DP-8800Plus/DP-8600 Digital Ultrasonic Diagnostic Imaging System

# Operator's Manual

## [Advanced Volume]

# Contents

## Product Information

Product Name: Digital Ultrasonic Diagnostic Imaging System
Model: DP-8800Plus/DP-8600
Issued date of this manual: 2009-01
Version: 1.3

## Intellectual Property Statement

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# Introduction of the Operator's Manuals

## 1. Notation Conventions

In this operator's manual, the following words are used in addition to the signal words related to the safety precautions (refer to "Safety Precautions"). Please read this operator's manual before using the system.

| | |
|---|---|
| **NOTE:** | Indicates information of interest to users of system as to exceptional conditions or operating procedures. |

## 2. Operator's Manuals

A Mindray service person or instructor will explain the basic operating procedures for this system at the time of delivery. However, read this operator's manual carefully before using the system in order to understand the detailed operating procedures, functions, performance, and maintenance procedures. The organization of the documents supplied with this system is shown below:

Operator's manuals of the main unit ------ Describe detailed system information on preparation, operating procedures, maintenance checks, and functions.

Operator's manuals of transducers ------ Describe the operating and sterilization procedures for transducers.

## 3. Interface in This Operator's Manual

Depending on the software version, the actual interface may appear different from those shown in this manual.

# Safety Precautions

### 1. Meaning of Signal Words

In this operator's 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 which, if not avoided, will result in death or serious injury.** |
| ⚠**WARNING** | **Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.** |
| ⚠**CAUTION** | **Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury.** |
| **NOTE** | Indicates a potentially hazardous situation which, if not avoided, may result in property damage. |

### 2. Meaning of Safety Symbols

| Symbol | Description |
|---|---|
|  | Type-BF applied part<br>NOTE :All ultrasound transducers can be connected to this system are Type-BF applied part. |
|  | "Attention" indicates the points requiring attention. Be sure to read the operator's manual concerning these points before using the equipment. |

### 3. Safety Precautions

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

**⚠CAUTION:**

1. **Display the most suitable image and select the most suitable measurement mode for the intended measurement. The results must be determined by a specialist.**
2. **The basic measurement results are not displayed in the exam report.**
3. **Be sure to perform measurement within images. If the area is outside the image, incorrect diagnosis may result.**
4. **In the obstetric measurement, ensure the measurement data corresponds to the specific fetus one by one.**
5. **The detailed precautions for each measurement are described in the corresponding section. Read and understand these precautions before performing the measurement.**
6. **Data in temporary storage areas, such as the CINE memory, is deleted when the power supply is turned OFF or when the Patient switch is pressed. Such data may also occasionally be deleted due to accidents. To minimize the possibility of reexamination being required as a result of unintended data deletion, back up the required images on external storage media.**
7. **Refer to the Operator's Manual (Basic Volume) for precautions regarding the use of this system.**

# 1 Preset

Preset function is used to set the system operating environment, status and the configuration parameters for each exam mode. The preset values are saved in the memory inside the system, which will not be lost if power-off occurs so as to ensure that the system operates in the user-desired status automatically after each start-up. This chapter gives detailed description about how to make system configuration through using the preset menu in Preset mode.

## 1.1 Entering/Exiting Preset Mode

To enter the preset mode:

Press the 『Preset』 key on the upper left part of the control panel. The Preset lamp lights up. The PRESET menu appears on the right part of the screen. See the following figure. The system accesses the Preset mode.

Select the item in the PRESET menu to preset the corresponding parameters.


To exit Preset mode:

In Preset mode, to close the PRESET menu, press 『Preset』 key, or press 『Exit』 key, or move the cursor to the [Return] item of the menu and press the 『Set』 key. The Preset indicator turns off. The system exits the Preset mode and begins running according the modified parameters.

**NOTE:** Only after exiting preset mode by using the methods above, the preset parameters can be effective.

## 1.2 Displaying/Modifying Preset Information

To set up all the preset parameters and curves, the user should select the item in the PRESET

menu to call up the preset dialog box. The general outline of the preset dialog box is as shown in the following figure.

To modify the preset parameters or curves:

1 Press the 『Preset』 key, and the indicator lights up. The PRESET menu appears on the right part of the screen.

2 Move the cursor to the item in the PRESET menu and press the 『Set』 key to pop up the corresponding preset dialog box.

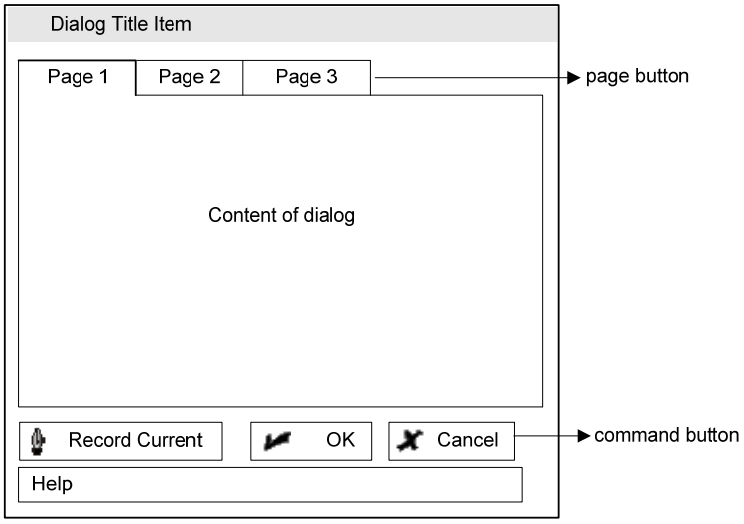
3 If the dialog box has more than one page, move the cursor to the button of the desired page and press the 『Set』 key to open the corresponding page.

4 Move the cursor to the bar of the parameter to be adjusted and use the 『Set』 or the 『Back』 key to adjust the parameter. At this time, the operating information is displayed in the Help bar.

5 After setting the information in the current page, select the button of another page to set other parameters. After all the parameters have been set up, press the 『Set』 key on the [OK] button to save the settings and close the dialog box.

6 To cancel the modifications, just press the 『Set』 key on the [Cancel] button. This action at the same time closes the dialog box.

7 Press the 『Preset』 or 『Exit』 key, or move the cursor to the [Return] item of the preset menu and press the『Set』key, to close the PRESET menu. The Preset indicator turns off. The system exits the Preset mode and begins running according to the modified parameters.




The function of special buttons:

[Record Current]

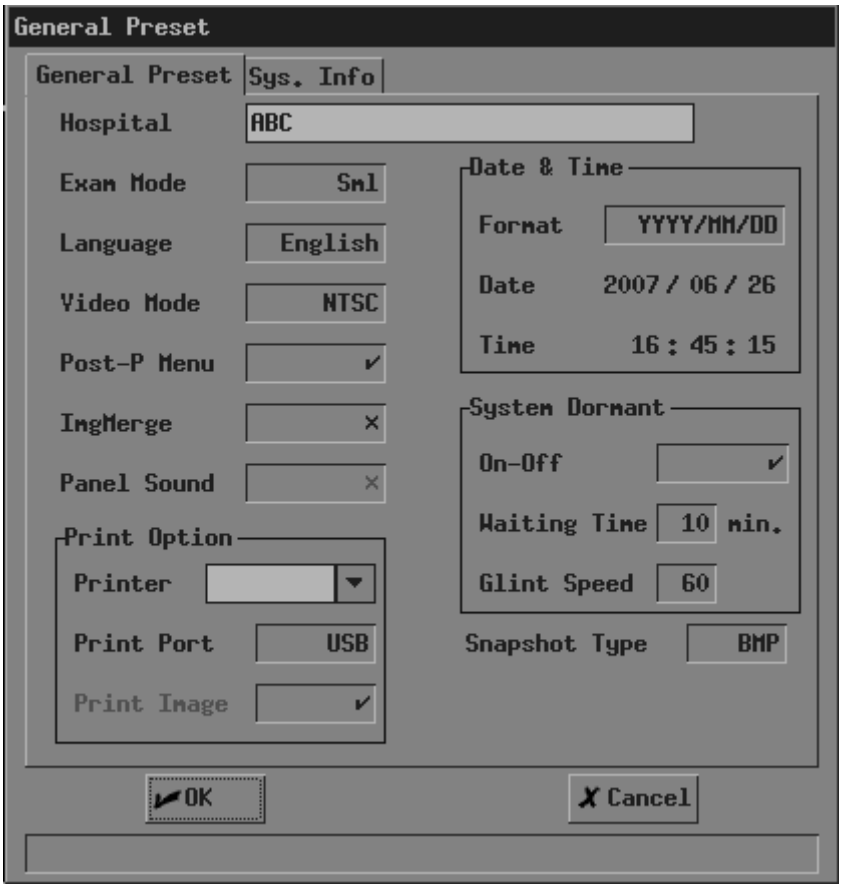
Besides setting the parameters in the current page one by one, the user can also use the “record the current value” method to preset parameters. Press the 『Set』 key on the [Record Current] to set each parameter (curve) as the value (parameter or curve) used by the system before accessing the preset mode. That is to say to set up the current operating parameters of

the system as the preset parameters.

**NOTE:** [Record Current] button is only valid in the current page.

## 1.3 General Preset

Move the cursor to select the [General] item in the menu to call up the [General Preset] dialog box. See the following figure.




The table below is the description of the preset items in the dialog box, see table below.

Items in the General Preset dialog box

| Item | Functional Description |
|---|---|
| Hospital | To enter the hospital name displayed on the top left corner of the screen and in the diagnosis report. |
| Exam Mode | To select the exam mode. |
| Language | To select the language used by the system. |
| Video Mode | Set the mode of video. |

| Item | Functional Description |
|---|---|
| Post-P Menu | To show/hide the Post-P submenu. |
| ImgMerge | To select merge image or not. |
| Panel Sound | To select if sound gives off when a key is pressed. |
| Printer | Select the printer type (generally use the system default). |
| Print Port | Select the way how the printer is connected. |
| Print Image | Select to print image or not. |
| Date Format | Set date format of the system. |
| Date | Set system date. Adjusting range of Year is 2000-2099. |
| Time | Set system time. Its format is XX hour: XX minutes: XX seconds. |
| (System dormant）On-Off | Set the system dormant or not. |
| Waiting Time | Set the system dormant waiting time. |
| Glint speed | Set the system dormant mark move speed. |
| Snapshot Type | To set the image format when the File key is pressed. |

Press the 『Sys. Info』button, and the system configuration information is displayed. Users cannot edit the information.

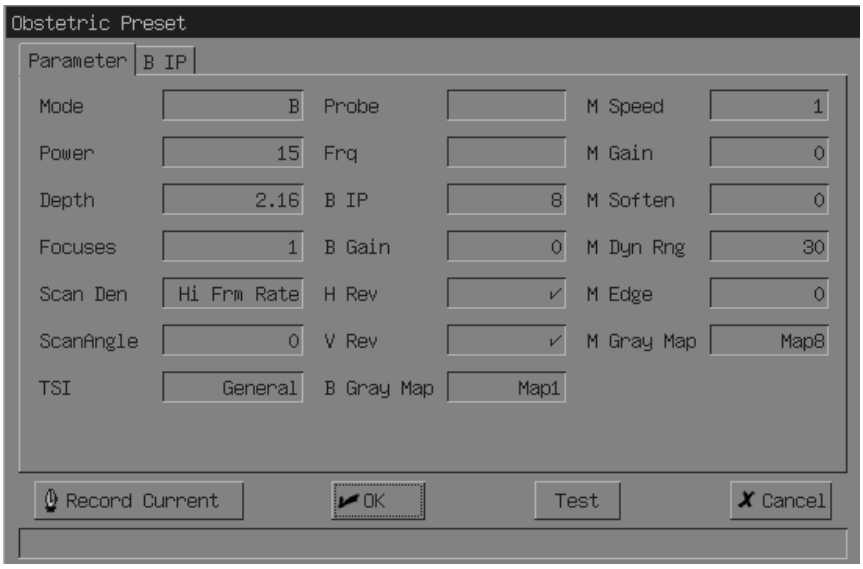
## 1.4 Mode Parameter Preset

The system has four exam modes, which are abdomen (general), gynecology, obstetric, and small parts. The most appropriate operating environment can be preset for each exam mode. The preset parameters of different exam modes are similar. Now use the obstetric exam as an example to illustrate how to preset the operating environment.

The preset dialog box of the obstetric exam has two pages, which are “Parameter” and “B IP”.

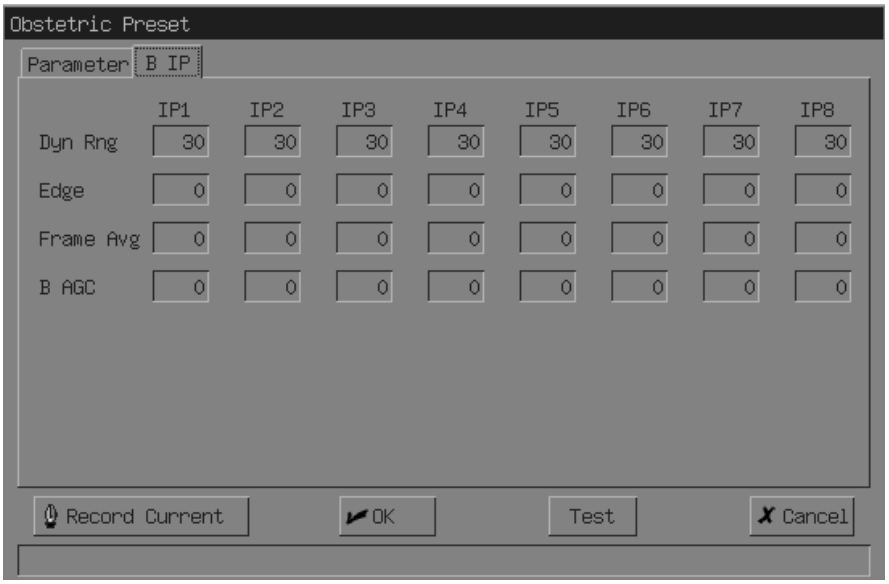
To preset parameters:

1 Move the cursor to the [Obstetric] item in the PRESET menu and press the 『Set』 key, then the dialog box of “Obstetric Preset” pops up. The default page Parameter is opened. The dialog box is as shown in the following figure.




2 Move the cursor onto the adjustment button for the parameter item to be modified, and press the 『Set』 or 『Back』key to modify the parameters. At this time the prompt information is displayed in the help information bar.

3 Select the [B IP] preset page. See the dialog box below.




4 Set the parameters of B IP page using the same method.

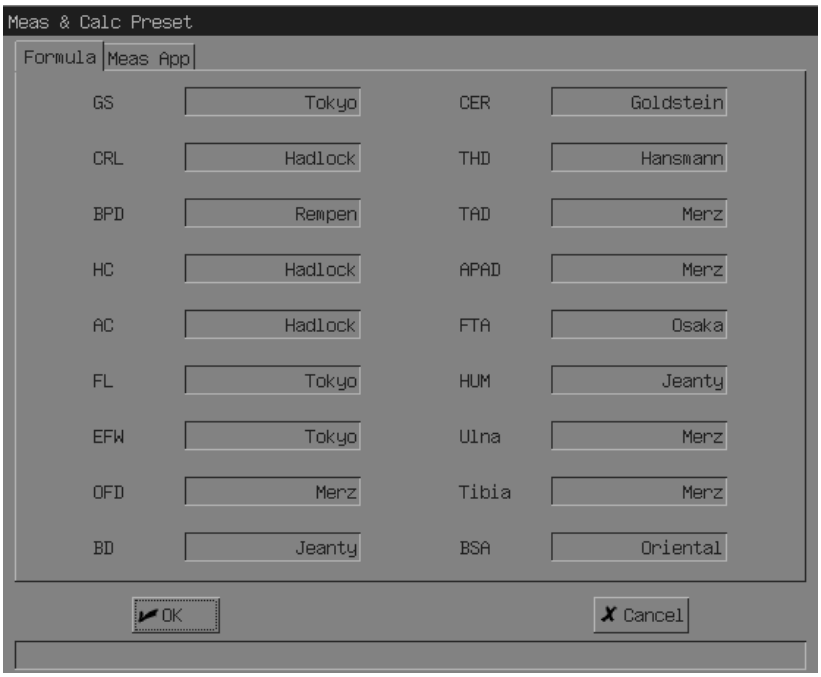
5 After all the parameters are set, press the 『OK』button, and all the settings become effective and be stored in the system. To cancel these settings, press the 『Cancel』button.

# 1.5 Measurement & Calculation Preset

## 1.5.1 Formula Preset

Formula Preset define formulae for calculating obstetric items, including GS, CRL, BPD,HC, AC,FL, EFW, OFD, OOD, CER, THD, TAD, APAD, FTA, HUM, Ulna, Tibia and BSA.

Move the cursor to the [Meas & Calc] in the [Preset] menu and press the 『Set』 key, then the dialog box pops up. The dialog box is displayed in two separate pages of formula and measure application. Select “Formula” item in “Meas & Calc Preset” page to open “Formula” preset page, See the figure below.




Preset formula

| **Preset items** | **Options** | Gestational Age **Calculating Table** |
|---|---|---|
| GS | Tokyo | FG+GA |
| | Hellman | FG |
| | Rempen | FG+GA |
| | Hansmann | FG+GA |
| | China | GA |

| **Preset items** | **Options** | Gestational Age **Calculating Table** |
|---|---|---|
| CRL | Tokyo | FG+GA |
| | Jeanty | GA |
| | Hadlock | FG+GA |
| | Nelson | GA |
| | Robinson | FG+GA |
| | Rempen | FG+GA |
| | Hansmann | FG+GA |
| | Osaka | FG+GA |
| | China | GA |
| BPD | Tokyo | FG+GA |
| | Hadlock | FG+GA |
| | Jeanty | GA |
| | Kurtz | FG |
| | Sabbagha | FG |
| | Hansmann | FG+GA |
| | Merz | FG+GA |
| | Rempen | FG+GA |
| | Osaka | FG+GA |
| | China | GA |
| | ChittyOI | FG+GA |
| HC | Hadlock | FG+GA |
| | Jeanty | GA |
| | Merz | FG |
| | Hansmann | FG+GA |
| | ChittyPL | FG+GA |
| AC | Hadlock | FG+GA |
| | Jeanty | FG |
| | Merz | FG |
| | ChittyPL | FG |
| FL | 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 |
| | China | GA |
| | Chitty | FG+GA |

| **Preset items** | **Options** | Gestational Age **Calculating Table** |
|---|---|---|
| EFW | Tokyo | / |
| | Hadlock1 | / |
| | Hadlock2 | / |
| | Hadlock3 | / |
| | Hadlock4 | / |
| | Shepard | / |
| | Campbell | / |
| | Merz1 | / |
| | Merz2 | / |
| | Hansmann | / |
| | Osaka | / |
| OFD | Merz | FG |
| | Hansmann | FG+GA |
| OOD | Jeanty | GA |
| CER | Hill | FG+GA |
| | Goldstein | FG |
| THD | Hansmann | FG+GA |
| TAD | Merz | FG |
| APAD | Merz | FG |
| FTA | Osaka | FG+GA |
| HUM | Jeanty | GA |
| | Merz | FG |
| Ulna | Merz | FG |
| Tibia | Merz | FG |
| BSA | Oriental | / |
| | Occidental | / |

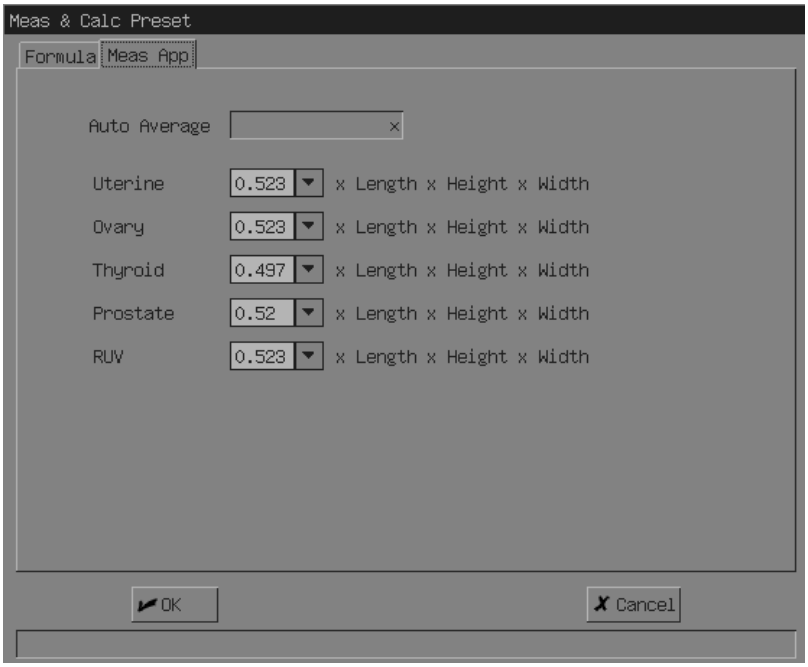
FG table and GA table are used in these formulae. In formula preset, three situations are presented for each item. Some formulae are included in both FG and GA tables but others are exclusive for GA or FG table. Please select reasonable formula according to below information:

(1) In the process of obstetric measurement, if the user does not enter LMP or BBT, 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 BBT, 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 BBT, the system will calculate GA based on FG table for all obstetric measured items. And at the same time the result window and the obstetric 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.

