DC-6

Diagnostic Ultrasound System

Operation Manual

[Advanced Volume]

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Product Information

Product Name: Diagnostic Ultrasound System

Model: DC-6

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Preface

This manual details the procedures for operating the DC-6 Diagnostic Ultrasound System. Carefully read and understand the manual before using the equipment to ensure its safe and correct operation.

NOTE: In actual applications, the following manual is available:
(1) Operation Manual (Basic Volume)
(2) Acoustic output data

Depending on the software version, the preset settings, and optional configuration, the actual interfaces may appear different from those shown in this manual.

NOTE: The functions described in operation manuals of this system, are not provided for all models sold in all regions. What functions are available depends on specific system you purchased.

Safety Precautions

1. Meaning of Signal Words

In this operation manual, the signal words ⚠ **DANGER**, ⚠ **WARNING**, ⚠**CAUTION** and **NOTE** are used regarding safety and other important instructions. The signal words and their meanings are defined as follows. Please understand their meanings clearly before reading this manual.

Signal word	Meaning
⚠ **DANGER**	**Indicates an imminently hazardous situation that, if not avoided, will result in death or serious injury.**
⚠ **WARNING**	**Indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.**
⚠ **CAUTION**	**Indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.**
NOTE	Indicates a potentially hazardous situation that, if not avoided, may result in property damage.

2. Meaning of Safety Symbols

Symbol	Description
⚠	"Attention" indicates the points requiring attention. Be sure to read the operation manual concerning these points before using the equipment.

3. Safety Precautions

Please observe the following precautions to ensure patient and operator's safety when using this system.

⚠ **CAUTION:**

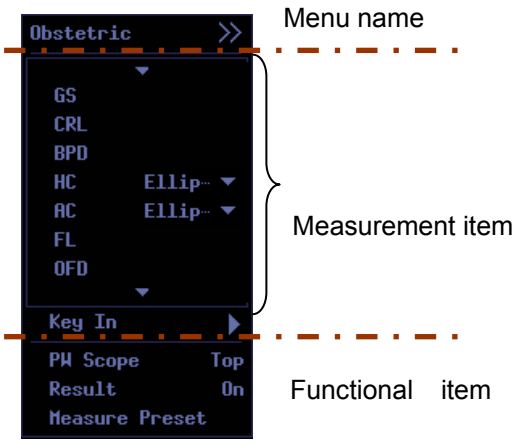
1. **Select the proper image and measurement tools. Only the professionals can decide the appropriate measurements and results.**
2. **You must perform measurements on an image. Once you perform a region outside of an image, you may have incorrect measurement and calculation results.**
3. **Before examining a new patient, press 『Patient』 to delete the patient information and data recorded in the memory for the previous patient. Otherwise, the new data may be confused with the data of the previous patient.**
4. **When the system is turned OFF or 『Patient』 key is pressed, all the measured data that have not been saved are lost.**
5. **Changing mode during measurement will clear up the general measurement data and the application measurement data on the screen.**
6. **Pressing 『FREEZE』 key to unfreeze the image during measurement will clear up the general measurement data, the application measurement data reserve.**
7. **Pressing 『Clear』 key will clear up the general measurement data, but the application measurement data on the screen is still keep on it.**
8. **Please attend to measurement data according with the correct fetal in obstetric measurement.**
9. **Please press 「Save」 button in the measurement report to save the current valid measurenment data.**
10. **To know the notes on the use of this system, refer to Operation Manual [Basic Volume].**

Contents

1 Measurement Overview

1.1 Measurement Menu

The measurement menu consists of three parts: menu name, measurement item, and functional item. The following takes obstetric measurement menu as an example.



Menu name: displays the name of the measurement menu. The submenu contained in the menu name can also be used to switch into other measurement menus.

Measurement item: activates measurements and calculations of the measurement items contained in the current measurement package.

- When a measurement item has a set of measurement indexes, move the cursor to the item and press the 『Set』 key to perform measurements one by one; or enter the submenu, then move the cursor to [Return] and press the 『Set』 key to return to the previous menu.
- When a measurement item has only one measurement index, move the cursor to the item and press the 『Set』 key to activate measurement and calculation of this item. The cursor displays at the center of the currently-applied image window.
- When there is more than one page of measurement items, move the cursor to "▼" or "▲"and press the 『Set』 key to display the next page.
- The Measurement item that cannot be activated in the current environment is grey and

cannot be used. To use it, you need to switch to the corresponding image mode to brighten it.

- In the applications measurement menu, "√" is displayed before the item, which has been measured and the result has been obtained.

Functional item: refer to the item triggered through the menu in the current situation.

- Spectrum range: the spectrum wave range for the auto trace method in the PW mode; it appears only when the auto trace method is available in the measurement items.
- Result window: used to show or hide the result window.
- Measurement preset: used to preset information relevant to measurements.

1.2 Menu Entry

Press the 

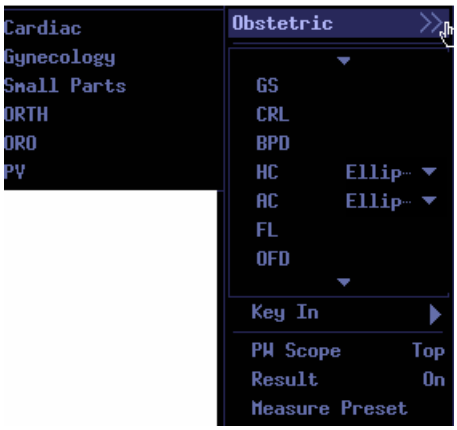
key to enter general measurement mode. The general measurement menu displays on the right side of the screen. You can switch to the general measurement menu in another mode by using the mode switch key.

Press the 

key to enter application measurement mode. The application measurement menu displays on the right side of the screen.

To switch between application measurements menus, move the cursor to the name of an application measurement menu (such as "Obstetric". There is "" on its right to indicate it has submenu) to pop up the options for other application measurement menus. Then move the cursor to any item of the submenu and press the 『Set』 key to switch to another measurement menu.

The following figure shows how to switch from "Obstetric" to other measurement menu.



1.3 Result Window

You can choose whether to display the measurement results through [Result] item in the measurement menu.

When “On” is selected, the result window displays the latest measurement results in time order. If there are too many results for the result window to contain, the old results will not be displayed.

1.3.1 Display of the result

- You can preset the result style window in the “Measurement Parameters” Preset dialog box. For details, refer to section “2.1 Preset Measurement Parameters”.
- The result window style can be switched over any time during the measurement.
  When some measurements are done and the result window (which should be “On”) displays the results, move the cursor to the upper right corner of result window and switch buttons (as shown below):

Different switch buttons are displayed for different display forms.

If you click H, the result window displays horizontally.

If you click V, the result window displays vertically.

If you click , you can view all results acquired in the current ultrasound exam.

If you click , the result window is restored.

1.4 Measurement Preset

You can enter the “Measure Preset” dialog box by clicking [Measure Preset] in the measurement menu or preset menu to preset the measurement items.

You can preset the following:

- Items set of general measurement package

- Items set of application measurement package
- Measurement menu
- Measurement report
- Obstetric formulas

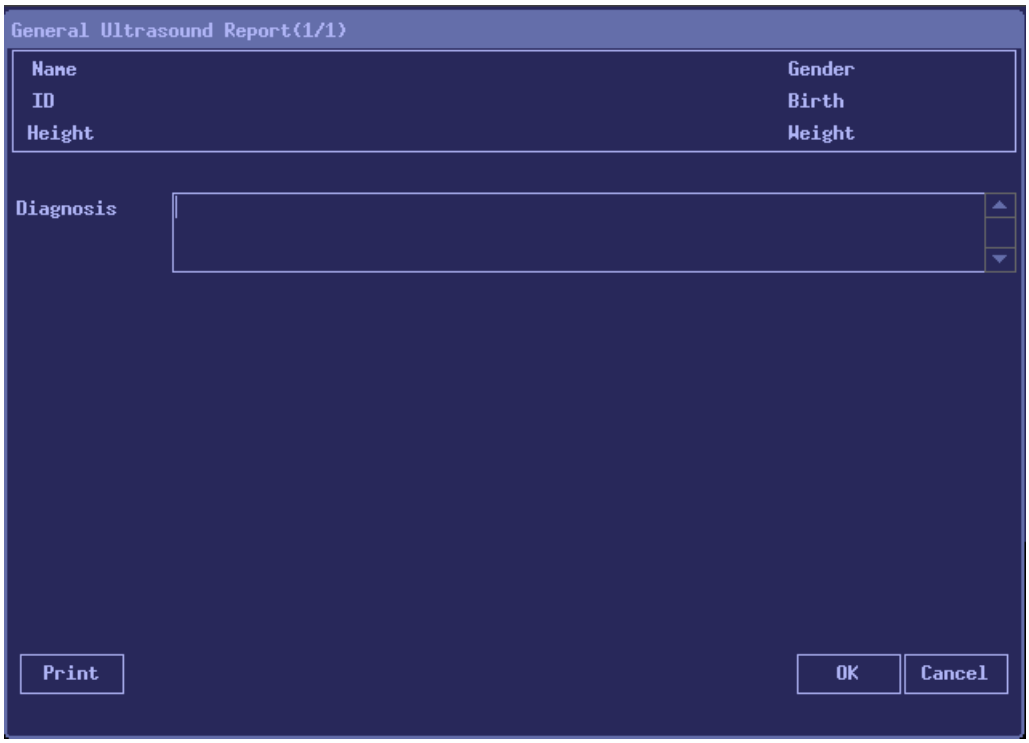
For details, refer to section “Measure Preset”.

All the menus and screens in this manual take the system in full configuration as an example.

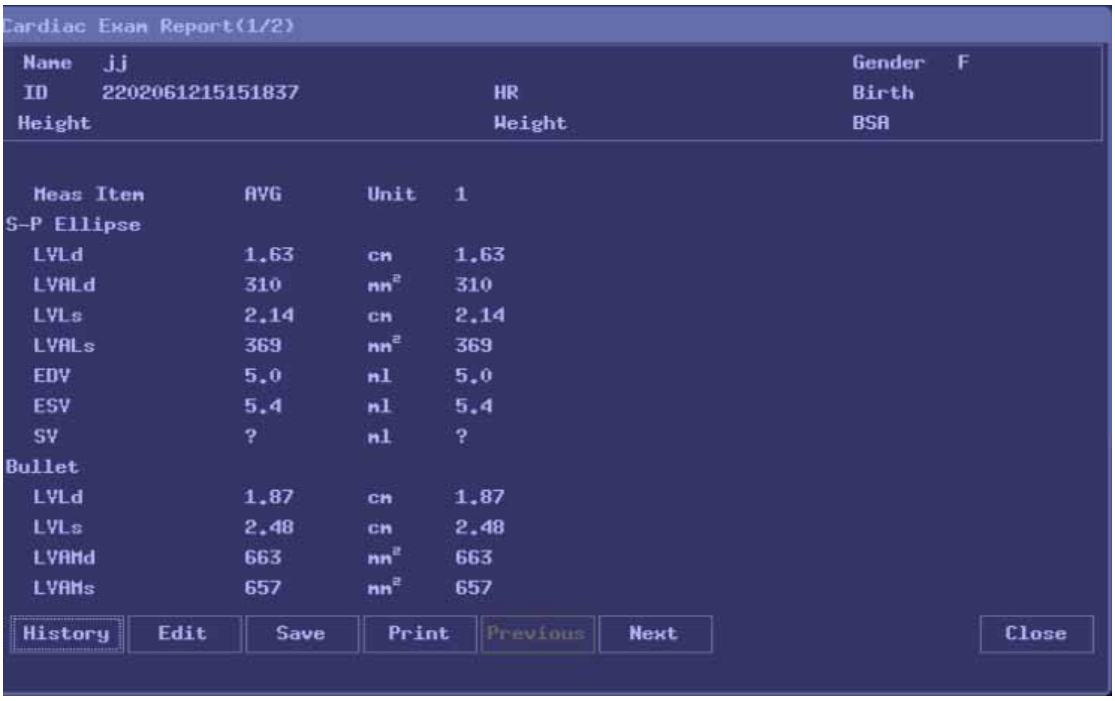
1.5 Measurement Report

Measurement reports are used to record measurement results. Each measurement pack generates an independent measurement report, which includes patient basic information, measurement and calculations results, and diagnostic results. You can edit, save, and print the report. You can also view history data. The obstetric exam report has [Growth] available.

For the general measurement report, it has no measurement results. Only patient basic information and editing boxes are available. You can add diagnosis information and click [Print] to print the report.



For the application measurement report, you can set the items to be displayed in the measurement report through the “Measure Preset” dialog box. For details, refer to section “Measure Preset”.

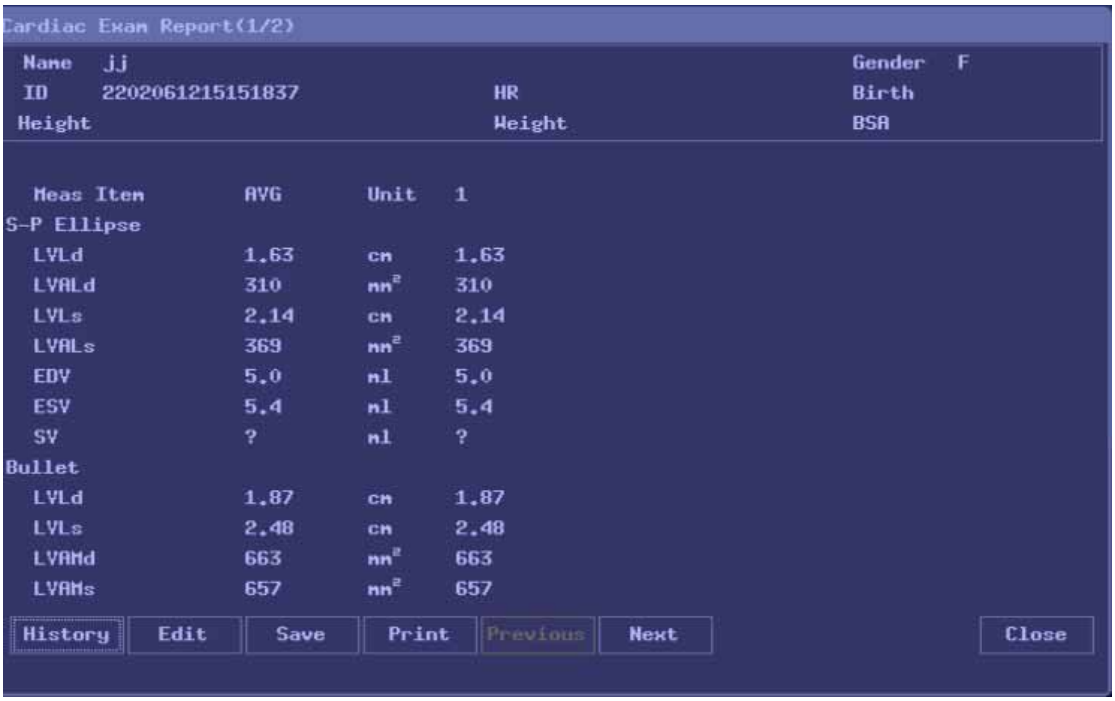


The following takes “Cardiac Exam Report” as an example to describe the functions of the measurement report.

1.5.1 View the report

In the cardiac measurement mode, you can press the 

key on the control panel to view the cardiac exam report.



1. If there are too many measurement items, the results are displayed page by page. Click [Previous] or [Next] to view other pages.

2. If the measurement value exceeds the threshold value, “?” is displayed.
3. If a calculation item has no corresponding application measurement item, the calculation item is not displayed.
4. For measurement or calculation values, the current measurement value or calculation value (maximum three) and mean measurement value are displayed.
5. To exit cardiac exam report, click [Close].

1.5.2 Edit the Report

On the “Cardiac Exam Report” screen, you can click [Edit] to enter the dialog box to edit the measurement results and ultrasound diagnoses.

1. You can edit the values of measurement item supported by the system and cannot edit the values of the calculation items.
2. When you have edited the value of a measurement item, the mean value of the measurement item and the value of correlative calculation item are automatically updated with the measurement value.
3. The editing dialog box displays all cardiac measurement items and calculations items, no matter whether the item is measured or not.
4. To edit a measurement value, move the cursor to the textbox to be edited and press the 『Set』 key to start editing.
5. When measurement values are displayed in multiple pages, click [Previous] or [Next] to view other pages.

6. To clear all measurement data (except patient basic information) in the report, click [Clear].
7. If the measurement value exceeds the threshold value, “?” is displayed.
8. On the last page, you can input the diagnostic results or edit the diagnostic results in [Diagnosis].
9. You can click [OK] to confirm your editing and exit the editing status, returning to view the report. To cancel your editing, click [Cancel] to exit the editing status and return to view the report.

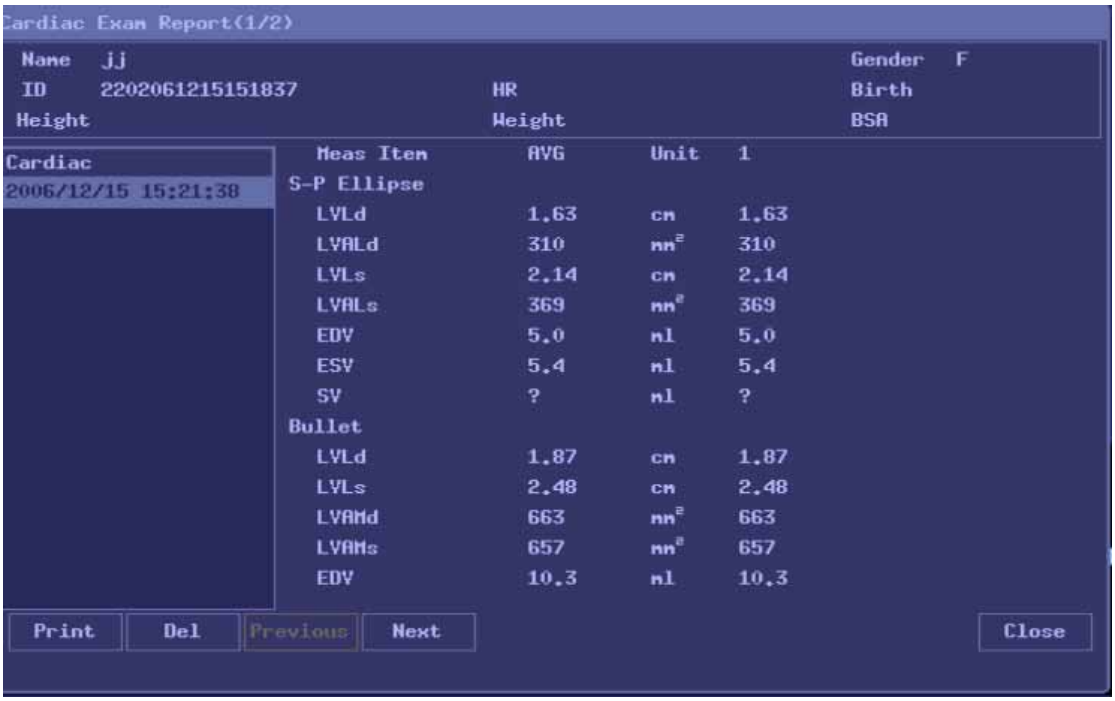
Note: Input appropriate data when you edit the values of measurement item, otherwise it may result in misdiagnose.

1.5.3 Save the Report

On the “Cardiac Exam Report” screen, you can click [Save] to save the current patient cardiac measurement results. However, you can save the report only when patient ID is available.

1.5.4 View History Reports

On the “Cardiac Exam Report” screen, you can click [History] to view the history measurement results of the current patient.



1. The history report window displays the patient cardiac measurement results already

saved.

2. To view other pages, click [Previous] or [Next].
3. The “Cardiac” list on the left side of the screen displays the measurement reports historically saved. You can move the cursor to view the desired report.
4. To delete the history report being viewed currently, click [Del].
5. To print the history report being viewed currently, click [Print].
6. To exit history report view, click [Close].

1.5.5 Print the Report

You can click [Print] to print the current or history cardiac exam report.

1.5.6 Others

You can click 

on the “Obstetric Exam Report” screen to pop up the “Obstetric Growth Curve” dialog box.

For details, refer to section “Obstetric Measurements”.

2 Measurement Preset

You can preset the measurement items based on your requirements, including

- Presetting measurement parameters;
- Adding/deleting a measurement package;
- Adding/deleting an item into/from a measurement package;
- Presetting how to display the menus;
- Presetting how to group the reports;
- Presetting obstetric formulas.

2.1 Preset Measurement Parameters

Enter “measurement parameters” preset: open [Preset] menu, move the cursor to “System Preset”, and then press the 『Set』 key, First enter the “System Preset” dialog box and move the cursor to “Meas Param” button. Then press the 『Set』 key to open the “Meas Param” tab sheet, as shown below:

You can preset the following parameters in the “Meas Param” tab sheet:

- General

You can preset “Caliper Name”, “Mark Size”, “Result Style”, and “Graph Result” by clicking “▼” to pop up the pull-down lists.

- Calculate

You can preset “Heart Beat”, “BSA”, “Auto Average”, and “SD Display” by clicking “▼” to pop up the pull-down lists.

- Report

You can preset “Report Style”, “Trend Format”, “Report Print”, and “Image Print” by clicking “▼”to pop up the pull-down lists.

- Unit

You can preset “Distance”, “Area”, “Volume”, “Time”, “V/Slope”, and “Accel” by clicking “▼” to pop up the pull-down lists.

- Volume

You can preset the formulas for calculating “Uterine”, “Ovary”, “Thyroid”, “Prostate”, “Renal”, “Residual”, and “Testicula”. The system provides default values. You can change the parameters in the formulas. To modify the parameter, move the cursor to the box after volume parameter, such as “  ”, and then press the 『Set』 key.

After presetting the parameters in the “Meas Param” tab sheet, click [OK] to confirm the parameters preset and close the dialog box. To cancel the presetting, click [Cancel].

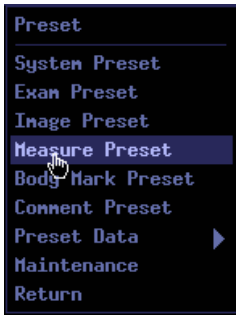
Users can also click the  button to restore the factory setups

2.2 Preset Measurement Packs

2.2.1 Enter Measurement Preset

Two methods are available to enter “Measure Preset”.

