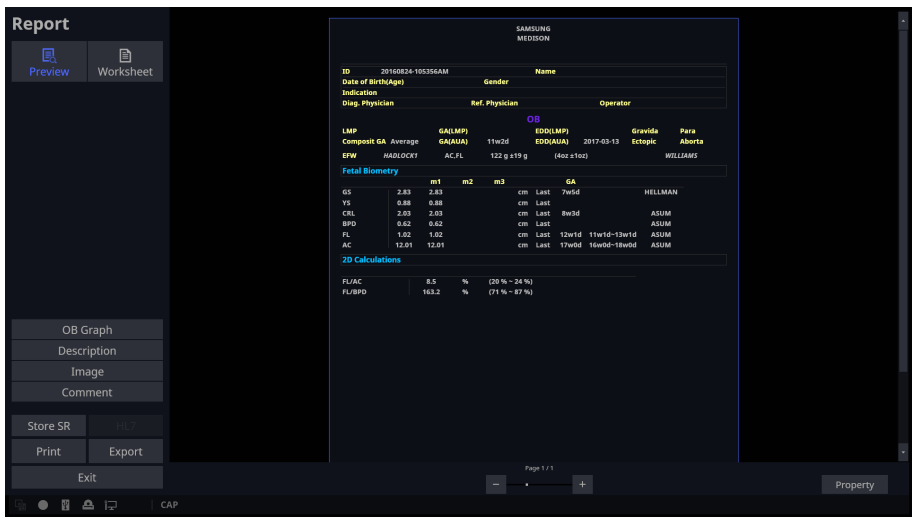
Property

Print

Set the type of Printer, Application, Print color, and Page.

Settings

You can set Header & Footer, Logo, Title, Patient Info, and Table Form of a report.



[Figure 8.3 Report Preview]

Printer

Select a USB Printer connected to the equipment.

Range

Set a page to save the print-out or images. **Current Page** selects the currently active page and **All Applications** selects all pages.

■ Application

Set application to save the Preview screen, printout, or images. **Current Application** will select applications established in the worksheet, while **All Application** will select all applications.

■ Color (Print)

Set the color of report in printout.

■ Color (Store)

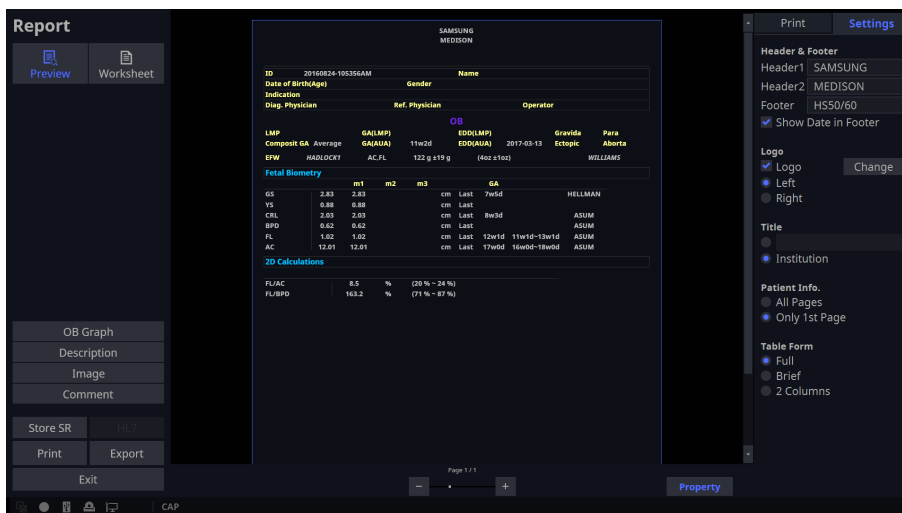
Set the color of image to save images.

■ Page

Set pages to save the Preview screen, printout, or images. **Echo Page** will select a landscape-formed report.

■ Header & Footer

Set the header and footer. Checking **Show Date in Footer** will display date in the bottom of the right-hand side.



[Figure 8.4 Header & Footer]

■ **Logo**

Set a logo on the top of the report. It can be changed once it is connected to a USB.

■ **Title**

Set the title. User-selected title or a title set in the Patient will be shown.

■ Patient Info.

Set Patient information shown on the page. **Only 1st Page** shows the Patient information only on the first page.

■ Table Form

Set the report form. Selection of **Brief** will show the results only, while selection of **2 Columns** will show measure items in the two columns.

Report

Preview

Worksheet

SAMUEL MEDSON

ID20160824-100356AM

Name

Date of Birth(Age)

Gender

Indication

Ref. physician

Operator

LMP

GA(LMP)

ED(LMP)

Gravida

Para

Composite GA Average

GA(AUA)

ED(AUA)

2017-03-13

Ectopic

Aborts

ETW

H05(OCT)

AC/L

122 g ±19 g

(4w ±1w)

WILLIAMS

Fetal Biometry

m1

m2

m3

GA

GS

2.83

2.83

cm

Last

7w5d

HELLMAN

YS

0.88

0.88

cm

Last

ASUM

CS

2.89

2.89

cm

Last

8w3d

ASUM

BDP

0.62

0.62

cm

Last

ASUM

FL

1.02

1.02

cm

Last

12w1d

11w1d-13w1d

ASUM

AC

12.01

12.01

cm

Last

17w0d

16w0d-18w0d

ASUM

2D Calculations

FL/AC

8.5

%

(20 % - 24 %)

FL/BDP

163.2

%

(71 % - 87 %)

OB Graph

Description

Image

Comment

Store SR

Print

Export

Exit

Page 1 / 1

-

+

Property

Print

Settings

Header & Footer

Header1 SAMSON

Header2 MEDISON

FooterH550/60

Show Date in Footer

Logo

Logo

Change

Left

Right

Title

Institution

Patient Info.

All Pages

Only 1st Page

Table Form

Full

Brief

2 Columns

[Figure 8.5 Columns]

Editing Report (Worksheet)

When you move the focus to a value that can be edited on a Worksheet, the borders of the edit window will be marked in blue, and Edit mode will start by clicking.

Report

20160803-030308PM 2016-08-03

Indication: _____

Diag. Physician: _____ Ref. Physician: _____ Operator: _____

LMP: _____ GA(Clin): _____ EDD(GA): _____ Gravida: _____ Para: _____

Composit GA: _____ Average: _____ GA(AUA): _____ 9w5d EDD(AUA): _____ 2017-03-03 Aborta: _____ Ectopic: _____

EFW: HADLOCK1 AC.FL 57 g ±9 g (2oz ±0oz) HADLOCK

Fetal Biometry

Label	Value	GA	GP	m1	m2	m3	Method	Av.US
GS	HELLMAN	0.56 cm		0.56			Last	
YS		0.54 cm		0.54			Last	
CRL	ASUM	0.41 cm	6w0d	0.41			Last	
BPD	ASUM	0.45 cm		0.45			Last	
FL	ASUM	0.91 cm	11w4d	10w4d-12w4d			Last	
AC	ASUM	5.68 cm	11w3d	10w3d-12w3d			Last	

2D Calculations

FL/AC	16.0 %	(20 %~24 %)	FL/BPD	201.7 %	(71 %~87 %)
-------	--------	-------------	--------	---------	-------------

Page 1 / 1

Screen Capture is complete

[Figure 8.6 Worksheet]

Preview

Worksheet

Application: OB

Store SR

HL7

Export

Print

Exit

Default Author

Delete Cell

Delete Line

Prev

Next

Fetus A

Page 1 / 1

[Figure 8.7 Worksheet – Touch Screen]

Modify Measurements

After you have edited a value and moved the focus away from the value or press Enter in the keyboard, the edited value will be applied. Edited values will be indicated with '*' in front of them. To delete a value, click the value that you wish to delete; the **Delete** button will be activated on the touch screen. Press this button to delete the value immediately.

Default Author

Reverts to the author of Setup settings.

Delete Cell

Select and delete a measurement value.

Delete Line

Delete all values with the same label as the selected value.



NOTE: If you change the Author in a Worksheet, the GA value will be changed. The Author you change in a Report is only valid within the Report; the Author of the Setup will be used for calculating the GA when you are taking measurements in Measurement mode.

AV.US

If Composite GA is Average, you may select or exclude GA values from each Label Av.US that have been used for calculation.

Measurement Display Method

The product allows you to measure one measurement item multiple times. However, only the first three measurement results are saved in a report.

When taking measurements for the same item more than once, measurements can be displayed in four ways. On the Edit Report screen, you can specify or change the measurement display method.

Go to **Set Up > Measurement > Application > Doppler > Display Absolute Value** and select 'On' to display absolute values in the report.

■ Average

Obtain the average of the measurements and display it on the screen.

■ Last

Display the last measurement on the screen.

■ Max

Display the largest value of the measurements on the screen.

■ Min

Display the smallest value of the measurements on the screen.