## 1.5.2 Measurement application preset

The [Meas App] preset page is shown in the figure below.




- Auto average (only available for obstetric measurements)
  It is used to preset if the measure items are to be calculated with the average values.

  √: Calculate the average of the recent measurement values (up to three) . (Note: the calculation item can't calculate the average, use the measure average to calculate.)

  X: the average calculation isn't conducted, and the latest measure value is the measurement result.

- Formulae
  It is used to preset the formulae for calculating the uteras volume, ovary volume, thyroid volume, prostate volume, and residual urine volume. You can either use the default factors in the formulae or modify them.

  To modify a factor, move the cursor to the box where the factor to be modified locates, press the 『Set』 key, and then edit the factor.

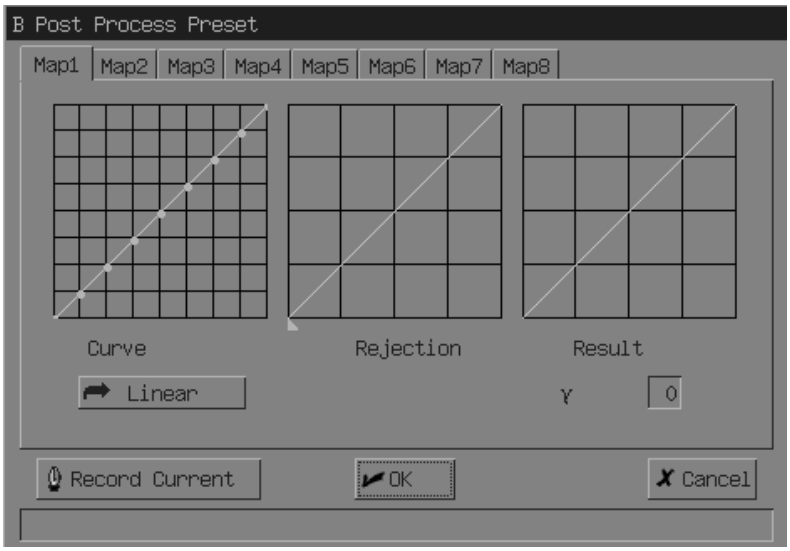
# 1.6 Post Process Preset

The post process preset is used to set parameters and curves for post process.
The items can be preset include gray transformation curve, gray rejection curve and γ correction.

The post process preset of B-mode and M-mode is realized via two dialog boxes. The preset procedures for the two modes are basically the same. Now we use B-mode post process preset as an example to illustrate the procedures.

Move the cursor to the [B Post Proc] item in the Preset menu and press the 『Set』 key. Then

the B Post Process Preset dialog box pops up. See the following figure.




The B Post Process Preset dialog box has eight pages representing eight kinds of gray map. The preset items and preset method in these eight pages are the same.

Now use the Map1 page as an example.

**NOTE:** The post process curves and parameters practically used by the system are set in the "Parameter" page of the preset dialog box of exam mode.

## 1.6.1 Gray transformation curve

There are nine "•" adjusting points on the gray transformation curve used to adjust the shape of the curve.

To adjust the gray transformation curve:

1 Press 『Set』 key on the "Map1" page button of the B Post Process Preset dialog box to select the "standard" gray map.

2 Move the cursor to an adjusting point on the curve, and the cursor changes into a "✣". Press the 『Set』 key and roll the trackball to move the "•" so as to adjust the curve. After adjusting the curve, press the 『Set』 key again to finish the adjustment. Or press the 『Back』 key to cancel the operation, and the "•" point will return to the original position. The system updates the "Result" curve. Use the same method to adjust other points.

3 Another way to set the gray transformation curve is adjusted by using the [Record Current] button. Actually, this method is a more practical one. Press the 『Set』 key on the [Record Current] to set the curve as the one currently used by the system and simultaneously to load the gray rejection curve and γ correction currently used by the system into the current page of the dialog box.

4 Press the 『Set』 key on the [Linear] button, the gray transformation curve will return to the factory default shape.

5 Press the 『Set』 key on the [OK] button to save the modification or on the [Cancel] button to give up the modification and close the dialog box at the same time.

**NOTE:** The [Linear] button is only valid to the gray transformation curve. This button is invalid to gray rejection curve and γ correction.

## 1.6.2 Gray rejection curve

There is only one "▲" adjusting point on the gray rejection curve used to adjust the rejection gray of the curve.

To adjust the gray rejection curve:

1 Press 『Set』 key on the [Map1] button in the dialog box to select the "Map1" gray map.

2 Move the cursor to the "▲" point on the curve, and the cursor changes into a "✣". Press the 『Set』 key and roll the trackball to move the "▲" point so as to adjust the curve. After adjusting the curve, press the 『Set』 key again to finish the adjustment. Or press the 『Back』 key to cancel the operation, and the "▲" point will return to the original position. The system updates the "Result" curve.

3 Or use the [Record Current] button to set the gray rejection curve. Press the 『Set』 key on the [Record Current] button to set the curve as the one currently used by the system and simultaneously to load the gray transformation curve and γ correction currently used by the system into the current page of the dialog box.

4 Press the 『Set』 key on the [OK] button to save the modification or on the [Cancel] button to give up the modification and close the dialog box at the same time.

## 1.6.3 γ correction

γ correction has four 4 steps, which are 0, 1, 2 and 3 corresponding respectively to the factor 1.0, 1.1, 1.2 and 1.3.

To adjust theγ correction:

1 Press the [Map1] button in the dialog box to select the "Map1" gray map.

2 Move the cursor to the [γ] button and press the 『Set』 or the 『Back』 key to select an appropriate γ value. The system updates the "Result" curve.

3 Or use the [Record Current] button to set γ value. Press the 『Set』 key on the [Record Current] to set the γ value as the one currently used by the system and simultaneously to

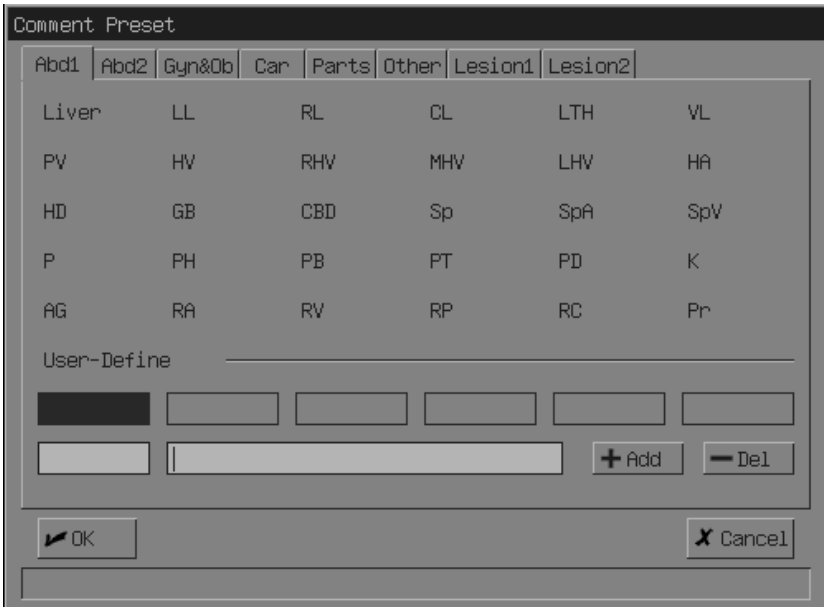
load the gray transformation curve and gray rejection curve currently used by the system into the current page of the dialog box.

4 Press the 『Set』 key on the [OK] button to save the modification or on the [Cancel] button to give up the modification and close the dialog box at the same time.

# 1.7 Comment Preset

There are 6 types of comments to be preset, which are abdomen, gynecology and obstetrics, cardiac, small parts, general, and lesion. Each type has many pieces of factory default comments. Also the user-defined comments (maximum 6 pieces) are also provided. You can add, modify or delete the user-defined comments.

Move the cursor to the [Comment] item in the PRESET menu and press the 『Set』 key. Then the dialog box of “Comment Preset” appears on the screen. See the following figure.




The method for adding, and deleting the user-defined comments is given below.

## 1.7.1 Adding comment

Now use adding user-defined comments into the [Parts] page as an example to illustrate the process.

■ Press the [Parts] page button to open the “Small Parts” comment page.

1 Move the cursor to a piece of “User-Define” button, the cursor then changes into a. Press the 『Set』 key to highlight this piece of comment.

2 Move the cursor into the left edit bar of “User-Define” comment and press the 『Set』 key. Then the “|” cursor displays in the edit bar. Use the keyboard to enter the content of the user-defined comment.

3 Move the cursor into the right edit bar of the “User-Define” comment and press the 『Set』 key. Then the “|” cursor displays in this edit bar. Use the keyboard to enter the help or explanation information for this piece of user-defined comment. (If no help information is to be added, this step can be omitted.)

4 Press the 『Set』 key on the [Add] button. The entered comment is displayed in the item of the user-defined comment selected the step 2.

5 Press the 『Set』 key on the [OK] button to save the modification or on the [Cancel] button to give up the modification and close the dialog box at the same time.

### 1.7.2 Deleting user-defined comment

Use the deletion of the user-defined comment in the [Small Parts] page as an example to illustrate the process.

1 Press the [Parts] button to open the “Parts” comment page.

2 Move the cursor on the button of a piece of already existed “user-defined comment”, then the cursor changes into a  . Press the 『Set』 key to highlight this piece of comment.

3 Move the cursor to the [Del] button and press the 『Set』 key. The selected piece of comment is then deleted.

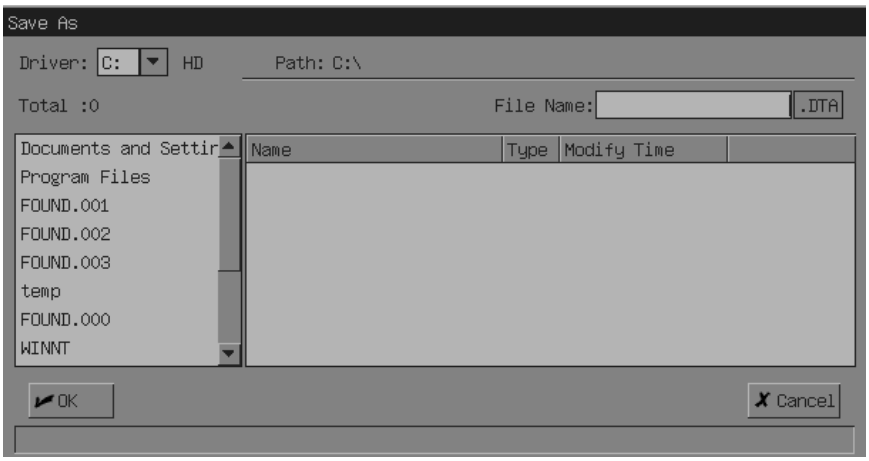
4 Press the 『Set』 key on the [OK] button to save the modification or on the [Cancel] button to give up the modification and close the dialog box at the same time.

## 1.8 Data Preset

### 1.8.1 Saving preset

DTA file is used to save/load the preset data of the system.

1 Move the cursor to the [Save] item of the [Preset Data] sub Menu and press the『Set』key. The dialog box of Save As appears on the screen.




2 Select the file path and enter the file name. (Please refer to “Save BMP file” for the details).

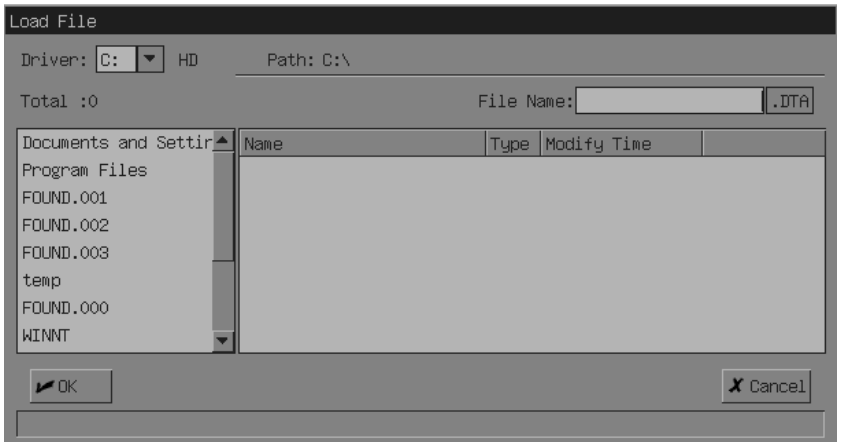
3 Press the 『Set』 key on the [OK] button to close the dialog box. The system will automatically save the information displayed on the current screen into the specified file.

## 1.8.2 Loading preset

Load the preset data in the DTA file into the preset data memory of the system and reset the system at the same time. Use the newly updated system preset data to organize and display the images.

1 Move the cursor to the [Load] item of the [Preset Data] sub menu and press the 『Set』 key. The “Load File” dialog box appears on the screen.

2 The operating procedures for selecting the drive and the disk directory are the same as those to save the file.




3 Move the cursor to the file to be opened in the list and press the 『Set』 key. The selected file is then highlighted.

4 Press the 『Set』 key on the [OK] button or just press the 『Set』 key on the selected file to close the dialog box.

5 After opening the DTA file, exit the File status. The system then resets and displays the images based on the updated system preset data.

### 1.8.3 Factory data preset

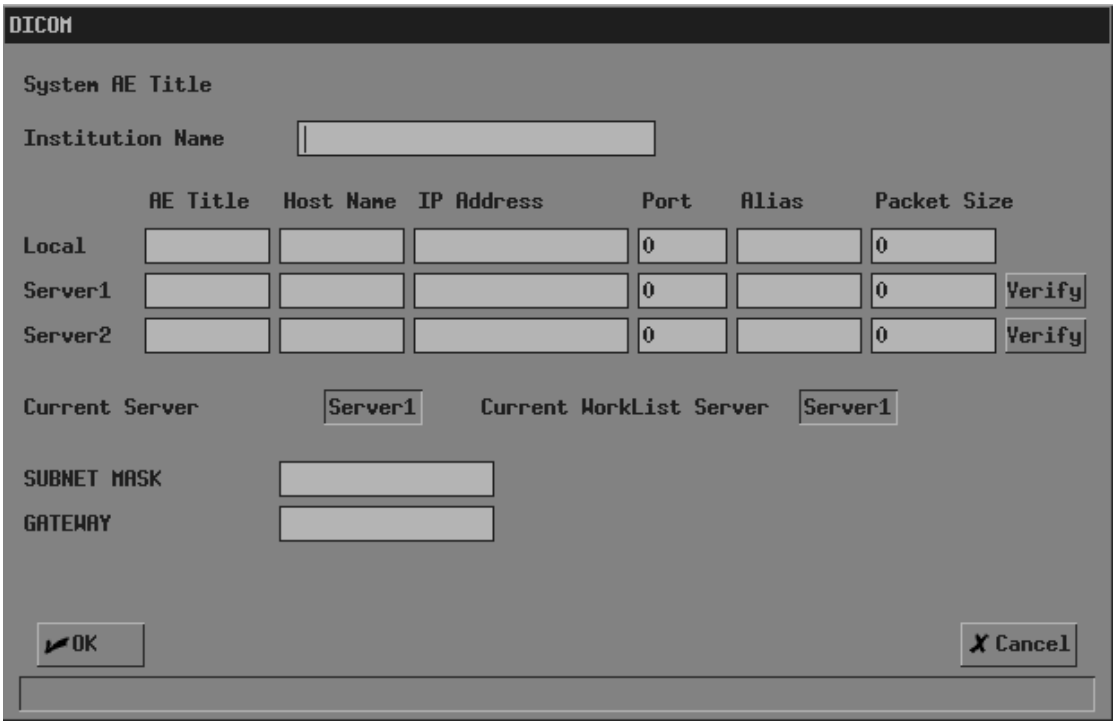
Move the cursor onto the [default] of the [Preset Data] submenu, and press the [Set] key, and then a dialog box pops up. See the figure below. If the [OK] button is pressed, the system will restore the preset data with factory data. To cancel the restoring of factory data, press the [Cancel] button.


## 1.9 Maintenance

The [Maintenance] item in PRESET menu is provided to update system software and realize special user requirement. If you want any special functions, please contact Mindray Company or its Local Office.

## 1.10 DICOM Preset

Move the cursor to the [DICOM] item and press the 『Set』 key to call up the [DICOM] dialog box. See the following figure.




The table below is the description of the preset items in the dialog box, see table below.

Items in the DICOM Preset dialog box

| No. | Item name | Meaning | |
|---|---|---|---|
| 1 | System AE Title | The name that has been set in the AE Title field of “Local” preset column is displayed. | |
| 2 | Institution Name | Set the hospital name. | |
| 3 | Local | (1) AE Title | Set the AE title of the local system. This name is the same as that set in the System AE Title field. |
| | | (2) Host Name | Set the host name of the local system. |
| | | (3) IP Address | Set the IP address of the local system. |
| | | (4) Port | Set the port number of the local system. |
| | | (5) Alias | Set the alias of the local system. |
| | | (6) Packet Size | Maximum PDU transmission size in bytes (does not need to be changed).<br>This setting can be changed in the range from 4K to 64K. If a value more than 64K is entered, a value of 16K is set. |
| 4 | Server1/Server2 | (1) AE Title | Set the AE title of the remote system. |
| | | (2) Host Name | Set the host name of the remote system. |
| | | (3) IP Address | Set the IP address of the remote system. |
| | | (4) Port | Set the port number of the remote system. |
| | | (5) Alias | Set the alias of Server1/Server2. |
| | | (6) Packet Size | Maximum PDU reception size in bytes (does not need to be changed).<br>This setting can be changed in the range from 4K to 64 K. If a value less than 4K or more than 64K is entered, a value of 16K is set. |
| 5 | Verify | After set the information of Server, click this button to verify the server is connected or not. | |
| 6 | Current Server | Select the current storage server. | |
| 7 | Current Worklist server | Select the current worklist server | |
| 8 | SUBNET MASK | Select subnet mask | |
| 9 | GATEWAY | Select gateway address | |
| 10 | OK | When this button is clicked, the changed parameters are saved and the window is closed. | |
| 11 | Cancel | When this button is clicked, the window is closed without saving the changed parameters. | |

# 2 Basic Operation of Measurements & Calculations

## 2.1 Accessing Measurement Status

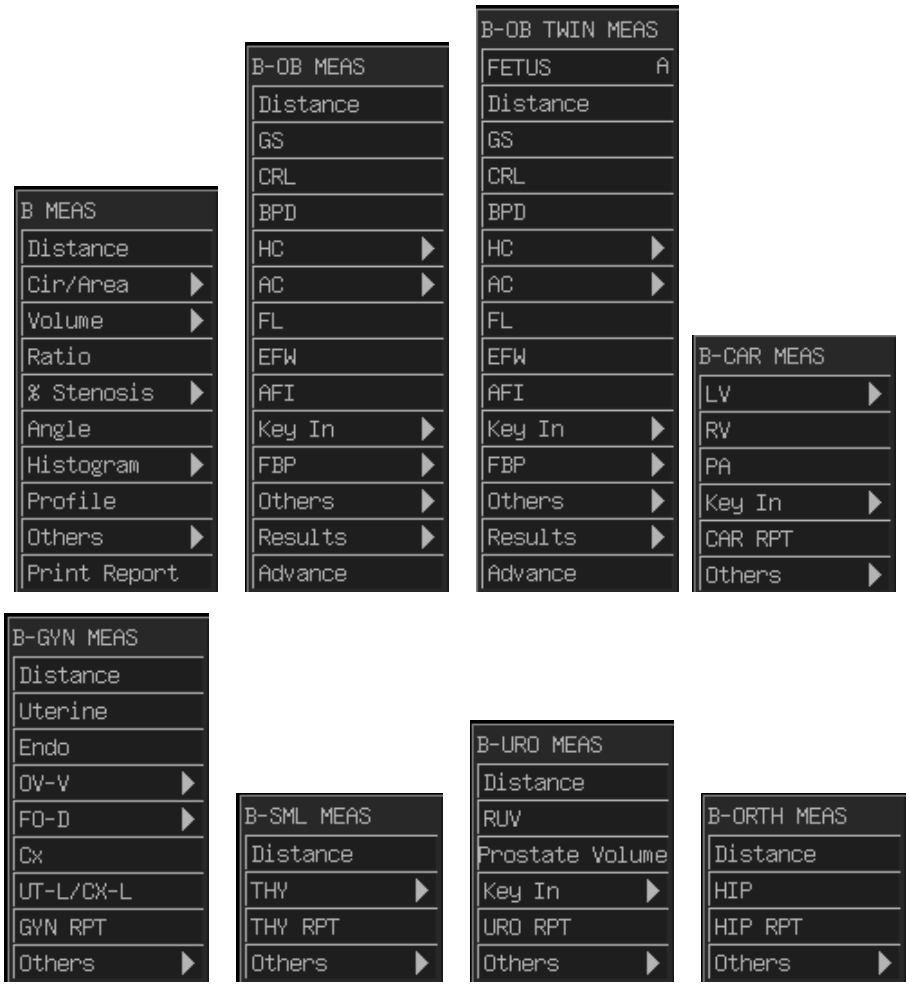
Press the 『Measure』 key to access Measurement status. The 『Measure』 lamp is on. The menu on the right side of the screen switches to Measurements and Calculations menu.