- Open [Preset] Menu, move the cursor to “Measure Preset”, and then press the 『Set』 key, as shown below:



- Open any general measurement menu or application measurement menu. Move the cursor to “Measure Preset” and the press the 『Set』 key, as shown below:

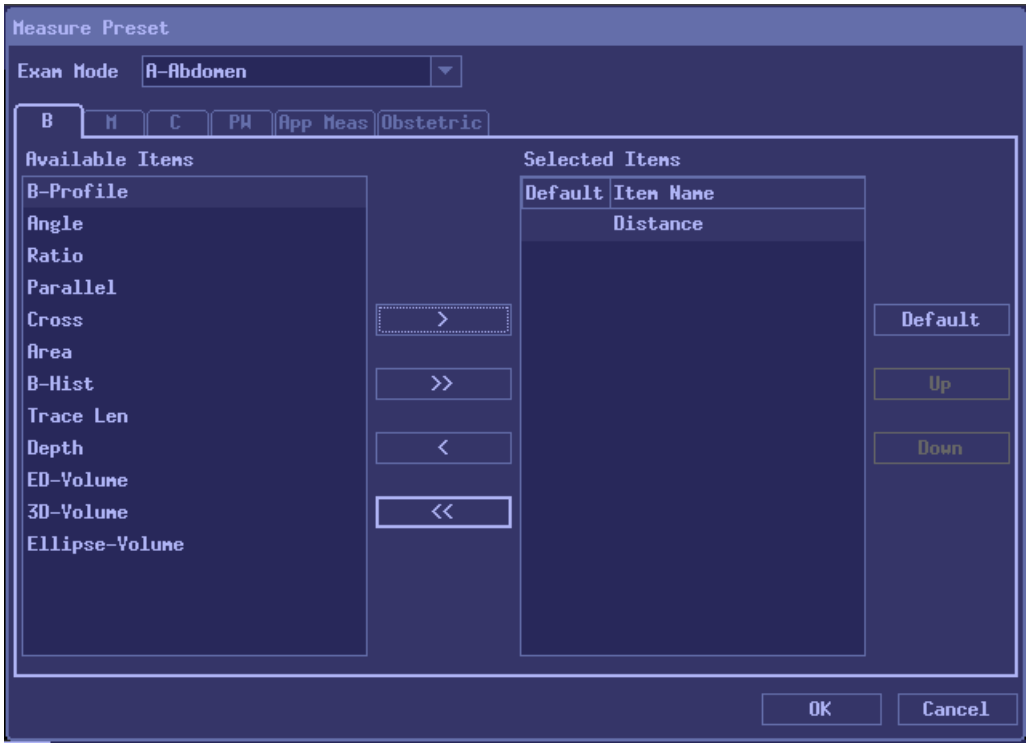
2.2.2 Preset General Measurement

You can preset a general measurement package for each image mode. On the “Measure Preset” screen, choose [B], [M], [C], or [PW] to switch to the corresponding tab sheet to preset the general measurement packages in different modes.

The general measurement packages in different modes are preset in the same way. The following takes presetting of general measurement package in B mode as an example.

To preset the general measurement package in B mode, do as follows:

1. Open the “Measure Preset” dialog box. Move the cursor to [B] and then press the 『Set』 key to enter the B mode general measurement preset tab sheet, as shown below:



2. The “Available Items” on the left side displays B mode general measurement items that the system is configured with. Yet they are not added to the B mode general measurement menu. You can choose the items you need from the available items and add them to the menu. The “Selected Items” on the right side displays the items that have been added to the menu. You can set default, delete or prioritize these selected items.
3. Select the target item.

   Except adding/deleting all items, other operations can only be performed when the target item is selected. To select the target item, move the cursor to the target item and then press the 『Set』 key to highlight the selected item.
4. Function of all operation buttons:

   [>]: Add the item selected from the “Available Items” into the “Selected Items”. This operation cannot be performed when this button becomes grey.

   [>>]: Add all items in the “Available Items” into the “Selected Items”. You do not need to select items.

   [<]: Delete the item selected from the “Selected Items” to the “Available Items”. This operation cannot be performed when this button becomes grey.

   [<<]: Delete all items in the “Selected Items” to the “Available Items”. You do not need to select items.

   [Default]: Set the item selected from the “Selected Items” to the default item in the B

mode general measurement menu. This operation cannot be performed when this button becomes grey; the default item be set is marked with "✔" before it.

Up: Move the item selected from the "Selected Items" up. This operation cannot be performed when this button becomes grey.

Down: Move the item selected from the "Selected Items" down. This operation cannot be performed when this button becomes grey.

5. After settings, move the cursor to [OK] and press the 『Set』 key to close the dialog box. All items in the "Selected Items" are displayed in the B mode general measurement menu. To cancel your settings, move the cursor to [OK] and press the 『Set』 key to close the dialog box.

2.2.3 Preset Application Measurement

Application measurements are related to application regions. Namely, different application measurements are appropriate for different application regions. This system configures different application regions with different measurement packages. The regions are: obstetric, cardiac, gynecology, small parts, urology, orthopedics, and peripheral vascular.

To enter application measurement preset, open the "Measure Preset" dialog box. Move the cursor to [App Meas] and then press the 『Set』 key to enter the application measurement preset tab sheet, as shown below:

To select exam mode, select through the pull-down list “Exam Mode A-Abdomen” in the upper left corner of the screen.

When necessary, you can select an item to set if there is any in the “Available items”. The functions of the buttons on the screen are same to those in section “Preset General Measurement Packages”.

Functions of other buttons:

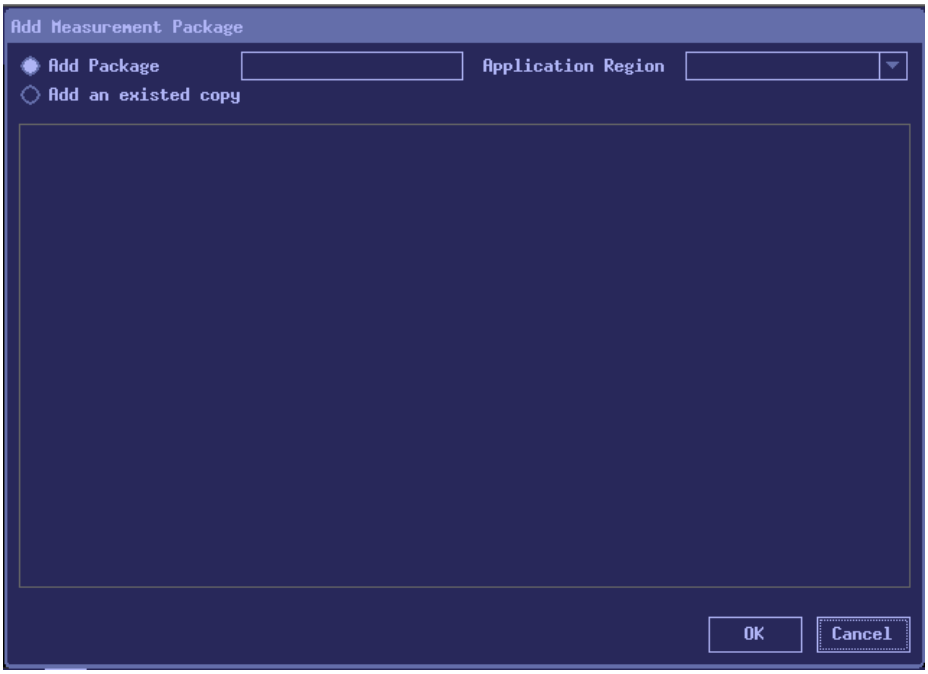
Add: Enter the screen to add new application measurement packages.

Delete: Delete the item already selected from the “Available items”. This operation cannot be performed when this button becomes grey.

Edit: Edit the item already selected from the “Available items”. This operation cannot be performed when this button becomes grey.

2.2.3.1 Add Application Measurement

To add an application measurement package, click [Add] to enter the “Add Measurement Package” screen, as shown below:



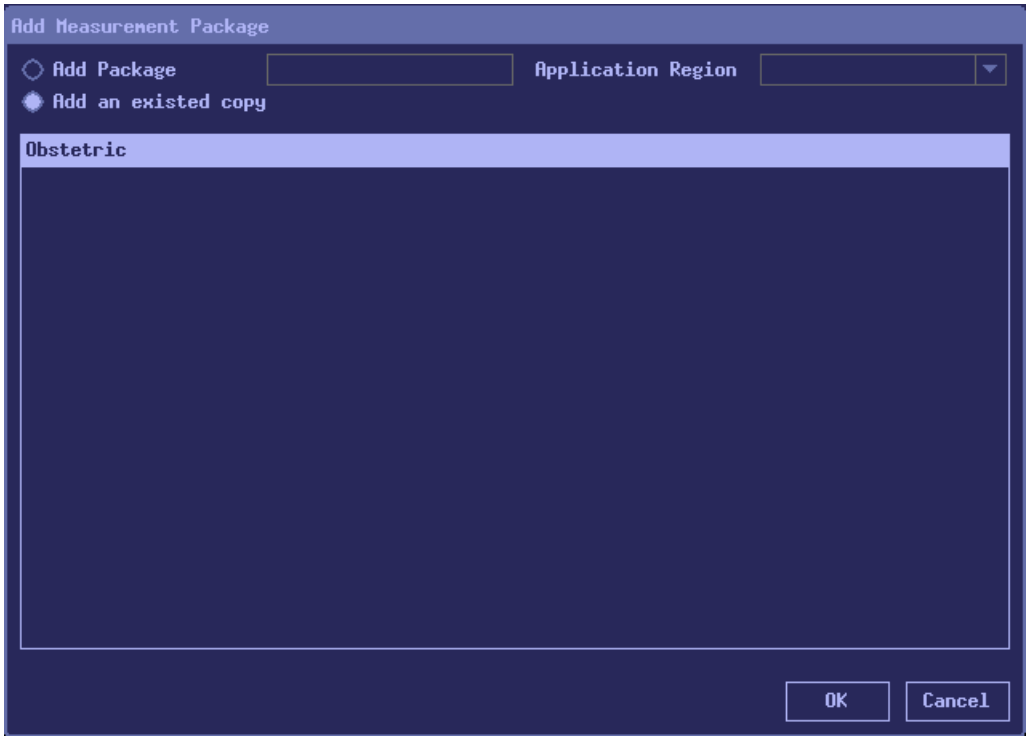
There are two ways to add application measurement:

- To create a package: click “Add Package” and move the cursor to the box after it. Press the 『Set』 key to enter the name of the package. Then select the corresponding

application region from the “Application Region” pull-down list. After setting, click [OK].

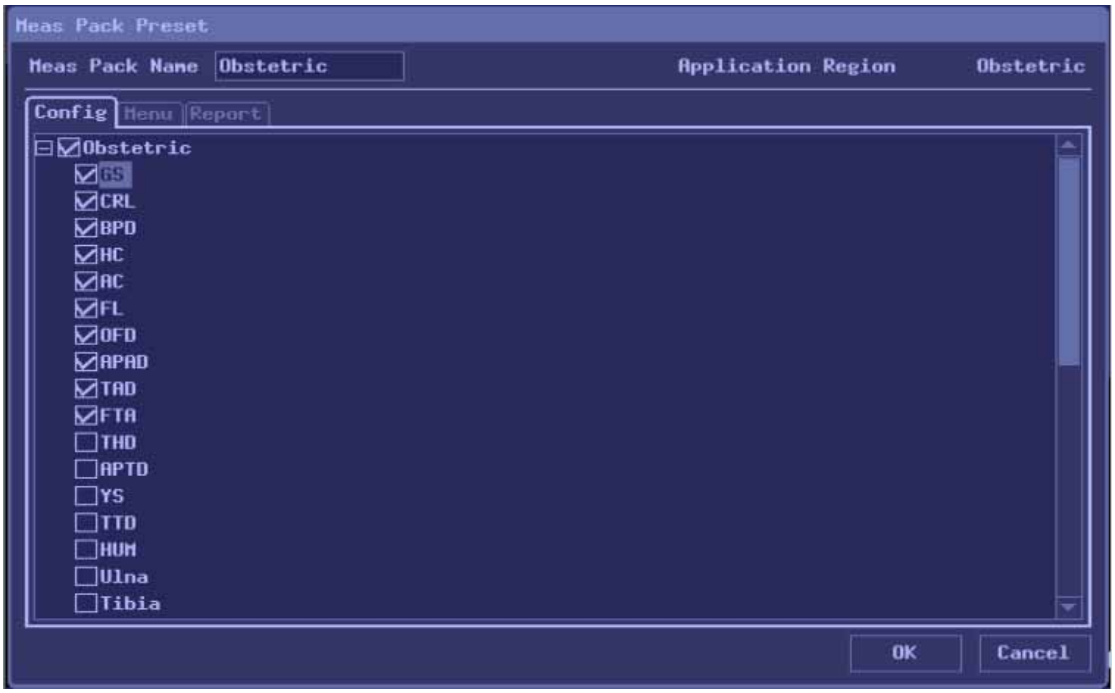
- To create a copy of existed measurement package as the new package: when a measurement package is already set in the system, you can copy the package and re-set it to produce a new package.

Select the measurement package to be copied from “Add an existed copy”. The package will be highlighted. Click [OK] to set the package. The follow-up operations are same to those in the case of create a package.



2.2.3.2 Configure Measurement Items

To configure the current measurement package with measurement items, open the “Config” tab sheet (as shown below), move the cursor onto “☐” before the item to select and press the『Set』key; “☑” indicates that the item is selected and configured to the current measurement package.



2.2.3.3 Preset Menus

To set the items to be displayed in the menu of the current measurement package, open the “Menu” tab sheet. The items added in the “Config” tab sheet are all displayed in the available items in the left list; the right list displays the items of the menu, and all items configured are displayed by default.

Select an item in the right list, and click the “ < ” button to delete this item from the menu;

Select an item in the left list, and click the “ > ” button to add this item to the right list, and this item will be displayed in the menu.

To delete or add all items, use the << or >> button.

After the setups are completed, click the “ OK ” button; To cancel the operation, click the “ Cancel ” button.

After an item is selected in the right list, perform the following operations:

（1）Click the Up or Down button to set the position where the item is located in the menu.

（2）Click Default to set this item to the default measurement item.

（3） For the items marked with ⊞, it indicates this item has a subitem. After the item is selected, click "Extend Menu" to change it to "☑ Extend Menu"; the subitem will be displayed in the submenu.

（4）Select the default measure caliper in the "Caliper Name" column.

After the setups are completed, click the "OK" button; To cancel the operation, click the "Cancel" button.

2.2.3.4 Preset Reports

To set the items to be displayed in the report, open "Report" tab sheet, and all items added in the "Config" tab sheet are displayed in the available items in the left list; the right list displays the items displayed in the report; by default, all items configured are displayed.

The operating method for the buttons on the screen is the same as that for the "Menu Setup" buttons.

After the setups are completed, click "OK"; to cancel the operation, click

“Cancel”.

2.2.4 Preset Obstetric Formulas

Obstetric measurement supports preset of the GA calculation formulas based on some measurement items. You can select the formula provided by the system or customize the GA calculation formula.

The following table lists the formulas provided by the system.

Obstetric measurement formulas

Item	Formula
GS	China (GA) Tokyo (FG+GA) Hellman (FG) Rempen (FG+GA) Hansmann (FG+GA)
CRL	China (GA) Tokyo (FG+GA) Jeanty (GA) Hadlock (FG+GA) Nelson (GA) Robinson (FG+GA) Rempen (FG+GA) Hansmann (FG+GA)

BPD	China (GA) Tokyo (FG+GA) Hadlock (FG+GA) Jeanty (GA) Merz (FG+GA) Kurtz (FG) Sabbagha (FG) Hansmann (FG+GA) Rempen (FG+GA) Osaka (FG+GA) ChittyOI（FG＋GA）
OFD	Merz (FG) Hansmann (FG+GA)
HC	Hadlock (FG+GA) Jeanty (GA) Merz (FG) Hansmann (FG+GA) ChittyPL（FG＋GA）
APAD	Merz (FG)
TAD	Merz (FG)
AC	Hadlock (FG+GA) Jeanty (FG) Merz (FG) ChittyPL（FG）
FTA	Osaka (FG+GA)
FL	China (GA) Tokyo (FG+GA) Hadlock (FG+GA) Jeanty (GA) Hohler (GA) Merz (FG+GA) Hansmann (FG+GA) O”Brien (FG) Warda (FG+GA) Osaka (FG+GA) Chitty（FG＋GA）
THD	Hansmann (FG+GA)
HUM	Jeanty (GA) Merz (FG)
Ulna	Merz (FG)
Tibia	Merz (FG)
RAD	Merz (FG)
FIB	Merz (FG)
CLAV	Yarkoni (FG+GA)
CER	Goldstein (FG) Hill (FG+GA)
OOD	Jeanty (GA)

NT	No data
LV	No data
TTD	No data
YS	No data
APTD	No data

Note:

FG and GA are used in these formulas. In formula preset, three situations are presented for each item. Some formulae are included in both FG and GA tables but others are exclusive for GA or FG table. Please select reasonable formula according to below information:

(1) In the process of obstetric measurement, if the user does not enter LMP or Exp.Ovular, GA table will be required for calculating GA. If the preset formula does not have corresponding GA table, the system will not display GA. If the user has entered LMP or Exp.Ovular, FG table will then be required for calculating GA. If the preset formula does not have corresponding FG table, the system will not display GA. After the user has entered LMP or EXP.OVULAR, the system will calculate GA based on FG table for all obstetric measured items. And at the same time the result window and report will be refreshed.

(2) Data of growth curve are all sourced from FG table. The user could select the formula in the pull-down list. The system will accordingly display the growth curve corresponding to the formula. The initial curve being displayed is decided by the preset formula. If the formula does not have corresponding FG table, fetal growth curve will not be displayed.

The following table lists the EFW formulas provided by the system.

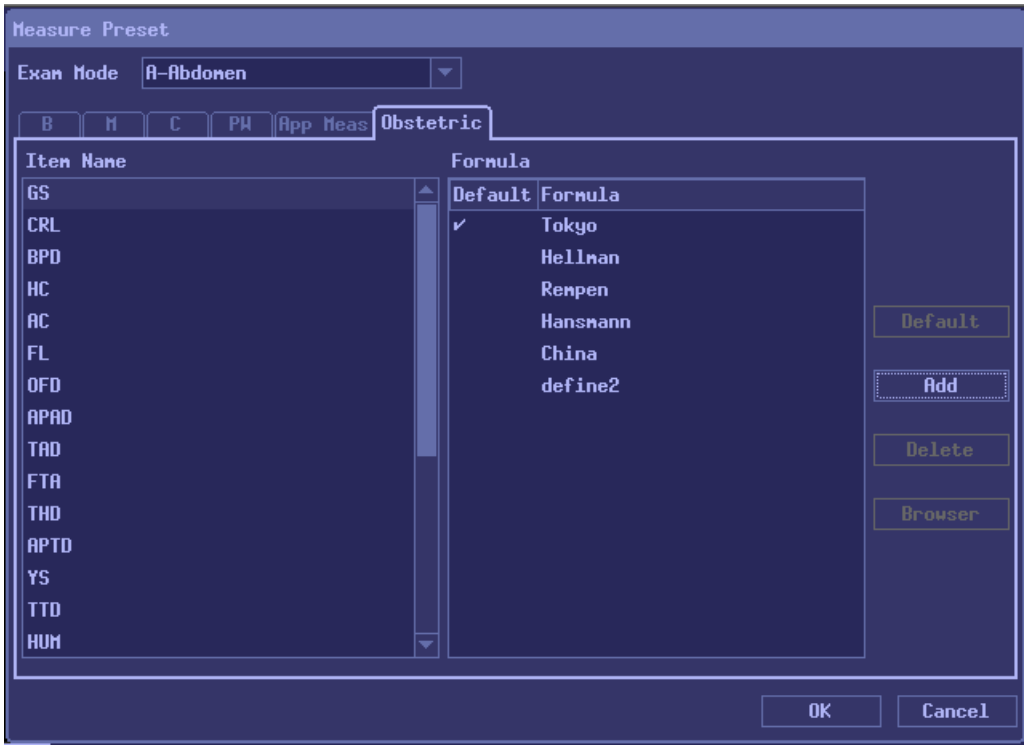
EFW formulas

Formula	Description	Unit	Unit of measurement items
Hadlock1	EFW=10^(1.304+(0.05281*AC)+(0.1938*FL)-(0.004*AC*FL))	g	cm
Hadlock2	EFW=10^(1.335-(0.0034*AC*FL)+(0.0316*BPD)+(0.0457*AC)+(0.1623*FL))	g	cm
Hadlock3	EFW=10^(1.326-(0.00326*AC*FL)+(0.0107*HC)+(0.0438*AC)+(0.158*FL))	g	cm
Hadlock4	EFW=10^(1.3596-(0.00386*AC*FL)+(0.0064*HC+(0.00061*BPD*AC)+ (0.0424*AC)+(0.174*FL))	g	cm
Shepard	EFW (Kg) =10^(-1.7492+(0.166*BPD)+(0.046*AC)-(2.646*AC*BPD/1000))	kg	cm
Merz1	EFW=-3200.40479+(157.07186*AC)+(15.90391*(BPD^2))	g	cm
Merz2	EFW=0.1*(AC^3)	g	cm
Hansmann	EFW=(-1.05775*BPD)+(0.0930707*(BPD^2)+(0.649145*THD)-(0.020562*(THD^2)+0.515263	kg	cm

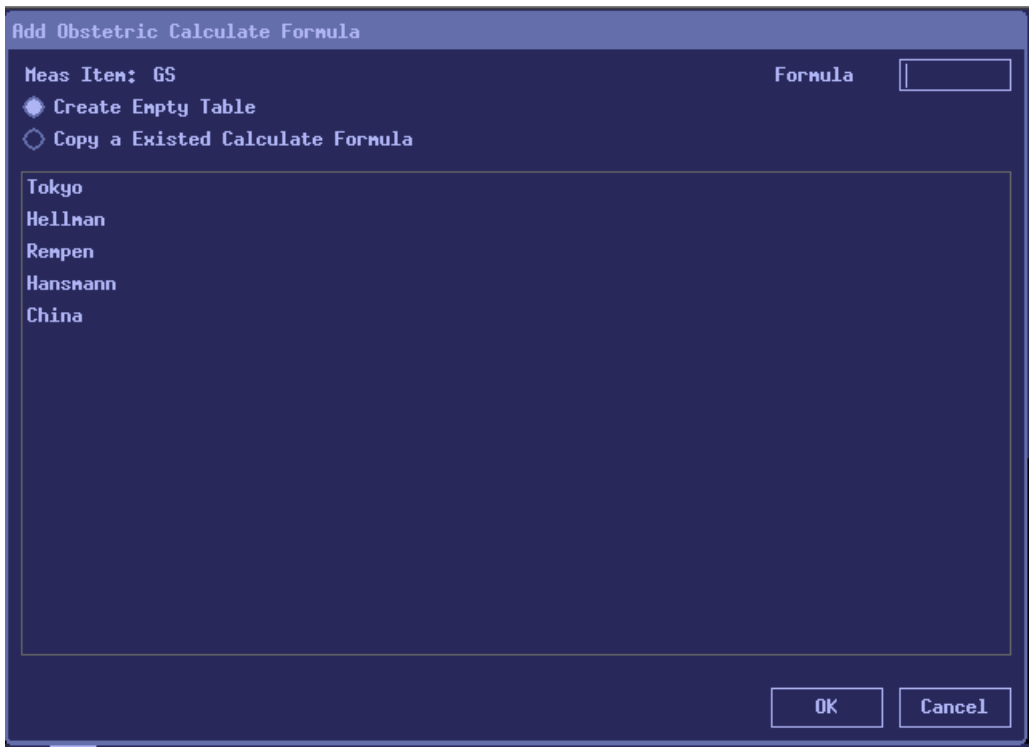
Tokyo	EFW=(1.07*(BPD^3))+(3.42*APTD*TTD*FL)	g	cm
Osaka	EFW=(1.25674*(BPD^3))+(3.50665*FTA*FL)+6.3	g	cm
Campbell	EFW (Kg)=EXP (-4.564+(0.282*AC)-(0.00331*(AC^2)))	kg	cm

Open the “Obstetric” tab sheet and you can perform the following operations:

- **Set default formula:** The names of the formulas for the measurement items highlighted in the “Item Name” are displayed in the “Formula”. The formula with “✔” before it is the default. To change the default formula, first select the formula to be set to the default and the formula will be highlighted. Then click “Default” and the formula just selected is set to the default with “✔” before it，click “Default” again to cancel the setting.