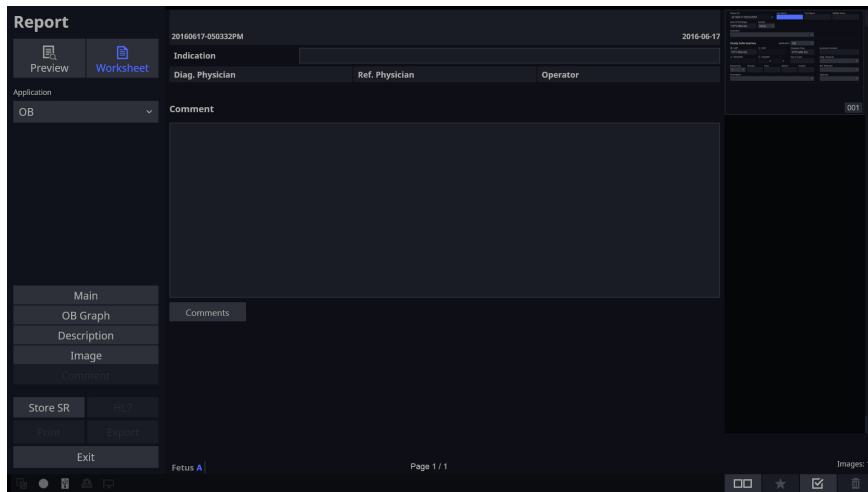
Adding Comments

Tap Comment on the touch screen or click **Comment** in the left-hand menu on the *Ultrasound Report* screen. A screen in which you can enter opinions will appear.

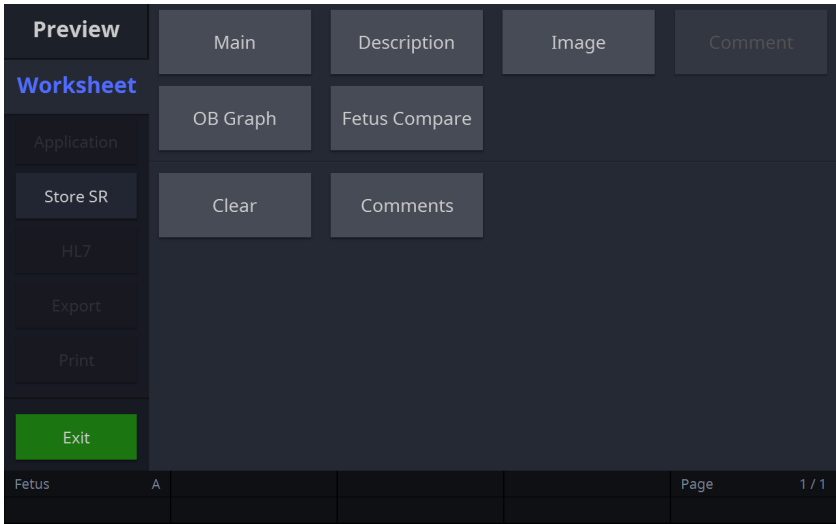
Tap the bottom of the entry window or the **Comment** button on the touch screen and a window will open to let you select a comment you have previously entered in Setup. Select **Comment** in the window and the selected text will be entered at the location of the cursor in the comment entry window.



NOTE: Comments may be added at **Setup > Report > Comment**. For more information, refer to 'Report' in 'Chapter 3. Utilities'.



[Figure 8.8 Comment]



[Figure 8.9 Comment – Touch Screen]

Print Reports

In the Preview screen, tap the **Print** button on the touch screen or press **Print** in the left-hand menu on *Report* screen. The measurement report for the selected application will be printed on a connected printer.

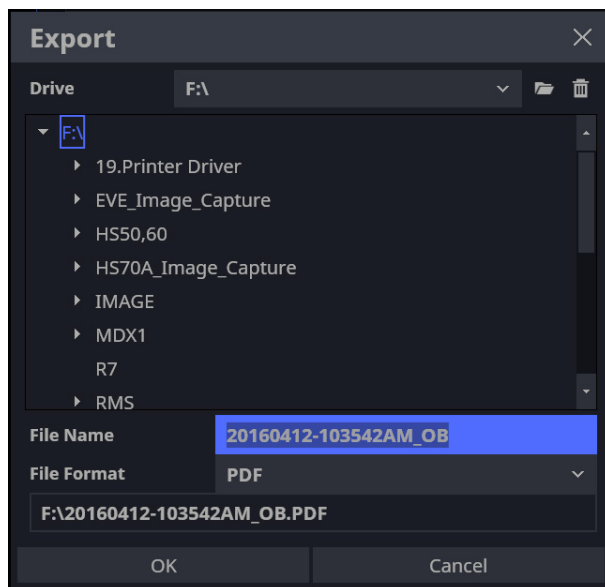


NOTE: You can change the printer settings for printing measurement reports at **Report > Preview > Property > Print**. For more information, refer to 'Peripheral Device Settings' in 'Chapter 3. Utilities'.

Saving Reports

In the Preview screen, tap **Export** on the touch screen. Or press **Export** in the left-hand side of *Report* screen. **Export** button is activated only when it is connected to a USB. *Export* window will appear and save the report in the external storage media.

Export window will appear and specify the directory, drive, file name, and file format. Click **OK** on the screen to save the report. Tap **Cancel** to cancel.



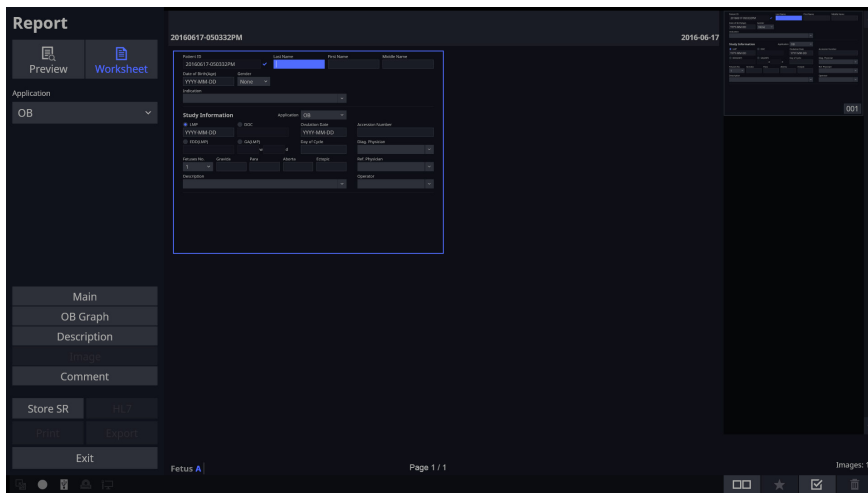
[Figure 8.10 Export]

Store SR

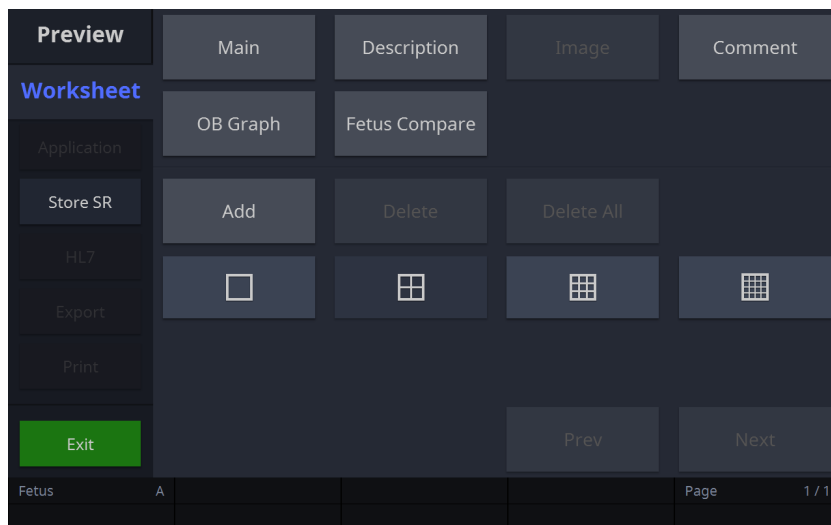
Tap **Store SR** on the touch screen or the Left Menu to save the Measure SR Information.

Images

Select this if you want to attach images to the report. Tap the **Image** button on the touch screen or press **Image** in the Left Menu on the *Ultrasound Report* screen to open a window where you can select images.



[Figure 8.11 Image]



[Figure 8.12 Image – Touch Screen]

1. Select images from the thumbnail on the right.
2. When images are selected, the **Add** button becomes active on the touch screen. Tap the **Add** button to attach the selected images to the report. Alternatively, double-click selected images among the thumbnails to attach the associated images.
3. If you select images attached to a report, the **Delete** button becomes active so that you may delete attached images. Press the **Delete All** button to delete all attached images.
4. You may select 1x1, 2x2, 3x3, or 4x4 for layout.

OB Graph

After taking OB measurements, press **Report** on the touchscreen or control panel. Tapping **OB Graph** on the touch screen displays the Graph screen.

Click/tap the **Single** or **Quad** button on the screen/touch screen. Select the layout on the graph screen. You can review the graph and trends. To return to the *Report* screen, tap **Preview** on the touch screen or the Left Menu.