## 2.2 Measurement Menu

The measurement menu is displayed on the right part of the screen. If the menu is not displayed, press the 『Menu』 key.

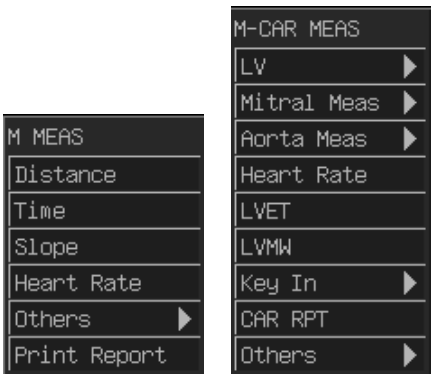
There are 8 menus for B mode measurements and calculations.

- B MEAS menu: used for general measurements and calculations of abdomen, gynecology, and small parts exam mode.
- B-OB MEAS menus: used for calculations of GA, fetal weight and EDD in obstetric exam mode.
- B-OB TWIN MEAS menus: used for GA calculation, fetal weight calculation, and EDD calculation in the OB twins exam mode.
- B-CAR MEAS: used for left ventricular function calculations, end-diastolic right ventricular internal diameter measurement, PA internal diameter measurement in cardiac exam mode.
- B-GYN MEAS menu: used for uterine and ovary measurements & calculations in gynecology exam mode.
- B-SML MEAS menu: used for thyroid measurements in small part exam mode.
- B-URO MEAS menu: used for residual volume, PV and PPSA measurements and calculations in urology exam mode.
- B-ORTH MEAS menu: used for HIP measurements in orthopedics exam.




Menu of M measurement refers to figure below:

- M MEAS: used for the general measurements on the M mode image, such as distance, heart rate, time, and slope.
- M-CAR MEAS menu: Used for the general measurements and calculations in M cardiac exam mode, such as LV function calculations, MV measument, AV measurement and so on.




Toggle among measurement menus:

- The type of the displayed measurement menu depends on the current exam mode and image mode.

- The user can also switch to one measurement menu by selecting the menu item in [Others] submenu.

The details of measurement menus are explained in following description of measurements.

## 2.3 Measured Result and Help Information

The general measurement results are displayed in the result window below the menu.
The application measurement results are displayed in the result window below the menu as well as the corresponding exam reports.

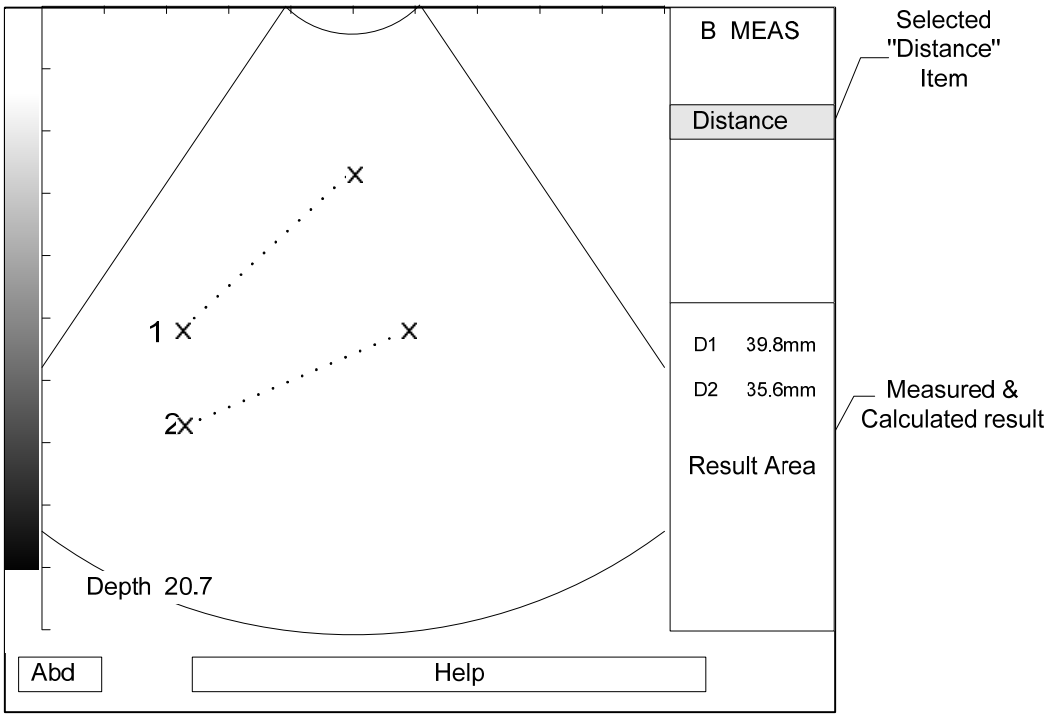
Except cardiac measurements, the values of the measured results in other application measurements can be averaged. This function is set in the Meas & Calc Preset dialog box.

□ **Results of application measurements**

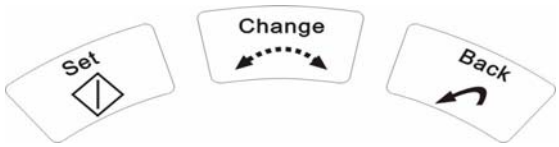
When a measurement item is measured several times, only the last measured result is displayed in the result window, but all results as well as the average values are displayed in the exam report (When the measurement times exceed three, the results of the lately three measurements and the average value of the lately three measurements are displayed). When the exam report is printed, only the average valued is printed out.
Note: the averaging function is not available for AF and AFI, and only the last measured result is displayed.

□ **Calculation results**

The calculation results are obtained based on the average values of the relevant measurements. If the averaging function is turned off, the calculation results are obtained based on the last measured value of the relevant measurements. The calculation results can be printed out.
The prompt information for each step in the process of measurement and calculation is displayed in the Help Bar located at the bottom of the screen, see figure below.




## 2.4 Keys Used during Measurement




The keys used during measurement are shown in the figure, which are to be used in conjunction with the trackball.

『Set』: used to start or end the measurement, or to anchor the two point of line measuring scale. The function of the key is to be described detailed in following practice.

『Back』: this key has two functions: to return to the previous step during measurement; to delete the previous measurement.

◆ Return to the previous step

Before finishing a measurement, the user can use this key to go back to the previous step. To different measuring scale, the 『Back』 key has different functions, which are to be discussed below.

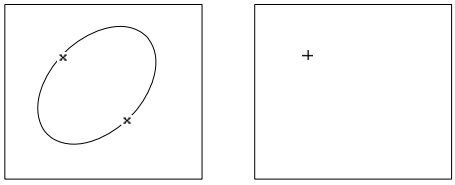
**Distance ruler:**

Before defining the end point, the result of pressing the 『Back』 key is shown in figure below.

Press『Back』

**Ellipse ruler:**

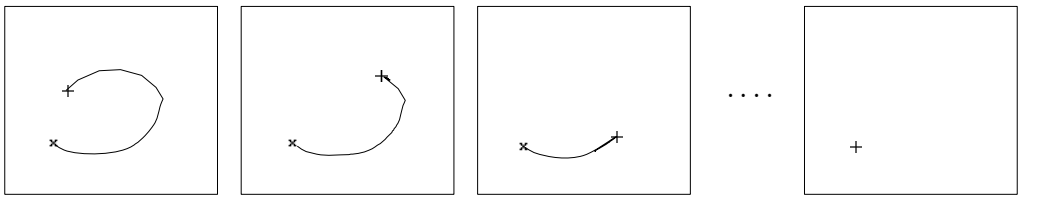
Before defining the active axis of the ellipse, the result of press the 『Back』 key is shown in figure below.



Press 『Back』

**Trace ruler:**

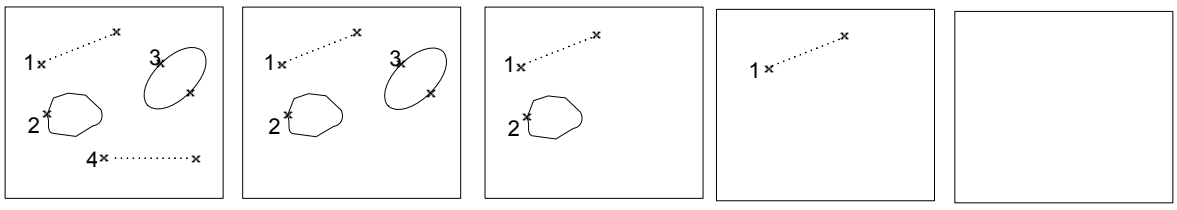
Before the start point and the end point of the trace scale join together, the result of pressing the 『Back』 key is shown in figure below.



Press『Back』 Press『Back』again Press『Back』repeatedly

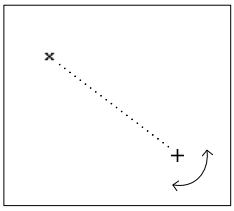
◆ Delete the previous measurement

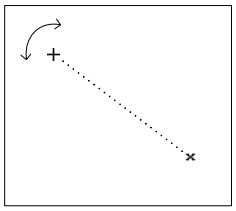
After the completion of one or more measurements, press the 『Back』 key in the image window to delete the previous measurement and also to clear the corresponding measured result in the Result Window. Press the 『Back』 key continuously to clear all the measuring scales. See figure below.



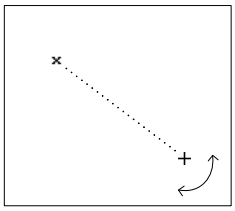

Press『Back』 Press『Back』again Press『Back』again Press『Back』again

『Change』: used to exchange the fixed end and the active end of the distance scale in the process of the measurement. See figure below.





Press 『Change』



Press『Change』again

## 2.5 Classification of Measurements and Calculations

All items in the measurement menu are divided into two major categories: measurement and calculation.

- Measurement is only active in the current image mode. Switching the image mode will clear all the measurements and the displayed results in the current image window.
- Calculation consists of some measurements, which are organized based on a certain steps. According to each measured result, the system determines the calculated results using specific formula. Calculations can be made in different image windows. As long as the current measuring step of the calculation can be done in the new image window, the current step of the calculation can be performed.

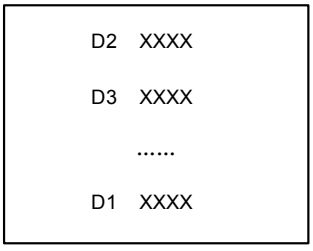
Lock the cursor into the image window:

During measurement, handlers can not move the cursor out of the image window until after the completion of measurement.

Measurement can be performed on either the magnified image, or the CINE review image ， or the real-time image.

## 2.6 Attention

1. Press 『Clear』 key., all comments, Body Mark, and measurements scale and general measurement data on the screen will be cleared up.
2. If measurement is to be done on a frozen image, unfreezing the image will clear up the basic measurements information. After open the CIN file or FRM file, unfreezing the image will clear up all comments, measurements, bodymarks and patient data.
3. The results are displayed as:“D1 XXXX,D2 XXXX,D3 XXXX……”.If more than measurement channels are executed, the latest measuring result “D1 XXXX” will be displayed at bottom of Result Window while the earliest result “D1 XXXX” will be deleted.



4. Both caliper (s) and result(s) can be displayed when you perform one or several continuous general measurement (s); but when you enter application measurement (from a general measurement; or, from one application measurement to another application measurement), the caliper and result will be cleared.

# 3 B mode General Measurements & Calculations

Press the 『B』 key to access B mode.

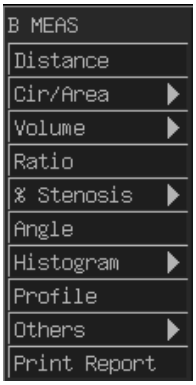
Press the 『ABD』 key to access abdomen (B general) mode.

Then press the 『Measure』 key to enter B general measurement status.

Confirm the B MEAS menu is displayed on the screen. If not, press the 『Menu』 key.

In measurement status, the cursor turns into a “+” in the image area.

After accessing the B mode B MEAS menu, the default is “Distance” measurement, i.e., if no measurement item is selected, the system will access the “Distance” measurement automatically.




## 3.1 Distance

Function: to measure the distance between two points.

Measurement channels: 4

Measuring method:

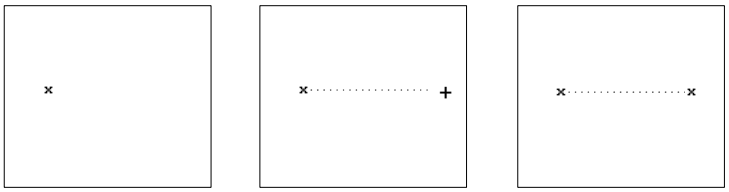
1 Move the cursor to the [Distance] item in the B MEAS menu and press the 『Set』 key.

2 Move the cursor into the image window, the cursor changes into a “+”. Roll the trackball to move the cursor to the start point of the measurement. Press the 『Set』 key, the fixed mark “✕” is displayed at the start point. The user can press the 『Back』 key to delete the start point determined just now.

3 Roll the trackball to move the cursor, the cursor "+" and the start mark "×" are always connected by a broken line. The system updates the measured result in the Result Window. At this time, press the 『Change』 key to exchange the fixed point and the active point of the measuring scale or press the 『Back』 key to delete the start point determined just now.

4 Roll the trackball to move the cursor "+" to the end point of the measurement. Press the 『Set』 key, the fixed mark "×" is displayed at the end point. The final result is determined and the measurement is completed.

5 Repeat the steps from 2 to 4 to perform a new measurement.



Press『Set』to anchor start point | Roll trackball to move cursor to end point | Press『Set』to anchor end point

# 3.2 Circumference and Area

## Ellipse

Function: to measure the circumference and area of a close region

Measurement channels: 4

Measuring method:

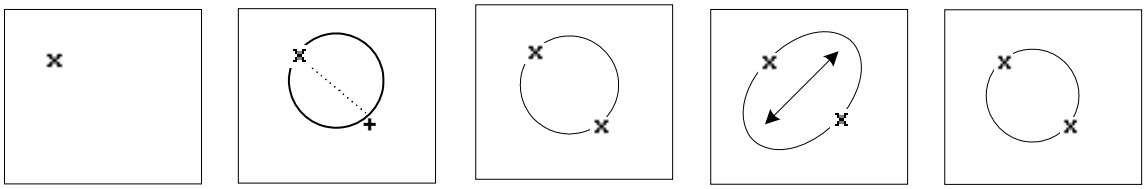
1 Move the cursor to the [Cir/Area] item, and then the [Cir/Area] submenu pops up automatically. Move the cursor to the [Ellipse] item in this submenu and press the 『Set』 key, the cursor changes into a "+".

2 Move the cursor to the start point of the fixed axis of the region to be measured. Press the 『Set』 key, mark "×" is displayed at the start point of the fixed axis.

3 Move the cursor to the end point of the fixed axis, the cursor "+" and the start point "×" are always connected by a broken line, and an ellipse is displayed on the screen. At this time pressing the 『Change』 key switches between the fixed end and the active end or pressing the 『Back』 key changes the previous fixed end to the active end, or pressing the 『Set』key determines the end point of the fixed axis.

4 Roll the trackball to adjust the length of the changeable axis of the ellipse to make the

ellipse rally with the region to be measured. Roll the trackball to left to shorten the changeable axis or to right to increase the changeable axis. At this time pressing 『Change』 or 『Back』key determines the length of the second axis, and activates the previous fixed end; or pressing the 『Set』key determines the ellipse measurement region; the measurement ends.



## Trace

Function: to measure the circumference and area of a close region.

Measurement channels: 4

Measuring method:

1 Move the cursor to the [Cir/Area] item and the [Cir/Area] submenu pops up automatically. Move the cursor then to the [Trace] item in the submenu, press the 『Set』 key and the cursor changes into a "+".

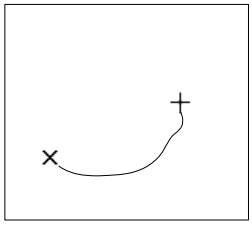
2 Move the cursor to the start point of the measurement, press the『Set』key, then the fixed mark "✕" is displayed at the start point.

3 Roll the trackball to move the cursor along the edge of the target region to be measured so as to draw out the trace line. To correct the trace line, press the 『Back』 key each time to remove the trace line of a certain number of pixels.

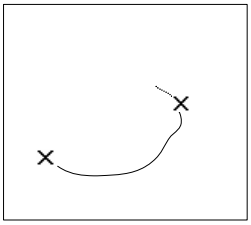
4 Press the 『Set』 key; a straight line connects the start point and the end point. Or when the cursor is very near to the start point of the trace line, the trace line automatically forms into a loop. The measured result is displayed in the Result Window. The measurement ends.

5 Press the 『Set』 key to start a new measurement.

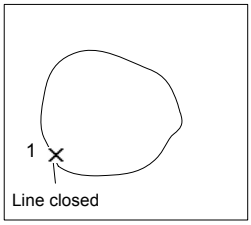
Move cursor to start point and press『Set』



Move cursor along the edge of target region



Press『Back』to remove the trace line of a certain number of pixels




Press『Set』to make curve closed

## 3.3 Volume

2-Axis method

Function: to measure the volume of the target object. 2-Axis method is used to measure the vertical section.

Channel number: 4.

The formula for 2-Axis method:

$V=(\pi/6)\times A\times B^2$

In the formula, A is the long axis of the ellipse and B the short axis.

Measuring procedures for 2-Axis method:

The procedures are the same as those of Ellipse method for circumference and area; the volume result is displayed in the result window.

3-Axis method

Function: to measure the volume of the target object. 3-Axis method is used to measure the vertical and horizontal sections.

Channel number: 1.

The formula for 3-Axis method:

$V=2/3\times A\times B\times M$

In the formula, M is the length of the third axis.

Measuring procedures for 3-Axis method:

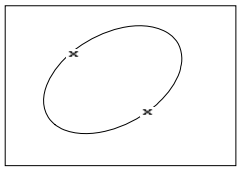
1 In B mode, scan and freeze the image.

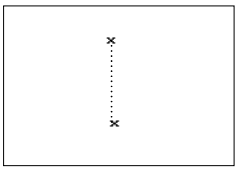
2 Select the [3-Axis] item in the [Volume] submenu. Draw an ellipse on the screen to make it meet the size of the region to be measured.

3 Unfreeze the image, re-scan and display the profile perpendicular to the previous image. Freeze the image and measure the length of the third axis. The method is the same as that to measure the distance.