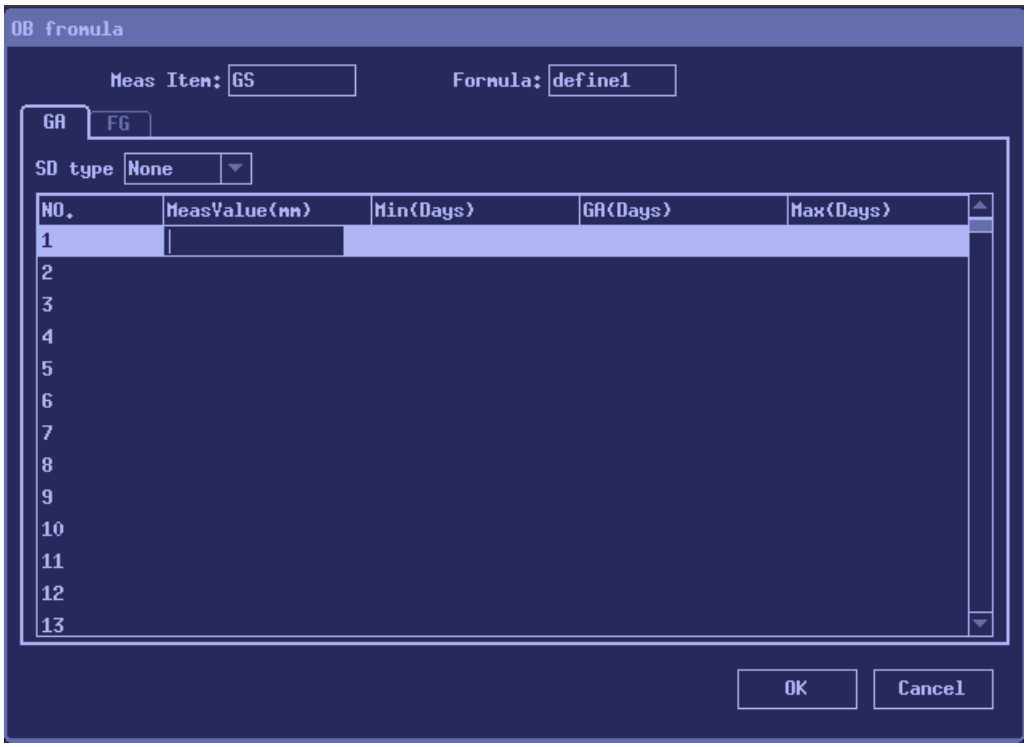


- **Add a new formula:** To add a new obstetric formula, select the item that will have new formula from the “Available Items” and then click “Add” to enter the “Add Obstetric Calculate Formula” dialog box, as shown below:



There are two methods to add a new formula:

(1) To create empty table: click the "Create Empty Table" and enter the name of the formula in the box after "Formula". Click [OK] to enter new formula table. Set "SD Type" and enter data in the table. Then move the cursor to where new data will be added. Press the 『Set』 key to pop up an editable box. Then enter the corresponding data. After that, click [OK].



(2) To create a copy of existed formula as the new formula: copy an existed formula and modify it to produce a new formula. First click "Copy a Existed Calculate Formula" and a formula (such as Tokyo formula for GS). Enter the formula name in the box after "Formula" and click [OK] to enter a table with data already. The data in the table can be modified. Set "SD Type" in the table. Move the cursor to where data will be modified. Press the 『Set』 key to pop up an editable box. After data modification, move the cursor to other places to continue modification. After that, click [OK].

- **Edit a formula:** You can edit the new formula you have added already. Select the formula to be edited from the "Selected Items" and then click "Edit" to enter editing state.

- **Brower a formula:** You cannot edit the formulas provided by the system. You can just browse them.

3 General Measurements

There are four types of general measurement menus available:

- B mode
- M mode
- PW mode
- Color mode

Among them, Color mode and B mode general measurement menus are basically the same. Therefore, the measurement items same to those in B mode measurement will be omitted in the description of Color mode measurement.

Press the 『Caliper』 key to enter general measurement and 『Menu』 key to display the general measurement menu corresponding to the image mode. Use the trackball to move the cursor to an item in the general measurement menu and press the 『Set』 key to start measurement. The measurement result is then displayed in the result window beneath the menu. During the measurement, you can press the 『Back』 key to repeat the operation steps in reverse order.

By default, the following measurements are performed when the image is in frozen state.

3.1 B Mode General Measurements

The figure above shows B mode general measurement menu. Click "▼" to open the folded menu. The following details the measurement items.

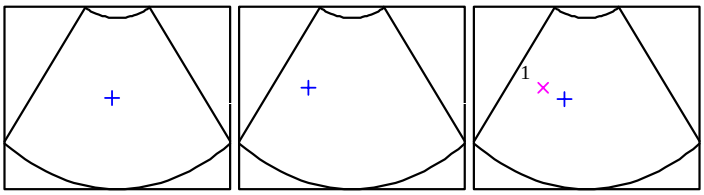
3.1.1 Depth

Function: measures the distance from the sector center of the image to a certain point in the case of fan-shaped scanning probe (such as phased array probe) and that from the probe surface of the image to a certain point in the direction of the ultrasonic wave in the case of convex array or linear array probes.

Steps:

1. Move the cursor to [Depth] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. Use the trackball to move the cursor to the measurement point.
3. Press the 『Set』 key and the fixed mark “X” displays at the point.
4. The measurement result is displayed in the result window. The measurement ends. The cursor continues to display “+”. Repeat steps 2 and 3 to start a new depth measurement.

The measurement steps are shown in the following figures:



3.1.2 Distance

Function: measures the distance between two points on the image.

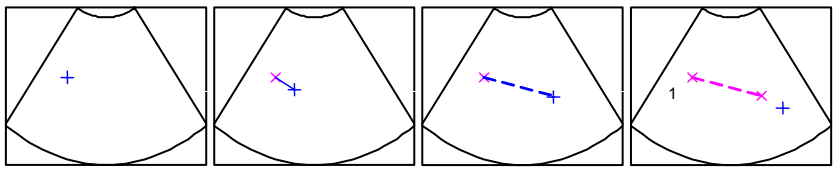
Steps:

1. Move the cursor to [Distance] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. Use the trackball to move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark “X” displays at the starting point.
3. Use the trackball to move the cursor. The “+” shaped cursor and the “X” marked starting point are always connected by a dash line. The result window displays the real-time measurement value. Press the 『Change』 key to switch between the fixed end and active end in the measurement, or press the 『Back』 key to cancel the previous operation.
4. Use the trackball to move the “+” cursor to the measurement end point. Press the 『Set』 key and the fixed mark “X” displays at the end point. The measurement result is finally

determined. The measurement ends.

5. Repeat steps 2-4 to start a new distance measurement.

The measurement steps are shown in the following figures:



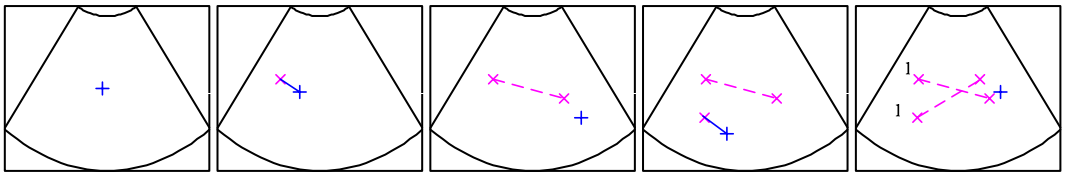
3.1.3 Angle

Function: measures the angle formed by two crossing planes on the image; range: 0°--180°.

Steps:

1. Move the cursor to [Angle] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. Use the method for distance measurement to fix the starting points of line segments a and b. Press the 『Change』 key to switch between the fixed end and active end in the measurement, or press the 『Back』 key to cancel the previous operation.
3. When the two line segments are fixed, the result window displays their lengths and angle they form. The measurement ends.
4. Repeat steps 2 and 3 to start a new angle measurement.

The measurement steps are shown in the following figures:



3.1.4 Area

Function: measures the area and circumference of a closed region on the image. Four measurement methods are available: Ellipse, Trace, Cross, and Spline.

■ Ellipse

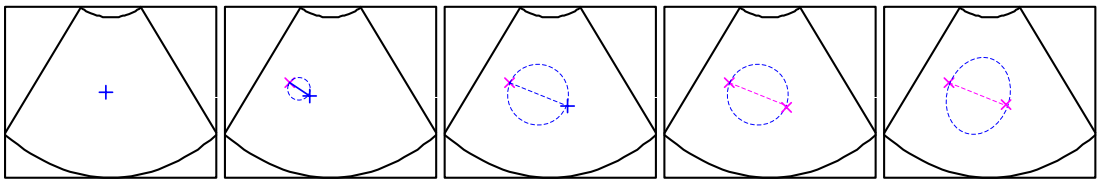
Steps:

1. Move the cursor to the right side of [Area] in the B mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Ellipse]. Press the 『Set』 key and the “+” shaped cursor appears.
2. Move the cursor to a certain point in the measurement region. Press the 『Set』 key to

determine the starting point of the fixed axis of the ellipse. This point is marked by "X".

3. Move the cursor to determine the end point of the fixed axis of the ellipse and then press the 『Set』 key. Press the 『Change』 key to switch between the fixed end and active end.
4. Move the cursor. The shape of the ellipse changes with the movement of the cursor. The base point is the fixed axis of the ellipse. Move the cursor to let the ellipse tally with the measurement region as much as possible. Use the trackball left to decrease the changeable axis and right to increase the changeable axis. Press the 『Set』 key to determine the ellipse region to be measured. The measurement ends. The result window displays measurement results of the ellipse circumference and area.
5. Press the 『Set』 key to start a new area measurement by way of Ellipse.

The measurement steps are shown in the following figures:

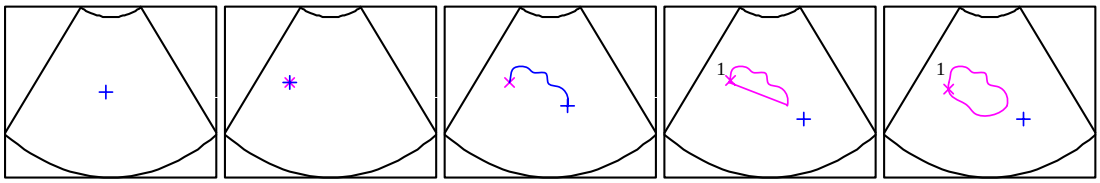


■ Trace

Steps:

1. Move the cursor to the right side of [Area] in the B mode "General Measure" menu. Move the cursor to "▼" and press the 『Set』 key to select [Trace]. Press the 『Set』 key and the "+" shaped cursor appears.
2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark "✕" displays at the starting point.
3. Use the trackball to move the cursor along the edge of the target region to be measured to draw out the trace line. To correct the trace line, rotate the functional knob anticlockwise to cancel some points and clockwise to restore some points.
4. When a straight line connects the start point and the end point, or when the cursor is very near to the start point of the trace line, the trace line automatically forms into a loop. The measurement ends. The result window displays the circumference and area of the region measured.
5. Repeat steps 2-4 to start a new area measurement by way of Trace.

The measurement steps are shown in the following figures:

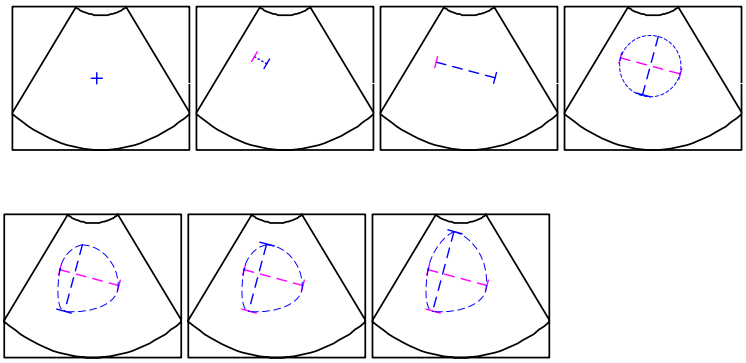


■ Cross

Steps:

1. Move the cursor to the right side of [Area] in the B mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Cross]. Press the 『Set』 key and the “+” shaped cursor appears.
2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark “|” displays at the starting point.
3. Use the trackball to determine the end point of the first axis and then press the 『Set』 key. Another dashed axis and dashed close region appears. They can be moved. The second axis is perpendicular to the fixed axis. Press the 『Change』 key to switch between the fixed axis and the active axis.
4. Use the trackball to an end of the second axis and then press the 『Set』 key to fix the axis.
5. Use the trackball to determine the end point of the second axis and then press the 『Set』 key to determine the length of the second axis. The measurement ends. The result window displays the circumference and area of the measurement region determined by the two cross lines.
6. Repeat steps 2—5 to start a new area measurement by way of Cross.

The measurement steps are shown in the following figures:



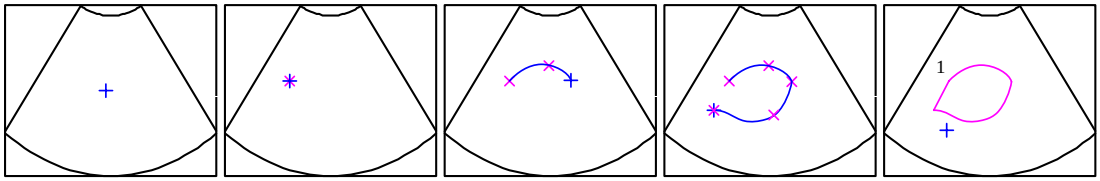
■ Spline

Steps:

1. Move the cursor to the right side of [Area] in the B mode “General Measure” menu.

Move the cursor to "▼" and press the 『Set』 key to select [Spline]. Press the 『Set』 key and the "+" shaped cursor appears.

2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark "×" displays at the starting point.
3. Move the trackball along the target region. Press the 『Set』 key to determine the second point. A closed region whose shape is to be determined appears on the screen.
4. Move the trackball along the target region further to determine the third, fourth … points. To correct a previous point, press the 『Back』 key. A maximum of 12 points can be determined to let the shape of the closed region tally with the target region as much as possible.
5. Press the 『Set』 key to determine the final point and then press this key again. The measurement ends. The result window displays the circumference and area of the measurement region.
6. Repeat steps 2-5 to start a new area measurement by way of Spline.



3.1.5 Volume

Function: measures the volume of the target object. Three measurement methods are available:

- Ellipse-Volume: measures the vertical section of the target object. The formula is V = (π/6) x A x B^2, in which, A is the long axis of the ellipse and B the short axis.
- ED-Volume: measures both the vertical and horizontal sections of the target object. The formula is V = (π/6) x A x B x M, in which, A and B are defined the same as in the Ellipse method and M is the length of the third axis.
- 3D-Volume: measures the lengths of the three axes of the target object. The formula is V = (π/6) x D1x D2 x D3.

The steps of Ellipse-Volume measurement method are similar to those of Ellipse for area measurement. Refer to Ellipse in section "Area".

■ ED-Volume

Steps:

1. Move the cursor to [ED-Volume] in the B mode "General Measure" menu. Press the

『Set』 key.

2. Use the Ellipse method to measure the area of the vertical section.
3. Unfreeze the image. Rescan section perpendicular to the previous image and then freeze the image again. Use the method for distance measurement to measure the length of the third axis. The measurement ends. The volume is calculated automatically. The result window displays the area of the ellipse section, the length of the third axis, and the volume.
4. Repeat steps 2 to 3 to start measuring the volume of a new target object.

■ 3D-Volume

Steps:

1. Move the cursor to [3D-Volume] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears.
2. Use the method for distance measurement to measure the lengths of the three axes of the target object, so as to calculate the volume.
3. Repeat step 2 to start measuring the volume of a new target object.

3.1.6 Cross Line

Function: measures the lengths of line segments a and b perpendicular to each other

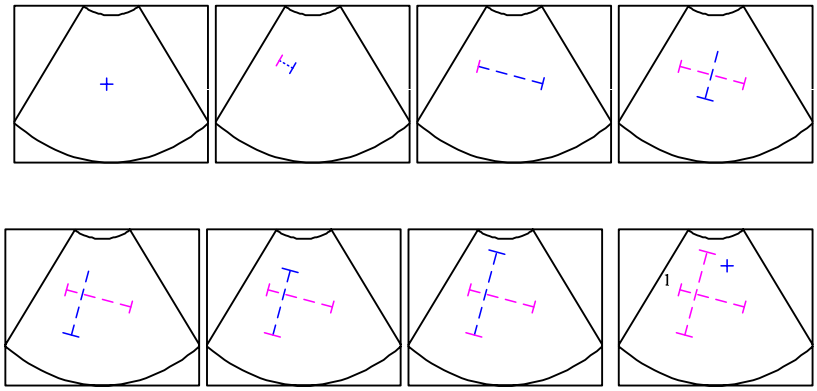
Steps:

1. Move the cursor to [Cross] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears.
2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark “⏐” displays at the starting point.
3. Move the trackball to the end point of the first line segment. Press the『Change』key to switch between the fixed end and the active end. Press the 『Back』 key to cancel the previous operation and the 『Set』 key to confirm the operation. Another line segment perpendicular to the fixed line segment appears on the screen. This line segment can be moved.
4. Move the trackball to the starting point of the second line segment. Press the 『Change』 key to switch between the fixed end and the active end. Press the button key to cancel the previous operation and the 『Set』 key to confirm the starting point.
5. Move the trackball to the end point of the second line segment. Press the 『Change』 key to switch between the fixed end and the active end. Press the 『Back』 key to

cancel the previous operation and the end point, and the 『Set』 key to confirm the end point of the second line segment. The measurement ends. The result window displays the lengths of the two cross line segments.

6. Repeat steps 2-5 to start a new measurement of cross lines.

The measurement steps are shown in the following figures:



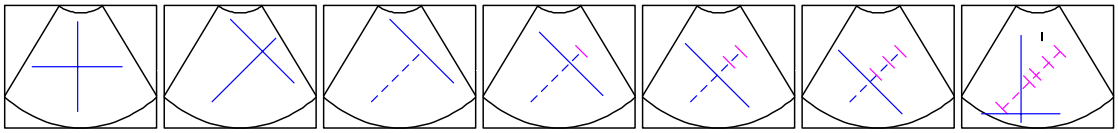
3.1.7 Parallel Line

Function: measures the distance between every two line segments of five parallel line segments, namely, four distances in total

Steps:

1. Move the cursor to [Parallel] in the B mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Use the trackball to locate the big “+” at the baseline of the line segment to be measured. Rotate the functional knob to change the angle of the baseline and then press the 『Set』 key to confirm it. A dash line appears starting with a short transverse line, indicating the position of the first parallel line.
3. Use the trackball to determine the position of the second parallel line. Press the 『Change』 key to switch between the fixed end and the active end. Press the 『Back』 key to cancel the previous operation and the 『Set』 key to confirm the operation. Short parallel lines appear at the original baseline. Continue moving the trackball to determine the positions of the third, fourth, and fifth parallel lines. When the fifth parallel line is determined, the tail end of the baseline is determined. The measurement ends. The result window displays the results.
4. Repeat steps 2 and 3 to start a new measurement.

The measurement steps are shown in the following figures:



3.1.8 Trace Length

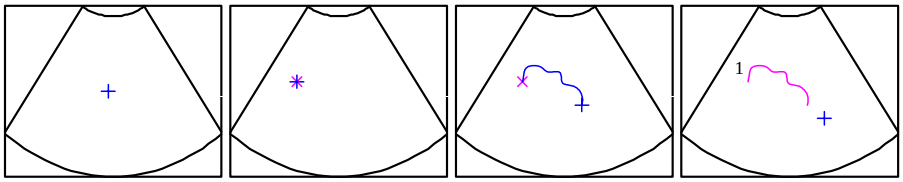
Function: measures the length of a curve on the image. Measurement methods available include Trace and Spline.

■ Trace

Steps:

1. Move the cursor to the right side of [Trace Len] in the B mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Trace]. Press the 『Set』 key and the “+” shaped cursor appears.
2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark “✕” displays at the starting point.
3. Use the trackball to move the cursor along the target to draw out the trace line. To correct the trace line, rotate the functional knob anticlockwise to cancel some points and clockwise to restore some points.
4. Press the 『Set』 key to determine the end point of the trace line. The measurement ends. The result window displays the length of the trace measured.
5. Repeat steps 2-4 to start a new measurement by way of Trace.