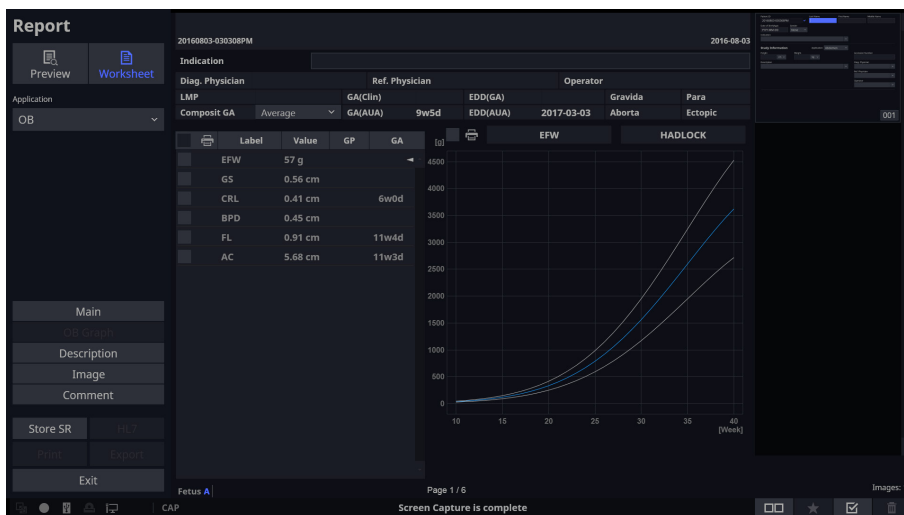
NOTE: The graph function can only be used with OB reports.

The list of measured items appears on the right side of the screen. If you select an item, a graph for the selected item will appear on the screen.

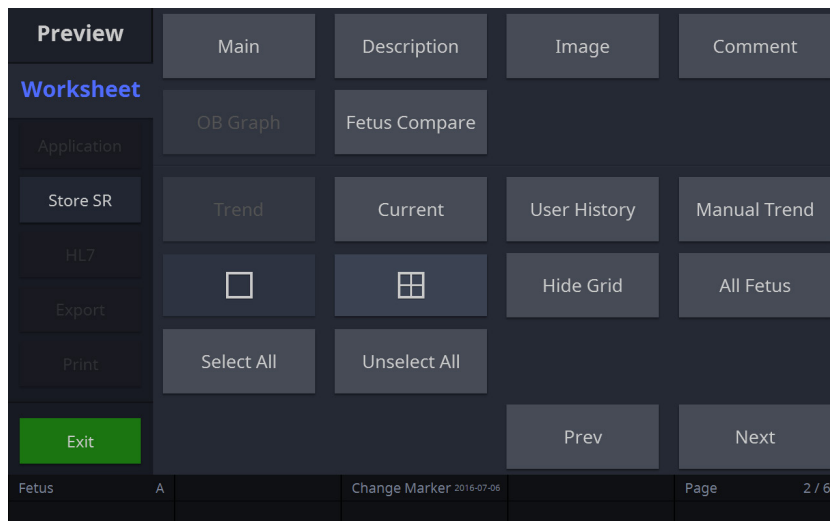


NOTE:

- ▶ To execute the graph function, at least one Label containing a Growth Table must be measured, and only a Label that has been measured may display graphs.
- ▶ A graph is created based on the patient ID, LMP and measurement date.



[Figure 8.13 OB Graph]



[Figure 8.14 OB Graph – Touch Screen]

■ Select a Graph

Use the Trackball and the **Set** button to select an item from the list.

■ Single

A graph representing one obstetrics measurement will be displayed.

■ Quad

A graph representing four obstetrics measurements will be displayed.

■ Hide Grid

Erase the grids on a graph.

■ All Fetus

Display graphs for all measured fetuses.

■ Current Fetus

Display graphs for the fetus currently being measured.

■ **Trend**

Tap **Trend** on the touch screen. The past and present measurement values for a fetus are displayed in the order of study date. It is shown on the graph with different markers for different study dates.

■ **Current**

Tap **Current** on the touch screen. The current measurements for a fetus are displayed by study date.

■ **User History**

The past and present measurement values for the fetus are displayed in a table format.

■ **Manual Trend**

Display the measurement values-manually entered by the user-which are to be displayed on the OB Growth Curve in Trend. Enter manually in Patient window.

■ **Prev**

Return to the previous page.

■ **Next**

Move on to the next page.

Tips!

Standard Deviation & Percentile

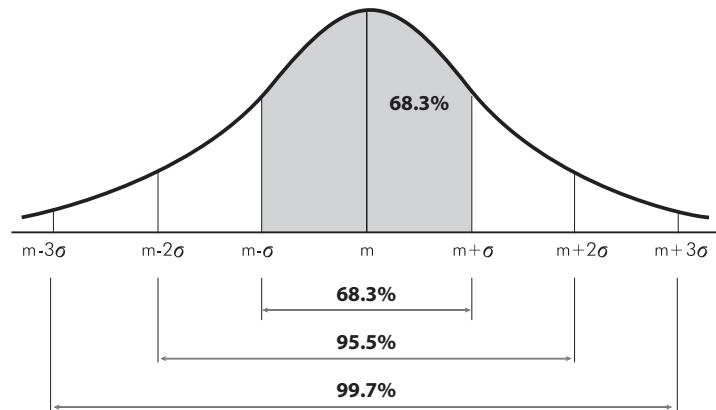
Among the OB information, the Growth table and the typical fetal distribution, for the same number of weeks, are used to determine the following information:

- ▶ The normal distribution curve.
- ▶ The measurements for an actual fetus or a position in EFW distribution.
- ▶ Whether or not a distribution point is within the normal range.

The number of weeks referenced for the Growth table can be set to LMP, Estab., DD, or Average US GA, under **Pctl. Criteria**; the typical setting is LMP.

When the LMP is not known or uncertain, or when the difference between the LMP and the Average US GA is substantial, care must be taken, as selecting different **Pctl. Criteria** can result in a significant difference.

The distribution of the number of weeks in the Growth table for the selected reference is a normal distribution. It is laterally symmetrical around 50% (the average) and it shows the distance from the average as a deviation. The deviation can be represented by Standard Deviation (SD) or Percentile terms.



[Figure 8.15 Distribution of Growth Table for the Selected Week (m: mean, σ : standard deviation)]

Tips!

When represented by SD, a point near to the average indicates a value closer to ± 0 SD and a point further away from the average indicates a value closer to the maximum or minimum value. The greater part of the range falls within ± 3 SD, with ± 1 SD representing 68.3% of the entire range. Thus it can be seen that most fetal measurements are tightly clustered around the average value.

The Percentile represents a point in distribution from between 0 and 100 inclusive. Therefore, the average point is represented as 50 Percentile.

As shown in the figure, the average point corresponds to 0 SD (that is, the 50th Percentile). If a point is in the range between -1 SD and +1 SD, it falls within 68.3% of the entire range. This means that the point falls within the range between 16 and 84.

Further, if a point is in the range between -2 SD and +2 SD, it falls within 95.5% of the entire range. Thus, the point falls in the range between 3 and 97.

The SD and Percentile are interchangeable. Percentile can be used when a fetal measurement ranking is desired while SD can be used when the distance between actual fetal measurements and the average measurement is sought.

While the range of Growth table references that are primarily used with OB measurement data varies depending on the user, the typical range accepted by most users is as below:

- ▶ When references are created based on SD:
 - -2.0 SD – +2.0 SD (when converted to Percentile: 2.28 Percentile – 97.72 Percentile)
 - -1.5 SD – +1.5 SD (when converted to Percentile: 6.68 Percentile – 93.32 Percentile)
 - -1.0 SD – +1.0 SD (when converted to Percentile: 15.87 Percentile – 84.13 Percentile)
- ▶ When references are created based on Percentile:
 - 2.5 Percentile – 97.5 Percentile (when converted to SD: -1.96 SD – 1.96 SD)
 - 5.0 Percentile – 95.0 Percentile (when converted to SD: -1.645 SD – 1.645 SD)
 - 10.0 Percentile – 90.0 Percentile (when converted to SD: -1.288 SD – 1.288 SD)

Description

Tap **Description** on the touch screen. OB and Gyn applications have their own preset items; for other applications, only user-added items are available.

■ General OB

This item only becomes active when OB measurement is available. Tap the **General OB** button on the touch screen and you can select a description for the selected item.

■ Early OB

This item only becomes active when OB measurement is available. Tap the **Early OB** button on the touch screen and you can select a description for the selected item.

■ Biophysical Profiles

5 items of Breathing, Movement, Tone, AFV, and NST may be left blank or set as 0, 1, or 2; the sum of each item will be displayed as Total.



NOTE: Biophysical Profile is activated only when OB measurement values exist.

■ Default

This value has been preset in advance by the user.

■ Save as Default

Save the values currently set on the screen as default values.

■ Clear

Delete all items.

■ Fetus Compare

In the *OB Study Information* screen, select the Number of Fetuses to enable measurement for each fetus when taking OB measurement. Tap the **Fetus Compare** button on the touch screen and measurement for each fetus is displayed.

[Figure 8.16 Description]

[Figure 8.17 Description – Touch Screen]

Closing Reports

Tap **Exit** on the touch screen or in the Left Menu. Alternatively, press the **Report** button on the control panel.