4 After the measurement, the measured result of the volume is displayed in the Result Window.

5 Repeat the step 1 through 4 to perform a new measurement.





3-Dist method:

Function: to calculate the volume through measurements of three axis lengths of the object.

Formula:

V=（π/6）×D1×D2×D3

D1,D2 and D3 are respectively lengths of the three axes.

The measuring method is as follows:

1. Move the cursor onto 3-Dist of the sub-menu of the Volume item and press to enter the measurement status.
2. Respectively measure lengths of the first, second and third axis, and the measuring method is the same as that of Distance measurement.
3. After the three lengths are measured, the calculated result of the volume is displayed in the result window.

## 3.4 Ratio

Function: to measure and calculate the ratio between two measured distance values. The first measured value is used as the numerator and the second measured value is used as the denominator.

Measurement channels: 4

Measuring method:

1 Move the cursor to the [Ratio] item, press the 『Set』 key. Move the cursor into the image window, the cursor changes into a “+”.

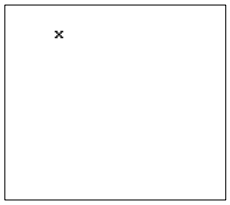
2 Measure the first distance D11. The method is the same as that to measure “Distance”.

3 Measure the second distanceD12. Move the cursor into the image window, the cursor changes into a “+”. Roll the trackball to move the cursor to the start point of the measurement. Press the 『Set』 key, the fixed mark “✕” is displayed at the start point. Roll

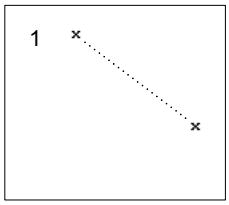
the trackball to move the cursor, the cursor "+" and the start mark "×" are always connected by a broken line. The system updates the measured result in the Result Window. At this time, press the 『Change』 key to exchange the fixed point and the active point of the measuring scale Press 『Change』 key again to exchange the numerator and denominator .

4 After finishing the measurements, the final calculated result of ratio is displayed in the Result Window.

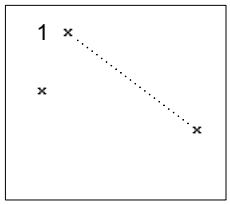
5 Press the 『Set』 key to start a new measurement and calculation.



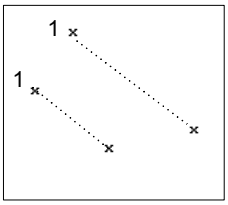
Press『Set』to set start point of first line




Press『Set』to set end point of first line




Press『Set』to set start point of second line




Press『Set』to set end point of second line

## 3.5 Stenosis Ratio

Function: to measure and calculate the stenosis of the blood vessels. The stenosis distance ratio and the stenosis area ratio are to be calculated according to the distance and area respectively.

- □ Stenosis ratio of length: use the distance caliper to respectively measure the diameters of the vessel at normal region and the vessel at the stenosis region, and apply the formula below to calculate the stenosis ratio.
- □ Stenosis ratio of area (Ellipse): use the Ellipse caliper to respectively measure the cross section areas of the vessel at normal region and the vessel at the stenosis region, and apply the formula below to calculate the stenosis ratio.
- □ Stenosis ratio of area (Trace): use the Trace caliper to respectively measure the cross section areas of the vessel at normal region and the vessel at the stenosis region, and apply the formula below to calculate the stenosis ratio.

The formulae for stenosis ratio:

%D=（(D1-D2）÷D1）×100%

%A=（(A1-A2）÷A1）×100%

In the formulae, D1 and A1 respectively represent the distance and area at the non-stenosis position. D2 and A2 respectively represent the distance and area at the stenosis position.

Measurement channels: 4

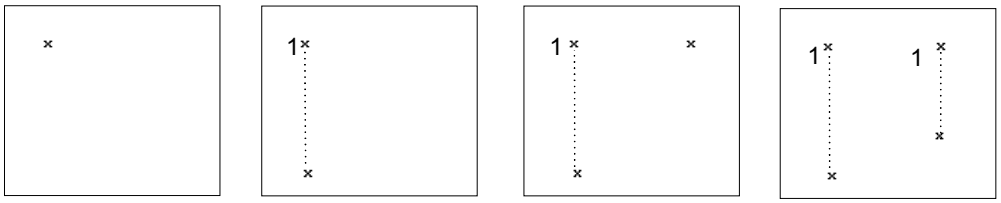
Method of measuring stenosis distance ratio:

1 Move the cursor to the [Distance] item of the [% Stenosis] submenu, press the 『Set』 key, the cursor changes into a “+”.

2 Measure the distance D1 at the non-stenosis position. The method is the same as that to measure distance.

3 Measure the distance D2 at the stenosis position. The method is the same as that to Distance measure. After the measurements, the final calculated result of stenosis ratio (DSR) is displayed in the Result Window.

See the following figures:



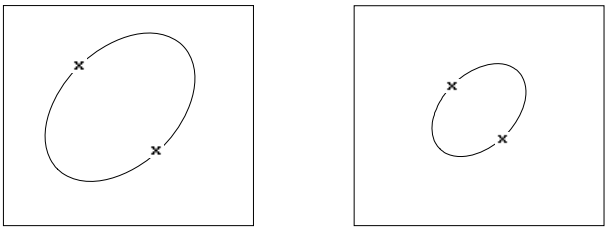

Method of measuring stenosis ratio of area (Ellipse):

1 Move the cursor to the [Area (Ellipse)] item of the [% Stenosis] submenu, press the 『Set』 key, and the cursor changes into a “+”.

2 Measure the area A1 at the non-stenosis point. The method is the same as ellipse method of measuring “Circumference/Area”.

3 Measure the area A2 at the stenosis point. The method is the same as ellipse method of measuring “Circumference/Area”. After the measurements, the calculated value ASR of the stenosis area ratio is displayed in the Result Window.

4 Repeat the steps 1 through 3 to do a new measurement.



Method of measuring stenosis ratio of area (Trace):

a) Move the cursor to the [Area (Trace)] item of the [% Stenosis] submenu, press the 『Set』 key, and the cursor changes into a “+”.

b) Measure the area A1 at the non-stenosis point. The method is the same as ellipse method of measuring “Circumference/Area”.

c) Measure the area A2 at the stenosis point. The method is the same as ellipse method of measuring “Circumference/Area”. After the measurements, the calculated value ASR of the stenosis area ratio is displayed in the Result Window.

d) Repeat the steps 1 through 3 to do a new measurement.

## 3.6 Angle

Function: to measure the angle between two straight lines (0～180°).
Measurement channels: 4

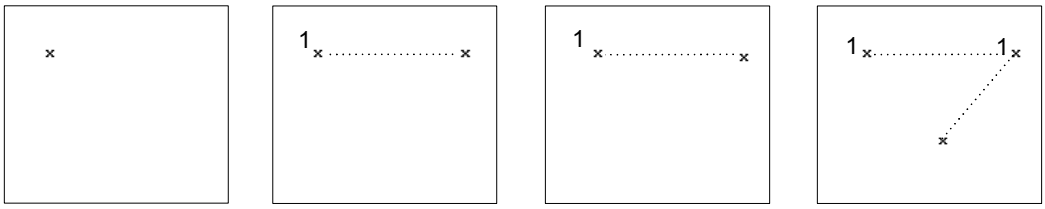
Measuring method:

1 Move the cursor to the [Angle] item, press the 『Set』 key. Move the cursor into the image window, the cursor changes into a “+”.

2 First draw a segment along one edge of the angle. The method is the same as that to measure distance.

3 Draw a segment along the other edge of the angle. The method is the same as that to measure distance. After the measurements, the angle between two segments as well as their each length is displayed in the Result Window.

4 Press the 『Set』 key to start a new measurement.




Press『Set』to set start point of first line | Press『Set』to set end point of first line | Press『Set』to set start point of second line | Press『Set』to set end point of second line

## 3.7 Histogram

Function: to calculate the gray distribution of the ultrasound echo signals within a specified region. Use the rectangle, ellipse or the trace to close the region to be measured. The result is shown in the form of histogram.
Histogram can be measured only on the frozen image.

Measurement channels: 4

Measuring method:

1 Freeze the image.

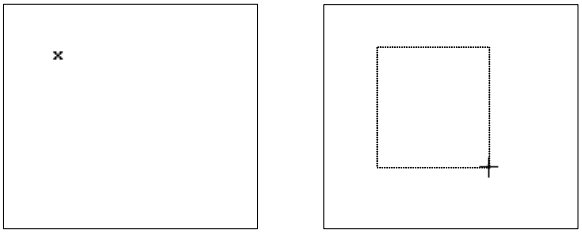
2 Move the cursor to the [Histogram] item, and then the [Histogram] submenu pops up. Move the cursor to the [Rectangle] item and press the『Set』key. Move the cursor into the image window, the cursor changes into a “+”.

3 First press the 『Set』 key to determine an apex of the rectangle.

4 Roll the trackball, a rectangle scale is displayed and updated with the move of trackball.

5 Press the 『Set』 key again to determine the apex of the across corner of the rectangle. In this way the rectangle area to be measured is determined. The calculated result of the histogram is displayed in the image window.

6 Repeat the step 3 through 5 to do a new measurement. The calculated results are in turn displayed in the upper right corner, the upper left corner, lower left corner and lower right corner of the image window.

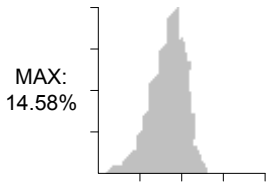


Press『Set』to set apex of rectangle

Press『Set』to set apex of the across corner

To measure the histogram using ellipse and trace methods, the method is the same as that to measure “circumference/area”.

The measured result of the histogram is as shown in the following figure, in which the X-axis represents the gray scale of the image ranging from 0 to 255 and the Y-axis represents the distribution ratio of each gray scale. The maximum value on the left represents the percentage of the maximally distributed gray in the whole gray distribution.




## 3.8 Profile

Function: to measure the gray distribution of the ultrasound signals on a profile in the vertical or horizontal direction.

Profile can be measured only on the frozen image.

Measurement channels: 4

Measuring method:

1 Freeze the image.

2 Move the cursor to the [Profile] item and press the『Set』key. Move the cursor into the image window, the cursor changes into a “+”.

3 Draw a straight line at the measuring position. Refer to the method to measure distance.

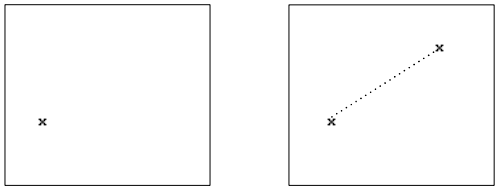
4 The profile is displayed in the window. See the following figure, in which,

5 Horizontal axis----the projection of the profile line on the horizontal direction.

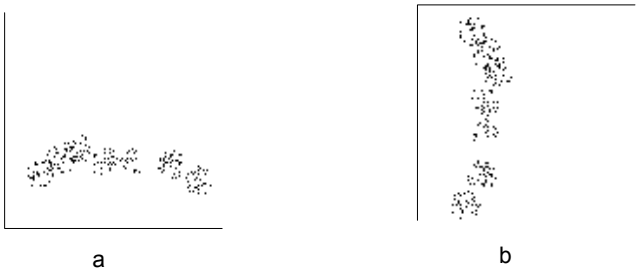
6 Vertical axis----the gray distribution of the corresponding points on the profile line. The range is 0 to 255.

When the angle between the straight line and the horizontal direction is above 45°, the profile is displayed as shown in the following figure, in which:
Vertical axis ---- the projection of the profile line on the vertical direction.
Horizontal axis ---- the gray distribution of the corresponding points on the profile line. The range is 0 to 255.

7 Press the『Set』key to start a new measurement.




Measure profile




Measured result of profile

## 3.9 Other Measurements

Select the [Others] item in the [B MEAS] menu to access other modes.

## 3.10 Printing General Report

After connected with the printers supported by system, the system can output a General Report in A4 style. This General Report has three parts: basic hospital and patient information; an image having the same size as the original one displayed on the screen; an area for the doctor to fill in his examining results (Exam) and diagnosis (Diagnosis).

Either in B MEAS menu, M MEAS menu or FREEZE MENU, after the [Print Report] item being selected, the system will output a General Report onto the connected printer. Let's take the printing operation in B MEAS as an example.

Procedures:

1 Check if there is paper in the paper box of the printer and if the printer is in normal state.

The user can use the printer only when printer is in normal status. For the detailed information, refer to the operator's manual of the printer.

Click the [Print Report] item in B MEAS menu, the dialog box appears indicating that the system is processing the printed data, please wait.

2 The printer starts printing out the report. Waiting until the dialog box closes; the user can perform other operations.

3 The printer feeds out the paper and then printing process ends. The whole printing process spends about 90 seconds.

**⚠WARNING: Strictly prohibit plug in/out the power cable and the signal cable of the printer when the power is still on, otherwise the system and the printer will be damaged.**

# 4 M Mode General Measurements & Calculations

Press the 『M』 or 『M/B』 key to access M or M/B mode.
Then press the 『Measure』 key to call up the M MEAS menu.
Make sure the M MEAS menu is on the right of the screen. If not, press the 『Menu』 key.


## 4.1 Distance

Function: To measure the distance between two points on the M mode image.
Measurement channels: 4

Method:

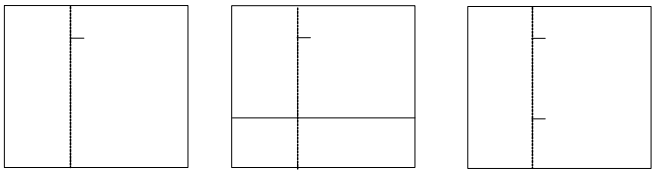
1 Move the cursor to the [Distance] item of the [M MEAS] menu and press the 『Set』 key. Move the cursor into the image window, the cursor changes into a big “+”.

2 Move the cursor to the start point of the measurement. Press the『Set』key, then the fixed mark “—” is displayed at the start point. Press the 『Back』 key to delete the start point determined just now.

3 Roll the trackball to move the cursor, the big “+” can only be moved along the vertical direction. The system updates the measured value in the Result Window. The user can press the 『Change』 key to exchange the fixed end and the active end of the measuring scale or press the 『Back』 key to delete the start point determined just now.

4 Roll the trackball to move the big “+” to the end point of the measurement. Press the『Set』key, the fixed mark “—” is displayed at the end point. The measured result is finally determined. The measurement ends.

5 Repeat the steps from 2 to 4 to do a new measurement.




## 4.2 Time

Function: to measure the time interval between two points on the M mode image.
Measurement channels: 4

Measuring method:

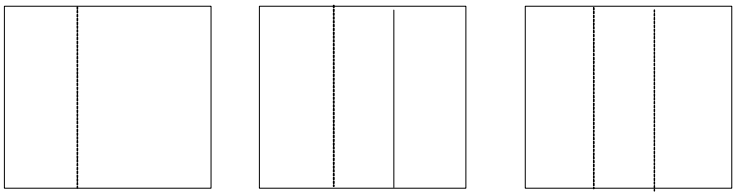
1 Move the cursor to the [Time] item of the [M MEAS] menu, and press the『Set』key. Move the cursor into the image window, the cursor changes into a big "+".

2 Move the cursor to the start point of the measurement. Press the 『Set』 key, the fixed mark of big " ┆ " is displayed at the start point. Press the 『Back』 key to delete the start point determined just now.

3 Roll the trackball to move the cursor, the big "|" can only be moved along the horizontal direction. The system updates the measured value in the Result Window. Now user can press the 『Change』 key to exchange the fixed end and the active end of the scale or press the 『Back』 key to delete the start point determined just now.

4 Roll the trackball to move the big "|" to the end point of the measurement. Press the 『Set』 key, the fixed mark " ┆ " is displayed at the end point. The measured result is finally determined. The measurement ends.

5 Repeat the steps from 2 to 4 to do a new measurement.




## 4.3 Slope

Function: to measure the slope (speed) between two points and also distance and time between two points.
Measurement channels: 4

Measuring method:

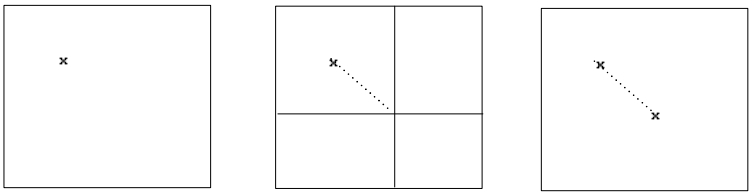
1 Move the cursor to the [Slope] item of the [M MEAS] menu, and press the 『Set』 key. Move the cursor into the image window. The cursor changes into a big "+".

2 Move the cursor to the start point of the measurement, press the 『Set』 key, the fixed mark "×" is displayed at the start point. Now can press the 『Back』 key to delete the start point determined just now.

3 Roll the trackball to move the cursor, the big "+" and the start point "×" are always connected by a broken line. The system updates the measured value in the Result Window. Press the 『Change』 key to exchange the fixed end and the active end of the scale or press the 『Back』 key to delete the start point determined just now.

4 Roll the trackball to move the big "+" to the end point of the measurement. Press the『Set』 key, the fixed mark "×" is displayed at the end point. The measured results are determined. The measurement ends.

5 Repeat the steps from 2 to 4 to do a new measurement.



Press『Set』to set start point | Move cursor to end point | Press『Set』to set end point

## 4.4 Heart Rate

Function: to calculate the number of heart beats per minute on the cardiac image.

Measurement channels: 4

Measuring method:

1 Move the cursor to the [Heart Rate] item, press the 『Set』 key. Move the cursor into the image window. The cursor changes into a big "+".

2 The default is to measure the time of two cardiac cycles. The procedures of measurement are the same as those to measure M mode time.

3 After the measurement, the calculated HR result is displayed in the Result Window.

4 Press the 『Set』 key to start a new measurement.

## 4.5 Others

Move the cursor to the [Others] item of the [M MEAS] menu and press the 『Set』 key. Then move the cursor to the [M-CAR MEAS] item of the [OTHERS] menu and press the 『Set』 key to enter the M-CAR MEAS menu.

# 5 Obstetric Measurements & Calculations

Obstetric measurements and calculations are usually performed on B mode image.

Press the 『OB』 key to access the Obstetric mode.

Press the 『Measure』 key to access the Measurement mode.

Confirm that the [B-OB MEAS] menu is displayed on the right part of the screen. If not, press the 『Menu』 key.

The default is “Distance” measurement in [B-OB MEAS] menu.

You can move the cursor to the [Advance] item of the [B-OB Meas] menu and press the 『Set』 key to enter the [B-OB ADV MEAS] menu. “OFD” measurement is the default measurement in [B-OB ADV MEAS] menu.


## 5.1 Measurements and Calculations

### 5.1.1 Items measured and calculated

- GS (gestational sac diameter)
- CRL (crown rump length)
- BPD (biparietal diameter)
- HC (head circumference)
- AC (abdominal circumference)

- FL (femur length)
- AF(amniotic fluid)
- AFI (amniotic fluid index)
- OFD (occipitofrontal diameter)
- OOD（Outer Orbital Diameter)
- CER (cerebellum)
- THD (thoracic diameter)
- TAD (transverse abdominal diameter)
- APAD (anteroposterior abdominal diameter)
- FTA (fetal trunk cross-sectional area)
- HUM (humerus length)
- Ulna (ulna length)
- Tibia (tibia length)
- YS (Yolk Sac)
- NT (Nuchal Translucency)
- EFW (estimated fetal weight)
- GA (diagnosed gestational age or clinical gestational age)
- EDD (estimated date of delivery)

### 5.1.2 Items keyed in

- LMP (last menstrual period)
- BBT(Basal Body Temperature)
- FBP(fetus biophysical profile)

## 5.2 OB Twins Measurement

Select the [B-OB TWIN MEAS] item in the submenu of [Others]; users can perform the OB measurement for twins. The measurement items are the same as that in the B-OB MEAS menu, the difference include:

- Fetus switching (by the “Fetus” item of the “B-OB TWIN MEAS” menu, select fetus A or fetus B);
- Respectively measure and browse the OB data of the two fetuses, and see if the measurement items in the measurement result window are displayed as “（A）”and“（B）”for distinguishing the results of the fetus A and the fetus B;
- Respectively generate the OB exam reports for the two fetuses;
- Respectively generate the growth curves for the two fetuses;

- Respectively complete the fetal biophysical profile and generate the reports for the two fetuses;
- Respectively print the OB exam reports for the two fetuses;
- For all the dialog boxes, users can respectively view the data of fetus A and fetus B by means of switching the [A<->B] button.