The measurement steps are shown in the following figures:



■ Spline

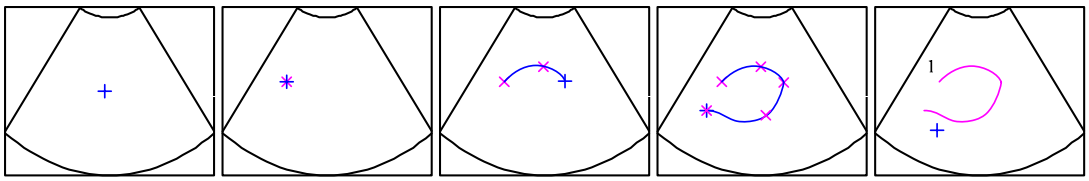
Steps:

1. Move the cursor to the right side of [Trace Len] in the B mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Spline]. Press the 『Set』 key and the “+” shaped cursor appears.
2. Move the cursor to the measurement starting point. Press the 『Set』 key and the fixed mark “✕” displays at the starting point.
3. Move the trackball along the target and press the 『Set』 key to determine the second,

third, fourth … points. A maximum of 12 points can be determined. The points are connected by smooth curves. Press the 『Set』 key twice to determine the final point, namely, the end point. The measurement ends. To correct a previous point, press the 『Back』 key. The result window displays the length of the curve.

4. Repeat steps 2 and 3 to start a new measurement by way of Spline.

The measurement steps are shown in the following figures:



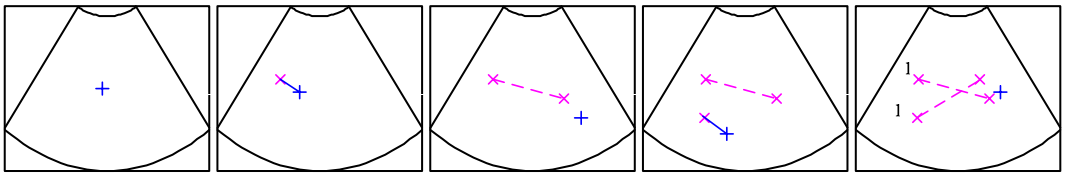
3.1.9 Ratio

Function: measures the lengths of two line segments and then calculates their ratio

Steps:

1. Move the cursor to [Ratio] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. Use the method for distance measurement to measure two line segments a and b.
3. The measurement ends when the two line segments are measured. The result window displays the lengths of the two line segments and their ratio.
4. Repeat steps 2 and 3 to start a new measurement.

The measurement steps are shown in the following figures:



3.1.10 B Profile

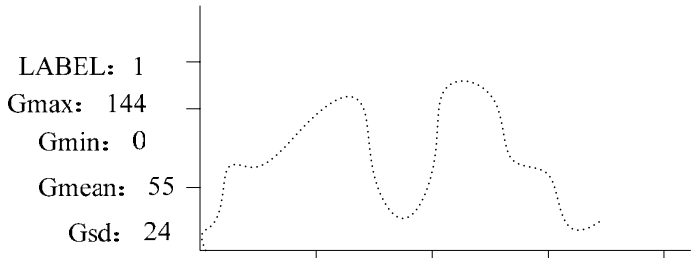
Function: measures the grey distribution of ultrasonic echo signals on a line.

Profile must be measured on the frozen image.

Steps:

1. Move the cursor to [B-Profile] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. Refer to the method for distance measurement. When the measurement completes, the

grey distribution on the measured line appears on the upper part of the screen, where the horizontal axis stands for the length of the line segment and the vertical axis for the grey of the image, as shown below:



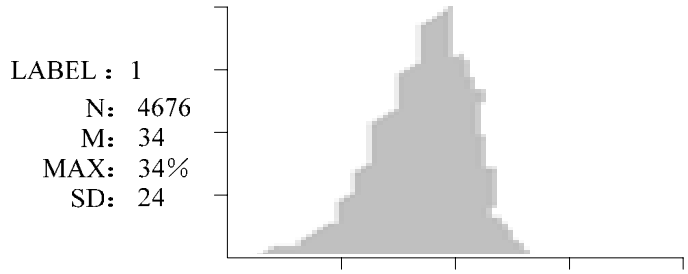
3.1.11 B Histogram

Function: measures the grey distribution of ultrasonic echo signals within a closed region. Measurement methods available include: Rectangle, Ellipse, Trace, and Spline.

Histogram must be measured on the frozen image.

Steps:

1. Move the cursor to [B-Hist] in the B mode “General Measure” menu. Press the 『Set』 key and the “+” shaped cursor appears at screen center.
2. When Rectangle method is used, first determine one end of the rectangle. Then move the cursor to see floating dashed line frame of the rectangle. Determine another end of the rectangle based on the target position. The rectangle region is determined. The measurement ends. When Ellipse, Trace, and Spline methods are used, refer to these methods used for area measurement respectively.
3. After the measurement completes, the result displays in the upper left corner of the screen. The horizontal axis stands for the grey of the image and the vertical axis for the grey distribution percentage.



3.2 M Mode General Measurements

The figure above shows M mode general measurement menu. The following details the measurement items.

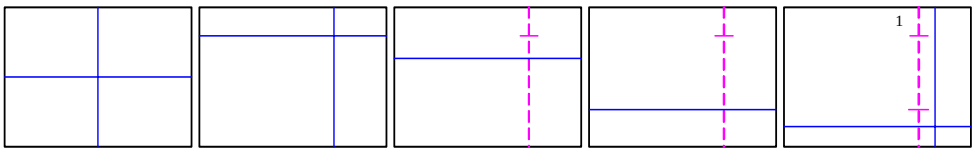
3.2.1 Distance

Function: measures the distance between two points on the M mode image.

Steps:

1. Move the cursor to [Distance] in the M mode “General Measure” menu. Press the『Set』key and the big “+” shaped cursor appears.
2. Move the cursor to the measurement starting point and press the 『Set』 key. The starting point displays the measurement baseline and the fixed mark “—”. You can press the 『Back』 key to delete the starting point just determined.
3. Use the trackball to move the cursor. The big “+” shaped cursor can only move in the perpendicular direction. The result window displays the real-time measurement value. Press the『Change』key to switch between the fixed end and active end or the『Back』key to delete the starting point just determined.
4. Use the trackball to move the big “+” shaped cursor to the measurement end point and press the 『Set』 key. The end point displays the fixed mark “—”. The result window displays the measurement result. The measurement ends.
5. Repeat steps 2-4 to start a new distance measurement.

The measurement steps are shown in the following figures:



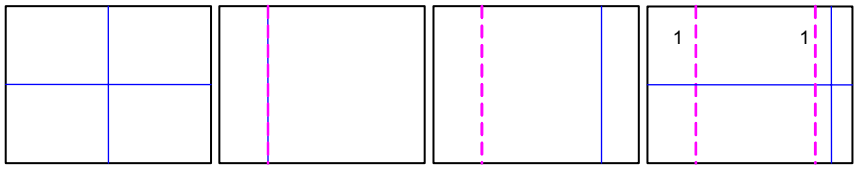
3.2.2 Time

Function: measures the time interval between two points on the M mode image.

Steps:

1. Move the cursor to [Time] in the M mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the measurement starting point and press the 『Set』 key. The starting point displays the big fixed mark “ ┆ ”. You can press the 『Back』 Key to delete the starting point just determined.
3. Use the trackball to move the cursor. The big “|” cursor can only move in the horizontal direction. The result window displays the real-time measurement value. Press the 『Change』 key to switch between the fixed end and active end or the 『Back』 key to delete the starting point just determined.
4. Use the trackball to move the big “|” cursor to the measurement end point and press the 『Set』 key. The end point displays the fixed mark “ ┆ ”. The result window displays the measurement result. The measurement ends.
5. Repeat steps 2-4 to start a new time measurement.

The measurement steps are shown in the following figures:



3.2.3 Slope

Function: measures the distance and time between tow points on the M mode image and calculates the average speed (slope) between the two points.

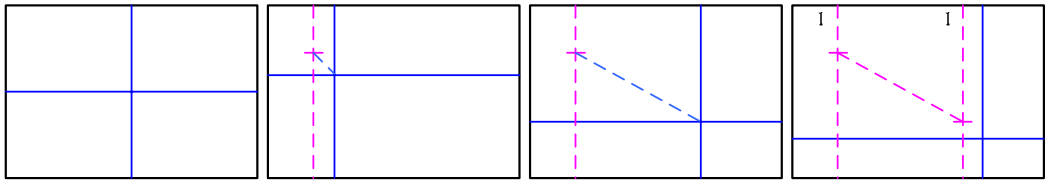
Steps:

1. Move the cursor to [SLP] in the M mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the measurement starting point and press the 『Set』 key. The starting point displays the fixed mark “┼”. You can press the 『Back』 Key to delete the starting point just determined.
3. Use the trackball to move the cursor. The big “+” shaped cursor and the “┼” marked starting point are always connected by a dash line. The result window displays the real-time measurement value. Press the 『Change』 key to switch between the fixed end and active end in the measurement or the 『Back』 key to delete the starting point just determined.
4. Use the trackball to move the big “+” cursor to the measurement end point. Press the 『Set』 key and the fixed mark “┼” displays at the end point. The result window

displays the measurement result. The measurement ends.

5. Repeat steps 2-4 to start a new slope measurement.

The measurement steps are shown in the following figures:



3.2.4 Heart Rate

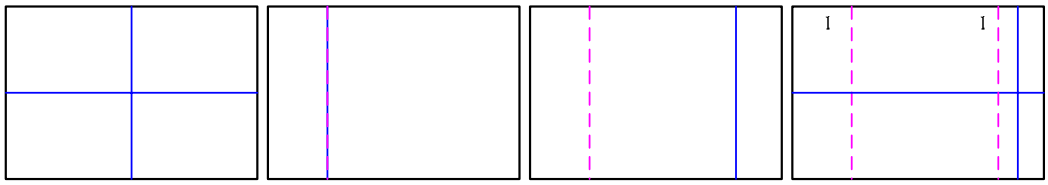
Function: measures the time interval between n (n≤8) cardiac cycles on the M mode image and calculates the number of heart beats per minute.

The number of cardiac cycles can be preset.

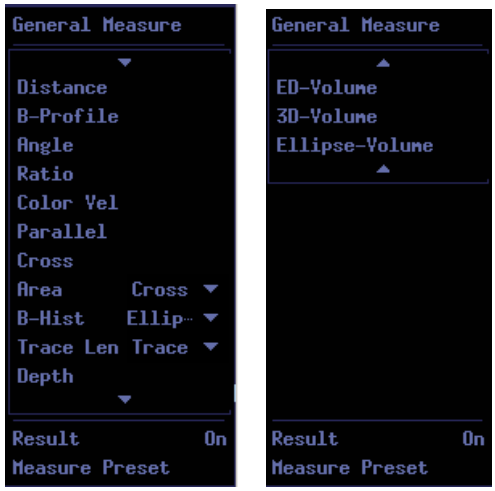
Steps:

1. Move the cursor to [HR] in the M mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Refer to the operation in M mode Time measurement
3. After the measurement, the result window displays the result of HR measurement.
4. Repeat steps 2 and 3 to start a new Heart Rate measurement.

The measurement steps are shown in the following figures:



3.3 Color Mode General Measurements



The figure above shows Color mode general measurement menu. Move the cursor to "▼" and press the 『Set』 key to open the folded menu. Color mode and B mode general measurement menus are basically the same except that the Color mode general measurement menu has one additional item: Color Velocity The following describes the new item. For the operations of other measurement items, refer to section "B Mode General Measurements".

3.3.1 Color Velocity

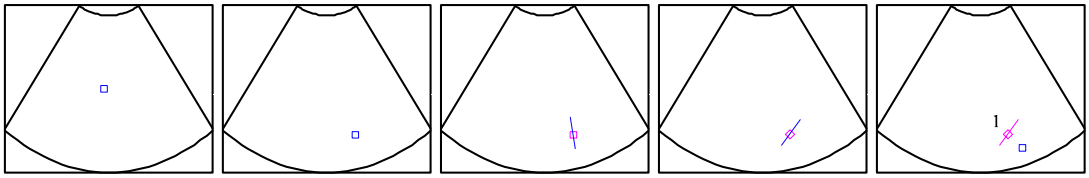
Function: measures the velocity of blood flow on the Color mode image

Color velocity must be measured on the frozen image.

Steps:

1. Move the cursor to [Color Vel] in the Color mode "General Measure" menu. Press the 『Set』 key and the "□" shaped cursor appears.
2. Move the cursor to the point to be measured for blood flow velocity and press the 『Set』 key to fix the point. A floating line is displayed in the direction parallel to the ultrasonic wave beam at that point. The compensation angle A is 0°.
3. Rotate the functional knob to change the compensation angle within the range of 0°-80º to align the floating line in the direction same to that of blood flow at the point to be measured. Press the 『Set』 key to fix the direction of blood flow. The measurement ends. The result window displays the value of Color Velocity.
4. Repeat steps 2 and 3 to start a new Color Velocity measurement.

The measurement steps are shown in the following figures:



3.4 PW Mode General Measurements

The figure above shows PW mode general measurement menu. Time and HR measurement items in the case of PW mode are similar to those in the case of M mode. They are omitted in this section. The following describes other items of PW mode general measurement menu.

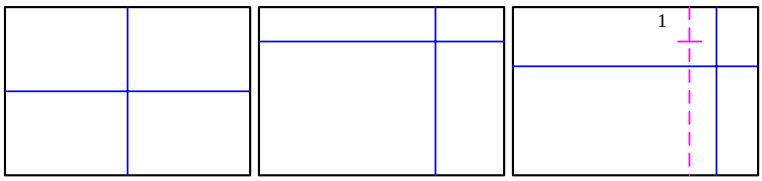
3.4.1 Velocity

Function: measures the velocity of a certain point and the pressure gradient on the Doppler spectral waveform on the PW mode image.

Steps:

1. Move the cursor to [Velocity] in the PW mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the point to be measured for velocity and press the 『Set』 key. The measurement ends. The result window displays the measurement result.
3. Repeat steps 1 and 2 to start a new velocity measurement.

The measurement steps are shown in the following figures:



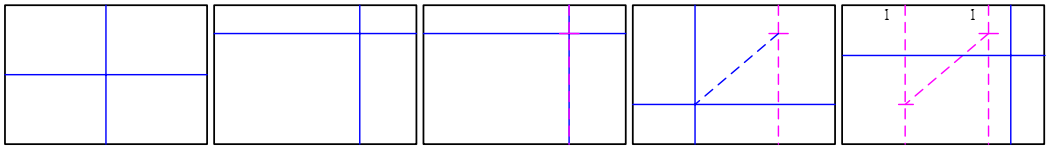
3.4.2 Acceleration

Function: measures the velocities of two points and their time interval on the PW mode image, and calculates the velocity difference within the unit time

Steps:

1. Move the cursor to [Accel] in the PW mode “General Measure” menu. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the first point to be measured for velocity and press the 『Set』 key to fix the point. Then velocity measurement of the first point completes. Use the trackball to determine the second point in the same way. Velocity measurement of the second point completes. The measurement ends.
3. Repeat steps 1 and 2 to start a new acceleration measurement.

The measurement steps are shown in the following figures:



3.4.3 Spectrum Trace

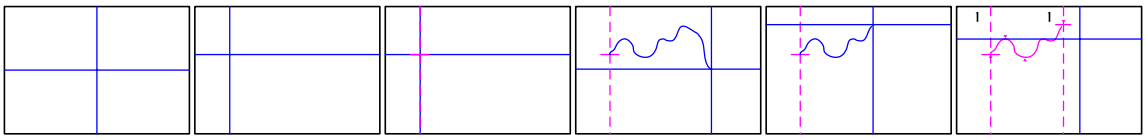
Function: measures such clinical indexes as velocity, pressure gradient, pressure index, resistance index through tracing one or several Doppler waveforms on the PW mode image. Measurement methods available are Trace, Spline, and Auto.

■ Trace

Steps:

1. Move the cursor to the right side of [Spectrum] in the PW mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Trace]. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the starting point of Doppler spectrum to be measured and press the 『Set』 key to fix the point. Move the cursor along the edge of the target region. Move the cursor right to draw a trace line overlapping the Doppler spectrum as much as possible. Move the cursor left or rotate the functional knob anticlockwise to correct the trace line already drawn.
3. Trace the end point of Doppler spectrum to be measured and press the 『Set』 key to fix the point. The measurement ends. The result window displays the results.
4. Repeat steps 2 and 3 to start a new spectrum trace.

The measurement steps are shown in the following figures:

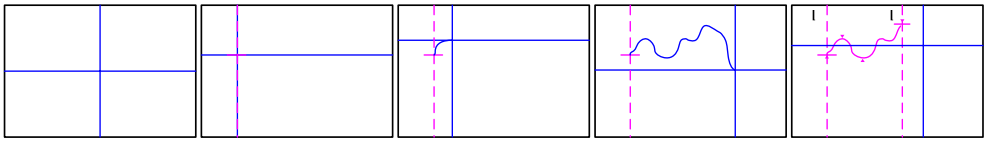


■ Spline

Steps:

1. Move the cursor to the right side of [Spectrum] in the PW mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Spline]. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the starting point of Doppler spectrum to be measured and press the 『Set』 key to fix the point. Move the cursor along the edge of the target region. Continue to fix the second, third …point (12 points at most) of Doppler spectrum. The points are connected by smooth curve.
3. When there are 12 points fixed, the measurement ends automatically. If it is necessary to end the measurement when there are less than 12 points fixed, press the 『Set』 key twice continuously at the final point. The result window displays the results.
4. Repeat steps 2 and 3 to start a new PW spectrum trace.

The measurement steps are shown in the following figures:



■ Auto

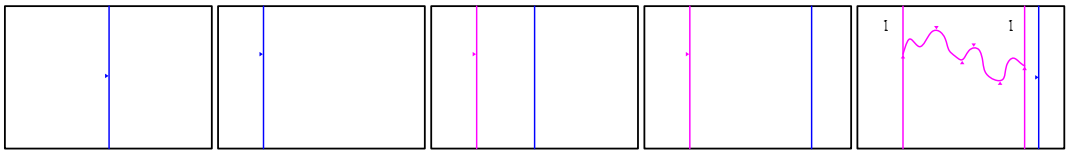
Auto spectrum trace must be measured on the frozen image.

Steps:

1. Move the cursor to the right side of [Spectrum] in the PW mode “General Measure” menu. Move the cursor to “▼” and press the 『Set』 key to select [Auto]. Press the 『Set』 key and the big “+” shaped cursor appears.
2. Move the cursor to the starting point of Doppler spectrum to be measured and press the 『Set』 key to fix the point.
3. Move the cursor to the end point of Doppler spectrum to be measured and press the 『Set』 key to fix the point. The measurement ends. The result window displays the results.

4. Repeat steps 2 and 3 to start a new PW spectrum trace.

The measurement steps are shown in the following figures:



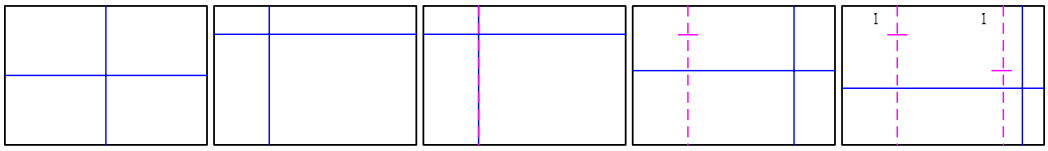
3.4.4 Resistance Index

Function: measures the velocities of two peak points on the blood flow waveform and their pressure gradient on the PW mode image, and calculates their resistance index (RI) and ratio.

Steps:

1. Move the cursor to [RI] in the PW mode “General Measure” menu. Press the『Set』key and the “+” shaped cursor appears.
2. Move the cursor to the first peak point to be measured for velocity and press the 『Set』key to fix the point. Then velocity measurement of the first peak point completes. Use the trackball to determine the second peak point in the same way. Velocity measurement of the second peak point completes. The measurement ends.
3. Repeat steps 1 and 2 to start a new RI measurement.

The measurement steps are shown in the following figures:



4 Obstetric Measurements

This Diagnostic Ultrasound System provides an obstetric measurement package. It calculates estimated fetal weight (EFW) and predicts gestational age (GA) and estimated date of delivery (EDD) by measuring various growth parameters of the fetus. It also assesses fetal growth state through tracing fetal growth curve.

4.1 Obstetric Measurement Items

The detailed measurement items are:

- Fetus measurement:

  Gestation sac (GS),

  Crown-rump length (CRL),

  Biparietal diameter (BPD),

  Head circumference (HC),

  Abdominal circumference (AC),

  Femur length (FL),

  Occipitofrontal diameter (OFD),

  Anteroposterior abdominal diameter (APAD),

  Transverse abdominal diameter (TAD),

  Fetal trunk cross-sectional area (FTA),

  Thoracic diameter (THD),

  Transverse trunk diameter (TTD),

  Anteroposterior trunk diameter (APTD),

  Yolk sac (YS),

  Nuchal translucency (NT)

  Humerus length (HUM),

  Ulna length (Ulna),

  Tibia length (Tibia),

Radial length (RAD),

Fibula length (FIB),

Clavicle length (CLAV),

Length of vertebrae (LV)

Cerebellum (CER),

Outer orbital diameter (OOD),

- Fetal weight calculation:

  Estimated fetal weight (EFW),

- Calculation items:

  HC/AC

  FL/AC

  FL/BPD

  AXT = APTD x TTD

- Amniotic fluid index :

  Amniotic fluid index (AFI)

- Fetal biophysical profile:

  Amniotic fluid (AF)

- Fetus Doppler measurement:

  Umbilical artery (Umb A),

  Middle cerebral artery (MCA),

  Fetal aorta (Fetal AO),

  Left uterine artery (Left Uterin),
  Right uterine artery (Right Uterin)

- Key-in items:

  Last menstrual period (LMP),

  Exp.Ovular

4.2 Obstetric Exam Preparations

Make the following preparations before performing obstetric exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the obstetric measurement mode.

Note: Please assure date of the system is correct, otherwise GA and EDD calculated by it is wrong.

4.2.1 Patient Information Input

During obstetric exam, you need to input obstetric information through the patient information dialog box as well as the general information of the patient. On the “Patient Info” screen, click [Detail] to open the detailed patient information input screen. Detailed patient information includes “General” and “OB” parts. The “OB” is unavailable if the patient is male.

For “General”, refer to section “Patient Information Input” in *Diagnostic Ultrasound System Operation Manual [Basic Volume]*. The following describes “OB”. See the screen below:

Patient OB information includes LMP, EXP. Ovular, Gestation, Gravida, Para, Ectopic, Aborta, Days of Cycle and etc. for clinical diagnoses.