Chapter 9

Image Managements

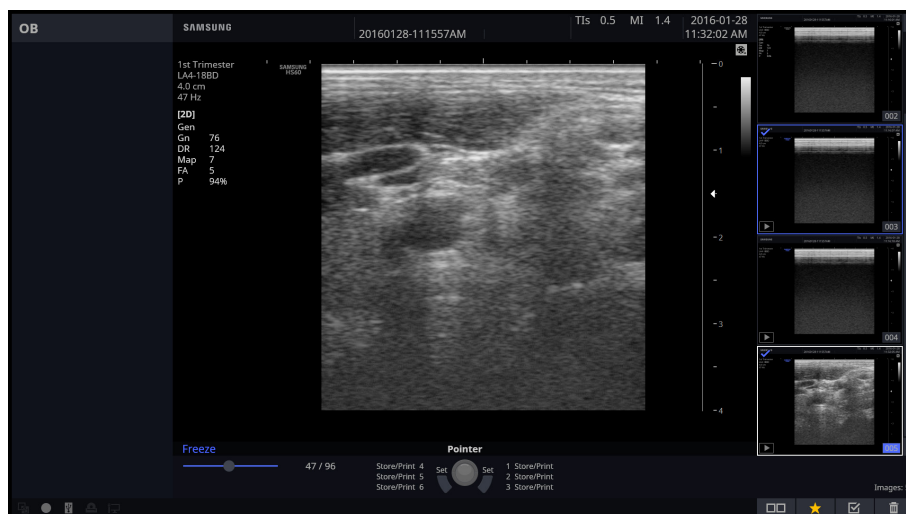
▣ <i>Cine/Loop</i>	9-3
▣ <i>Annotating Images</i>	9-5
Annotation	9-5
BodyMarker	9-10
▣ <i>Saving, Playing and Transferring Images</i>	9-12
Saving Images.....	9-12
Playing Images.....	9-13
Transferring Images	9-14
▣ <i>Printing Images</i>	9-15
Printing Images	9-15
▣ <i>SonoView Mode</i>	9-16
Exam List	9-17
Review – Exam Mode	9-19
Review – Compare Mode	9-24
DICOM Q/R	9-31

:: Cine/Loop

Images are automatically saved in the memory during scanning. The saved images are useful for patient diagnosis and review.

The saved images can be in Cine or Loop, depending on the diagnosis mode.

- ▶ 2D Cine: These are images temporarily saved in all diagnosis modes except M Mode and Spectral Mode.
- ▶ Trace Cine: Images that are saved in M Mode and Spectral Mode.



[Figure 9.1 Cine]

Starting and Finishing Image Review

During scanning, press the **Freeze** button on the control panel. The scanning is stopped and the system switches to the image review mode screen.

Press the **Freeze** button again to return to the scan mode.

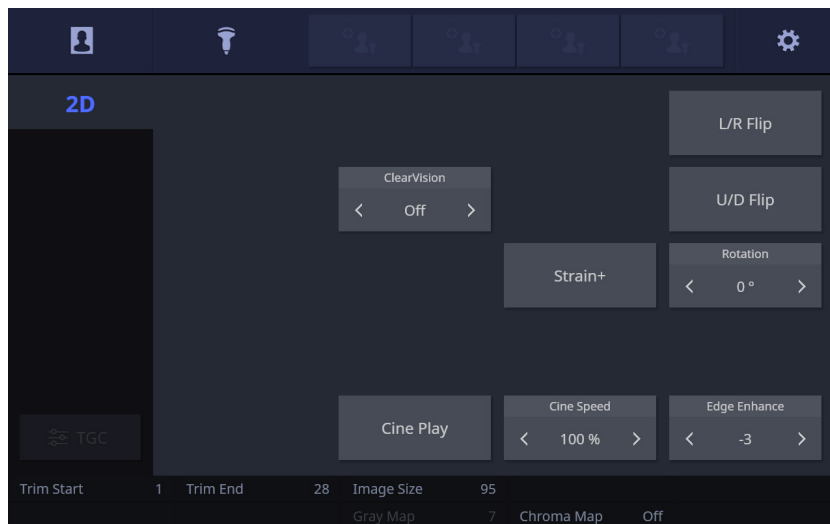
How to Review Images

Move the cursor to the Cine or Bar in the user information area to review an image. You can search through saved images by moving the cursor with the trackball. The total number of saved images and the number of the image currently being reviewed are shown next to the bar.

■ Selecting Loop

Select an image to play by pressing the **Change** button in the control panel.

The touch screen menu is changed when images are reviewed.



[Figure 9.2 Reviewing Images – Touch Screen]

■ Cine Play

Tap **Cine Play** on the touch screen. You can stop or resume playback of an image by tapping the button.

■ Cine Speed

Use the **Cine Speed** button on the touch screen to adjust the automatic playback speed of 2D Cine or Trace Cine. Speed may be adjusted between 6-300%.



NOTE: For an explanation of the other items on the touch screen, refer to Basic Mode in 'Chapter 7. Diagnosis Mode'.

■ Reviewing Image in Multi-image Mode

Only the images in an active area can be reviewed. To review images in another area, change the active area by using the **Dual** or **Quad** button on the control panel.

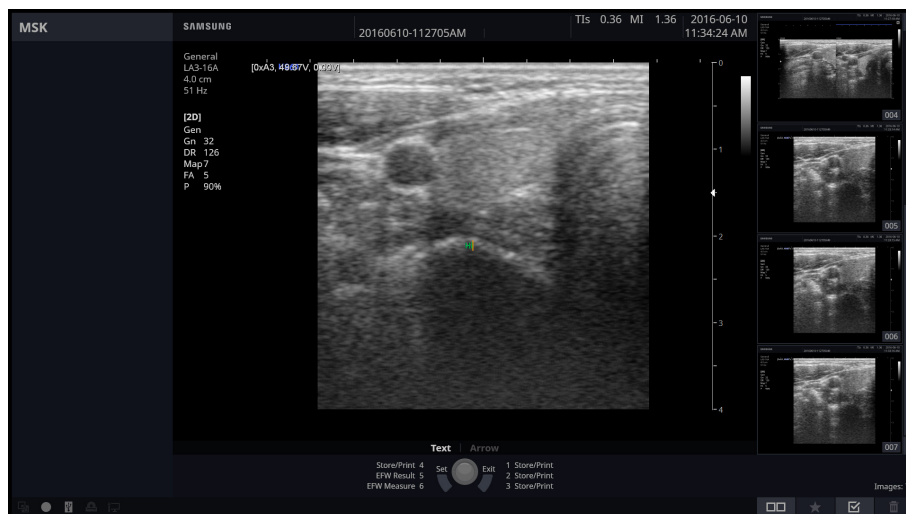
:: Annotating Images

Annotation

Enter or display text, Arrow, or BodyMarker on an image. This function is useful for differentiating or marking a diagnosis area.

Starting Annotation Mode

Press the **Text** or **Arrow** button on the control panel.



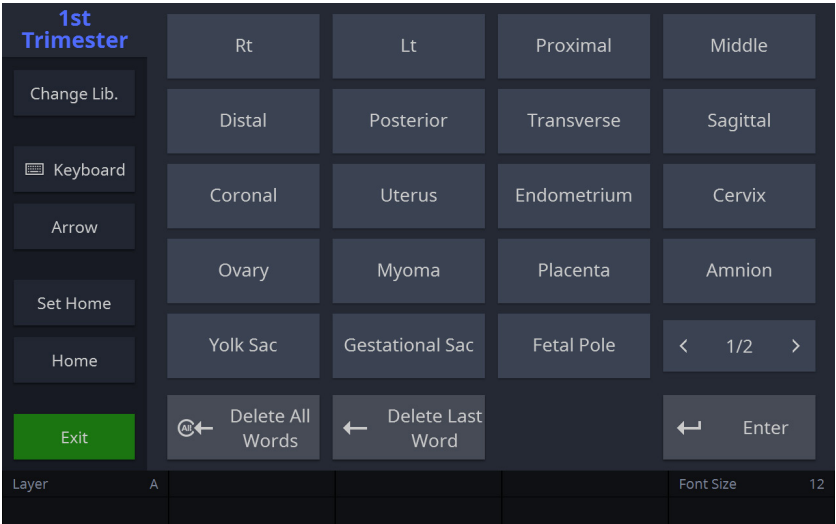
[Figure 9.3 Annotation Mode]

Typing Text

Press the **Text** button in the control panel and enter text directly with the keyboard, or select predefined text on the touch screen.

You can move the cursor by using the trackball.

■ **Text Mode in Soft Menu**



[Figure 9.4 Screen Keyboard]

■ **Change App.**

Tap the touch screen or use the dial-button to change application. The text list will change depending on the selected application.

■ **Keyboard**

Tapping the  button on the touch screen opens the on screen keyboard.

■ **Arrow**

You can enter an arrow in a place you want over an image.

■ **Delete Last Word**

Erase the last entered text. Alternatively, use the **Annotation** key on the keyboard.

■ **Delete All Words**

All of the entered text has been erased. Alternatively, use the **Delete All** key on the keyboard.



NOTE: Selecting **Setup > Annotation > Select Library** allows you to edit the entire page. For a more detailed description, refer to 'Chapter 3. Utilities'.

■ Home

When tapping the **Home** button on the touch screen, it is moved to the established cursor location by **Set Home** button.

■ Set Home

Set the initial cursor position when Annotation mode starts. Place the cursor on the screen and tap **Set Home** on the touch screen.

■ Layer

Set Layer A and B.

■ Font Size

Select the font size to use. Select a value between 8 and 72 by using the dial-button on the touch screen.