The [B-OB TWIN MEAS] menu is shown in the figure below:


## 5.3 Fetal Growth Measurements

The parameters given below are general indexes used to evaluate the fetal growth. After measuring each parameter, the system will automatically calculate the GA based on the measured results.

**NOTE:**

1. GA derived from the calculation of entered LMP or BBT is called clinic GA; GA derived from the calculation of the measured data is diagnostic GA.
2. If GA is outside the range of the gestational evaluation table or exceeds 45 weeks, GA is displayed as “GA OOR（GA Out of Range）”; GA will not be displayed if the measurement item cannot correspond to the gestational evaluation table.
3. The formula that used in every measured item can be preset. Please refer to “1.5.1 Formula Preset”.
4. Every measurement must be measured in the effect image area.

### 5.3.1 GS

1 Move the cursor to the [GS] item, press the『Set』key and move the cursor into the image window. The cursor changes into a “+”.

2 To measure GS, refer to the “Distance” measurement in B mode general measurements.

3 The measured result of GS is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.2 CRL

1 Move the cursor to the [CRL] item. Press the 『Set』 key and move the cursor into the image window. The cursor changes into a “+”.

2 To measure CRL, refer to the “Distance” measurement in B mode general measurements.

3 The measured result of CRL is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.3 BPD

1 Move the cursor to the [BPD] item. Press the 『Set』 key and move the cursor into the image window. The cursor changes into a “+”.

2 To measure BPD, refer to the “Distance” measurement in B mode general measurements.

3 The measured result of BPD is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.4 HC

Two methods are available to measure HC. They are Ellipse method and Trace method.

1 Move the cursor to the [HC] item. The [HC] submenu pops up. Move the cursor to the [Ellipse] or [Trace] in this submenu. Press the 『Set』 key, the cursor changes into a “+”.

2 To measure HC, refer to the “Circumference and Area” measurement in B mode general measurements.

3 The measured result of HC is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.5 AC

Two methods are available to measure AC. They are Ellipse method and Trace method.

1 Move the cursor to the [AC] item. The [AC] submenu pops up. Move the cursor to the [Ellipse] or [Trace] item in this submenu. Press the 『Set』 key, the cursor changes into a "+".

2 To measure AC, refer to the "Circumference and Area" measurement in B mode general measurements.

3 The measured result of AC is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to "Formula Preset" for details.).

### 5.3.6 FL

1 Move the cursor to the [FL] item. Press the『Set』 key and move the cursor into the image window. The cursor changes into a "+".

2 To measure FL, refer to the "Distance" measurement in B mode general measurements.

3 The measured result of FL is displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to "Formula Preset" for details.).

### 5.3.7 AFI

Number of measurement channels: one.

1 Move the cursor to the [AFI] item in the [B-OB MEAS] menu. Press the 『Set』 key to enter AFI measurement.

2 The lengths are to be measured. The details of measurement operation are the same as to measure "Distance".

3 When the four lengths are all measured, the AFI result will be displayed on the screen automatically.

### 5.3.8 OFD

1 Move the cursor to the [OFD] item of the [B-OB ADV MEAS] menu and press the『Set』key to enter measurement status.

2 Method to measure OFD is the same as that to measure "Distance" in B-mode.

3 After measurement, OFD result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to "Formula Preset" for details.).

### 5.3.9 OOD

1 Move the cursor to the [OOD] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure OOD is the same as that to measure “Distance” in B-mode.

3 After measurement, OOD result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on whether LMP or BBT has been entered or not before the measurement.

### 5.3.10 CER

1 Move the cursor to the [CER] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure CER is the same as that to measure “Distance” in B-mode.

3 After measurement, CER result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.11 THD

1 Move the cursor to the [THD] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure THD is the same as that to measure “Distance” in B-mode.

3 After measurement, THD result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

### 5.3.12 TAD

1 Move the cursor to the [TAD] item of the [B-OB ADV MEAS] menu; press the 『Set』 key to enter measurement status.

2 Method to measure TAD is the same as that to measure “Distance” in B-mode.

3 After measurement, TAD result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on whether LMP or BBT has been entered or not before the measurement.

## 5.3.13 APAD

1 Move the cursor to the [APAD] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure APAD is the same as that to measure “Distance” in B-mode.

3 After measurement, APAD result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on whether LMP or BBT has been entered or not before the measurement.

## 5.3.14 FTA

Two methods are available to measure FTA. They are Ellipse method and Trace method.

1 Move the cursor to the [FTA] item of the [B-OB ADV MEAS] manu and the [FTA] submenu pops up.

2 Select the [Ellipse] or [Trace] item from the [FTA] submenu; press the 『Set』 key to enter measurement status.

3 Method to measure FTA is the same as that to measure “Circumference/Area” in B-mode.

4 After measurement, FTA result will be displayed in the result window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

## 5.3.15 HUM

1 Move the cursor to the [HUM] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure HUM is the same as that to measure “Distance” in B-mode.

3 After measurement, HUM result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on the formula preset and whether LMP or BBT has been entered or not before the measurement (refer to “Formula Preset” for details.).

## 5.3.16 Ulna

1 Move the cursor to the [Ulna] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure Ulna is the same as that to measure “Distance” in B-mode.

3 After measurement, Ulna result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on whether LMP or BBT has been entered or not

before the measurement.

### 5.3.17 Tibia

1 Move the cursor to the [Tibia] item of the [B-OB ADV MEAS] menu and press the 『Set』 key to enter measurement status.

2 Method to measure Tibia is the same as that to measure “Distance” in B-mode.

3 After measurement, Tibia result will be displayed in the Result Window. Whether GA is displayed in the result window or not lies on whether LMP or BBT has been entered or not before the measurement.

### 5.3.18 YS

1. Move the cursor onto the [YS] item of [B-OB ADV MEAS] menu, and press the 『Set』 key to enter the measurement.
2. Refer to the distance measurement of the B MEAS menu for the measuring method.
3. After the measurement finishes, the result will be displayed in the result window.

### 5.3.19 NT

1. Move the cursor onto the [NT] item of [B-OB ADV MEAS] menu, and press the『Set』 key to enter the measurement.
2. Refer to the distance measurement of the B MEAS menu for the measuring method.
3. After the measurement finishes, the result will be displayed in the result window.

## 5.4 EDD Calculations

### 5.4.1 Calculating EDD according to LMP

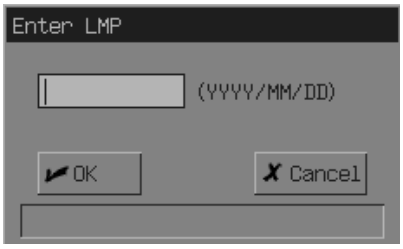
1 Move the cursor to the [Key In] item, and then the [Key In] submenu pops up. Move the cursor to the [LMP] item of the submenu. Press the 『Set』 key, the dialog box of [Enter LMP] pops up.

2 Enter the date of LMP into the edit bar according to the date format which displays in the dialog box. (Can only enter the LMP value that make the calculated GA not exceeds 45 weeks).

3 Move the cursor to the [OK] item and press the 『Set』 key. The result of EDD is displayed

in the Result Window. Or move the cursor to the [Cancel] item and press the 『Set』 key to give up the input and the result of EDD will not be displayed.

The full name of LMP is: Last Menstrual Period.
EDD=LMP+280days



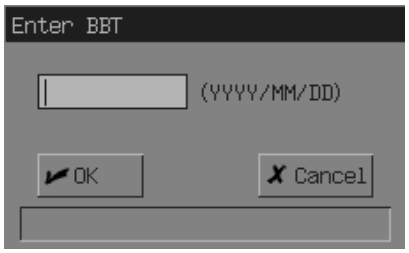

## 5.4.2 Calculating EDD according to BBT

1 Move the cursor to the [Key In] item, and then the [Key In] submenu pops up. Move the cursor to the [BBT] item of the submenu. Press the 『Set』 key, the dialog box of [Enter BBT] pops up.

2 Enter the date of last BBT into the dialog box according to the date format which displays in the dialog box. (Can only enter the BBT value that make the calculated GA not exceeds 45 weeks).

3 Move the cursor to the [OK] item and press the 『Set』 key. The result of EDD is displayed in the Result Window. Or move the cursor to the [Cancel] item and press the 『Set』 key to give up the input and the result of EDD will not be displayed.

The full name of BBT is: Basal Body Temperature.
EDD=BBT+266days




# 5.5 EFW Calculations

The system can calculate EFW based on the measured data of some fetal growth indexes.

## 5.5.1 Formulae

Formula to be used to calculate EFW must be set in advance in PRESET menu. There are eleven formulae to calculate EFW, listed below:

- **Tokyo University formula:**

EFW＝(1.07*(BPD^3))+(3.42*APTD*TTD*FL)

In which, APTD is anteroposterior trunk diameter; TTD is transverse trunk diameter. The EFW unit is g, and the unit of measurement items is cm.

- **Osaka University formula:**

  EFW＝1.25674*(BPD^3)+3.50665×FTA×FL+6.3

  In which, FTA is fetal trunk cross-sectional area. The EFW unit is g, and the unit of measurement items except FTA is cm. FTA unit is $cm^2$.

- **HADLOCK1 formula:**

  EFW＝10^(1.304 +(0.05281 * AC) + (0.1938 * FL)–(0.004 * FL * AC))

- **HADLOCK2 formula:**

  EFW＝10^(1.335 – (0.0034*AC*FL)+(0.0316*BPD)+(0.0457*AC)+(0.1623*FL))

- **HADLOCK3 formula:**

  EFW=10^(1.326-(0.00326*AC*FL)+(0.0107*HC)+（0.0438*AC）+（0.158*FL）)

- **HADLOCK4 formula:**

  EFW=10^（1.3596-(0.00386*AC*FL)+(0.0064*HC)+（0.00061*BPD*AC）+(0.0424*AC)+(0.174*FL)）

  In formulae of HADLOCK1 to HADLOCK4, the EFW unit is g, and the unit of measurement items is cm.

- **Shepard formula:**

  EFW(Kg)=10^(-1.7492+（0.166*BPD）+（0.046*AC）-（2.646*AC*BPD/1000）)

  The EFW unit is kg, and the unit of measurement items is cm.

- **Merz1 formula:**

  EFW=-3200.40479+（157.07186*AC）+（15.90391*(BPD^2)）

  The EFW unit is g, and the unit of measurement items is cm.

- **Merz2 formula:**

  EFW=0.1*(AC^3)

  The EFW unit is g, and the unit of measurement items is cm.

- **Hansmann formula:**

  EFW （Kg） =(-1.05775*BPD)+0.0930707*(BPD^2)+（0.649145*THD）-0.020562*(THD^2)+0.515263

  The EFW unit is kg, and the unit of measurement items is cm.

- **Campbell formula:**

  EFW（Kg）＝EXP(-4.564+(0.282*AC)-(0.00331*(AC^2)))

  The EFW unit is kg, and the unit of measurement items is cm.

## 5.5.2 Measurement items

When users select different formula, there are different items to be measured. So user can evaluate EFW according to real measurement items in applications.

### 5.5.3 Sample

Refer to the prompt information on the lower part of the screen for detailed measurement procedures.
Following uses “Tokyo University” formula as an example to explain how to calculate EFW.

1 Move the cursor onto [EFW] menu item and press『Set』key. Move the cursor into Image Window, the cursor will turn into a “+”.

2 Method to measure BPD is the same as that to measure “Distance” in B-mode.

3 Follow the step to measure APTD.

4 Follow the step to measure TTD.

5 Follow the step to measure FL. After finishing all measurements, the system will calculate EFW value and display it in the Result Window.

## 5.6 Results

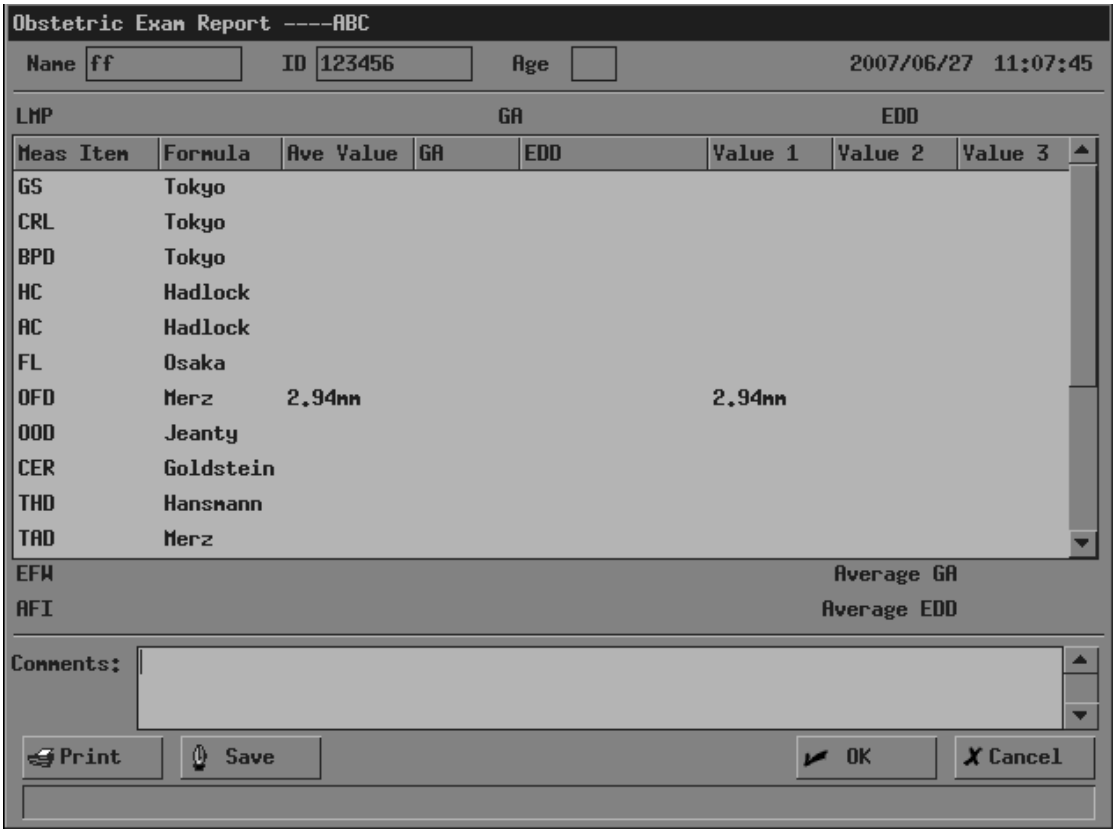
### 5.6.1 Obstetric exam report

After finishing the obstetric exam, the system can automatically generate the obstetrics report.

The data in the obstetrics report include:

- Hospital Name
- General Data of the Patient (name, ID, age)
- Exam Date and time
- Measured Values and Calculated Results
- Calculation Formula
- Comments
- Save/Printout Report

After one of more measurements and calculations of obstetric exam, move the cursor to the [Report] item of the [Results] submenu, press the 『Set』 key to open the dialog box of Obstetric Exam Report. See figure below.




Obstetric Exam Report

- In the above OB exam report, there are two “GA” and two “EDD”; the former “GA” and “EDD” are “clinic gestational week” and “clinic estimated date of delivery”; the latter “GA” and “EDD” are “diagnostic gestational week” and “diagnostic estimated date of delivery”. The “clinic gestational week” and “clinic estimated date of delivery” are derived from the calculation of LMP or BBT. The “diagnostic gestational week” and “diagnostic estimated date of delivery” are derived from the calculation of the measured data. The “average GA” and “average EDD” are respectively the average of multiple “diagnostic gestational week” and the average of multiple “diagnostic estimated date of delivery”.
- In the OB exam report, the displayed measured values are the latest ones (3 measurements at most), and the average value of these measurements is displayed.
- If users want to add the comments of the doctor into the report, move the cursor into the edit bar of “Comments”, and press the 『Set』key, and then the cursor will be displayed as “|”in the edit bar. Now users can add the comments.
- To print the exam report, press the [Print] button. To save this report in the file list of this patient, press the [Save] button (If there isn’t the clinic gestational week or clinic EDD calculated from LMP or BBT, pressing this button is invalid and the report cannot be saved).
- In the Twins measurement mode, the [A<->B] button is used for switching between OB

exam reports of fetal A and fetal B.

- During the process of or after finishing the measurements and calculations, the report can be generated at any time for the user to view the measuring process. Then use the cursor to select [OK] or [Cancel] button to close the report and continue the measurement.

**NOTE:**

1. The system cannot save data being measured.
2. Before clicking [Save], be sure that the data to be saved is what you really want. If the saved data is wrong or not complete, misdiagnoses will occur.

## 5.6.2 Growth curves comparison

Data of growth curve are all sourced from FG table. Function: “growth curve comparison” means to compare the measured data of the fetus with the normal growth curve in order to determine if the fetus grows normally. In addition, the growth curve can indicate a fetus history measurement data.

Procedure:

1 Measure one or more items of fetal growth indexes (including GS, CRL, BPD, HC, AC, FL, OFD, CER, THD, TAD, APAD, FTA, HUM, Ulna, Tibia).

2 Enter LMP or BBT. For the detailed procedure, please refer to section 5.4.1 and 5.4.2.

3 Move the cursor onto [Results] menu item; the [Results] submenu will pop up automatically. Then move the cursor onto [Growth Curve] submenu item and press『Set』key. The screen will display “Obstetric Growth Curve” dialog.

4 The default page “GS” is opened in the dialog. The formula displayed on the right is the one based on which the current growth curve is generated. Move the cursor onto other Formula button and press 『Set』 key; the screen will display the normal growth curve of this Formula in order to determine the growth situation of the fetus.

5 Move the cursor onto the button for other page and press 『Set』 key; the growth curve of other exam item and the corresponding position of the measured parameter value on the growth curve will be displayed.

6 Now use the BPD page as an example to illustrate the BPD growth curve, see figure 5-5. In which the BPD growth curve and the corresponding position of measured BPD value (marked with “+”, “■” or ”✙” ) on the growth curve are displayed. The current growth curve is based on Tokyo formula.

Meanings of the marks on the growth curve:

■：represents history measurement value

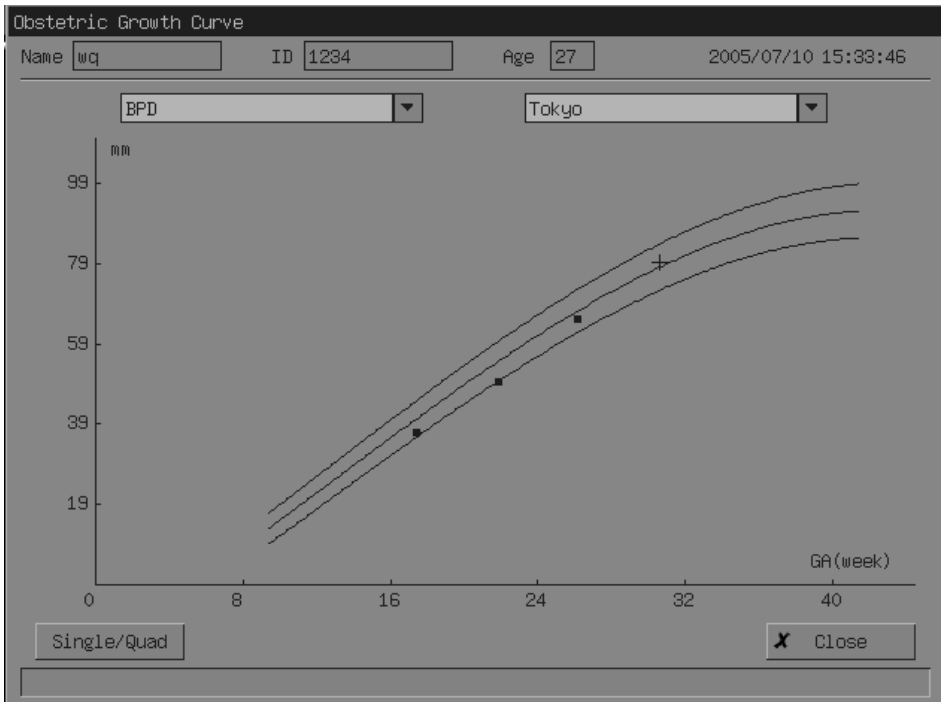
＋：represents the current measurement value, and the current results is not saved.

：represents the current measurement value, and the current results have been saved.