If LMP is input, EDD and GA are then calculated based on LMP, namely, EDD by LMP and GA by LMP.

If EXP. Ovular is input, another EDD and GA are then calculated based on EXP. Ovular., namely, EDD by Exp.Ovular and GA by Exp.Ovular.

Input corresponding information for “Gestation”. Input “2” for twins. The maximum valid value is “3”. If no information is input, “1” is the default value by the system.

After inputting information required, click [OK] to confirm&save the information, and to exit the “Patient Info” screen.

4.2.2 Multi-fetus Exam

This system supports examination of more than one fetus. You can set the number of fetuses in the OB tab sheet of “Patient Info” dialog box. Clinical indexes of a maximum of three fetuses can be measured simultaneously.

In the case of multi-fetus exam, the following items display in the obstetric measurement menu. You can switch between fetus A, fetus B, or fetus C.

The fetuses are measured respectively. The measurement results are displayed by A, B or C in the result window to differentiate the fetuses.

On the “Obstetric Exam Report” screen, you can choose to display the report of different fetuses through 

.

On the “Obstetric Growth Curve”, you can choose to display the growth curves of different fetuses through 

, 

, and 

.

4.2.3 Obstetric Measurement Menu

Press the 『Measure』 key to enter the application measurement mode in B or PW mode. Press the 『Menu』 key to display the application measurement menu. Click [Obstetric] from the submenu to switch to obstetric measurement menu.

Obstetric measurement can be performed in B mode or PW mode. The following figures show the obstetric measurement menu.

Obstetric measurement items can be set through “Measure Preset”. Different configurations may cause inconsistency with the menu above.

4.2.4 Obstetric Measurement Preset

Obstetric measurement preset is similar to that of other application measurement modes. For details, refer to section “Measurement Preset”.

In addition, obstetric measurement supports presetting of the GA calculation formulas based on some measurement items. You can select the formula provided by the system or customize the GA calculation formula. For details about obstetric formulas, refer to section 2.2.4 “Preset Obstetric Formulas”.

4.3 Obstetric Measurements and Calculations

You can refer to section “General Measurements” to understand the operations in obstetric measurement.

Typically, distance measurement is used for fetus measurement and fetus long bone measurement. Area measurement is used for HC, AC, and FTA measurements. Four distances are measured in multiple images to obtain the value of AFI. Distance measurement method in B mode is used to measure a single distance.

The measurement method for spectrum trace in PW mode is used for fetus Doppler measurement.

The following table describes the measurement methods used for various measurement items.

Category	Measurement item	Measurement method
Fetus measurement	GS	Same to distance measurement in B mode
	CRL	Same to distance measurement in B mode
	BPD	Same to distance measurement in B mode
	HC	Same to area measurement in B mode
	AC	Same to area measurement in B mode
	FL	Same to distance measurement in B mode
	OFD	Same to distance measurement in B mode
	APAD	Same to distance measurement in B mode
	TAD	Same to distance measurement in B mode
	FTA	Same to area measurement in B mode
	THD	Same to distance measurement in B mode
	APTD	Same to distance measurement in B mode
	YS	Same to distance measurement in B mode
	TTD	Same to distance measurement in B mode
	NT	Same to distance measurement in B mode
	HUM	Same to distance measurement in B mode
	Ulna	Same to distance measurement in B mode
	Tibia	Same to distance measurement in B mode
	RAD	Same to distance measurement in B mode
	FIB	Same to distance measurement in B mode
	CLAV	Same to distance measurement in B mode
	LV	Same to distance measurement in B mode
	CER	Same to distance measurement in B mode
	OOD	Same to distance measurement in B mode
	FHR	Same to HR measurement in M mode

EFW	EFW	Calculation item
Calculation item	HC/AC	Calculates ratio
	FL/AC	Calculates ratio
	FL/BPD	Calculates ratio
	AXT	Calculates the product: AXT = APTD x TTD
AFI	AFI	Calculation item
Fetal biophysical profile	AF	Same to distance measurement in B mode
Fetus Doppler measurement	Umb A	Same to spectrum trace in PW mode
	MCA	Same to spectrum trace in PW mode
	Fetal AO	Same to spectrum trace in PW mode
	Left Uterin	Same to spectrum trace in PW mode
	Right Uterin	Same to spectrum trace in PW mode

4.3.1 LMP and Exp.Ovular

You can select to key in LMP and Exp.Ovular in the “Obstetric” menu. Move the cursor to “Key In” to open the submenu and then select “LMP Input” or “Exp.Ovular Input”. If you have already input patient information in the “Patient Info” dialog box, you are free to key in LMP and Exp.Ovular or not. Similarly, if you key in LMP and Exp.Ovular in the “Key In” submenu, the information is also displayed on the “Patient Info” screen. If you key in such information again, the data finally keyed in prevails.

When LMP and Exp.Ovular are input whether before or after measurement, EDD and GA are calculated automatically for clinical diagnoses.

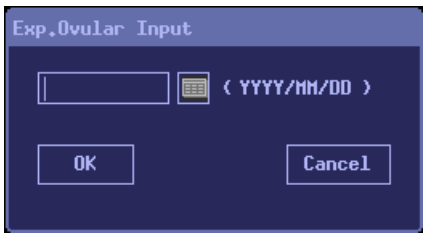
- Key in LMP

When you select “LMP” in the key in submenu, “LMP Input” dialog box pops up, as shown below:

You can input the date as per the date format (YYYY/MM/DD) given after the input box. For example, if you want to input Jan. 1, 2006, the format is “2006/01/01” or “2006/1/1”. Or you can click “ ” after the input box to select the correct date. If you are not used to the date format, you can change it in the “system Preset” dialog box. For details, refer to section “Preset” in *Diagnostic Ultrasound System Operation Manual [Basic Volume]*.

- Key in Exp.Ovular

When you select “Exp.Ovular” in the submenu, “Exp.Ovular Input” pops up, as shown below:



Same to “Key in LMP”.

4.3.2 Distance Measurement Items

- To enter distance measurement items

  Open the “Obstetric” menu and move the cursor to the item to be measured. Then press the 『Set』 key to start measurement.

- To perform distance measurement

  The distance measurement operations are consistent with those in B mode distance measurement. The following takes BPD as an example. The steps are:

1. Move the cursor to [BPD] in the B mode “Obstetric” menu. Press the『Set』key and the “+” shaped cursor appears at screen center.
2. Move the trackball to the measurement starting point. Press the 『Set』 key and the fixed mark “✕” displays at the starting point.
3. Use the trackball to move the cursor. The “+” shaped cursor and the “✕” marked starting point are always connected by a dash line. The result window displays the real-time measurement value. Press the 『Change』 key to switch between the fixed end and

active end in the measurement.

4. Move the "+" shaped cursor to the measurement end point and press the 『Set』 key. The end point displays the fixed mark "×". The result window displays the measurement result. The measurement ends.

- To calculate GA

  After measurement operations are performed, the results are displayed in the result window. Whether the result window displays GA depends on formula presetting and also on whether LMP and Exp.Ovular are already input before the measurement (for details, refer to section 2.2.4 "Preset Obstetric Formulas").

4.3.3 Area Measurement Items

- To enter area measurement items

  Open the "Obstetric" menu and move the cursor to the item to be measured. Select the measurement method through "▼". Four measurement methods are available: Ellipse, Trace, Cross, and Spline. Move the cursor to the desired method and then press the 『Set』 key to start measurement.

- To perform area measurement

  The operations are consistent with those in B mode area measurement. Refer to section 3.1.4 "Area".

- To calculate GA

  After measurement operations are performed, the results are displayed in the result window. Whether the result window displays GA depends on formula presetting and also on whether LMP and Exp.Ovular are already input before the measurement (for details, refer to section 2.2.4 "Preset Obstetric Formulas").

4.3.4 FHR Measurement

Enter the M image mode, open the "Obstetric" menu and move the cursor onto the [FHR], and then press the 『Set』 key to enter the measurement status.

The method is the same as that for "HR" measurement in the M mode.

4.3.5 Fetus Doppler Measurement

- To enter fetus Doppler measurement

  Enter PW image mode first. Then open the "Obstetric" menu. Move the cursor to the

item to be measured. Select the measurement method through "▬". Press the 『Set』 key to start measurement.

- To perform fetus Doppler measurement

  The operations are consistent with those in PW mode spectrum trace measurement. Clinical indexes such as velocity, pressure gradient, pressure index, resistance index are acquired through tracing one or several Doppler waveforms. Measurement methods available are Trace, Spline, and Auto. Refer to section 3.4.3 "Spectrum Trace".

4.3.6 AFI Measurement

AFI is the sum of maximum AFs in the four quadrants around the fetal bellybutton. The formula is AFI = AF1 + AF2 + AF3 + AF4.

Steps:

1. Move the cursor to [AFI] and then press the 『Set』 key to start measurement, the submenu pop up.
2. Move the cursor to [AF1] and then press the 『Set』 key to measure AF1(whose measurement method is same to distance measurement). Then AF2, AF3, and AF4 are shown. After four AFs are measured continuously, the value of AFI displays in the result window.

   You can not measure the mean value of multiple AFIs. Only the latest AFI value is saved in the report.

4.3.7 EFW Measurement

EFW is a calculation item. It is obtained by measuring multiple fetal parameters.

EFW supports multiple calculation formulas. When different formulas are used, calculations select different measurement items and are performed in different measurement orders. The mean values of the measurement parameters are put in the formula to calculate EFW. The system is configured with the some formulas and you can preset the default formula before measurement， please refer to "2.2.4 Preset Obstetric Formulas".

When you have set EFW formula and started EFW measurement, a submenu pops up, displaying the measurement items. The following takes hadlock4 as an example to describe the EFW measurement steps.

1. Select [EFW] in the "Obstetric" menu and press the 『Set』 key to pop up the submenu.

2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays "+".
3. When all items are measured, the system will apply hadlock4 to EFW calculation based on the measured AC, FL, BPD, and HC. The results are displayed in the result window.

During the measurement, if all items required for EFW formula have been measured, EFW will be displayed in the result window automatically. If some items have been measured already, the EFW value will be updated based on the latest average value of the measurement items.

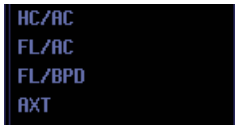
If the value of EFW exceeds the threshold for the formula, it is underlined automatically.

4.3.8 Calculation Items

The system provides the calculation results of several sets of parameters:

- HC/AC
- FL/AC
- FL/BPD
- AXT = APTD x TTD

You can select the measurement items as shown in the following figure:



If all items required for the calculation item have been measured, the value of the calculation item will be displayed in the result window automatically. If some items have been measured already, the value of the calculation item will be updated based on the latest average value of the measurement items.

4.4 Obstetric Exam Report

During obstetric measurement or after measurement of an item ends, you can press the

key on the control panel to view the obstetric exam report.

The item results already measured are displayed in the report.

On the “Obstetric Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

Besides, the obstetric exam report has two additional parts: fetal biophysical profile and obstetric growth curve. The following describes the two parts.

4.4.1 Fetal Biophysical Profile

Fetal biophysical profile means to first obtain a few indexes related to fetal growth by way of experiment or measurement after observing the ultrasound image of the fetus for a period of time and then evaluate the fetal situation based on some scoring criteria.

The scoring criteria the system provides are based on Vintzileos formula, as shown in the following table.

Fetal scoring criteria (Vintzileos formula)

Fetal growth index	0 score	1 score	2 scores	Observation time	Notes
FHR	FHR acceleration ≤1 times	FHR acceleration ≥15 times per minute; duration≥15s;1-4 times	FHR acceleration≥15times/minute; duration≥15s; ≥5 times	20 minutes	Acquired through fetal stress experiment. These scores can be entered into the system.
FM	No fetal movement	1 to 2 fetal movements	≥3 fetal movements	30 minutes	
FBM	No FBM, or duration≤30 s	FBM≥1 times; duration: 30-60s	FBM≥1 times; duration≥60s	30 minutes	
FT	Limbs stretched, no bend, and fingers loose	Limbs or spine stretch-and-bend movements ≥1	Limbs and spine stretch-and-bend movements ≥1	30 minutes	
AF	AF<1cm	1cm≤AF≤2cm	AF>2cm	Acquired through measuring B-type image	

PL	III	Placenta is on the posterior wall; therefore it is difficult to estimate placental level.	≤ II	Based on placenta ultrasound image, placenta maturity falls into four levels: 0, I, II, and III.

After the depth of amniotic fluid being measured and the scores of fetal stress experiment and the placenta level being entered, the system can automatically generate an FBP Report based on the specified formula. The scores of the indexes above and the total score are included in the report.

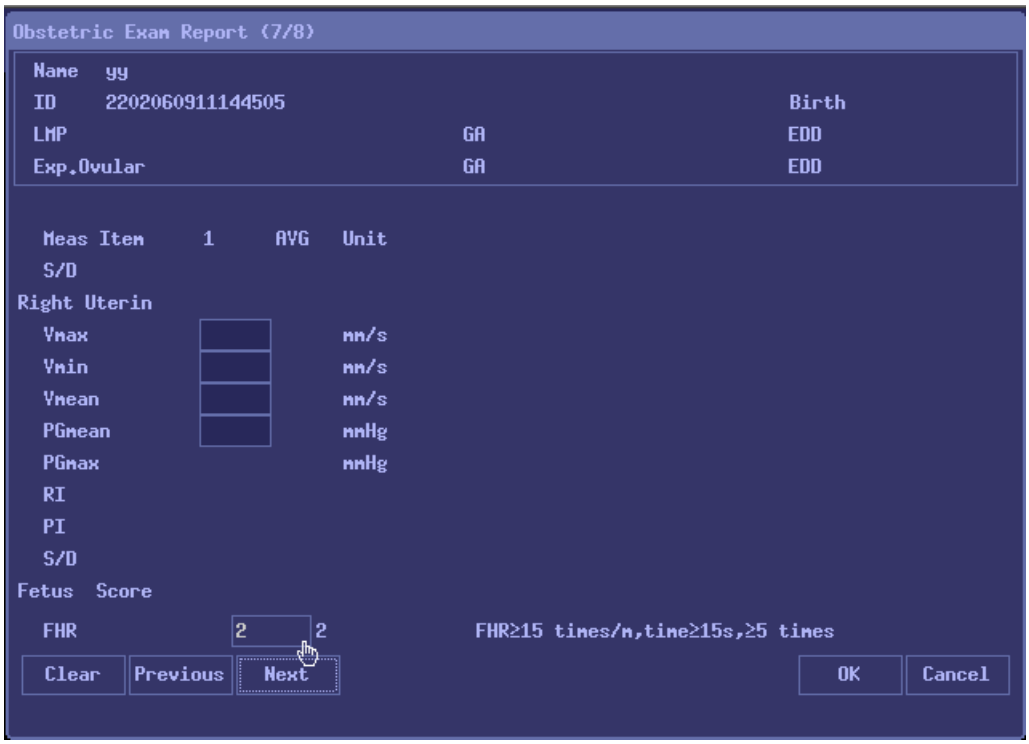
Fetal scoring results criteria

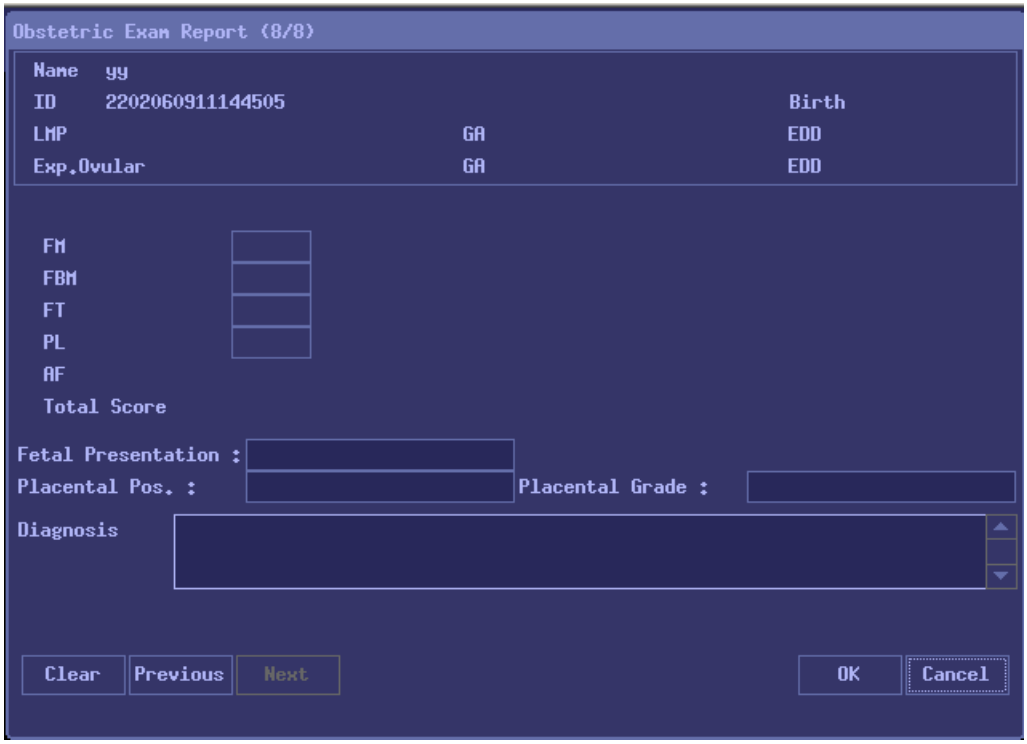
Total scores	Growth condition
7-12 scores	Normal fetus; low risk of chronic asphyxia
3-6 scores	Suspicious risk of fetal chronic asphyxia
0-2 scores	Highly suspicious risk of fetal chronic asphyxia

If AF measurement is already configured, the system is automatically configured with FBP function.

Maximum AF is significant clinically. Therefore, you can not measure the mean value of multiple AFs. Only the latest AF value is saved.

On the “Obstetric Exam Report” screen, click [Edit] to enter editing mode. Click [Next] to find FBP items. You can key in the scores.





The method to key in a score:

Move the cursor to the "[ ]" box after the scoring item and press the 『Set』 or 『Back』 key to enter the score. And fetal presentation, placental position, placental grade can be keyed in.

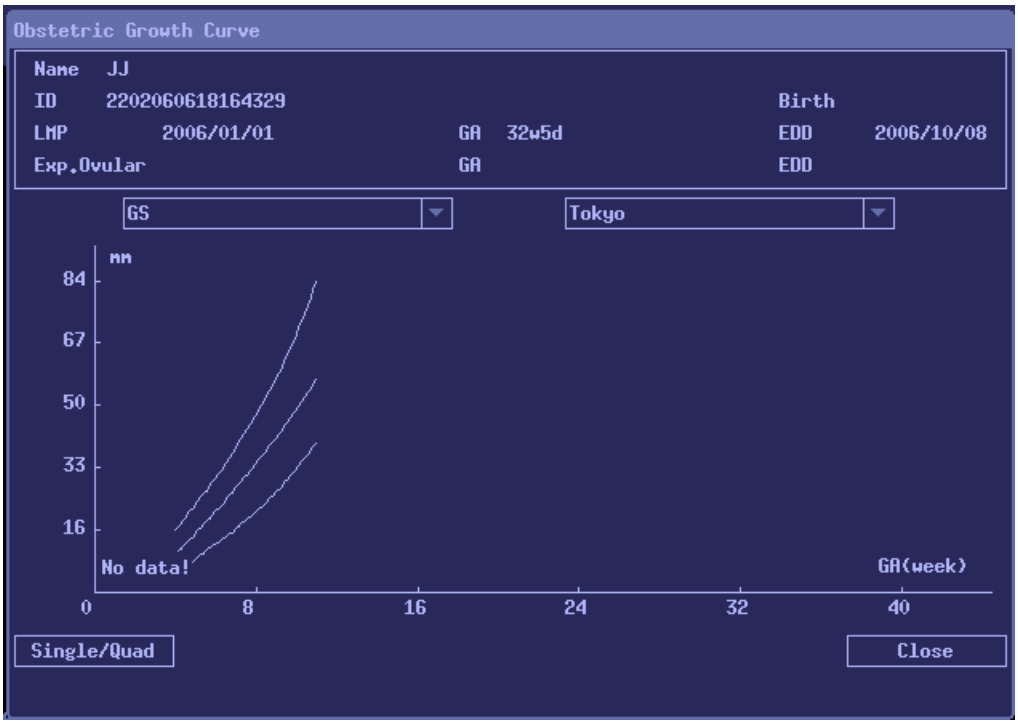
When all scores are entered, the total score displays in the obstetric exam report. Click [Ok] button to view the fetal biophysical profile report.

4.4.2 Fetus Growth Curve

Fetus growth curve means to compare the measured data of the fetus with the normal growth curve to judge whether the fetus is in normal growth state.

Steps:

1. Measure one or multiple items of fetal growth parameters.
2. Enter LMP or Exp.Ovular.
3. Enter the “Obstetric Exam Report” dialog box and move the cursor to [Growth]. Press the 『Set』 key and the following figure appears, displaying obstetric growth curve.



4. The “GS” table sheet is displayed by default. The formula on the right is that used for current growth curve. Move the cursor to other formula and press the 『Set』 key to display the normal growth curve when this formula is selected, so as to compare the current growth curve with the normal one.

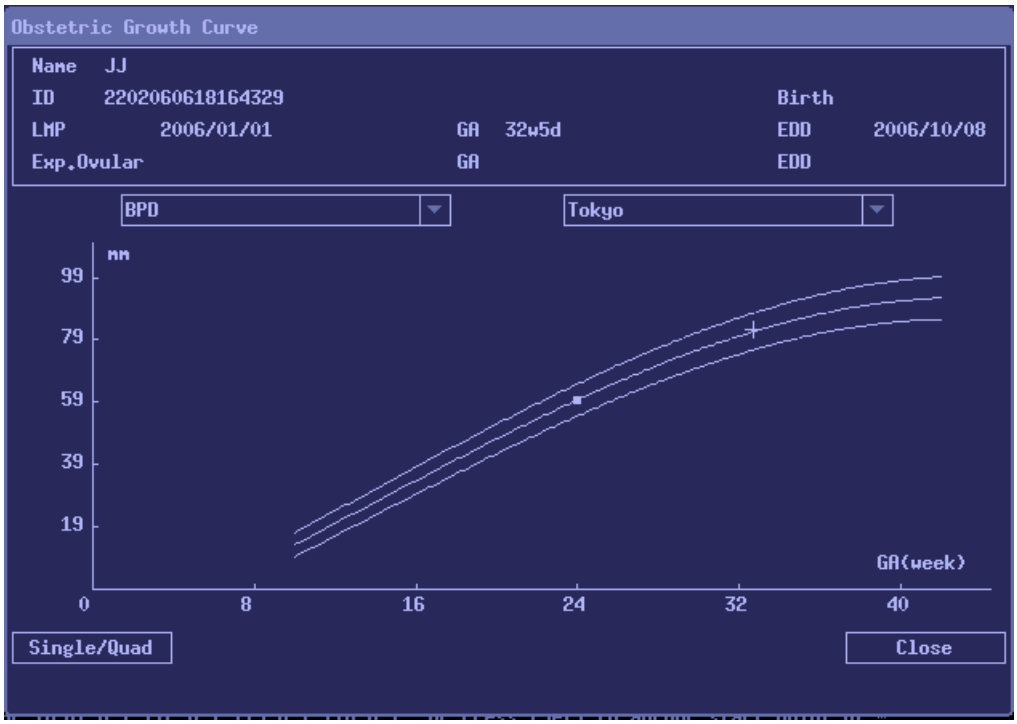
5. Move the cursor to other items respectively and press the 『Set』 key. The normal growth curve of the item displays and the corresponding positions of the measurement value on the normal growth curve also appear.