❏ Deleting Text

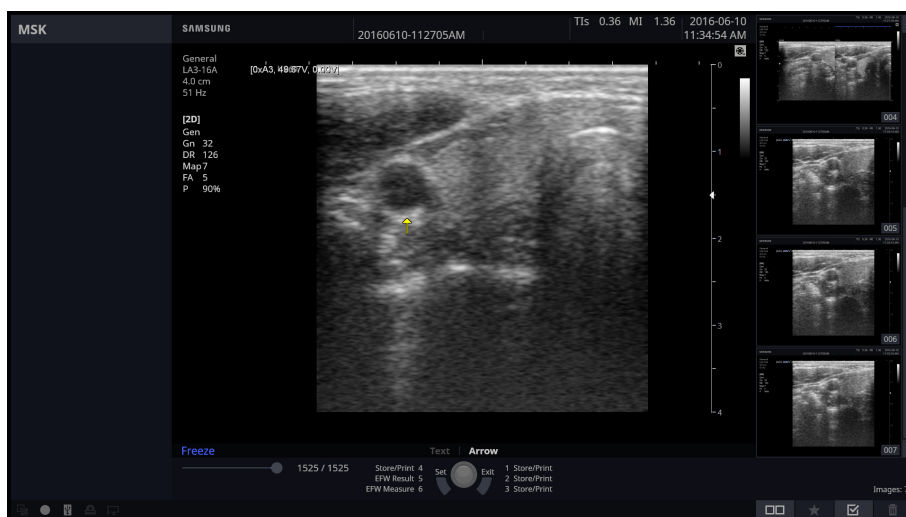
Press the **Clear** button on the control panel. All the text entered on the screen will be deleted.

❏ Exiting Text Mode

Press the **Exit** button on the control panel or tap the **Exit** button on the touch screen.

❏ Arrow Mode

You can enter an arrow over an image. This function is useful for differentiating or marking a diagnosis area.



[Figure 9.5 Arrow Mode]

❏ Entering Arrow

1. When pressing the **Arrow** button on the control panel, it is converted to the entry mode.
Or press the **Arrow** button in the keyboard.
2. Use the dial-button's **Arrow Type** to select the type of arrow you want.
3. Move the arrow to the desired position by using the trackball.
4. To adjust the size of the arrow, use the dial-button's **Arrow Size**.
5. To adjust the rotation angle of the arrow, use the dial-button's **Rotate Arrow**.
6. Press the **Set** button to finish. Press **Exit** to cancel.



Arrow and Pointer Button

Pointer function is available in Annotation mode.

Deleting Arrows

Press the **Clear** and **Delete All Arrows** button on the control panel to delete all arrows displayed on the screen. To delete the last arrow entered, tap **Delete Last Arrow** on the touch screen.

Exiting Arrow Mode

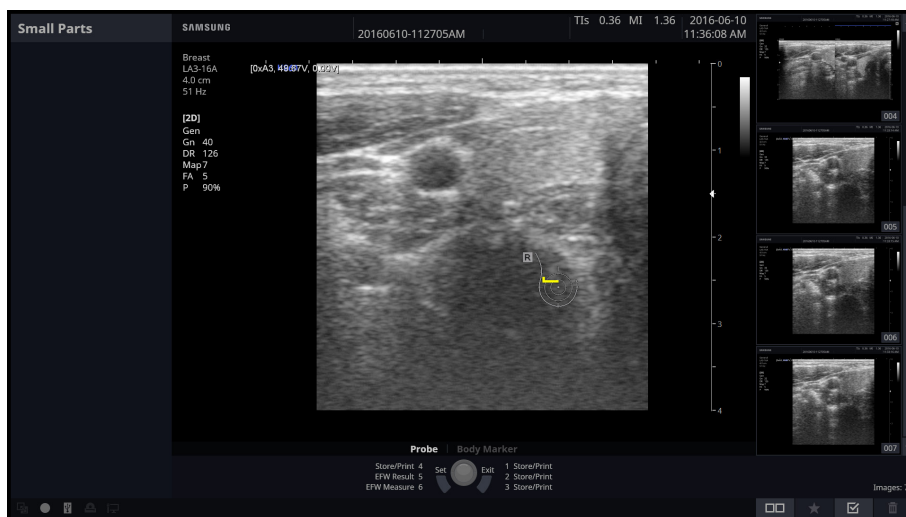
Press the **Exit** button on the touch screen or control panel.

BodyMarker

Enter a BodyMarker over an image. This function is useful for differentiating or marking a diagnosis area.

❏ Entering BodyMarker Mode

When pressing **Marker/Ref** Knob on the control, it is converted to *BodyMarker* entry mode and the touch screen shows BodyMarker.



[Figure 9.6 BodyMarker Mode]

❏ Inserting BodyMarker

1. BodyMarkers will appear on the touch screen.
 - ▶ The types of BodyMarker shown on the touch screen vary depending on the selected application.
 - ▶ Up to 19 BodyMarkers can be listed on the screen at one time.

When more BodyMarkers are provided, use > button on the touch screen to navigate the pages

2. Tap the touch screen button or dial button for the BodyMarker you want; the BodyMarker will then be displayed on the image.
3. When pressing **Change Lib**, it can be immediately changed to a desirable application.
4. Select a desirable probe shape by using **Probe Type** dial-button.

5. Adjust cursor angle by using the **Rotate Probe** dial-button or the **Angle** button on the control panel.
6. Adjust the cursor size by using **Size** dial-button.
7. Set the initial cursor position when BodyMarker starts. Place the cursor on the screen and tap **Store Probe Position** on the touch screen.
8. To finish entering BodyMarkers, press the **Set** or **Exit** button on the control panel. To cancel it, press **Clear** on the touch screen or tap the **Delete** button on the touch screen.

Changing BodyMarker Position

1. Press the **Change** button on the control panel.
2. Move the BodyMarker to a desired position by using the Trackball.
3. Press the **Set** button on the control panel again to confirm the new position.

Deleting a BodyMarker

Press **Clear** on the touch screen or tap the **Delete** button on the touch screen.

Exiting BodyMarker Mode

Tap the **Exit** button on the control panel or touch screen.



NOTE: Go to **Setup > BodyMarker > Library** to set the library of BodyMarker. For a more detailed description, refer to 'Chapter 3. Utilities'.

:: Saving, Playing and Transferring Images

Saving Images



WARNING: You must always enter the patient ID, because all images are saved according to patient ID. Failure to enter a patient ID may result in a loss of and/or critical errors in previously saved images.

The saved images are displayed in the thumbnail area.

❏ Saving Image

If no patient information has been entered, a *Temp ID* will be created and saved. The saved images can then be edited and managed in SonoView mode.

❏ Saving (Still Image/Multi Frame Image)

Use the Store Clip function of **U1–6** button to save it. For a detailed description for **Store/Print** settings, refer to 'Chapter 3. Utilities'.

- ▶ When frozen, specify the range of the image you want to save by using the trackball or the **Trim Start** and **Trim End** buttons on the touch screen, then tap the configured **U1–6** buttons to save the Cine image.
- ▶ Live Mode works as shown below according to settings. For information about the settings, please refer to 'Chapter 3. Utilities'.

If patient information does not exist, saving Cine in Freeze Mode will create a Temp ID for saving.

If all frames are saved in Live Mode, the saving process is automatically finished according to a predefined time.

The saved images are added to the thumbnail list on the right side of the screen.

Playing Images

You can play the saved images in SonoView and Diagnosis Modes.

❏ Playing Images in SonoView



NOTE: Refer to 'SonoView' in this chapter.

❏ Viewing Images in Diagnosis Mode

Use the **Pointer** button on the control panel. Note that this function is available only when there are images saved in the thumbnail list. Press the **Pointer** button and the cursor will appear on the screen.

Transferring Images

HS50/HS60 allows you to transfer images to a PACS system that supports DICOM. You can transfer all saved images automatically, or select a desired image and transfer it manually. For information on the DICOM server settings and DICOM operations, please refer to 'Connectivity Settings' in 'Chapter 3. Utilities'.

Transferring Images in Diagnosis Mode

You can transfer images automatically. Images are transferred by using the storage server transmission method in **Setup > Connectivity > DICOM**. Please refer to "Connectivity Settings" in 'Chapter 3. Utilities' of this manual.

Transferring Images in SonoView

You can transfer images manually. The following two methods are available:

Sending Exam

Send all images for an exam.

1. Select an exam from the Exam List.
2. Click the **Send** button on the left side of the screen. All images for the selected exam will be sent.

Sending Selected Images

Select a desired image from among the images for an exam and send it out.

1. Select the image in the *SonoView* screen.
2. Click the **Send** button on the left side of the screen. The selected images will be sent.

:: Printing Images

**NOTE:**

- ▶ Use it after establishing functions in **Setup > Peripherals > Printer**.
- ▶ Configure the Store/Print functions in **Setup > Customize > Buttons** before use.

Printing Images

Press the **U1-6** buttons on the control panel. Images are printed via an echo printer. For information on how to set up a printer, please refer to 'Chapter 3. Utilities'.

:: SonoView Mode

This is the HS50/HS60's integrated image management program. It provides image saving/filing, preview, delete, and other PC-compatible export features.

The image file types used in this product follow the international standard DICOM (Digital Imaging and Communication in Medicine). As a result, the PACS (Picture Archiving Communication System) can be implemented without any additional costs, and it's easy to exchange image files with other hospitals or equipment.

This product supports the Bitmap file format (.bmp), which is commonly used on standard PCs, ensuring easier exchange of image data.