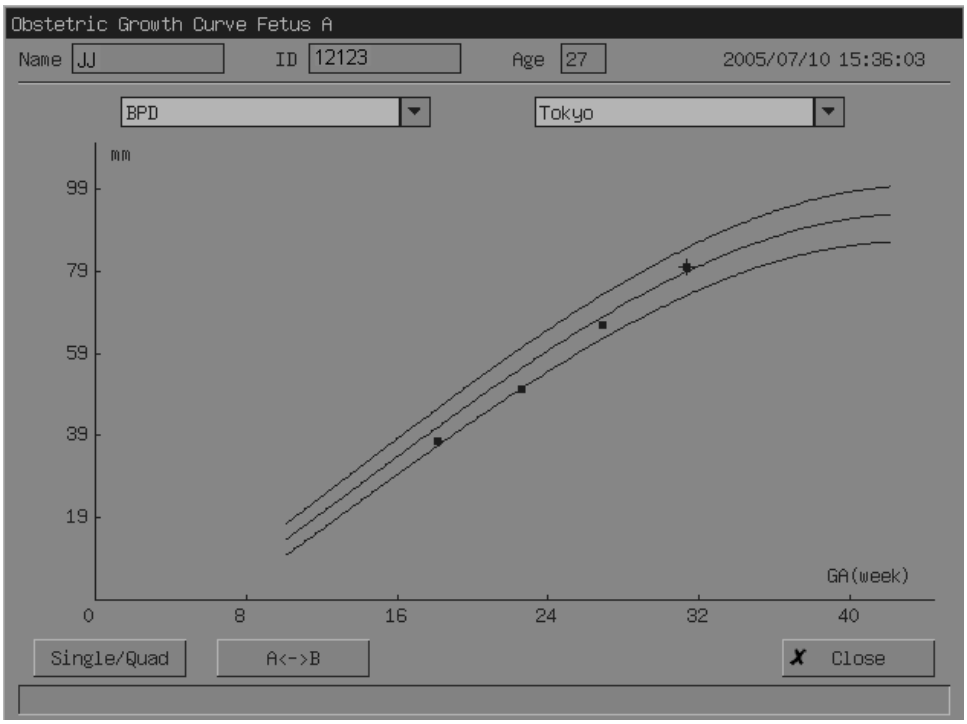
7 Move the cursor onto [Close] button and press 『Set』. The dialog will disappear and the screen restores original display.

8 User can select “Single” or “Quad” mode in exam report. See the figures as follows.

Note：If the patient ID is empty, clinical GA is not calculated or the measurement value is not valid, the factual growth curve will not be displayed.

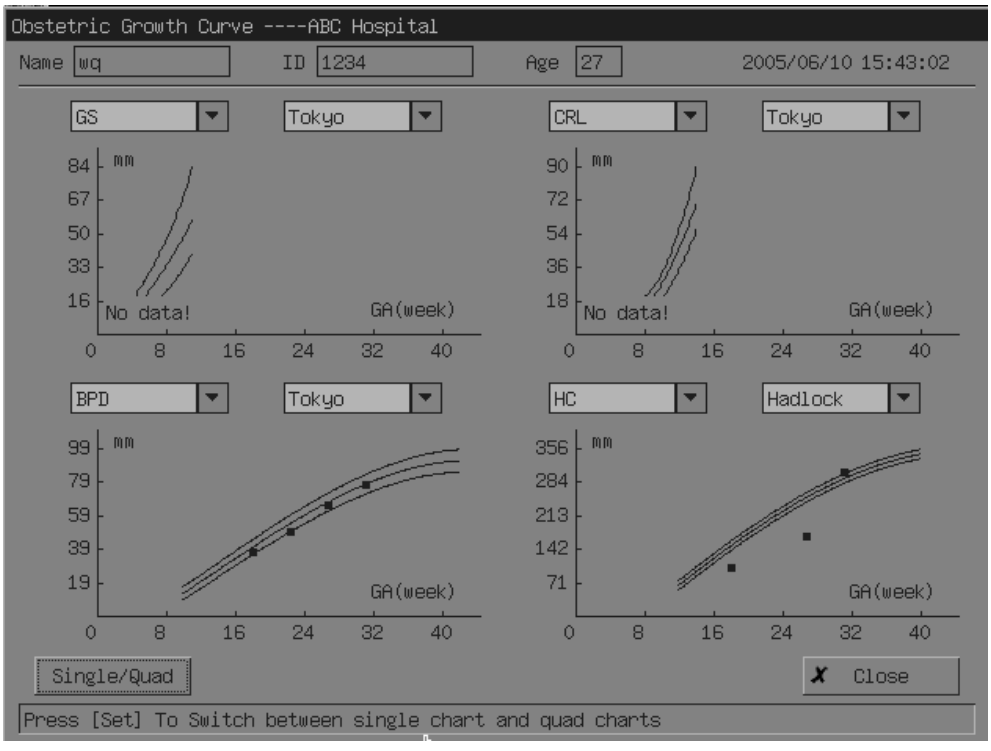



Dialog box of growth curve for obstetric exam（Single）

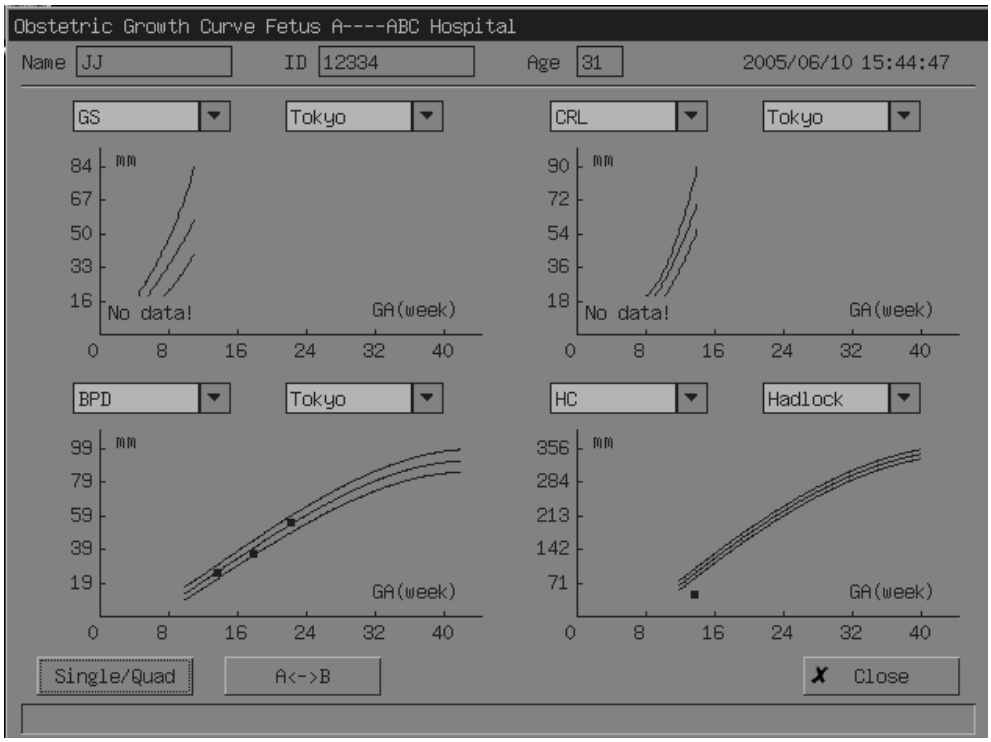



Dialog box of growth curve for obstetric twins exam（Single）

Press [Single/Quad] in above figure. User can get the figure as follow.



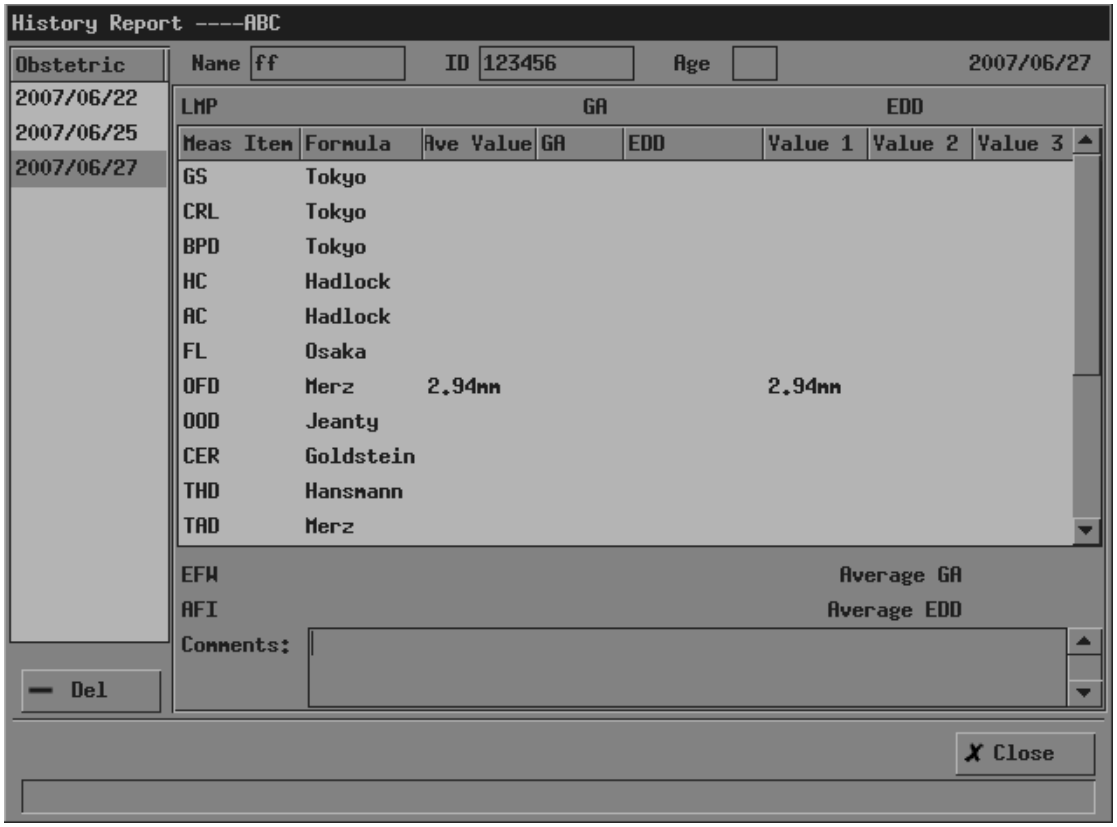

Dialog box of growth curve for obstetric exam（Quad）




Dialog box of growth curve for obstetric twins exam（Quad）

## 5.6.3 History report

Move the cursor onto the [History Report] of the submenu of [Results]; users can view the history reports of the patient (30 reports at most). The history report is shown in the figure below.




Obstetric History Report

In the “Obstetric” list at the left side, there displays the history reports of this patient (displayed in the sequence of exam time). When a report is selected, the content of it will be displayed at the right side. When a report is selected, it can be deleted by pressing the [Del] button.

Press the [Close] button, the dialog box closes.

## 5.6.4 Fetal biophysical profile

Fetal Biophysical Profile means to first obtain a few indexes related to fetal growth through the way of experiment or measurement and then evaluate the hazardous situation that the fetus is facing by grading these indexes respectively. The result scores can be used as guidance to clinical treatment.

There are 6 indexes to be obtained at the help of experiment or measurement:

- Stress fetal heart rate acceleration (FHR)
- Fetal movement (FM)
- Fetal breathing movement (FBM)
- Fetal tension (FT)
- Amniotic fluid (AF)
- Placenta level (PL)

Of these 6 indexes, AF is obtained through measuring the depth of amniotic fluid. Placenta level means to divide the growing period of the fetus into four levels based on the placenta

images of different stages. The four levels are 0, I, II and III.

Other indexes are obtained through fetal stress experiment, which requires about 20 to 30 minutes.

#### 5.6.4.1 Measuring depth of amniotic fluid

Number of measurement channels: one.

1 Move the cursor to the [FBP] item in the menu, the [AF] submenu pops up automatically. Move the cursor to the [AF] item and press 『Set』 key, the cursor then moves into the image window and displays as a "+".

2 Measure the depth of amniotic fluid. Refer to the method of "Distance" measurement in B-mode Measurement.

3 After measurement, the depth of amniotic fluid will be displayed in the Result window. If the scores of the fetal stress experiment have been entered, the total scores of fetal biophysical profile will then be displayed in the Result window.

FBP grading criteria:

- 2 scores: max. amniotic fluid depth ＞ 2 cm;
- 1 score: max. amniotic fluid depth is 1 to 2cm;
- 0: max. amniotic fluid depth ＜ 1cm.

#### 5.6.4.2 Entering scores for each index based on fetal stress experiment and placenta level

**FBP grading criteria:**

1. FHR

   Examining time: 20 minutes

   FBP grading criteria:

   - 2 scores: Condition is during fetal movements, FHR acceleration ≥15 times/minute and lasting time≥15S. It is 2 scores if the appearance of the situation meeting the condition ≥5 times within 20 minutes;
   - 1 score: Condition is during fetal movements, FHR acceleration≥15 times/minute and lasting time ≥15s. It is 1 score if the appearance of the situation meeting the condition is 1~4 times within 20 minutes；
   - 0 score: during fetal movements, FHR acceleration≤1 times within 20 minutes

2. FM

   - Examining time: 30 minutes
   - FBP grading criteria:

- 2 scores: fetal movements ≥3 times within 30 minutes;
- 1 score: fetal movements is 1~2 times within 30 minutes;
- 0 score: no fetal movements within 30 minutes.

3. FBM

- Examining time: 30 minutes
- FBP grading criteria:
- 2 scores: FBM≥1, lasting time ≥60s;
- 1 score: FBM≥1, lasting time is 30-60s;
- 0 score: no FBM or lasting time ≤30s.

4. FT

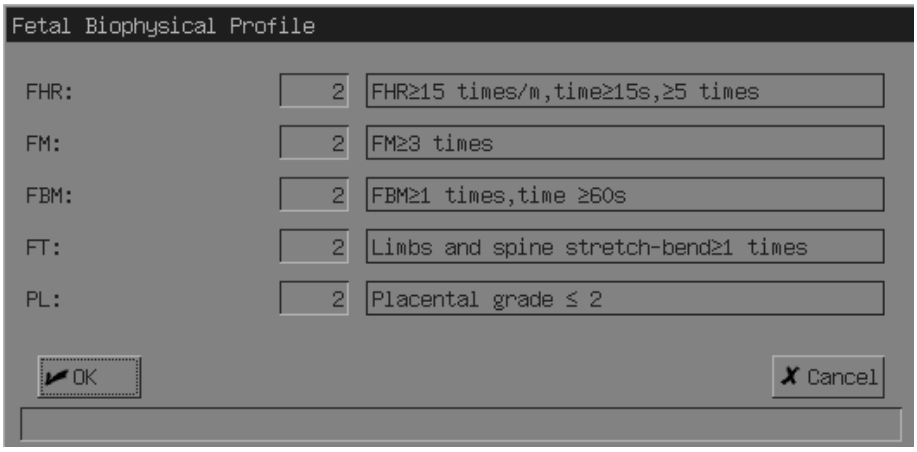
- Examining time: 30 minutes
- FBP grading criteria:
- 2 scores: limbs and spine stretch-and-bend movements ≥1 within 30 minutes;
- 1 score: limbs or spine stretch-and-bend movements ≥1 within 30 minutes;
- 0 score: limbs only stretch , no bend, and fingers loose within 30 minutes

5. PL

- FBP grading criteria:
- 2 scores: placental level ≤Ⅱ;
- 1 score: placenta is on the posterior wall, therefore difficult to estimate placental level;
- 0 score: placental level is III.

**Enter scores for each index:**

1 Move the cursor to [FBP] item, the [Key In] submenu pops up automatically. Move the cursor to the [Key In] item in the submenu and press 『Set』 key, the dialog box of “Fetal Biophysical Profile” pops up as shown in the figure below.




2 Based on the results of fetal stress experiment, set up the scores for each fetal index: Move the cursor to one of the buttons used to adjust the scores of indexes, use『Set』key or 『Back』key to change the value. The fetal stress experiment information corresponding to the value is displayed in the Information bar on the right side.

3 After giving all indexes scores, press 『Set』 key on the [OK] button to make the setups into effect and close the dialog box at the same time. If the AF value has been set up, the total value of FBP will then be displayed in the Result window.

4 Or just press 『Set』 key on the [Cancel] button to give up these setups and close the dialog box at the same time.

#### 5.6.4.3 FBP report

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 form FBP Report based on the specified formula.

Formula: Vintzileos formula.

The data displayed in the report include:

- Fetal growing state based on individual index:

| Scores of individual index | Growing condition |
|---|---|
| 2 scores: | Normal |
| 1 score: | Slight Abnormity |
| 0 score: | Obvious Abnormity |

- Total scores and general fetal growing condition

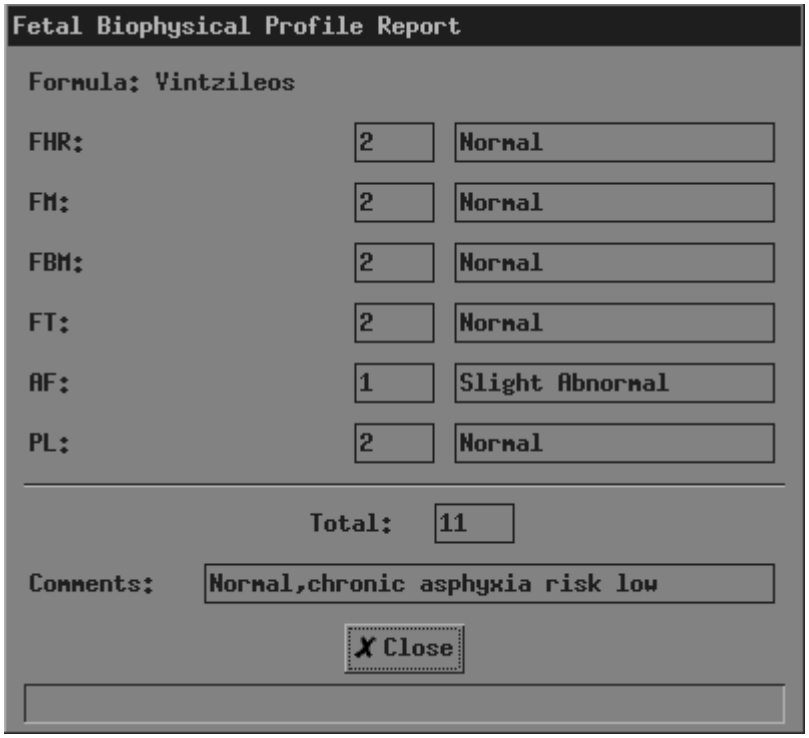
| Total scores | Growing condition |
|---|---|
| 7-12 scores | Normal fetus, chronic asphyxia's risk is low. |

| | |
|---|---|
| 3-6 scores | Fetus chronic asphyxia's risk is suspicious. |
| 0-2 scores | Fetus chronic asphyxia's risk is highly suspicious. |

**FBP Report**

Operating method:

Move the cursor to the [FBP Report] item in the [Results] menu and press 『Set』 key to open the dialog box of "Fetal Biophysical Profile Report" as shown in the figure below.




The dialog box of Fetal Biophysical Profile Report

## 5.6.5 Print obstetric report

The Obstetric Report generated by the system can be printed out in A4 paper size. Besides the information in the dialog box, the report also contains an image as the same as the image displayed on the screen (marked with "fetal A" or "fetal B" in twin report).

Move the cursor to the Print button at the Obstetric Exam Report screen and press the 『Set』 key to print the obstetric report.

Procedures:

1 Check if there is paper in the paper box of the printer and if the printer is in normal state.

The user can use the printer only when printer is in normal status. For the detailed information, refer to the operator's manual of the printer.

2 Open the dialog box of Obstetric Exam Report.

3 Click the [Print] button in the dialog box, the dialog box of Obstetric Exam Report closes and a dialog box appear indicating that the system is processing the printed data, please wait.

**NOTE:** After clicking the [Print] button, the entered data in the dialog box is then accepted by the system, i.e. the function of clicking the [Print] button is the same as clicking the [OK] button, and then print.

4 The printer starts printing out the report. Waiting until the dialog box closes; the user can perform other operations.