6. Take Tokyo formula for BPD measurement as an example. The figure below shows the normal growth curve of BPD and the corresponding positions of fetal BPD measurement values (indicated by “■” , “+” or “✛”) on the normal growth curve. Tokyo formula is that used for current growth curve.

   ■: indicates history measurement value;

   +: indicates current measurement value and the current results are not saved;

   ✛: indicates current measurement value and the current results have been saved;



7. In the case of multi-fetus measurement, select "A", "B", and "C" respectively to view the growth curve of fetus A, fetus B, or fetus C. You can click "Single" or "Quad" to display the curves.

8. Move the cursor to [Close] and then press the 『Set』 key. The dialog box disappears.

Note:

If the patient ID is blank, clinical GA is not calculated or the measurement value is not valid, and the actual growth curve will not be displayed.

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CRL

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OFD

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TAD

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APAD

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THD

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HUM

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CLAV "Clavicular Measurement: A New Biometric Parameter for Fetal Evaluation." Journal of Ultrasound in Medicine 4:467-470, September 1985.

CER Goldstein I, et al. Cerebellar measurements with ultrasonography in the evaluation of fetal growth and development. Am J Obstet Gynecol 1987; 156:1065-1069.

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RAD Merz E., Werner G. & Ilan E. T., 1991
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FIB Merz E., Werner G. & Ilan E. T., 1991
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OOD Jeanty P, Cantraine R, Cousaert E, et al.
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Antory M. intzileos, MD, Winston A. Campbell, Chareles J. Ingardia, MD, and David J. Nochimson, MD, Fetal Biophysical Parameters Distribution and Their Predicted Values , Obstetric and Gynecology Journal 62:271, 1983

5 Cardiac Measurements

This Diagnostic Ultrasound System provides a cardiac measurement package, which facilitates clinical diagnoses through measuring such parameters as LV, Mitral, Valve, Tricuspid Valve, Aortic Valve, AoR, Pulmonary Vein Valve, LV Mass, ET and etc.

5.1 Cardiac Measurement Items

1. LV function measurement
   - S-P Ellipse
   - B-P Ellipse
   - Bullet
   - SIMPSON
   - CUBE
   - TEICHHOLZ
   - Simpson SP
   - Gibson
   - Simpson BP
2. LV measurement
3. RV measurement
4. Aortic measurement
5. MPV measurement
6. MV measurement
7. TV measurement
8. PV measurement
9. PVV measurement
10. Volume flow measurement
11. HR measurement

5.2 Cardiac Exam Preparations

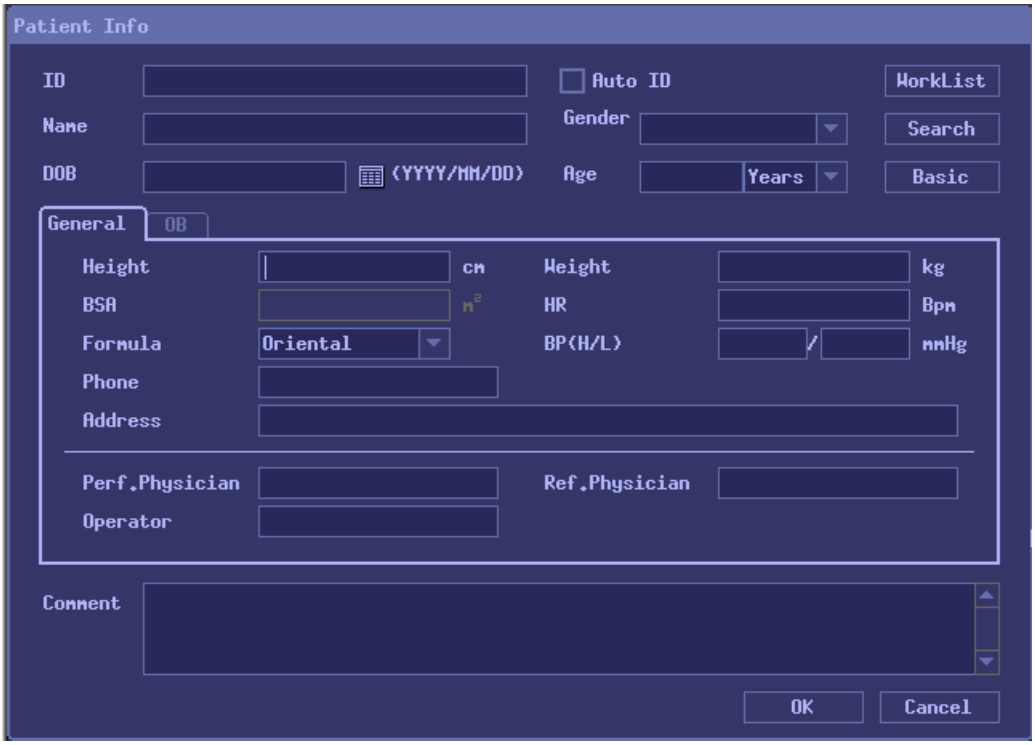
Make the following preparations before performing cardiac exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.

- If patient information is unavailable, register through the patient information dialog box.
- Switch to the cardiac measurement mode.

5.2.1 Patient Information Input

During cardiac exam, you need to input more information through the patient information dialog box as well as the general information of the patient such as name, gender, and age. On the “Patient Info” screen, click [Detail] to open the detailed patient information input screen. Enter the “General” tab sheet to input patient information.



The patient information required for cardiac exam involves height, weight, BSA (automatically calculated based on height and weight by using the selected formula), HR, and BP. Other special notes can be written in the “Comment”.

5.2.2 Cardiac Measurement Menu

Press the 『Measure』 key to enter the application measurement mode in B/Color, M, or PW mode. Press the 『Menu』 key to display the application measurement menu. Select [Cardiac] from the submenu to switch to cardiac measurement menu.

The following figures show the cardiac measurement menu.

5.2.3 Cardiac Measurement Preset

Open the “Measure Preset” dialog box to preset the formulas for calculating cardiac cycle and BSA. For details, refer to section “Measurement Preset”.

5.3 Cardiac Measurements and Calculations

All measurements of some items, described in this Chapter, will be performed in several image modes, so you shall select appropriate image modes to measure.

5.3.1 LV Function Measurement

The LV function measurement is, on the B or M image, to measure a series of clinical indexes to analyze the LV diastolic and systolic capabilities.

5.3.1.1 S-P Ellipse

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
LVLd	Left ventricular long-axis length at end diastole	Same to distance measurement in B mode
LVALd	Left ventricular long-axis area at end diastole	Same to area measurement in B mode
LVLs	Left ventricular long-axis length at end systole	Same to distance measurement in B mode
LVALs	Left ventricular long-axis area at end systole	Same to area measurement in B mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	Calculation item. The formula is: EDV（ml）＝ 8/3/π×（LVALd（cm^2））^{2}/LVLd（cm）

ESV	End-systolic left ventricular volume	Calculation item. The formula is: ESV（ml）= 8/3/π×（LVALs（cm^2））^{2}/LVLs（cm）
SV	Stroke volume	Calculation item. The formula is: SV（ml）= EDV（ml）－ ESV（ml）
CO	Cardiac output	Calculation item. The formula is: CO（l/min）= SV（ml）× HR（bpm）/ 1000
EF	Ejection fraction	Calculation item. The formula is: EF（No unit）= SV（ml）/ EDV（ml）
SI	SV Index	Calculation item. The formula is: SI（No unit）= SV（ml）/ BSA（m^2）
CI	CO Index	Calculation item. The formula is: CI（No unit）= CO（l/min）/ BSA（m^2）
BSA	Body surface area	Calculated based on the set formula. Formula options are: Oriental, Occidental

II. Operating procedures:

1. Move the cursor to [S-P Ellipse] in the “Cardiac” menu and press the『Set』key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. At end diastole of left ventricle, measure the following parameters respectively:
   LVLd: same to distance measurement in B mode;
   LVALd: same to area measurement in B mode;
   EDV value is then calculated.
4. At end systole of left ventricle, measure the following parameters respectively:
   LVLs: same to distance measurement in B mode;
   LVALs: same to area measurement in B mode;
   ESV value is then calculated.
5. After LVALs is measured, SV and EF are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, and CI can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.2 B-P Ellipse

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
LVALd	Left ventricular long-axis area at end diastole	Same to area measurement in B mode
LVAMd	Left ventricular short-axis area at the level of the Mitral valve at end diastole	Same to area measurement in B mode
LVIDd	Left ventricular short-axis diameter at end diastole	Same to distance measurement in B mode
LVIDs	Left ventricular short-axis diameter at end systole	Same to distance measurement in B mode
LVAMs	Left ventricular short-axis area at the level of the Mitral valve at end systole	Same to area measurement in B mode
LVALs	Left ventricular long-axis area at end systole	Same to area measurement in B mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	Calculation item. The formula is: EDV (ml) = 8/3/π×LVALd (cm^2) ×LVAMd (cm^2) /LVIDd (cm)
ESV	End-systolic left ventricular volume	Calculation item. The formula is: ESV (ml) = 8/3/π×LVALs (cm^2) ×LVAMs (cm^2) /LVIDs (cm)
SV	Stroke volume	Calculation item. The formula is: SV (ml) = EDV (ml) − ESV (ml)
CO	Cardiac output	Calculation item. The formula is: CO (l/min) = SV (ml) × HR (bpm) / 1000
EF	Ejection fraction	Calculation item. The formula is: EF (No unit) = SV (ml) / EDV (ml)
SI	SV Index	Calculation item. The formula is: SI (No unit) = SV (ml) / BSA (m^2)
CI	CO Index	Calculation item. The formula is: CI (No unit) = CO (l/min) / BSA (m^2)
BSA	Body surface area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor to [B-P Ellipse] in the “Cardiac” menu and press the『Set』key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. At end diastole of left ventricle, measure the following parameters respectively:

   LVIDd: same to distance measurement in B mode;

LVAMd: same to area measurement in B mode;

LVALd: same to area measurement in B mode;

EDV value is then calculated.

4. At end systole of left ventricle, measure the following parameters respectively:

   LVIDs: same to distance measurement in B mode;

   LVAMs: same to area measurement in B mode;

   LVALs: same to area measurement in B mode;

   ESV value is then calculated.

5. After LVALs is measured, SV and EF are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, and CI can be calculated and displayed.

6. Click [Return] to return to the previous menu.

5.3.1.3 Bullet

I. Measurement items:

Abbr.	Description	Algorithm or operation
LVLd	Left ventricular long-axis length at end diastole	Same to distance measurement in B mode
LVAMd	Left ventricular short-axis area at the level of the Mitral valve at end diastole	Same to area measurement in B mode
LVLs	Left ventricular long-axis length at end systole	Same to distance measurement in B mode
LVAMs	Left ventricular short-axis area at the level of the Mitral valve at end systole	Same to area measurement in B mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	Calculation item. The formula is: EDV（ml）= 5/6×LVLd（cm）×LVAMd（cm^2）
ESV	End-systolic left ventricular volume	Calculation item. The formula is: ESV（ml）= 5/6×LVLs（cm）×LVAMs（cm^2）
SV	Stroke volume	Calculation item. The formula is: SV (ml) = EDV (ml) − ESV (ml)
CO	Cardiac output	Calculation item. The formula is: CO (l/min) = SV (ml) × HR (bpm) / 1000
EF	Ejection fraction	Calculation item. The formula is: EF（No unit）= SV（ml）/ EDV（ml）
SI	SV Index	Calculation item. The formula is: SI (No unit) = SV (ml) / BSA (m^2)

CI	CO Index	Calculation item. The formula is: CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body surface area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor to [Bullet] in the “Cardiac” menu and press the 『Set』 key to pop up the submenu..
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. At end diastole of left ventricle, measure the following parameters respectively:
   LVLd: same to distance measurement in B mode;
   LVAMd: same to area measurement in B mode;
   EDV value is then calculated.
4. At end systole of left ventricle, measure the following parameters respectively:
   LVLs: same to distance measurement in B mode;
   LVAMs: same to area measurement in B mode;
   ESV value is then calculated.
5. After LVAMs is measured, SV and EF are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, and CI can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.4 SIMPSON

I. Measurement items:

Abbr.	Description	Algorithm or operation
LVLd	Left ventricular long-axis length at end diastole	Same to distance measurement in B mode
LVAMd	Left ventricular short-axis area at the level of the Mitral valve at end diastole	Same to area measurement in B mode
LVAPd	Left ventricular short-axis area at the level of the papillary muscle at end diastole	Same to area measurement in B mode
LVLs	Left ventricular long-axis length at end systole	Same to distance measurement in B mode
LVAMs	Left ventricular short-axis area at the level of the Mitral valve at end systole	Same to area measurement in B mode

LVAPs	Left ventricular short-axis area at the level of the papillary muscle at end systole	Same to area measurement in B mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	*1
ESV	End-systolic left ventricular volume	*1
SV	Stroke volume	Calculation item. The formula is: SV（ml）＝ EDV（ml）－ ESV（ml）
CO	Cardiac output	Calculation item. The formula is: CO（l/min）＝ SV（ml）× HR（bpm）/ 1000
EF	Ejection fraction	Calculation item. The formula is: EF（No unit）＝ SV（ml）/ EDV（ml）
SI	SV Index	Calculation item. The formula is: SI（No unit）＝ SV（ml）/ BSA（m^2）
CI	CO Index	Calculation item. The formula is: CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body surface area	Calculated based on the set formula.

*1 means:

$$EDV[mL] = \frac{LVLd[mm]}{9} \times \left(4 \times LVAMd[mm^2] + 2 \times LVAPd[mm^2] + \sqrt{LVAMd[mm^2] \times LVAPd[mm^2]}\right) / 1000$$

$$ESV[mL] = \frac{LVLs[mm]}{9} \times \left(4 \times LVAMs[mm^2] + 2 \times LVAPs[mm^2] + \sqrt{LVAMs[mm^2] \times LVAPs[mm^2]}\right) / 1000$$

Note： When you measure the left ventricle using Simpson method, be sure to keep the 4-chamber profile and 2-chamber profile perpendicular. Otherwise the measure result will be incorrect.

II. Operating procedures:

1. Move the cursor to [SIMPSON] in the “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. At end diastole of left ventricle, measure the following parameters respectively:
   LVLd: same to distance measurement in B mode;
   LVAMd: same to area measurement in B mode;
   LVAPd: same to area measurement in B mode;
   EDV value is then calculated.

4. At end systole of left ventricle, measure the following parameters respectively:
   LVLs: same to distance measurement in B mode;
   LVAMs: same to area measurement in B mode;
   LVAPs: same to area measurement in B mode;
   ESV value is then calculated.
5. After LVAPs is measured, SV and EF are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, and CI can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.5 CUBE

I. Measurement items:

Abbr.	Description	Algorithm or operation
IVSTd	Interventricular septal thickness at end diastole	Same to distance measurement in B/M mode
LVIDd	Left ventricular short-axis diameter at end diastole	Same to distance measurement in B/M mode
LVPWd	Left ventricular posterior wall thickness at end diastole	Same to distance measurement in B/M mode
IVSTs	Interventricular septal thickness at end systole	Same to distance measurement in B/M mode
LVIDs	Left ventricular short-axis diameter at end systole	Same to distance measurement in B/M mode
LVPWs	Left ventricular posterior wall thickness at end systole	Same to distance measurement in B/M mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	EDV (ml) = LVIDd $(cm)^3$
ESV	End-systolic left ventricular volume	ESV (ml) = LVIDs $(cm)^3$
SV	Stroke volume	Calculation item. The formula is: SV（ml）＝ EDV（ml）－ ESV（ml）
CO	Cardiac output	Calculation item. The formula is: CO（l/min）＝ SV（ml）× HR（bpm）/ 1000
EF	Ejection fraction	Calculation item. The formula is: EF（No unit）＝ SV（ml）/ EDV（ml）
FS	Fractional shortening	FS[No unit] =(LVIDd [mm]–LVIDs[mm])/LVIDd [mm]

MVCF	Mean velocity of circumferential fiber shortening	MVCF= (LVIDd [mm] – LVIDs [mm]) / (LVIDd [mm] × ET [ms] / 1000)
SI	SV Index	Calculation item. The formula is: SI（No unit）＝ SV（ml）/ BSA（m^2）
CI	CO Index	CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body surface area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor to [CUBE] in the M mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. At end diastole of left ventricle, measure the following parameters respectively:
   IVSTd: Same to distance measurement in B/M mode
   LVIDd: Same to distance measurement in B/M mode. EDV is calculated.
   LVPWd: Same to distance measurement in B/M mode
   EDV value is then calculated.
4. At end systole of left ventricle, measure the following parameters respectively:
   IVSTs: Same to distance measurement in B/M mode
   LVIDs: Same to distance measurement in B/M mode. ESV is calculated.
   LVPWs: Same to distance measurement in B/M mode
   ESV value is then calculated.
5. After LVPWs is measured, SV, EF and FS are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, CI, and MVCF can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.6 TEICHHOLZ

I. Measurement items:

Abbr.	Description	Algorithm or operation
IVSTd	Interventricular septal thickness at end diastole	Same to distance measurement in B/M mode
LVIDd	Left ventricular short-axis diameter at end diastole	Same to distance measurement in B/M mode
LVPWd	Left ventricular posterior wall thickness at end diastole	Same to distance measurement in B/M mode
IVSTs	Interventricular septal thickness at end systole	Same to distance measurement in B/M mode
LVIDs	Left ventricular short-axis diameter at end systole	Same to distance measurement in B/M mode
LVPWs	Left ventricular posterior wall thickness at end systole	Same to distance measurement in B/M mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	EDV (ml) =(7×(LVIDd (cm))$^{3)}$/(2.4 + LVIDd(cm))
ESV	End-systolic left ventricular volume	ESV (ml)=(7×(LVIDs (cm))^3)/(2.4 + LVIDs(cm))
SV	Stroke volume	Calculation item. The formula is: SV（ml）＝ EDV（ml）－ ESV（ml）
CO	Cardiac output	Calculation item. The formula is: CO（l/min）＝ SV（ml）× HR（bpm）/ 1000
EF	Ejection fraction	Calculation item. The formula is: EF（No unit）＝ SV（ml）/ EDV（ml）
FS	Fractional shortening	FS[No unit] =(LVIDd [mm]–LVIDs[mm])/LVIDd [mm]
MVCF	Mean velocity of circumferential fiber shortening	MVCF= (LVIDd [mm] – LVIDs [mm]) / (LVIDd [mm] × ET [ms] / 1000)
SI	SV Index	Calculation item. The formula is: SI（No unit）＝ SV（ml）/ BSA（m^2）
CI	CO Index	CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body surface area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor to [Teichholz] in the M mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.

2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays "+".
3. At end diastole of left ventricle, measure the following parameters respectively:
   IVSTd: Same to distance measurement in B/M mode
   LVIDd: Same to distance measurement in B/M mode. EDV is calculated.
   LVPWd: Same to distance measurement in B/M mode
   EDV value is then calculated.
4. At end systole of left ventricle, measure the following parameters respectively:
   IVSTs: Same to distance measurement in B/M mode
   LVIDs: Same to distance measurement in B/M mode. ESV is calculated.
   LVPWs: Same to distance measurement in B/M mode.
   ESV value is then calculated.
5. After LVPWs is measured, SV, EF and FS are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO, CI, and MVCF can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.7 Simpson SP

On the image of four-cavity or two-cavity plane of section of the cardiac tip, a vertical plane is used to calculate area and a long axis is used to calculate volume. The area region is divided into 20 ellipse slices, and the long axis is used as axes to revolve the image so that the LV volume is obtained.

I. Measurement items:

Abbr.	Description	Algorithm or operation
EDV	End-diastolic left ventricular volume	$\mathrm{EDV}(ml)=\pi\times{LVLd(cm)}/{20}\times\sum_{i=1}^{20}r_i^{\,2}(cm)$
ESV	End-systolic left ventricular volume	$\mathrm{ESV}(ml)=\pi\times{LVLs(cm)}/{20}\times\sum_{i=1}^{20}r_i^{\,2}(cm)$
HR	Heart Rate	Key In
SV	Stroke Volume	Calculation item. The formula is: SV (ml) = EDV (ml) − ESV (ml)
CO	Cardiac Output	Calculation item. The formula is: CO (l/min) = SV (ml) × HR (bpm) / 1000
EF	Ejection Fraction	Calculation item. The formula is: EF (No unit) = SV (ml) / EDV (ml)
SI	SV INDEX	Calculation item. The formula is: SI (No unit) = SV (ml) / BSA (m^2)
CI	CO INDEX	CI (No unit) = CO (l/min) / BSA (m^2)
BSA	Body Surface Area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor onto [Simpson SP] of the “Cardiac” menu, and press the『Set』key, and then the [Simpson SP] submenu appears.
2. Move the cursor onto any item of the [Simpson SP] submenu, and press the『Set』key to perform measurements or calculations; the cursor is displayed as “+” indicating the measurement status.
3. Measure end-diastolic left ventricular endocardium and set the position of the long axis, the measurement method is the same as that for area measurement, and then the EDV is obtained.
4. Measure end-systolic left ventricular endocardium and set the position of the long axis, the measurement method is the same as that for area measurement, and then the ESV is obtained.
5. The results of SV and EF are calculated and displayed; If patient height, weight, and heart rate are already entered, SI, CO and CI can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.1.8 Simpson BP

Two vertical planes (on the image of four-cavity or two-cavity plane of section of the cardiac tip) and a long axis are used to calculate volume. The area region is divided into 20 ellipse slices, and the long axis is used as axes to revolve the image so that the LV volume is obtained.