■ Launching SonoView Mode

Press the **SonoView** button on the control panel. This will launch the *SonoView* screen.

If there are saved images available for the current exam, the information and saved images for the exam will appear when SonoView Mode starts.

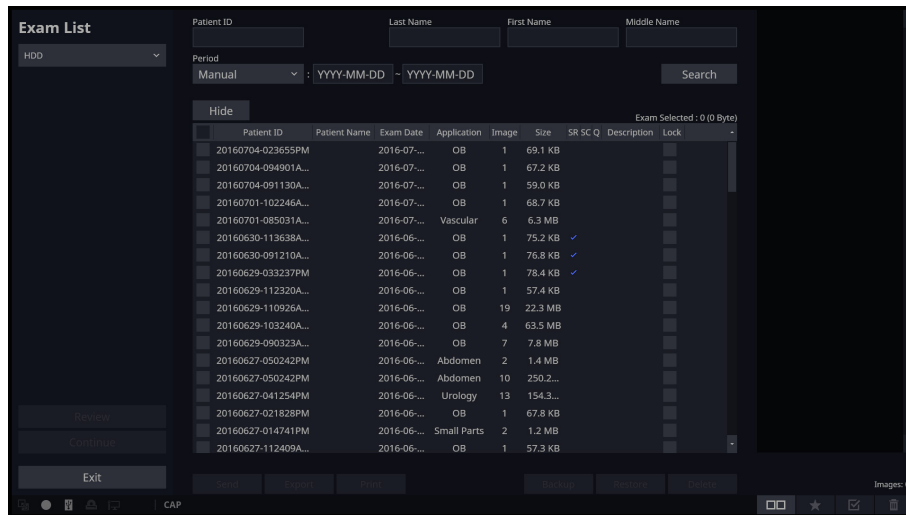


WARNING:

- ▶ Before saving images or using SonoView Mode, you must register the patient information.
- ▶ All diagnosis information in the product is saved and managed for each patient ID. As a result, saving images without entering a patient ID may result in a loss of and/or critical errors in previously saved images.

Exam List

Appears when the **SonoView** button is pressed. Or tap **Exam List** in Review Mode to see the exam list.



[Figure 9.7 Exam List]

Enter search criteria at the top of the Exam List screen, and press **Search**. Search results will be listed on the screen.

You can select an exam from the list and examine, delete, or send it.

Refer also to 'Printing Images' and 'Transferring Images via DICOM' later in the document.

You can select the data storage location. HDD, Media, and Q/R are provided.

Hide Search

Hides the Exam list.

Show Search

Shows hidden Exam list.

Backup Exam

Gets activated when selecting an exam in HDD. Continue to back up the selected exam. Select a drive to back up to and press **Yes** to continue the backup process.

Restore Exam

Gets activated when selecting an exam from USB storage or CD/DVD. Load the selected exam to HDD.

Review

When one or more exams are selected, the button is activated. The review screen for the selected exams will open. For a more detailed description, refer to 'Review Exam Mode'.

Continue

Is activated when an exam from the last 24 hours is selected. This allows you to modify the exam.

Review – Exam Mode

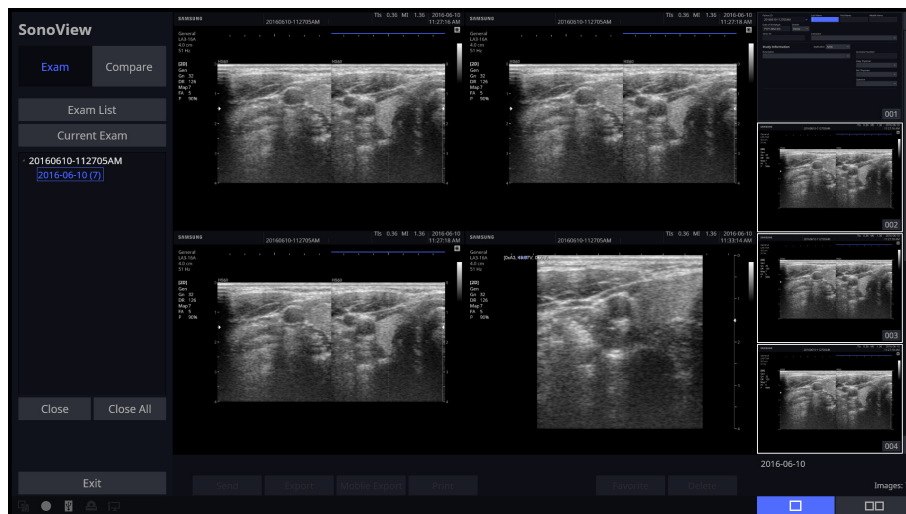
Press **Exam** in the upper left corner of the screen.

In the Exam Mode, you can review the current or saved exam.

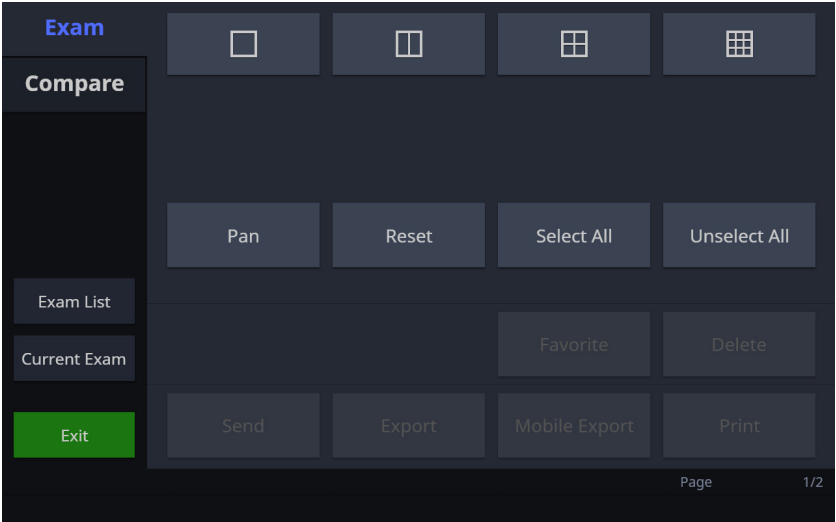
The image that is selected on the screen will be highlighted with a white border.

Exam Mode Screen

Exams for each patient ID are displayed by date in a tree structure on the left-hand side of the screen. The number represents the number of saved images. To show or hide exams, use the trackball and the **Set** button to select a desired ID.



[Figure 9.8 Exam Mode]



[Figure 9.9 Exam Mode – Touch Screen]

Exam Select

Use the trackball and the **Set** button to select a desired exam from the list on the left-hand side of the screen. The selected exam will be marked on the list in blue. The saved image will also be displayed on screen.

■ Reviewing the current exam

Click **Current Exam**. The current exam and its images are displayed on the screen. This button is only enabled when the patient ID is registered. Exams brought from the ExamList can be closed by using **Close** or **Close All** button.

■ Reviewing exams performed within the last 24 hours

Double-click an image. The exams that were performed within the last 24 hours and their images, are displayed. The first performance date of the exam appears in the feedback area.

You can place measurements, annotations, and BodyMarkers on the loaded exam screen. In addition, you can update the exam with new image scans.

■ Reviewing exams performed prior to the last 24 hours

Double-click an image. The exams that were performed prior to the last 24 hours and their images, are displayed. The first performance date of the exam appears in the feedback area.

You can place measurements, annotations, and BodyMarkers on the loaded exam screen. However, you cannot update the exam with new image scans.

Exam Scroll

The image of the previous or next page is displayed on the screen. Access by rotating the **Page** dial-button on the touch screen. Rotating the dial-button to the left displays the previous page image, while rotating it to the right displays the next page image.

However, this button may not be used when the number of exams saved is less than the number of images that appear on a page under the current layout.

Closing Exam Review

Tap **Close** on the touch screen. To close all exams in the list, click the **Close All** button.

Pan

You can use the **Set** button to move the image or scan within the selected image layout.

Reset

Reset the selected image or scan to the initially saved screen.

Select All

All images in the current exam will be selected.

Unselect All

All images in the selected exam will be deselected.

Favorite

After selecting an image in the Exam SonoView Mode, you'll be able to use the **Favorite** button on the touch screen.

When you select a Favorite, it will be displayed as  in the top right-hand corner of the thumbnail image.

Delete

Delete the selected image.

Zoom

Use by rotating the **Zoom** dial-button on the touch screen. You can adjust the selected images between 3 and 200. This appears when an image is selected.

Page

Run by rotating the **Page** dial-button on the touch screen. Move images of the selected exam.

❏ Layouts

You can adjust the number of images displayed on the screen. Use the touch screen button that represents the layout. Up to 9 images (3×3) can be compared at the same time.

The numbers shown in the layout section indicate the column and row of where an image will be displayed on the screen. You can change the numbers shown in the layout section to customize the layout.

❏ Displaying in Full Screen

Place the cursor on the image and double click the **Set** button to display the thumbnail loading screen in Scan Mode.

❏ Reviewing 3D Images

If the saved image is 3D, the 3D indicator  will appear at the bottom of the image. Double clicking the screen will start 3D View for image review.