5 The printer feeds out the paper and then printing process ends.

**⚠WARNING: Never plug in/out the power cable and the signal cable of the printer when the power is still on, otherwise the system and the printer will be damaged.**

## 5.7 Others

Users can enter other application measurements through [Others] item from the [B-OB MEAS] menu. Select corresponding item referring to the following figure and press 『Set』 key to switch it.

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# 6 Cardiac Measurements & Calculations

The cardiac exam and measurements are generally performed in M mode or M/B mode.

## 6.1 M Mode Measurements

Two ways to enter the [M-CAR MEAS] menu are as follows:

1. Press the 『CAR』 key.

   Press the 『M』 or 『M/B』 key to access the M mode or M/B mode.

   Press the 『Measure』 key to access the Measurement mode.

   Confirm that the [M-CAR MEAS] menu is displayed on the right part of the screen. If not, press the 『Menu』 key.

2. Press the 『M』 or 『M/B』 key to access the M mode or M/B mode.

   Press the 『Measure』 key to access the Measurement mode.

   Confirm that the menu is displayed on the right part of the screen. If not, press the 『Menu』 key. Move the cursor to the [Others] item, select the [M-CAR MEAS] item and then press the 『Set』 key.

The [M-CAR MEAS] menu is as follows:

The items of cardiac exam in M mode are included in the following table:

**1. Cube**

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVIDd | Left ventricular short-axis diameter at end diastole | Distance measurement in M mode | mm |
| LVIDs | Left ventricular short-axis diameter at end systole | Distance measurement in M mode | mm |
| LVET | Ejection time | Time measurement in M mode | ms or s |
| HR | Heart rate | Measured in M mode or keyed in | bpm |
| EDV | End-diastolic left ventricular volume | EDV [ml] = $LVIDd^3[mm]^3$ / 1000 | ml |
| ESV | End-systolic left ventricular volume | ESV [ml] = $LVIDs^3[mm]^3$ / 1000 | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] - ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml])×100% | / |
| FS | Fractional shortening | FS = ((LVIDd [mm] – LVIDs [mm]) / LVIDd [mm])×100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| MVCF | Mean velocity of circumferential fiber shortening | MVCF = (LVIDd [mm] – LVIDs [mm]) / (LVIDd [mm] × LVET [ms] / 1000) | / |
| BSA | Body surface area | Calculated by selecting a formula.<br>Oriental:<br>BSA = $WT^{0.425}$ * $HT^{0.725}$ * 73.58 / 10000<br>Occidental :<br>BSA = $WT^{0.425}$ * $HT^{0.725}$ * 71.84 / 10000<br>HT: height (cm)<br>WT: weight (kg)<br>BSA: area of body surface ($m^2$) | $m^2$ |

## 2. Teichholz

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVIDd | Left ventricular short-axis diameter at end diastole | Distance measurement in M mode | mm |
| LVIDs | Left ventricular short-axis diameter at end systole | Distance measurement in M mode | mm |
| LVET | Ejection time | Time measurement in M mode | ms or s |
| HR | Heart rate | Measured in M mode or keyed in | bpm |
| EDV | End-diastolic left ventricular volume | $EDV[ml] = \frac{7 \times LVIDd^3[cm]^3}{2.4 + LVIDd[cm]}$ | ml |
| ESV | End-systolic left ventricular volume | $ESV[ml] = \frac{7 \times LVIDs^3[cm]^3}{2.4 + LVIDs[cm]}$ | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] - ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml]) ×100% | / |
| FS | Fractional shortening | FS = ((LVIDd [mm] – LVIDs [mm]) / LVIDd [mm])×100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| MVCF | Mean velocity of circumferential fiber shortening | MVCF[circ/s] = (LVIDd [mm] – LVIDs [mm]) / (LVIDd [mm] × LVET [ms] / 1000) | circ/s |
| BSA | Body surface area | Calculated by selecting a formula.<br>Oriental:<br>BSA = $WT^{0.425}$*$HT^{0.725}$*73.58/10000<br>Occidental:<br>BSA = $WT^{0.425}$*$HT^{0.725}$*71.84/10000 | $m^2$ |

### 3. Others

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| EF Slope | Mitral valve closing speed | Slope measurement in M mode | mm/ |
| ACV | AC descending speed | Slope measurement in M mode | mm/s |
| CA | Amplitude of the A wave | Distance measurement in M mode | mm |
| CE | Amplitude of the E wave | Distance measurement in M mode | mm |
| CA/CE | CA/CE ratio | CA/CE = CA [mm]/CE[mm] | / |
| DEV | Mitral valve openingspeed | Slope measurement in M mode | mm/s |
| DCT | Mitral valve opening time | Time measurement in M mode | s |
| QMV | Mitral valve volume | QMV[ml]=4*DEV[cm/s]*DCT[s] | ml |
| AOD | The diameter of the aorta | Distance measurement in M mode | mm |
| LAD | The diameter of the left atrium | Distance measurement in M mode | mm |
| LAD/AOD | Ratio of left atrium to aortic | LAD/AOD = LAD[mm]/AOD[mm] | / |
| MAVO1 | The opening diameter of that the aorta valve at the beginning | Distance measurement in M mode | mm |
| MAVO2 | The opening diameter of that the aorta valve at the end | Distance measurement in M mode | mm |
| AA | The amplitude of the aorta posterior wall | Distance measurement in M mode | mm |
| AVSV | Aortic valve volume | AVSV[ml]＝(MAVO1[cm] + MAVO2[cm]) *LVET[s] *50+AA[cm] | ml |
| LVPWd | Left ventricular posterior wall thickness at end diastole | Same to distance measurement in M mode | mm |
| LVSTd | Interventricular septal thickness at end diastole | Same to distance measurement in M mode | mm |
| LVIDd | Left ventricular short-axis diameter at end diastole | Same to distance measurement in M mode | mm |
| LVMW | Left ventricle muscle weight | LVMW[g]=1.04*[(IVSTd[cm]+LVIDd[cm] + LVPWd[cm])$^3$ – LVIDd$^3$[cm]$^3$]–13.6 | g |
| LVMWI | Left ventricle muscle weight index | LVMWI = LVMW[g]/BSA[m$^2$] | / |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| BSA | Body surface area | Calculated by selecting a formula.<br>Oriental:<br>BSA = $WT^{0.425}$*$HT^{0.725}$*73.58/10000<br>Occidental:<br>BSA = $WT^{0.425}$*$HT^{0.725}$*71.84/10000 | $m^2$ |

## 6.1.1 LV

The LV measurement on M-mode image is performed based on the EDV and ESV values calculated by left ventricular end systolic and end diastolic short-axis diameters.

Measurement items regarding left ventricular function include LVIDd and LVIDs. The physiological parameters that can be calculated are SV, EF, FS, CO, MVCF, CI and SI.

There are two formulae available to calculate Cardiac Volume in M-mode. They are Teichholz and CUBE.

- **Teichholz formula:**

$$EDV[ml] = \frac{7 \times LVIDd^3[cm]^3}{2.4 + LVIDd[cm]}$$

$$ESV[ml] = \frac{7 \times LVIDs^3[cm]^3}{2.4 + LVIDs[cm]}$$

- **CUBE formula:**

EDV [ml] = $LVIDd^3[mm]^3$ / 1000

ESV [ml] = $LVIDs^3[mm]^3$ / 1000

Teichholz and CUBE formulae adopt same measuring process. Detailed measuring methods are to be introduced in the coming sections.

**NOTE:**

LVIDd > LVIDs must be met in order to ensure correct measurement. Otherwise; measurement and calculation cannot be performed correctly.

## 6.1.2 SV, EF, FS

Calculations of SV, EF and FS on M-mode image are performed based on the ESV and EDV values calculated according to the measuring results of left ventricular end systolic and end diastolic internal diameters.

Procedure:

1. Move the cursor to the [LV] item of the [M-CAR MEAS] menu; the [LV] submenu will pop

up. Move the cursor to the [Teichholz] or [CUBE] submenu item and press『Set』key. The cursor will turn into a big “+”.

2. Measure LVIDs at the end of left ventricular systole. The method is the same as that to measure “Distance” in “M MEAS” menu. The LVIDs value and ESV result will be displayed in the Result Window.
3. Measure LVIDd at the end of left ventricular diastole. The method is the same as that to measure “Distance” in “M MEAS” menu. The LVIDd value and EDV result will be displayed in the Result Window.
4. After measuring LVIDd, the system will simultaneously calculate SV, EF and FS and display their values in the Result Window.

### 6.1.3 CO

After measuring left ventricular function, the system can further calculate CO based on the measured HR value or input HR value.

Measuring HR:

1. Move the cursor onto [Heart Rate] item and press 『Set』 key. Move the cursor into Image Window, the cursor will turn into a big “+”.
2. Measure HR by using the same method as that to measure HR in “M MEAS” menu.
3. After measuring HR, the Result Window will display measured HR value and calculated CO value.

Entering HR value directly using the keyboard:

Procedure:

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [Heart Rate] item and press 『Set』 key. The “Enter HR” dialog will appear on the center of the screen.
2. Enter the correct HR value (beats/min) or user can select the value through “⇕” key. The range of HR able to be keyed in is 30~180 bpm.


3. Press『Set』key on [√ OK] button to confirm the input value. The calculated CO value will be

displayed in the Result Window.

## 6.1.4 MVCF

After measuring left ventricular function, the system can further calculate MVCF based on the measured LVET value or input LVET value.

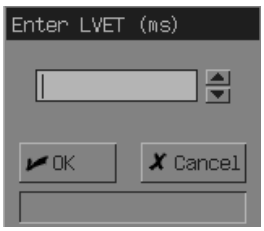
Measuring LVET:

1. Move the cursor onto [LVET] item and press 『Set』 key. Move the cursor into Image Window, the cursor will turn into a "+".
2. Measure LVET using the same method as that to measure "Time" in "M MEAS" menu.
3. After measuring LVET, LVET and MVCF values will be displayed in the Result Window.

Entering LVET time directly using keyboard:

Procedure:

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [LVET] item and press 『Set』 key. The "Enter LVET (ms)" dialog will appear on the center of the screen.
2. Enter LVET value (ms) or select the value through "⇕" key. The range of LVET able to be keyed in is 10~300ms.



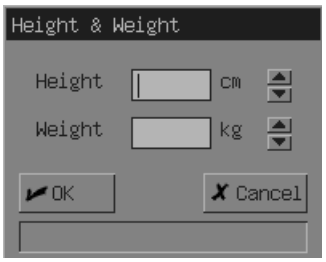

3. Press 『Set』 key on [OK] button to confirm the input value. The MVCF value will be displayed in the Cardiac Exam Report.

## 6.1.5 CI, SI

After measuring left ventricular function and HR, the system can further calculate CI and SI based on the input height and weight values.

Entering height and weight:

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [H & W] item and press 『Set』 key. The "Height & Weight" dialog will appear on the center of the screen.
2. Enter height (cm) and weight (kg) values. The range of height is 20~300 cm; the weight range is 1~150 kg.




3. Press 『Set』 key on [OK] button to confirm the input value. The BSA, CI and SI values will be displayed in the Result Window.

## 6.1.6 Measuring all parameters of LV simultaneous

The calculating items introduced above can be measured and calculated on the same image window by following the procedure below.

Procedure:

1. Enter or measure HR value.
2. Enter or measure LVET time.
3. Enter patient height and weight.
4. Measure LV function.
5. The parameter values mentioned above will then be obtained. They will be displayed in the Result Window.

## 6.1.7 LVMW and LVMWI

After measuring the left ventricular function and HR, the system can calculate LVMW using the measured values of LVPWd (left ventricular posterior wall thickness at end diastole) and IVSTd (inter-ventricular septum thickness at end diastole). If the height and weight are entered, the system can also calculate LVMWI.

Method of calculating the LVMW:

1. Move the cursor to the [LVMW] item and press the 『Set』 key. Move the cursor into the image window, the cursor changes into a big “+”.
2. Measure the LVPWd.
3. Measure the IVSTd and LVIDd.
4. After the measurements, the calculated values of LVMW is displayed in the Result Window. If the height and weight are entered before the measurement, the LVMWI value can be displayed simultaneously.

## 6.1.8 Mitral measurement

Move the cursor to the [Mitral Meas] item, and then the submenu pops up as shown in the figure below:


- The method of measuring EF Slope, ACV and CA/CE:

1. Move the cursor to the [Mitral Meas] item, and then the submenu pops up. Move the cursor to the [EF Slope], [ACV] or the [CA/CE] item of the submenu and press the『Set』key. The cursor changes into a big "+".
2. Measure EF Slope. The method is the same as the "Slope" measurement of M mode general measurements.
3. Measure ACV. The method is the same as the "Slope" measurement of M mode general measurements.
4. Measure CA/CE. Respectively measures the amplitude of peak A to C and peak E to C. The method is the same as the "Distance" measurement of M mode general measurements. After the measurements, the calculated values are displayed in the Result Window.

- Calculating QMV:

Calculation formula: QMV = 4 * DEV * DCT

Method:

1. Move the cursor to the [Mitral Meas] item, and then the submenu pops up. Move the cursor to the [Valve Volume] item and press the『Set』key. The cursor changes into a "+".
2. First measure DEV. The Method is the same as the "Slope" measurement of M mode general measurements".
3. Then measure DCT, the method is the same as the "Time" measurement of M mode general measurements".
4. The calculated QMV result is displayed in the Result Window.

## 6.1.9 Aorta measurement

Aorta measurements contains: Ratio of left atrium dimension and aortic root dimension (LAD/AOD) and aorta valve volume (AVSV).

- Calculating LAD/AOD:

1. Move the cursor to the [AORTA MEAS] item, the submenu pops up. Move the cursor to the [LAD/AOD] item of the submenu. Press the 『Set』 key, the cursor changes into a big "+".

2. Respectively measure LAD and AOD, the method is the same as the “Distance” measurement of M mode general measurements.
3. After the measurements, the calculated results of LAD/AOD are displayed in the Result Window.

- Calculating AVSV:

1. Move the cursor to the [Aorta Meas] item, the submenu pops up. Move the cursor to the [Valve Volume] item and press the 『Set』 key. The cursor changes into a big “+”.
2. Measure MAVO1. The method is the same as the “Distance” measurement of M mode general measurements.
3. Measure MAVO2. The method is the same as the “Distance” measurement of M mode general measurements.
4. Measure AA. The method is the same as the “Distance” measurement of M mode general measurements.
5. Measure LVET. The method is the same as the “Time” measurement of M mode general measurements.
6. After finishing the above measurements, the calculated AVSV value is displayed in the Result Window.

## 6.2 B Mode Measurements

It is relatively more accurate to measure the left ventricular volume on a two-dimensional echocardiography, especially on M/B mode image, on which both the end systolic two-dimensional echocardiography and the end diastolic two-dimensional echocardiography can be easily and accurately obtained. Moreover, the calculated result is more accurate, too. Therefore, it is recommended to perform cardiac measurements and calculations on M/B mode image.

Two ways to enter the [B-CAR MEAS] menu are as follows:

1. Press the 『CAR』 key.

   Press the 『B』 key or 『M/B』 key to access B or M/B mode.

   Press the 『Measure』 key.

   Confirm that the menu is displayed on the right part of the screen. If not, press the 『Menu』 key.

   If in B mode, the system will automatically access the [B-CAR MEAS] menu. If in M/B mode, the [M-CAR MEAS] menu will display in the screen. Move the cursor to the [Others] item in the [M-CAR MEAS] menu and select the [B-MEAS] item, then press the 『Set』 key to enter the [B-CAR MEAS] menu.

2. Press the 『B』 key or 『M/B』 key to access B or M/B mode.

Press the 『Measure』 key to enter Measurement status.

Confirm that the menu is displayed on the right part of the screen. If not, press the 『Menu』 key.

If in M/B mode, the system will automatically access the [M MEAS] menu. Move the cursor to the [Others] item and select the [B-MEAS] item, then press the 『Set』 key to enter the B mode Measurement menu. If in B mode, the system will automatically access the B mode Measurement menu. Move the cursor to the [Others] item of the B mode Measurement menu and select the [B-CAR MEAS] menu, then press the 『Set』 key to enter the [B-CAR MEAS] menu.

The default measurement is the left ventricular function measurements using “single-plane ellipse formula”.


The items of cardiac exam in B mode are included in the following table:

**1. S-P Ellipse**

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVLd | Left ventricular long-axis length at end diastole | Distance measurement in B mode | mm |
| LVALd | Left ventricular long-axis area at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVLs | Left ventricular long-axis length at end systole | Distance measurement in B mode | mm |
| LVALs | Left ventricular long-axis area at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| HR | Heart rate | Keyed In | bpm |
| EDV | End-diastolic left ventricular volume | EDV [ml] = (8/3/π) × (LVALd[$mm^2$])$^2$ / LVLd [mm] / 1000 | ml |
| ESV | End-systolic left ventricular volume | ESV [ml] = (8/3/π) × (LVALs[$mm^2$])$^2$/ LVLs [mm] / 1000 | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] – ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml]) × 100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| BSA | Body surface area | Calculated by the selected formula | $m^2$ |

**2. B-P Ellipse**

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVALd | Left ventricular long-axis area at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVAMd | Left ventricular short-axis area at the level of the Mitral valve at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVIDd | Left ventricular short-axis diameter at end diastole | Distance measurement in B mode | mm |
| LVALs | Left ventricular long-axis area at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVAMs | Left ventricular short-axis area at the level of the Mitral valve at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVIDs | Left ventricular short-axis diameter at end systole | Distance measurement in B mode | mm |
| HR | Heart rate | Keyed In | bpm |
| EDV | End-diastolic left ventricular volume | EDV [ml] = (8/3/π) × LVALd [$mm^2$]× LVAMd [$mm^2$] / LVIDd [mm] / 1000 | ml |
| ESV | End-systolic left ventricular volume | ESV [ml] = (8/3/π) × LVALs [$mm^2$] × LVAMs [$mm^2$] / LVIDs [mm] / 1000 | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] – ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml]) ×100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| BSA | Body surface area | Calculated by the selected formula | $m^2$ |

### 3. Bullet

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVAMd | Left ventricular short-axis area at the level of the Mitral valve at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVLd | Left ventricular long-axis length at end diastole | Distance measurement in B mode | mm |
| LVAMs | Left ventricular short-axis area at the level of the Mitral valve at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVLs | Left ventricular long-axis length at end systole | Distance measurement in B mode | mm |
| HR | Heart rate | Keyed In | bpm |
| EDV | End-diastolic left ventricular volume | EDV [ml] = (5/6) × LVLd [mm] × LVAMd [$mm^2$] / 1000 | ml |
| ESV | End-systolic left ventricular volume | ESV [ml] = (5/6) × LVLs [mm] × LVAMs [$mm^2$] / 1000 | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] – ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml])×100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| BSA | Body surface area | Calculated by the selected formula. | $m^2$ |

### 4. Mod. simpson

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVAMd | Left ventricular short-axis area at the level of the Mitral valve at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVLd | Left ventricular long-axis length at end diastole | Distance measurement in B mode | mm |
| LVAPd | Left ventricular short-axis area at the level of the papillary muscle at end diastole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVAMs | Left ventricular short-axis area at the level of the Mitral valve at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| LVLs | Left ventricular long-axis length at end systole | Distance measurement in B mode | mm |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVAPs | Left ventricular short-axis area at the level of the papillary muscle at end systole | Ellipse of Cir/Area measurement in B mode | $mm^2$ or $cm^2$ |
| HR | Heart rate | Keyed In | bpm |
| EDV | End-diastolic left ventricular volume | *1 | ml |
| ESV | End-systolic left ventricular volume | *1 | ml |
| SV | Stroke volume | SV [ml] = EDV [ml] – ESV [ml] | ml |
| CO | Cardiac output | CO [l/min] = SV [ml] × HR [bpm] / 1000 | l/min |
| EF | Ejection fraction | EF = (SV [ml] / EDV [ml]) ×100% | / |
| SI | SV Index | SI = SV [ml] / BSA [$m^2$] | / |
| CI | CO Index | CI = CO [l/min] / BSA [$m^2$] | / |
| BSA | Body surface area | Calculated by the selected formula. | $m^2$ |

*1 $$EDV[ml] = \frac{LVLd[mm]}{9} \times \left(4 \times LVAMd[mm^2] + 2 \times LVAPd[mm^2] + \sqrt{LVAMd[mm^2] \times LVAPd[mm^2]}\right) / 1000$$

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

**5. Other measurements and calculations in B mode**

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| LVET | Ejection time | keyed in | ms |
| FS | ractional shortening | FS = ((LVIDd [mm] – LVIDs [mm]) / LVIDd [mm])×100% | / |
| MVCF | Mean velocity of circumferential fiber shortening | MVCF = (LVIDd [mm] – LVIDs [mm]) / (LVIDd [mm] × ET [ms] / 1000) | / |

## 6.2.1 LV measurement using Single Plane Ellipse method

1. Move the cursor onto [LV] menu item. The “LV” submenu will pop up. Move the cursor onto [S-P Ellipse] submenu item and press 『Set』 key. The cursor will turn into a “+”.