I. Measurement items:

Abbr.	Description	Algorithm or operation
EDV	End-diastolic left ventricular volume	*2
ESV	End-systolic left ventricular volume	*2
HR	Heart Rate	Key In
SV	Stroke Volume	Calculation item. The formula is: SV（ml）＝ EDV（ml）－ ESV（ml）
CO	Cardiac Output	Calculation item. The formula is: CO（l/min）＝ SV（ml）× HR（bpm）/ 1000
EF	Ejection Fraction	Calculation item. The formula is: EF（No unit）＝ SV（ml）/ EDV（ml）
SI	SV INDEX	Calculation item. The formula is: SI（No unit）＝ SV（ml）/ BSA（m^2）
CI	CO INDEX	CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body Surface Area	Calculated based on the set formula.

*2 means:

$$\mathrm{EDV}(ml) = \pi \times {MAX\{LVLd_{2i}(cm), LVLd_{4i}(cm)\}}/{20} \times \sum_{i=1}^{20} (r_{2i}(cm) \times r_{4i}(cm))$$

$$\mathrm{ESV}(ml)=\pi\times{MAX\{LVLs_{2i}(cm),LVLs_{4i}(cm)\}}/{20}\times\sum_{i=1}^{20}(r_{2i}(cm)\times r_{4i}(cm))$$

To calculate LV volume on the image of two-cavity plane of section:

$$\mathrm{EDV2}(ml)=\pi\times{LVLd_{2i}(cm)}/{20}\times\sum_{i=1}^{20}{r_{2i}}^{2}(cm)$$

$$\mathrm{ESV2}(ml)=\pi\times{LVLs_{2i}(cm)}/{20}\times\sum_{i=1}^{20}{r_{2i}}^{2}(cm)$$

To calculate LV volume on the image of four-cavity plane of section:

$$\mathrm{EDV4}(ml)=\pi\times{LVLd_{4i}(cm)}/{20}\times\sum_{i=1}^{20}{r_{4i}}^{2}(cm)$$

$$\mathrm{ESV4}(ml)=\pi\times{LVLs_{4i}(cm)}/{20}\times\sum_{i=1}^{20}{r_{4i}}^{2}(cm)$$

II. Operating procedures:

1. Move the cursor onto [Simpson BP] of the “Cardiac” menu, and press the『Set』key, and then the [Simpson BP] submenu appears.
2. Move the cursor onto any item of the [Simpson BP] submenu, and press the『Set』key to perform measurements or calculations; the cursor is displayed as “+” indicating the measurement status.
3. Measure end-diastolic left ventricular endocardium on the image of two-cavity plane of section and set the position of the long axis, the measurement method is the same as that for area measurement, and then the EDV2 is obtained.
4. Measure end-systolic left ventricular endocardium on the image of two-cavity plane of section and set the position of the long axis, the measurement method is the same as that for area measurement, and then the ESV2 is obtained.
5. Measure end-diastolic left ventricular endocardium on the image of four-cavity plane of section and set the position of the long axis, the measurement method is the same as that for area measurement, and then the EDV4 is obtained.
6. Measure end-systolic left ventricular endocardium on the image of four-cavity plane of section and set the position of the long axis, the measurement method is the same as that for area measurement, and then the ESV4 is obtained.
7. The results of SV and EF are calculated and displayed; If patient height, weight, and

heart rate are already entered, SI, CO and CI can be calculated and displayed.

8. Click [Return] to return to the previous menu.

5.3.1.9 Gibson

I. Measurement items:

Abbr.	Description	Algorithm or operation
IVSTd	Interventricular septal thickness at end diastole	Same to distance measurement in B/M mode
LVIDd	Left ventricular internal diameter at end diastole	Same to distance measurement in B/M mode
LVPWd	Left ventricular posterior wall thickness at end diastole	Same to distance measurement in B/M mode
IVSTs	Interventricular septal thickness at end systole	Same to distance measurement in B/M mode
LVIDs	Left ventricular internal diameter at end systole	Same to distance measurement in B/M mode
LVPWs	Left ventricular posterior wall thickness at end systole	Same to distance measurement in B/M mode
HR	Heart Rate	Key In
EDV	End-diastolic left ventricular volume	$\mathrm{EDV}(ml)=\pi/6\times(0.98\times LVIDd(cm)+5.90)\times LVIDd(cm)^2$
ESV	End-systolic left ventricular volume	$\mathrm{ESV}(ml)=\pi/6\times(1.14\times LVIDs(cm)+4.18)\times LVIDs(cm)^2$
SV	Stroke Volume	Calculation item. The formula is: SV（ml）＝ EDV（ml）－ ESV（ml）
CO	Cardiac Output	Calculation item. The formula is: CO（l/min）＝ SV（ml）× HR（bpm）/ 1000
EF	Ejection Fraction	Calculation item. The formula is: EF（No unit）＝ SV（ml）/ EDV（ml）
SI	SV INDEX	Calculation item. The formula is: SI（No unit）＝ SV（ml）/ BSA（m^2）
CI	CO INDEX	CI（No unit）＝ CO（l/min）/ BSA（m^2）
BSA	Body Surface Area	Calculated based on the set formula.

II. Operating procedures:

1. Move the cursor onto [Gibson] of the “Cardiac”in the M mode, press the 『Set』key, and then the [Gibson] submenu appears.
2. Move the cursor onto any item of the [Gibson] submenu, press the『Set』key to perform measurements or calculations; the cursor is displayed as “+”indicating the measurement status.
3. At end diastole of left ventricle, measure the following parameters respectively:
   IVSTd: Same to distance measurement in B/M mode
   LVIDd: Same to distance measurement in B/M mode.
   LVPWd: Same to distance measurement in B/M mode.
   EDV value is then calculated.

4. At end systole of left ventricle, measure the following parameters respectively:
   IVSTs: Same to distance measurement in B/M mode
   LVIDs: Same to distance measurement in B/M mode.
   LVPWs: Same to distance measurement in B/M mode
   ESV value is then calculated.
5. After LVPWs is measured, SV and EF are calculated and displayed simultaneously. If patient height, weight, and heart rate are already entered, SI, CO and CI can be calculated and displayed.
6. Click [Return] to return to the previous menu.

5.3.2 LV Mass and LVMWI

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
LVPWd	Left ventricular posterior wall thickness at end diastole	Same to distance measurement in B/M mode
IVSTd	Interventricular septal thickness at end diastole	Same to distance measurement in B/M mode
LVIDd	Left ventricular short-axis diameter at end diastole	Same to distance measurement in B/M mode
LV Mass	Left ventricle muscle mass	LV Mass(g) = 1.04 x ((LVPWd (cm) + IVSTd(cm) + LVIDd (cm))^3 – LVIDd (cm)^3) - 13.6
LVMWI	Left ventricle muscle mass index	LVMWI (No unit) = LV Mass (g)/ BSA (m^2)

II. Operating procedures:

1. Move the cursor to [LV mass] in the B mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure the following parameters respectively:
   LVPWd: same to distance measurement in B/M mode;
   IVSTd: same to distance measurement in B/M mode;
   LVIDd: same to distance measurement in B/M mode;
   LV mass is then calculated.
4. If height and weight have been input already, LVMWI is calculated and displayed simultaneously.
5. Click [Return] to return to the previous menu.

5.3.3 RVDd

Function: measures Right Ventricular End Diastolic Diameter.

The measurement method is same to distance measurement in B mode.

5.3.4 RVSd

Function: measures Right Ventricular End Systolic Diameter.

The measurement method is same to distance measurement in B mode.

5.3.5 MPA

Function: measures the Main Pulmonary Artery.

The measurement method is same to distance measurement in B mode.

5.3.6 ET

Function: measures the ejection time of left ventricle

The measurement method is same to time measurement in M mode.

5.3.7 HR

Function: measures the number of heart beats per minute

The measurement method is same to heart rate measurement in M mode. You can also input heart rate directly through the “General” tab sheet in the “Patient Info” dialog box.

5.3.8 LAD/AOD

Function: measures the ratio of left atrium to aortic (LAD/AOD (No unit)).

Steps:

1. Move the cursor to [LAD/AOD] in the M mode “Cardiac” menu and press the『Set』key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure LAD and AOD respectively in the same method to distance measurement in M mode. Then the value of LAD/AOD is obtained.

4. Click [Return] to return to the previous menu.

5.3.9 Mitral Valve

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
EFSLP	Mitral valve closing speed	Same to slope measurement in M mode
ACV	AC descending speed	Same to slope measurement in M mode
CA	Amplitude of the A wave	Same to distance measurement in M mode
CE	Amplitude of the E wave	Same to distance measurement in M mode
CA/CE	CA/CE ratio	CA/CE[no unit]=CA[mm]/CE[mm]

II. Operating procedures:

1. Move the cursor to [Mitral Valve] in the M mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure EFSLP in the same method to slope measurement in M mode.
4. Measure ACV in the same method to slope measurement in M mode.
5. Measure CA and CE in the same method to distance measurement in M mode. Then the value of CA/CE is obtained.
6. Click [Return] to return to the previous menu

5.3.10 Mitral Valve Flow

I. Measurement and calculation items:

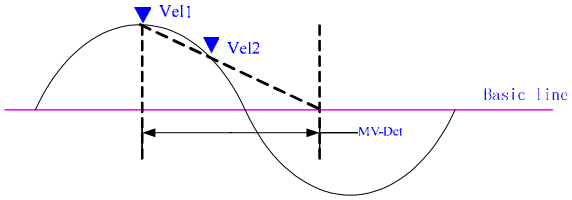
Abbr.	Description	Algorithm or operation
E-Wave-Vel	Mitral valve E wave velocity	Same to velocity measurement in PW mode
A-Wave-Vel	Mitral valve A wave velocity	Same to velocity measurement in PW mode
PHT	Mitral Valve pressure half time	Doppler measurement
MV-Area	Mitral Valve area	MV-Area(cm^2)= 220/PHT(ms)
VTI	Mitral Valve Velocity-Time Integral	Same to spectrum trace measurement in PW mode (options are: Trace Spline, and Auto)
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Mitral Valve peak Pressure Gradient	
MPG	Mitral Valve Mean Pressure Gradient	

E-Wave-Dur	Mitral Valve E wave duration	Same to time measurement in PW mode
A-Wave-Dur	Mitral Valve A wave duration	Same to time measurement in PW mode
MV-IRT	Mitral Valve isovolumic relaxation time	Same to time measurement in PW mode
MV-Dct	Mitral Valve deceleration time	Doppler measurement
MR Velocity	Mitral Regurgitation velocity	Same to velocity measurement in PW mode
MR-PG	Mitral Regurgitation Pressure Gradient	
MV-Diameter	Mitral Valve diameter	Same to distance measurement in B mode
MV-E/A	E/A velocity	MV-E/A (No unit) = E-Wave-Vel (cm/s) /A-Wave-Vel (cm/s)
MV-A/E	A/E velocity	MV-A/E (No unit) = A-Wave-Vel (cm/s)/ E-Wave-Vel (cm/s)
SV	Stroke volume	SV(ml)= 0.785 (MV-Diameter)^2(cm) x ∣VTI∣(cm)
SI	SV Index	SI(No unit) = SV(ml)/BSA(m^2)
CO	Cardiac output	CO(l/min)= SV(ml) x HR(bpm)/1000
CI	CO Index	CI(No unit) = CO(l/min)/BSA(m^2)

II. Operating procedures:

1. Move the cursor to [Mitral Valve] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure E-Wave-Vel and A-Wave-Vel in the same method to velocity measurement in PW mode. Measure MV-E/A and MV-A/E.
4. Measure PHT by way of Doppler measurement. Calculate MV-Area.
5. Trace MV V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.

   VTI, Vpeak, Vmean, PPG, and MPG are obtained respectively.
6. Measure E-Wave-Dur, A-Wave-Dur, and MV-IRT in the same method to time measurement in PW mode.
7. Measure MV-Dct by way of Doppler measurement.



8. Measure MR Velocity in the same method to velocity measurement in PW mode. MR Velocity and MR-PG are obtained respectively.
9. Measure MV-Diameter in mode through the same method to distance measurement in B mode.

10. Click [Return] to return to the previous menu.

5.3.11 Tricuspid Valve Flow

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
TV Velocity	Tricuspid Valve velocity	Same to velocity measurement in PW mode
TV-PG	Tricuspid Valve pressure gradient	TV-PG(mmHg)= 4×TV Velocity(m/s)^2
VTI	Tricuspid Valve velocity-time integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto) PPG (mmHg) = 4 x PS (m/s)^2
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Tricuspid Valve peak pressure gradient	
MPG	Tricuspid Valve mean pressure gradient	
TR-VTI	Tricuspid regurgitation velocity-time integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto) RVSP (mmHg) = RAP(mmHg) + TR-PPG (mmHg)
TR-Vpeak	Tricuspid regurgitation peak velocity	
TR-Vmean	Tricuspid regurgitation mean velocity	
TR-PPG	Tricuspid regurgitation peak pressure gradient	
TR-MPG	Tricuspid regurgitation mean pressure gradient	
RVSP	Right ventricle systole pressure	
RAP	Right atrium pressure	Key In. The default is 10.0 mmHg. The value range is 0–50.0 mmHg.

II. Operating procedures:

1. Move the cursor to [Tricuspid Valve] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure TV Velocity in the same method to velocity measurement in PW mode.
   TV Velocity and TV-PG are obtained respectively.
4. Trace TV V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.
   VTI, Vpeak, Vmean, PPG, and MPG are obtained respectively.
5. Trace TR V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.
   TR-VTI, TR-Vpeak, TR-Vmean, TR-PPG, and TR-MPG are obtained respectively. If

RAP is keyed in, RVSP can be obtained.

6. Click [Return] to return to the previous menu.

5.3.12 LVOT

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
LVOT-Vel	Left ventricular outflow tract velocity	Same to velocity measurement in PW mode LVOT - PG (mmHg) = 4 x LVOT - Vel(m/s)^2
LVOT-PG	Left ventricular outflow tract pressure gradient	
VTI	Left ventricular outflow tract velocity-time integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto) PPG (mmHg) = 4 x PS (m/s)^2
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Left ventricular outflow tract peak pressure gradient	
MPG	Left ventricular outflow tract mean pressure gradient	
LVOT-D	Left ventricular outflow tract diameter	Same to distance measurement in B mode
SV	Stroke volume	SV(ml) = 0.785 x (LVOT-D)^2(cm) x ABS丨VTI丨(cm)
SI	SV Index	SI(No unit) = SV(ml)/BSA(m^2)
CO	Cardiac output	CO(l/min) = SV(ml) x HR(bpm)/1000
CI	CO Index	CI(No unit) = CO(l/min)/BSA(m^2)

II. Operating procedures:

1. Move the cursor to [LVOT] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure LVOT Velocity in the same method to velocity measurement in PW mode.

   LVOT-Vel and LVOT-PG are obtained respectively.
4. Trace LVOT V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.

   VTI, Vpeak, Vmean, PPG, and MPG are obtained respectively.
5. Measure LVOT-D in B mode through the same distance method in B mode.
6. If patient height, weight, and heart rate are already entered, SV, SI, CO, CI can be calculated.
7. Click [Return] to return to the previous menu.

5.3.13 Aortic Valve Flow

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
AoV Velocity	Aortic Valve velocity	Same to velocity measurement in PW mode. AoV - PG(mmHg) = 4 x AoV Velocity(m/s)^2
AoV-PG	Aortic Valve Pressure Gradient	
VTI	Aortic Valve Velocity-Time Integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto). PPG(mmHg) = 4 x PS (m/s)^2
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Aortic Valve peak Pressure Gradient	
MPG	Aortic Valve Mean Pressure Gradient	
AoV-A-Trace	Aortic Valve trace area	Same to trace method of area measurement in B mode
SV	Stroke volume	SV(ml) = 0.785 x (LVOT - D)^2(cm) x ABS｜LVOT - VTI｜(cm)
SI	SV Index	SI(No unit) = SV(ml)/BSA(m^2)
CO	Cardiac output	CO(l/min) = SV(ml) x HR(bpm)/1000
CI	CO Index	CI(No unit) = CO(l/min)/BSA(m^2)
AoV-Area	Aortic Valve area	AoV-A(cm^2) = SV(ml)/AoV - VTI(cm)/100

II. Operating procedures:

1. Move the cursor to [Aortic Valve] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure AoV Velocity in the same method to velocity measurement in PW mode.
   AoV Velocity and AoV-PG are obtained respectively.
4. Trace AoV V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.
   VTI, Vpeak, Vmean, PPG, and MPG are obtained respectively.
5. Measure AoV-A-Trace in the same method to trace of area measurement in B mode.
6. If SV and VTI are already obtained, AoV-Area can be calculated. The formulas are:
7. Click [Return] to return to the previous menu.

5.3.14 AoR

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
AoR-Vmax	Aortic Regurgitation Maximum Velocity	Same to acceleration measurement in PW mode. AoR-DcR(cm/s^2)=(AoR-Vmax(cm/s)-AoR-Ved(cm/s))/AoR-Time(s) AoR-DcT(s)= AoR-Vmax(cm/s)/AoR-DcR(cm/s)
AoR-Ved	Aortic Regurgitation End Diastolic Velocity	
AoR-DcR	Aortic Regurgitation Deceleration Rate	
AoR-DcT	Aortic Regurgitation Deceleration Time	
AoR-Time	Aortic Regurgitation Time	

II. Operating procedures:

1. Move the cursor to [AoR] in the PW mode “Cardiac” menu and press the 『Set』 key to start measurement. The cursor displays “+”.
2. Measure AoR in the same method to acceleration measurement in PW mode. AoR-Vmax, AoR-Ved, AoR-Time, AoR-DcR, and AoR-DcT are obtained respectively.

5.3.15 Pulmonary Valve Flow

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
PV Velocity	Pulmonary Valve Velocity	Same to velocity measurement in PW mode. PV-PG(mmHg) = 4 x PV Velocity(m/s)^2
PV-PG	Pulmonary Valve Pressure Gradient	
VTI	Pulmonary Valve Velocity-Time Integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto). PPG(mmHg)= 4×PS (m/s)^2
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Pulmonary Valve peak Pressure Gradient	
MPG	Pulmonary Valve Mean Pressure Gradient	
PV Diameter	Pulmonary Valve Diameter	Same to distance measurement in B mode.
SV	Stroke volume	SV(ml)=0.785x(PV Diameter)^2(cm)xABS｜VTI｜(cm)
SI	SV Index	SI(No unit) = SV(ml)/BSA(m^2)
CO	Cardiac output	CO(l/min)= SV(ml)xHR(bpm)/1000
CI	CO Index	CI(No unit)= CO(l/min)/BSA(m^2)

II. Operating procedures:

1. Move the cursor to [Pulmonary Valve] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure PV Velocity in the same method to velocity measurement in PW mode.
   PV Velocity and PV-PG are obtained respectively.
4. Trace PV V in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.
   VTI, Vpeak, Vmean, PPG and MPG are obtained respectively.
5. Measure PV Diameter in B mode through the same method to distance measurement in B mode.
6. If patient height, weight, and heart rate are already entered, SV, SI, CO, and CI can be calculated.
7. Click [Return] to return to the previous menu.

5.3.16 Right Ventricular

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
RV-ET	Right ventricle ejection time	Same to time measurement in PW mode
RV-AcT	Right ventricle acceleration time	Same to time measurement in PW mode
RV-PEP	Right ventricle pre ejection period	Same to time measurement in PW mode
RV-AcT/ET	Ratio of right ventricle acceleration time to ejection time	RV-AcT/ET(No unit)= RV-AcT(s)/RV-ET(s)
RV-STI	Right ventricle systole time interval	RV-STI(No unit)= RV-PEP(s)/RV-ET(s)

II. Operating procedures:

1. Move the cursor to [Right Ventricular] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure RV-ET in the same method to time measurement in PW mode.

4. Measure RV-AcT in the same method to time measurement in PW mode.
5. Measure RV-PEP in the same method to time measurement in PW mode.
6. RV-AcT/ET and RV-STI can be obtained.
7. Click [Return] to return to the previous menu.

5.3.17 Pulmonary Vein Valve

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
S1-Wave-Vel	Pulmonary Vein Valve SI Velocity	Same to velocity measurement in PW mode
S2-Wave-Vel	Pulmonary Vein Valve S2 Velocity	Same to velocity measurement in PW mode
D-Wave-Vel	Pulmonary Vein Valve D Velocity	Same to velocity measurement in PW mode
PVA Wave V	Pulmonary Vein Valve PVA Velocity	Same to velocity measurement in PW mode
PVA Wave Dur	Pulmonary Vein Valve PVA Duration	Same to time measurement in PW mode
S-Wave-VTI	Pulmonary Vein Valve S Velocity-Time Integral	Same to spectrum trace measurement in PW mode
D-Wave-VTI	Pulmonary Vein Valve D Velocity-Time Integral	Same to spectrum trace measurement in PW mode
PVV DcT	Pulmonary Vein Valve Deceleration time	Same to time measurement in PW mode
PVV-S2/D	Pulmonary Vein Valve S2 velocity /D velocity	PVV-S2/D(No unit) = S2-Wave-Vel (cm/s)/ D-Wave-Vel (cm/s)
PVV-SF	Pulmonary Vein Valve systole fraction	PVV-SF(No unit) = S-Wave-VTI (cm)/(S-Wave-VTI (cm)+ D-Wave-VTI (cm))

II. Operating procedures:

1. Move the cursor to [Pulmonary Vein Valve] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Measure S1-Wave-Vel in the same method to velocity measurement in PW mode.
4. Measure S2-Wave-Vel in the same method to velocity measurement in PW mode.
5. Measure D-Wave-Vel in the same method to velocity measurement in PW mode.
6. Measure PVA Wave V in the same method to velocity measurement in PW mode.
7. Measure PVA Wave Dur in the same method to time measurement in PW mode.
8. Measure S-Wave-VTI in the same method to spectrum trace in PW mode.
9. Measure D-Wave-VTI in the same method to spectrum trace in PW mode.
10. Measure PVV DcT in the same method to time measurement in PW mode

11. If S2-Wave-Vel and D-Wave-Vel are already measured, PVV-S2/D is calculated automatically.

    If S-Wave-VTI and D-Wave-VTI are already measured, PVV-SF is calculated automatically.