❏ Cine play

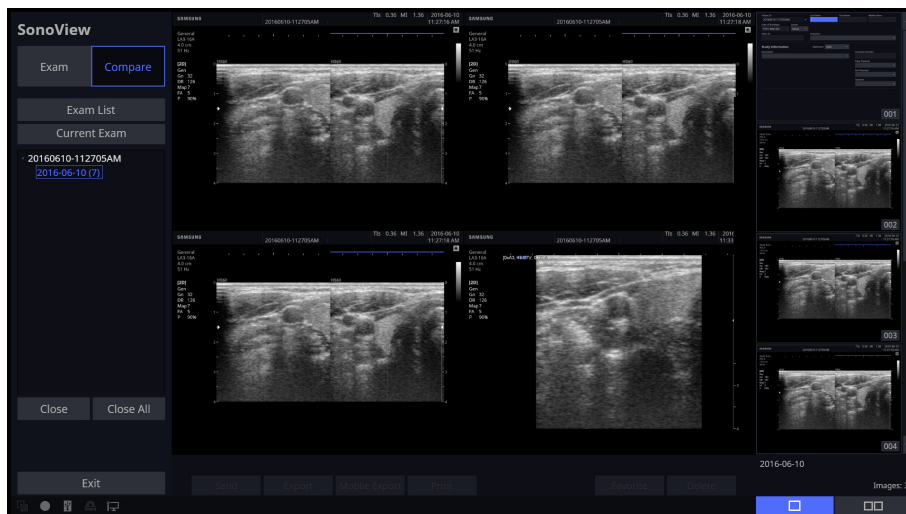
Tap the **Cine Play** button on the touch screen if the saved image is Cine. You can use Play, Pause, and Stop to navigate the image forwards and backwards.

Review – Compare Mode

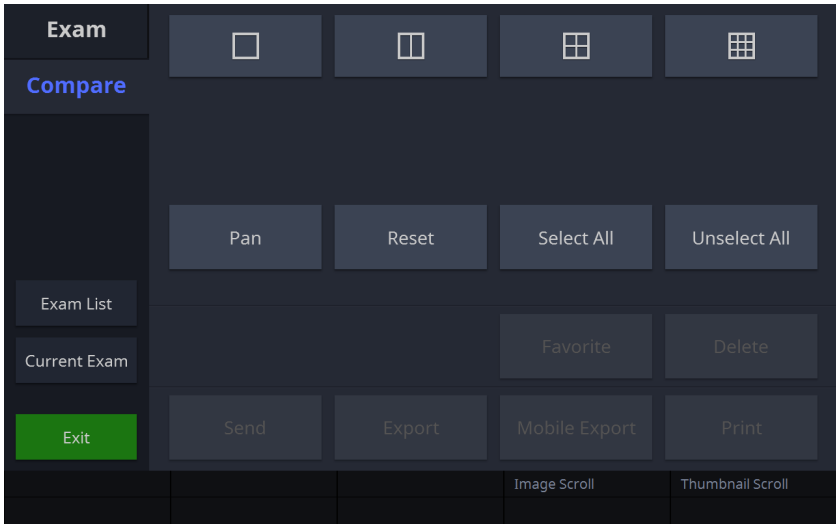
Press **Compare** in the upper left corner of the screen. In Compare Mode, you can select the images related to an exam to compare and review them. The image that is selected on the screen will be highlighted with a blue border.

Compare Mode Screen

As in Exam Mode, exams for each ID appear on the screen. In addition, images for the selected exam are displayed in thumbnail format.



[Figure 9.10 Compare Mode]



[Figure 9.11 Compare Mode – Touch Screen]

All functions except *Page and the details below are the as same as those in Exam Mode.

 Select an Image

Use the trackball and the **Set** button to select an image from the thumbnail list. The selected image is highlighted in blue in the list. Select a location on the screen where the image will be displayed and then the selected image will appear.



NOTE: Only scanned data can be loaded into the image area.

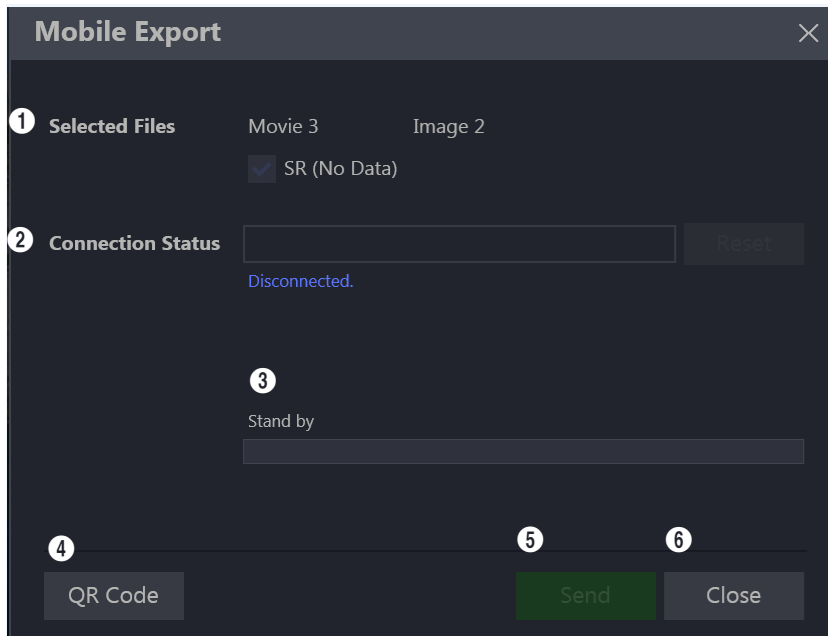
 Thumbnail Scroll

Images of the previous or next pages are displayed in the thumbnail list. Select the desired image by scrolling with the trackball or using the **Thumb Scroll** dial-button on the touch screen. Rotating the dial-button to the left displays the previous page's images in the thumbnail list. Rotating it to the right displays the next page's images in the thumbnail list.

Image Scroll

The image of the previous or next page is displayed on the screen. Select the desired image by using the trackball or using the **Image Scroll** dial-button on the touch screen.

Mobile Export



[Figure 9.12 Exam Mode – Mobile Export]

- ❶ Selected Files: It shows types of selected images.
When selecting SR checkbox, it will only be transferred when the file to be transferred contains an SR.
- ❷ Connection Status: The phone number of the connected smartphone (if connected via Wi-Fi) will be displayed.
- ❸ Stand by: Displays data conversion and transfer status.
- ❹ QR Code: Use the smartphone's QR code scanner to download the Mobile Export application.
- ❺ Send: Send the selected images to the smartphone.
- ❻ Close: Close Mobile Export.

**NOTE:**

- ▶ Mobile Export is an optional feature of this product.
- ▶ Images that can be transferred through the Mobile Export are available only for acquired still image or recorded video.
- ▶ Enter the clinic name in the system setting. The clinic's name will be displayed at the bottom of the application screen when you run the Mobile Export application.

**Tips!****Preparation**

- ▶ To use Mobile Export, the system and your smartphone need to be connected via Wi-Fi or a USB data cable.
- ▶ You can use the USB Wi-Fi Dongle Key to set up Wi-Fi on the system.

Printing Images

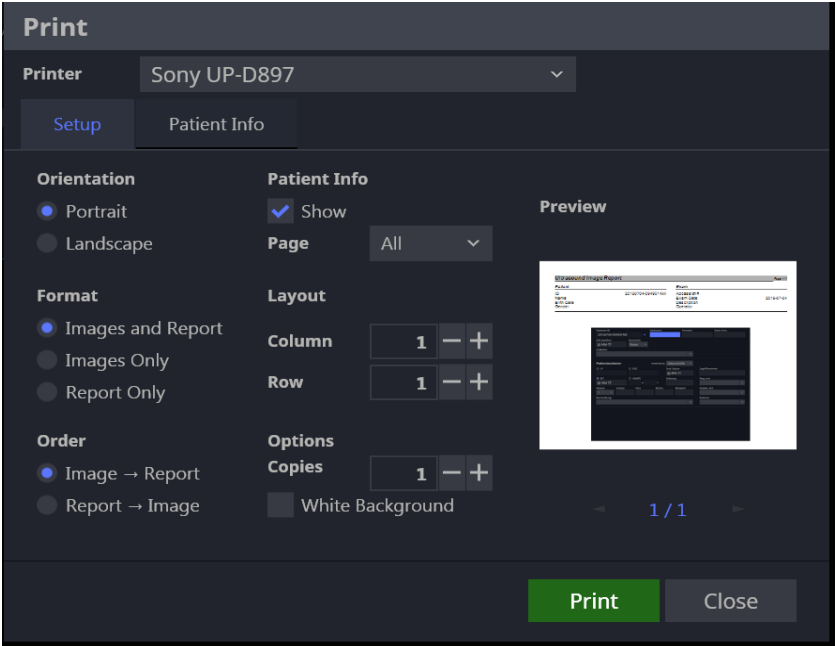
1. Press the **Print** button. The *Print* window will be displayed.
2. Select the type, printing direction, and options for the printer.
3. Click the **Print** button to print the image. Click **Close** to cancel.

**Tips!****Canceling a Print Job in Progress**

To cancel a print job in progress, use Setup > Peripherals > Peripherals > Printer > Printer Setting. Select the printer with the print job you want to cancel, and press the **Clear Print Setting** button. For more information, refer to 'Chapter 3. Utilities' in this manual.