12. Click [Return] to return to the previous menu.

5.3.18 Volume Flow

I. Measurement and calculation items:

Abbr.	Description	Algorithm or operation
VTI	Velocity-Time Integral	Same to spectrum trace measurement in PW mode (options are: Trace, Spline, and Auto). PPG(mmHg) = 4 x PS $(m/s)^2$
PS	Peak Systolic Velocity	
TAMAX	Time Averaged Maximum Velocity	
PPG	Peak pressure gradient	
MPG	Mean pressure gradient	
AcT	Acceleration time	Same to time measurement in PW mode
DcT	Deceleration time	Same to time measurement in PW mode
CycleT	Cardiac cycle time	Same to time measurement in PW mode
CSA	Cross section area	Same to trace method of area measurement in B mode
SV	Stroke volume	SV(ml)= Vmean(cm/s)×CSA(cm^2)×60(s)
SI	SV Index	SI(No unit)= SV(ml)/BSA(m^2)
CO	Cardiac output	CO(l/min)= SV(ml)×HR(bpm)/1000
CI	CO Index	CI(No unit)= CO(l/min)/BSA(m^2)

II. Operating procedures:

1. Move the cursor to [VolumeFlow] in the PW mode “Cardiac” menu and press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item. The cursor displays “+”.
3. Trace Velocity in the same method to spectrum trace in PW mode. Options are Trace, Spline, and Auto.

   VTI, Vpeak, Vmean, PPG, and MPG are obtained respectively.
4. Measure AcT in the same method to time measurement in PW mode.
5. Measure DcT in the same method to time measurement in PW mode.
6. Measure CycleT in the same method to time measurement in PW mode.

7. Measure CSA in B mode through the same method to trace of area measurement in B mode.
8. If VM and CSA are already measured, SV is calculated automatically. If patient height, weight, and heart rate are already entered, SI, CO, and CI can be calculated and displayed.
9. Click [Return] to return to the previous menu.

5.4 Cardiac Exam Report

During cardiac measurement or after measurement of an item ends, you can press the 

key on the control panel to view the cardiac exam report.

The item results already measured are displayed in the report.

On the “Cardiac Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

6 Gynecology Measurements

This Diagnostic Ultrasound System provides a gynecology measurement package, which facilitates clinical diagnoses through measuring such parameters as uterus, endometrium, ovary and follicle.

6.1 Gynecology Measurement Items

Gynecology measurements involve Endo, Uterus, Uterine Cervix, Ovary volume and Follicle. The detailed measurement items are:

- Endometrium (Endo)

- Uterus volume

Uterus length, uterus height, uterus width

Uterus body

- Uterine Cervix

Cervix length, cervix height, cervix width

- Uterus / cervix (UT-L/CX-L)

- Ovary volume

Left ovary volume: left ovary length, left ovary height, left ovary width;

Right ovary volume: right ovary length, right ovary height, right ovary width.

- Follicle

Left follicle length, left follicle width;

Right follicle length, right follicle width.

6.2 Gynecology Exam Preparations

Make the following preparations before performing gynecology exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the gynecology measurement mode.

6.2.1 Patient Information Input

You need to register patient information during gynecology exam.

For details, refer to section “Patient Information Input” in *Diagnostic Ultrasound System Operation Manual [Basic Volume]*.

6.2.2 Gynecology Measurement Menu

Gynecology measurement can be performed in B or Color mode with same measurement items. The following figures show the gynecology measurement menu.

Press the 『Measure』 key to enter the application measurement mode in B or Color mode. Press the 『Menu』 key to display the application measurement menu. Select [Gynecology] from the submenu to switch to gynecology measurement menu.

6.2.3 Gynecology Measurement Preset

Open the “Measure Preset” dialog box to preset the formulas for calculating uterine and ovary volumes. For details, refer to section “Measurement Preset”.

6.3 Gynecology Measurements and Calculations

6.3.1 Endometrium (Endo)

Function: measures Endo by using the method for distance measurement in B mode.

Steps:

1. Select [Endo] in the “Gynecology” menu and then press the 『Set』 key to enter measurement.
2. Use the method for distance measurement in B mode to measure Endo.
3. When the measurement completes, the result window displays the Endo value automatically.

6.3.2 Uterus Body

Function: measures uterus length, uterus height, uterus widtg and calculate uterus volume based on the preset formula. Uterus body is calculated based on the formula “uterus body = length + height + wudth”.

Steps:

1. Select [Uterus] in the “Gynecology” menu and then press the 『Set』 key to enter measurement.
2. Use the method for distance measurement in B mode to measure length, height, and width.
3. When the measurement completes, the result window displays the values of length, height, width, volume, and uterus body automatically.

6.3.3 Uterine Cervix

Function: measures Uterine Cervix length, height, width.

If uteris and Uterine Cervix are already measured, UT-L/CX-L is calculated automatically.

Steps:

1. Select [Uterine Cervix] in the “Gynecology” menu and then press the 『Set』 key to

enter measurement.

2. Use the method for distance measurement in B mode to measure length, height, width.
3. When the measurement completes, the result window displays the values of length, height, width automatically. If uterus length is already measured, UT-L/CX-L is also displayed in the result window.

6.3.4 Uterine/cervix (UT-L/CX-L)

Function: calculates the ratio of uterus length to Uterine Cervix length.

Steps:

1. Select [UT-L/CX-L] in the “Gynecology” menu and then press the 『Set』 key to enter measurement.
2. Use the method for distance measurement in B mode to measure uterus length and Uterine Cervix length.
3. When the measurement completes, the result window displays the value of UT-L/CX-L.

6.3.5 Ovary Volume

Function: for Ovary Volume, there are left Ovary Volume and right Ovary Volume. The system measures the length, height, and width of ovary to calculate ovary volume. The measurement formula can be preset in the “Measure Preset” dialog box. For details, refer to section “Measurement Preset”.

The method for measuring left ovary volume is similar to that for measuring right ovary volume. The following takes left ovary volume measurement for an example.

Steps:

1. Select [Left Ovary Volume] in the “Gynecology” menu and then press the 『Set』 key to enter measurement.
2. Use the method for distance measurement in B mode to measure length, height, width.
3. When the measurement completes, the result window displays the values of length, height, width and volume.

6.3.6 Follicle

Function: for follicle measurement, there are left follicle measurement and right follicle measurement. The system uses the method for distance measurement to measure the diameter of follicle or two follicle axes perpendicular to each other to calculate follicle. Up to

eight follicles can be measured. You need to specify the serial numbers of the follicles before measuring every follicle. The measurement items include follicle length and width.

Steps:

1. Select [Left Follicle 1] in the “Gynecology” menu and then press the 『Set』 key to enter measurement of the first dominant follicle.
2. Use the method for distance measurement in B mode to measure the length and width of dominant follicle.
3. When the measurement completes, the result window displays the length and width of dominant follicle.

6.4 Gynecology Exam Report

During gynecology measurement or after measurement of an item ends, you can press the 

key on the control panel to view the gynecology exam report.

The item results already measured are displayed in the report.

On the “Gynecology Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

7 Peripheral Vascular (PV) Measurement

7.1 PV Measurement Items

PV measurement involves the following:

- Common carotid artery (CCA)
- Internal carotid artery (ICA)
- External carotid artery (ECA)
- Vertebral artery (VERT)
- Upper extremity (Upper)
- Lower extremity (Lower)

The methods for measuring different kinds of blood vessels are the same. The following measurement indexes can be obtained:

- (In B or Color mode) measures VesselD (Vessel Diameter) and ResidualD (Residual Diamter) to obtain %StenosisD (%Stenosis Distance) ; measures VesselA (Vessel Area) and ResidualA (Residual Area) to obtain %StenosisA (%Stenosis Area) ; measures CSD (Cross Sectional Diameter) and CSA (Cross Sectional Area);

  %StenosisD(No unit)=(VesselD(cm)- ResidualD(cm))/VesselD(cm)×100%

  %StenosisA(No unit)=(VesselA(cm2)-ResidualA(cm2))/VesselA(cm2)×100%

- (for Spectrum trace in PW mode) measures VPS (peak velocity at systole) , VED (velocity at end diastole), TAMAX (Time Averaged Maximum Velocity) , PGmean (mean pressure gradient), PGvps, S/D (ratio of systole to diastole), RI (resistance index), and PI (pulsation index);

  PGvps(mmHg)=4xVPS(m/s)2

  PGmean(mmHg)

  RI(No unit)=｜(VPS(m/s) -VED(m/s))/VPS(m/s)｜

  PI(No unit)=｜(VPS(m/s) -VED(m/s))/TAMAX (m/s)｜

S/D(No unit)= VPS(m/s)/VED(m/s)

- Measures CSD, CSA and VM (Mean Velocity) to obtain VFD (VolumeFlowD) and VFA (VolumeFlowA)

  VFD(ml/min)= ｜TAMAX (cm/s)｜x (πxCSD(cm)2/4)x60(s)

  VFA(ml/min)=｜TAMAX (cm/s)｜x CSA(cm2)x60(s)

7.2 PV Exam Preparations

Make the following preparations before performing PV exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the PV measurement mode.

7.2.1 Patient Information Input

You need to register patient information during PV exam.

For details, refer to section “Patient Information Input” in *Diagnostic Ultrasound System Operation Manual [Basic Volume]*.

7.2.2 PV Measurement Menu

The following figures show the PV measurement menu.

Press the 『Measure』 key to enter the application measurement mode in B or Color mode. Press the 『Menu』 key to display the application measurement menu. Select [PV] from the submenu to switch to PV measurement menu.

7.2.3 PV Measurement Preset

Open the “Measure Preset” dialog box to preset the related parameters. For details, refer to section “Measurement Preset”.

7.3 PV Measurements and Calculations

The following takes “Left CCA” as an example to describe the measurement steps. The steps for other measurement items are the same.

1. Move the cursor to [Left CCA] in the “PV” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Measuring velocity: with the use of Trace, obtains VPS, VED, VM, PGvps, PGmean, RI, PI, and S/D.
4. Measuring %StenosisD: with the use of distance measurement method in B/Color mode, obtains %StenosisD by measuring VesselD and ResidualD.
5. Measuring %StenosisA: with the use of area measurement method in B/Color mode, obtains %StenosisA by measuring VesselA and ResidualA.
6. Measuring VF: measures CSD using distance measurement method in B/Color mode and CSA using area measurement method in B/Color mode. If the value of VM is already acquired through velocity measurement, calculate VFD and VFA.
7. When the measurement completes, the result window displays all measurement and calculation results.
8. Select [Return] to return to the previous menu.

7.4 PV Exam Report

During PV measurement or after measurement of an item ends, you can press the 

key on the control panel to view the PV exam report.

The item results already measured are displayed in the report.

On the “PV Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

8 Small Parts Measurements

This Diagnostic Ultrasound System provides a small parts measurement package, which facilitates clinical diagnosis through measuring left thyroid volume and right thyroid volume.

8.1 Small Parts Measurement Items

Small parts measurement items include:

- Left thyroid volume

  Left thyroid length, left thyroid height, left thyroid width

- Right thyroid volume

  Right thyroid length, right thyroid height, right thyroid width

8.2 Small Parts Exam Preparations

Make the following preparations before performing small parts exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the small parts measurement mode.

8.2.1 Patient Information Input

You need to register patient information during small parts exam.

For details, refer to section “Patient Information Input” in *Diagnostic Ultrasound System Operation Manual [Basic Volume]*.

8.2.2 Small Parts Measurement Menu

Small parts measurement can be performed in B or Color mode with same measurement

items. The following figure shows the small parts measurement menu.

Press the 『Measure』 key to enter the application measurement mode in B or Color mode. Press the 『Menu』 key to display the application measurement menu. Select [Small Parts] from the submenu to switch to small parts measurement menu.

8.2.3 Small Parts Measurement Preset

Open the “Measure Preset” dialog box to preset the formulas for calculating thyroid volume and other parameters. For details, refer to section “Measurement Preset”.

8.3 Small Parts Measurements and Calculations

8.3.1 Left Thyroid

Function: measures the size of the left thyroid.

Steps:

1. Select [L Thy] in the “Small Parts” menu and then press the 『Set』 key to pop up the submenu.
2. Move the cursor to any item of the submenu and press the 『Set』 key to start measurement of this item.
3. Use the method for distance measurement in B mode to measure the length, height, and width of the left thyroid.
4. When the measurement completes, the result window displays the length, height, width, and volume of the left thyroid.

8.3.2 Right Thyroid

Function: measures the size of right thyroid.

The measurement method is the same to that for left thyroid.

8.4 Small Parts Exam Report

During small parts measurement or after measurement of an item ends, you can press the 

key on the control panel to view the small parts exam report.

The item results already measured are displayed in the report.

On the “Small Parts Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

9 Urology Measurements

9.1 Urology Measurement Items

- Prostate (Pro)

  Prostate length, prostate height, prostate width, prostate volume (PV)

  Prediction of the prostate special antigen density (PPSA)

  Prostate special antigen density (PSAD)

- Left seminal vesicle

  length

  height

  width

- Right seminal vesicle

  length

  height

  width

- Left renal

  length

  height

  width

  RCT

- Right renal

  length

  height

  width

  RCT

- Left adrenal
  length
  height
  width

- Right adrenal
  length
  height
  width

- Residual Volume (RUV)
  length
  height
  width

- Left testicular volume
  length
  height
  width

- Right testicular volume
  length
  height
  width

9.2 Urology Exam Preparations

Make the following preparations before performing urology exam:

- Confirm that the currently-selected transducer is appropriate.
- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the urology measurement mode.

9.2.1 Patient Information Input

You need to register patient information during urology exam.

For details, refer to section “Patient Information Input” in Diagnostic Ultrasound System Operation Manual [Basic Volume].

9.2.2 Urology Measurement Menu

Urology measurement can be performed in B mode. The following figures show the urology measurement menu.

Press the『Measure』key to enter the application measurement mode in B mode. Press the 『Menu』 key to display the application measurement menu. Select [URO MEAS] from the submenu to switch to urology measurement menu.

9.2.3 Urology Measurement Preset

Open the “Measure Preset” dialog box to preset the formulas for calculating prostate volume, renal volume, residual volume, and testicle volume. For details, refer to section “Measurement Preset”.

9.3 Urology Measurements and Calculations

9.3.1 Prostate

Function: first employs transrectal scanning method to calculate PV, and then use the following formulas to calculate PPSA and PSAD. Note that the length, height, and width of prostate are measured through distance measurement method.

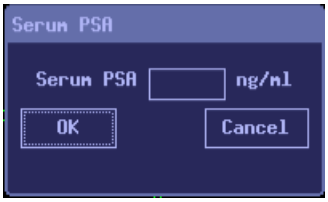
- Measuring PV: obtains through the calculation formula for PV setting in “Measure Preset”.
- Measuring PPSA: PPSA (ng/ml) = 0.12 x PV (ml)
- Measuring PSAD: PSAD (ng/ml^2 or No unit) = SPSA (ng/ml)/PV (ml)

Steps:

1. Move the cursor to [Prostate] in the “URO” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure the length, height, and width of prostate, so as to calculate PV and PPSA.
4. Select [Return] to return to the previous menu.

9.3.2 PSAD

After measuring PV, select [Serum PSA] to pop up “Serum PSA” dialog box (this step can be omitted if Serum PSA has already been entered) to calculate PSAD.



You can also select [PSAD] directly to pop up “Serum PSA” dialog box. Enter the value of Serum PSA and PV. PSAD is calculated and displayed in the result window.

9.3.3 Left Seminal Vesicle

Function: measures the size of left seminal vesicle by using the method for distance measurement in B mode.

Steps:

1. Move the cursor to [L. Seminal Vesicle] in the “URO” menu. Press the『Set』key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure the length, height, and width of left seminal vesicle. The results are displayed in the result window.
4. Select [Return] to return to the previous menu.

9.3.4 Right Seminal Vesicle

Same to the measurement method for Left Seminal Vesicle.

9.3.5 Left Renal

Function: measures left renal volume. Note that length, height, and width are measured through distance measurement method in B mode. The formula for calculating left renal volume is set in “Measure Preset”. RCT is obtained by using distance measurement method in B mode.

Steps:

1. Move the cursor to [Left Renal] in the “URO” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure length, height, and width, so as to calculate left renal volume. Then also use the distance measurement method in B mode to obtain RCT. The results are displayed in the result window.
4. Select [Return] to return to the previous menu.

9.3.6 Right Renal

Same to the measurement method for Left Renal.

9.3.7 Left Adrenal

Function: measures the length, height, and width of left adrenal using the method for

distance measurement in B mode

Steps:

1. Move the cursor to [Left Adrenal] in the “URO” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure the length, height, and width of left adrenal. The results are displayed in the result window.
4. Select [Return] to return to the previous menu.

9.3.8 Right Adrenal

Same to the measurement method for Left Adrenal.

9.3.9 RUV

Function: measures the residual volume after urination discharge in the bladder, namely, the size of bladder after urination discharge. The formula for calculating RUV is set in “Measure Preset”. Note that RUV length, RUV height, and RUV width are measured through distance measurement method in B mode.

Steps:

1. Move the cursor to [RUV] in the “URO” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure RUV length, RUV height, and RUV width, so as to calculate RUV. The results are displayed in the result window.
4. Select [Return] to return to the previous menu.

9.3.10 Left Testicular

Function: measures the size of left testis. The formula for calculating Testicular Volume is set in “Measure Preset”. Note that the length, height, and width of left testicular are measured through distance measurement method in B mode.

Steps:

1. Move the cursor to [Lt Ts] in the “URO” menu. Press the 『Set』 key to pop up the submenu (when extension submenu is already set).
2. Move the cursor to any item of the submenu. Then press the 『Set』 key to enter measurement.
3. Use the method for distance measurement in B mode to measure the length, height, and width of left testicular. The results are displayed in the result window.
4. Select [Return] to return to the previous menu.

9.3.11 Right Testicular

Same to the measurement method for Left Testicular.

9.4 Urology Exam Report

During urology measurement or after measurement of an item ends, you can press the 

key on the control panel to view the urology exam report.

The item results already measured are displayed in the report.

On the “Urology Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

9.5 Reference Literature

(1) PSAD: MITCHELL C. BENSON, IHN SEONG, CARL A. OLSSON, J, McMahon, and WILLIAM H.COONER *The Use of Prostate Specific Antigen Density to Enhance the Predictive Value of the Intermediate Levels of Serum Prostate Specific Antigen* THE JOURNAL OF UROLOGY Vol.147, p817~821, March 1992.

(2) Monoclonal PSA: Peter J. Littrup MD, Fed LeE. MD, Curtis Mettin. PD. *Prostate Cancer Screening: Current Trends and Future Implications* CA-A CANCER JOURNAL FOR CLINICIANS Vol.42, No.4 July/Aug. 1992.

10 Orthopedics Measurements

Hip Joint Angle (HJA) measurement is used in orthopedics. Such measurement provides early diagnosis for infant hip joint dislocation. In clinical applications, dislocation type can be estimated based on the age and joint angle of the infant.

10.1 Orthopedics Measurement Items

- HJA

α: the angle between the baseline (BL) and the ARL

β: the angle between the baseline (BL) and the IL

Dislocation type can be determined through Graf method, as described in the following table.

Dislocation type	Criteria			Result
	α	β	Patient	
I	α≥60°	β<77°	All ages	I
II	50°≤α≤59°		Younger than three months of age	IIa
	50°≤α≤59°	β<55°	Three months of age or older than three months	IIb
	43°≤α≤49°	β≤77°	All ages	IIc
	43°≤α≤49°	β>77°	All ages	IId
III	α<43°	β>77°	All ages	III
IV	Quantitative angle measurement of cannot be performed.		All ages	?????
	Others	Others	All ages	?????

10.2 Orthopedics Exam Preparations

Make the following preparations before performing orthopedics exam:

- Confirm that the currently-selected transducer is appropriate.

- Check that the current date of the system is correct.
- If patient information is unavailable, register through the patient information dialog box.
- Switch to the orthopedics measurement mode.

10.2.1 Patient Information Input

You need to register patient information during orthopedics exam.

For details, refer to section “Patient Information Input” in Diagnostic Ultrasound System Operation Manual [Basic Volume].

10.2.2 Orthopedics Measurement Menu

Orthopedics measurement can be performed in B or Color mode with same measurement items. The following figure shows the orthopedics measurement menu.

Press the 『Measure』 key to enter the application measurement mode in B or Color mode. Press the『Menu』key to display the application measurement menu. Select [ORTH MEAS] from the submenu to switch to orthopedics measurement menu.

10.2.3 Orthopedics Measurement Preset

Open the “Measure Preset” dialog box to preset the related parameters. For details, refer to section “Measurement Preset”.

10.3 HJA Measurement

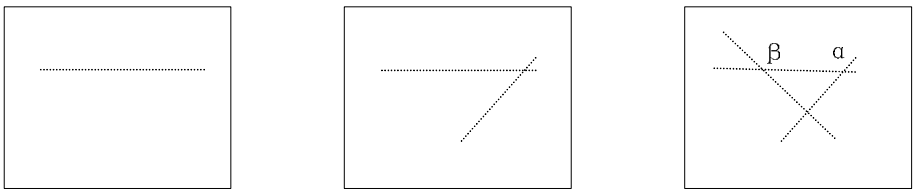
Although some operations can be made in unfrozen state, we recommend you freeze the image first to ensure measurement accuracy. By default, the following measurements are performed when the image is in frozen state.

Steps:

1. Select [HJA] in the “ORTH MEAS” menu and then press the 『Set』 key to enter measurement.

2. A line appears. Use the trackball to move the line to the position of the hip joint. Then rotate the functional knob to fix the baseline and press the 『Set』 key.
3. A second line appears immediately. Use the method for adjusting the first line to determine the ARL. Meanwhile, the value of α displays in the result window. Press the 『Set』 key to fix the second line.
4. Use the same method to fix the third line IL. The angle of β also comes out. If patient age is entered, dislocation type is also displayed.

The measurement steps are shown in the following figures:



10.4 Orthopedics Exam Report

During orthopedics measurement or after measurement of an item ends, you can press the 

key on the control panel to view the orthopedics exam report.

The item results already measured are displayed in the report.

On the “ORTH Exam Report” screen, press the [Edit] button to edit the measurement results and ultrasound diagnoses. Press the [Save] button and [Print] button to save and print the report respectively. To view history reports, press the [History] button.

For details, refer to section “Measurement Overview”.

10.5 Reference Literature

(1) **Graf R**.,“Sonographic diagnosis of hip dysplasia. Principles, sources of error and consequences” Ultraschall Med. 1987 Feb; 8(1):2-8.

(2) **Schuler P**.,“Principles of sonographic examination of the hip” Ultraschall Med. 1987 Feb; 8 (1):9-13.

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