NOTE: If Thermal Printer is selected, Include Header and Include Page Numbers will be inactive, and headers and page numbers will not be printed on the pages.

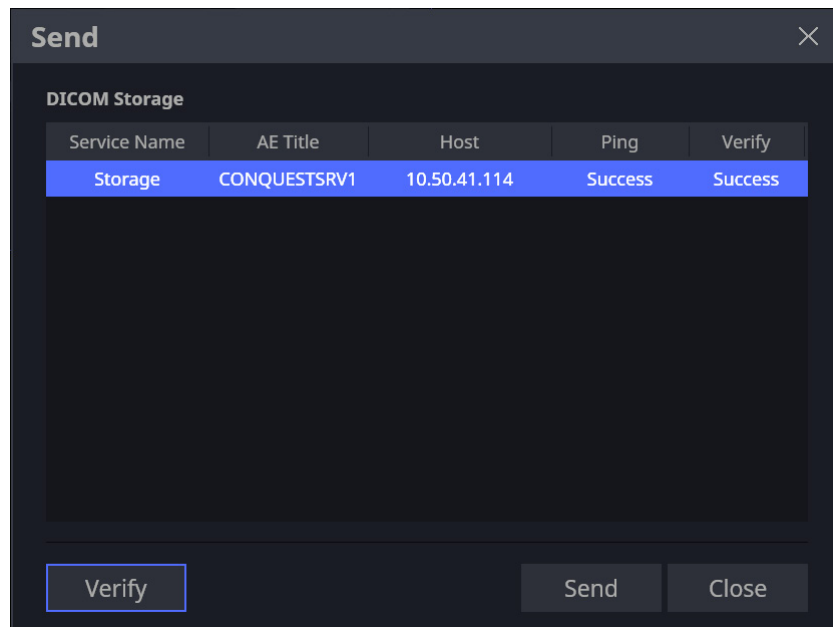


[Figure 9.13 Image Print]

❏ Transferring Images via DICOM

Transfer the selected image and measurement data via DICOM. The icon is enabled only when an image is selected. The icon is disabled in a system where DICOM is not enabled.

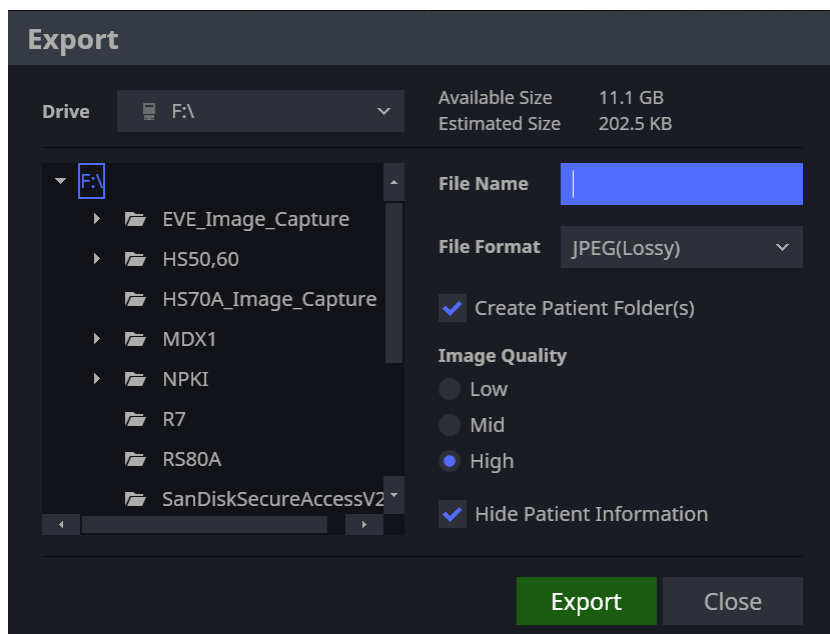
1. Select an image and click the **Send** button on the screen. The DICOM Storage window will appear.
2. Press the **Send** button to transfer the selected image to the DICOM server. Click **Close** to cancel.



[Figure 9.14 DICOM Storage]

❏ Transferring Images

1. Press the **Export** button. *Export* window will open.
2. Specify the various parameters, such as directory, drive, filename and file format.
 - ▶ Select the Create Patient Folder(s) checkbox to automatically create folders using patient information.
 - ▶ If the Hide Patient Information checkbox has been selected, patient information is not displayed.
 - ▶ You can select Low, Mid, or High for Image Quality.
3. Click the **Export** button to start a transfer. Click the **Close** button to cancel.



[Figure 9.15 Image Export]

❏ Exiting SonoView

Click the **Exit** button on the screen. Alternatively, you can press the **SonoView** button or the **Exit** button on the control panel to exit SonoView Mode.

DICOM Q/R

At least one server should be registered in the DICOM Q/R settings.



NOTE: Before using this feature, make sure that DICOM Q/R is properly configured. To configure DICOM Q/R, please refer to 'Chapter 3. Utilities' and configure **Setup > Connectivity > DICOM** functions before use. There is no limit on the number of DICOM Q/R servers you can register.

Run DICOM Q/R

Retrieve an image from the selected server by following this process:

1. After entering the ID in the *Patient* window, register or start an exam.
In the SonoView mode, enter an Exam List and select the combobox to Q/R.
2. Enter the Patient ID, Accession Number, or Last Name as a search term.
 - ▶ Alternatively, search by selecting the modality you wish to find. You may select MR, CT, Mammo, US, DR, or PET for the modality.
 - ▶ You may search by designating a period. Select Period. Select either Today, Last Week, Last Month, or Manual in the combo box. If Manual is selected, you do not have to select date separately.
3. Press the **Search** button to search.
4. Patient ID, Patient Name, Modality, Exam Date, Accession Number, Description, and Series Count will appear on the Study List search result.
5. Up to three studies can be selected from the Study List of the same Patient ID.
6. Select a study on the Study List to search within a series. Modality, Exam Date, Description, Series No., Image Count, and Status will appear on the Series List search result.
7. After searching for Series, select the Series you wish to retrieve. You may select or deselect up to 10 series by using the **Select All** checkbox. Click **Retrieve**. If 10 series are selected, no additional series can be selected.

Exam List

Q/R

Patient ID

Last Name

Accession Number

Exam Date

Manual

YYYY-MM-DD

YYYY-MM-DD

Modality

☒ MR

☐ CT

☐ Mammo

☐ US

☐ DR

☐ PET

Search

Hide

Selected : 0 (Choose Up to 3)

Total Studies : 0

Patient ID	Patient Name	Exam Date	Modality	Description	Accession Number	Series Count
------------	--------------	-----------	----------	-------------	------------------	--------------

Selected : 0 (Choose Up to 10)

Total Series : 0

Modality	Exam Date	Description	Series #	Image Count	Status
----------	-----------	-------------	----------	-------------	--------

Review

Continue

Exit

Retrieval

Retrieval Data Manager

Images: 0

[Figure 9.16 DICOM Q/R]

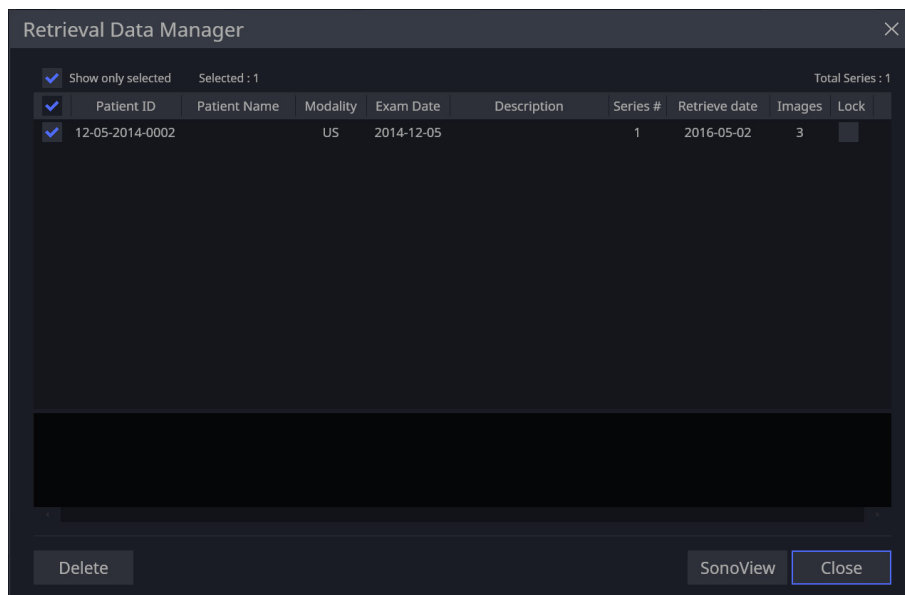
Retrieval Data Manager

1. Press **Retrieval Data Manager** to display the *Retrieved Data Manager* window.
2. In the *Retrieved Data Manager* window, select the series by using the checkbox.



NOTE: If you have not started the diagnosis, select the series in the *Data Manager* window by using the checkbox and press **Delete** to delete. Locked exams cannot be deleted by using the checkbox.

3. Press the **SonoView** button to view the selected exam image in the *SonoView* window.
4. This function can be used to compare data by pressing **Compare**.
5. Checking **Show Only Selected** will show the selected exams only.
6. Tap **Close** on the screen.



[Figure 9.17 Retrieval Data Manager]