2. At left ventricular end systole, measurement following parameters:
   LVLs: using the same method as that to measure “Distance” in “B MEAS” menu.
   LVALs: using the same method as that to measure “Circumference/Area” in “B MEAS” menu by means of Ellipse method.
   The ESV value will be calculated.

3. At left ventricular end diastole, measure following parameters:

LVLd: using the same method as that to measure “Distance” in “B MEAS” menu.
LVALd: using the same method as that to measure “Circumference/Area” in “B MEAS” menu by means of Ellipse method.
The EDV value will be calculated.

4. After measuring LVALd, the system will calculate SV and EF values and at the same time display them in the same way as M mode Cardiac Measurement Results.

## 6.2.2 Others measurement method for LV

Other measurement methods are similar to Single Plane Ellipse method. The measuring procedure is the same as that for the corresponding item in “B MEAS” menu. You can proceed with the operation by following the message given in HELP bar.

**NOTE:**

When using the Mod. Simpson method to measure LV, be sure the two-chamber and the four-chamber cross-sectional images are perpendicular to avoid wrong measurement results.

## 6.2.3 CO

After measuring left ventricular function, the system can further calculate CO according to the HR value entered by the user.

To enter HR value directly from keyboard:

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [Heart Rate] submenu item and press 『Set』 key. The “Enter HR” dialog will appear on the center of the screen.
2. Enter HR value (beats/min), or use the key to select proper value. The range of HR able to be keyed in is 30~180 bpm.
3. Press『Set』key on [OK] button to confirm the input value. The calculated CO value will be displayed in the Result Window.


## 6.2.4 Entering LVET and calculating MVCF

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [LVET] submenu item and press 『Set』 key. The “Enter LVET (ms)” dialog will appear on the center of the screen.

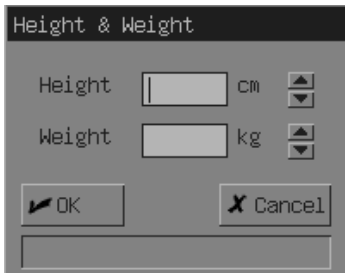
2. Enter LVET value (ms), or use the key to select proper value. The range of LVET able to keyed in is 10~300 ms. See figure below.
3. Press 『Set』 key on [OK] button to confirm the input value.
4. If FS has been measured, the LVET and calculated MVCF value will be displayed in the result window.


## 6.2.5 CI, SI

After measuring left ventricular function and HR, the system can further calculate CI and SI based on the input height and weight values.

To enter patient height and weight:

1. Move the cursor onto [Key In] item. The [Key In] submenu will pop up. Move the cursor onto [H & W] submenu item and press 『Set』 key. The “Height & Weight” dialog will appear on the center of the screen.
2. Enter height (cm) and weight (kg) values. Height range: 20~300 cm; weight range: 1~150 kg.
3. Press 『Set』 key on [OK] button to confirm the input value. The BSA, CI and SI values will be displayed in the Result Window.




## 6.2.6 RV

1. Move the cursor to the [RV] item. Press the 『Set』 key and move the cursor into the image window. The cursor changes into a “+”.
2. To measure RV, refer to the “Distance” measurement in B mode general measurements.
3. The measured result of RV is displayed in the Result Window.
4. Repeat the steps from 1 to 3 to do a new RV measurement.

### 6.2.7 PA

1. Move the cursor to the [PA] item. Press the 『Set』 key and move the cursor into the image window. The cursor changes into a “+”.
2. To measure PA, refer to the “Distance” measurement in B mode general measurements.
3. The measured result of PA is displayed in the Result Window.
4. Repeat the steps from 1 to 3 to do a new PA measurement.

### 6.2.8 Other parameters

To measure other parameters of cardiology, the user may access the M mode image.

## 6.3 Cardiac Exam Report

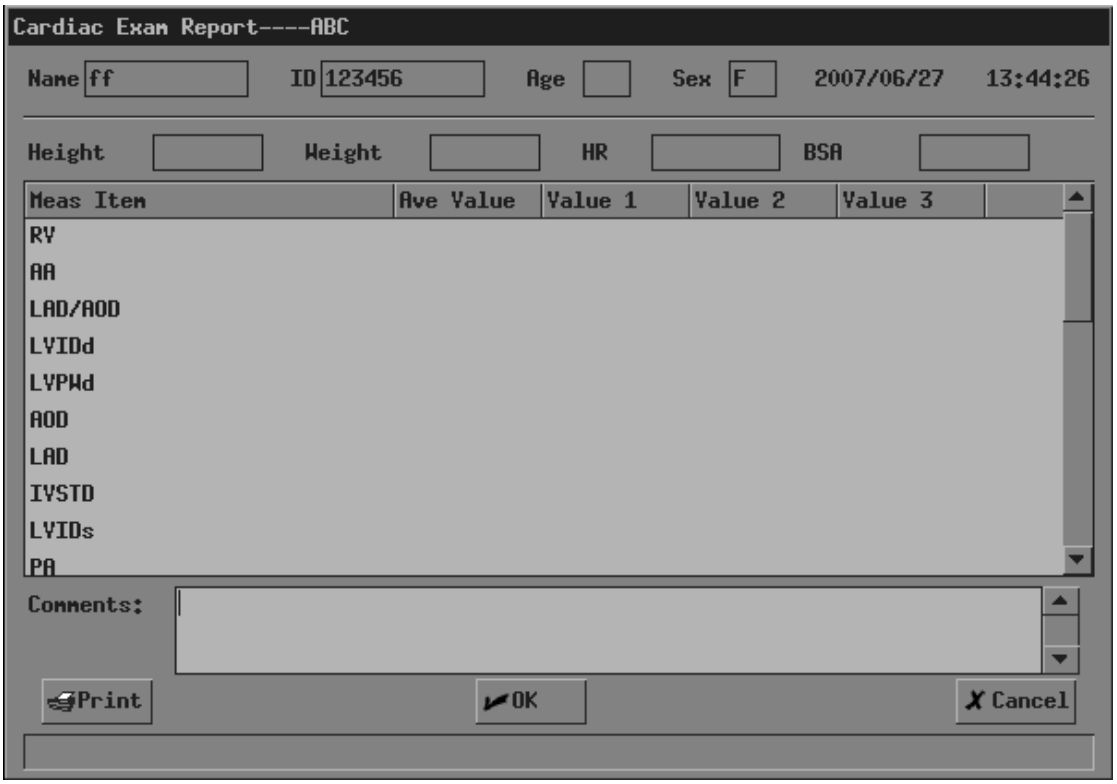
### 6.3.1 Previewing exam report

After finishing the cardiac exam, the system can automatically generate the Cardiac Exam Report.

The cardiac Exam Report contains following information:

- Hospital Name
- General Information of the Patient
- Exam Date
- Measured Values and Calculated Results
- Comments
- Print out Report

After one or more measurements have be completed or in the process of measurements and calculations of cardiac exam, move the cursor to the [CAR RPT] item of either the [B-CAR MEAS] menu or the [M-CAR MEAS] menu and press the 『Set』 key to call up the dialog box of Cardiac Exam Report as shown in figure below.




- All the measuring items and calculating indexes are displayed in the report. Also all the measured data and calculated results are displayed in the report.
- If the doctor's diagnosis needs to be added into the report, just anchor the cursor into the Edit Bar of "Comments", then press the 『Set』 key. When the annotation cursor "|" appears in the Edit Bar, the user can start entering the comments.
- Press the [Print] button, the corresponding report is then printed out.

During the process of or after finishing the measurements and calculations, the report can be generated at any time for the user to view the measuring data. Then move the cursor to the [OK] or the [Cancel] button and press the 『Set』 key to close the report and continue the measurement.

## 6.3.2 Printing cardiac report

Move the cursor to the [Print] button in the [Cardiac Exam Report] window, and press the 『Set』 key to print the cardiac exam report. Refer to the section "Printing out the Obstetric Report" for detailed procedures.

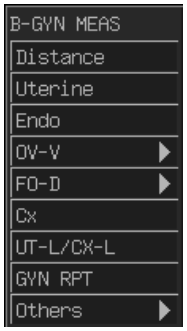
# 7 Gynecology Measurements & Calculations

Gynecology measurements and calculations are usually performed on B mode image.

Press the 『GYN』 key to access the gynecology mode. Press the 『Measure』 key to access the Measurement mode.

Confirm that the [B-GYN MEAS] menu is displayed on the right part of the screen. If not, press the 『Menu』 key. The system accesses the gynecology mode. The default is “Distance” measurement.

The whole menu of gynecology measurements details as below:




The measurement & calculations items of gynecology exam are included in the following table:

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| UT-L | Uterus length | Distance measurement | mm |
| UT-H | Uterus height | Distance measurement | mm |
| UT-W | Uterus width | Distance measurement | mm |
| UT-V | Uterus volume | UT-V[$mm^3$]=K×UT-L[mm] ×UT-H[mm]×UT-W[mm] K is a presettable factor, the default of which is 0.523. | $mm^3$ |
| UT | Uterus diameter | UT[mm]=UT-L[mm]+UT-W[mm]+UT-H[mm] | mm |
| Endo | Endometrium | Distance measurement | mm |
| L.OV-L | Left ovary length | Distance measurement | mm |
| L.OV-H | Left ovary height | Distance measurement | mm |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| L.OV-W | Left ovary width | Distance measurement | mm |
| L.OV-V | Left ovary volume | L.OV-V[$mm^3$]=K×L.OV-L[mm]×L.OV-W[mm]×L.OV-H[mm]<br>K is a presettable factor, the default of which is 0.523. | $mm^3$ |
| R.OV-L | Right ovary length | Distance measurement | mm |
| R.OV-H | Right ovary height | Distance measurement | mm |
| R.OV-W | Right ovary width | Distance measurement | mm |
| R.OV-V | Right ovary volume | R.OV-V[$mm^3$]=K×R.OV-L[mm]×R.OV-W[mm]×R.OV-H[mm]<br>K is a presettable factor, the default of which is 0.523. | $mm^3$ |
| L.FO-L | Left follicle length | Distance measurement | mm |
| L.FO-W | Left follicle width | Distance measurement | mm |
| R.FO-L | Right follicle length | Distance measurement | mm |
| R.FO-W | Right follicle width | Distance measurement | mm |
| CX-L | Uterine cervix length | Distance measurement | mm |
| CX-W | Uterine cervix width | Distance measurement | mm |
| CX-P | Uterine cervix ply | Distance measurement | mm |
| UT-L/CX-L | Uterine body / cervix | Ratio of UT-L / CX-L | / |

# 7.1 UT

1. Move the cursor to the [Uterine] item of the [B-GYN MEAS] menu and press the 『Set』 key.

2. The UT measurement includes the UT-L, UT-H and UT-W measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of UT-L, UT-W and UT-H are completed, the values of UT and UT-V will be displayed on the screen.

# 7.2 Endo

1. Move the cursor to the [Endo] item of the [B-GYN MEAS] menu and press the 『Set』 key.
2. The detailed operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurement is completed, the value of Endo will be displayed on the screen.

# 7.3 OV-V

## 7.3.1 L.OV-V

1. Move the cursor to the [OV-V] item of the [B-GYN MEAS] menu, select the [L.OV-V] item from the submenu, and then press the 『Set』 key.
2. The measurement includes the L.OV-L, L.OV-H and L.OV-W measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of L.OV-L, L.OV-W and L.OV-H are completed, the value of L.OV-V will be displayed on the screen.

## 7.3.2 R.OV-V

The details of operations are the same as the L.OV-V measurement described above. Please refer to it.

# 7.4 FO-D

## 7.4.1 L.FO

1. Move the cursor to the [FO-D] item of the [B-GYN MEAS] menu, select the [L.FO] from the submenu, and then press the 『Set』 key.
2. The measurement includes the L.FO-L and L.FO-W measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of L.FO-L and L.FO-W are completed, the values will be displayed on the screen.

### 7.4.2 R.FO

The details of operations are the same as the L.FO measurement described above. Please refer to it.

## 7.5 CX

1. Move the cursor to the [CX] item of the [B-GYN MEAS] menu and press the 『Set』 key.
2. The measurement includes the CX-L, CX-P and CX-W measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements are completed, the values will be displayed on the screen. If the UT-L has been measured before, the result of UT-L/CX-L will be displayed.

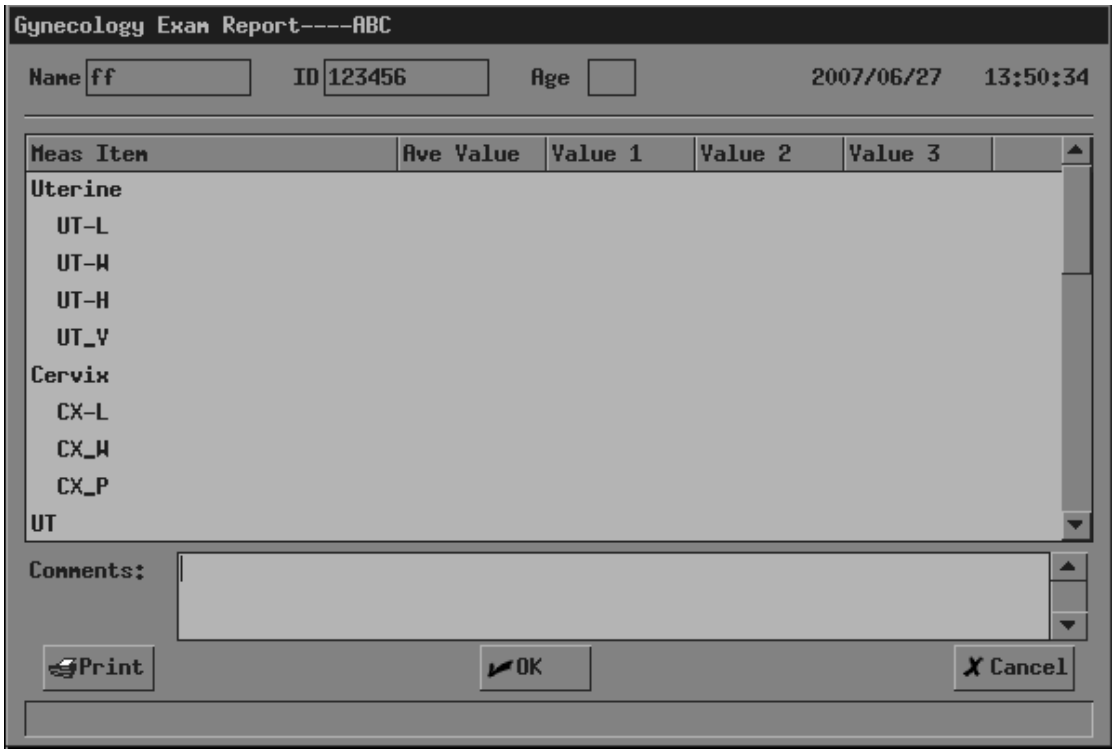
## 7.6 UT-L/CX-L

1. Move the cursor to the [UT-L/CX-L] item of the [B-GYN MEAS] menu and press the 『Set』 key.
2. The measurement includes the UT-L and CX-L measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of UT-L and CX-L are finished, the value of UT-L/CX-L will be displayed on the screen automatically .
4. If any of the UT-L and CX-L has been measured before, the ratio of UT-L/CX-L will be displayed automatically when the other item is measured.

## 7.7 Gynecology Exam Report

### 7.7.1 Previewing gynecology exam report

The application measurement values of gynecology exam are displayed in report automatically.




### 7.7.2 Printing gynecology exam report

Move the cursor to the [Print] button in the [Gynecology Exam Report] window and press the 『Set』 key to print the report. Refer to the section “Obstetric Exam Report” for detailed procedure.

## 7.8 Others

Users can enter other application measurements through [Others] item of the [B-GYN MEAS] menu.

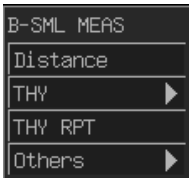
# 8 Small parts Measurements & Calculations

Small parts measurements and calculations are usually performed on B mode image.

Press the 『SML』 key to access the small parts mode. Press the 『Measure』 key to access the Measurement mode.

Confirm that the [B-SML MEAS] menu is displayed on the right part of the screen. If not, press the 『Menu』 key. The system accesses the small parts measurement mode. The default is “Distance” measurement.

The menu of small parts measurements details as below:




The measurement & calculation items of small parts exam are included in the following table:

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| L.THY-V | Left thyroid volume | L.THY-V[$mm^3$]=K×L.THY-L[mm]×L.THY-W[mm]×L.THY-H[mm]<br>K is a presettable factor, the default of which is 0.497. | $mm^3$ |
| L.THY-L | Left thyroid length | Distance measurement | mm |
| L.THY-W | Left thyroid width | Distance measurement | mm |
| L.THY-H | Left thyroid height | Distance measurement | mm |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| R.THY-V | Right thyroid volume | R.THY-V[$mm^3$]=K×R.THY-L[mm]×R.THY-W[mm]× R.THY-H[mm]<br>K is a presettable factor, the default of which is 0.497. | $mm^3$ |
| R.THY-L | Right thyroid length | Distance measurement | mm |
| R.THY-W | Right thyroid width | Distance measurement | mm |
| R.THY-H | Right thyroid height | Distance measurement | mm |

# 8.1 THY

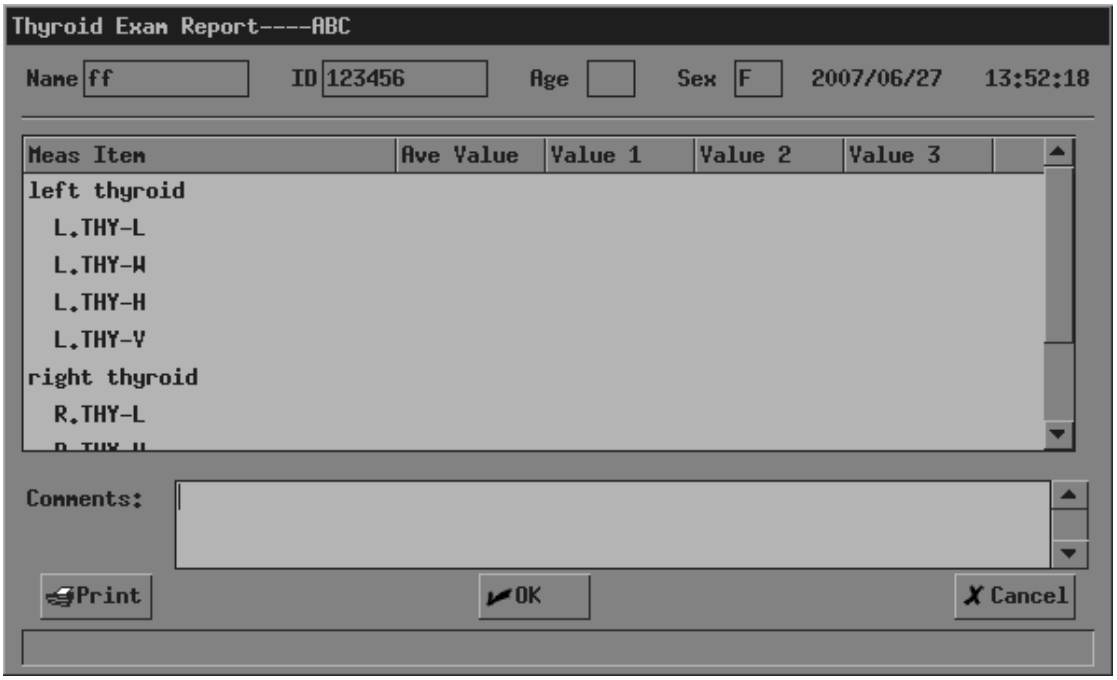
## 8.1.1 L.THY-V

1. Move the cursor to the [THY] item of the [B-SML MEAS] menu, select the [L.THY-V] item from the submenu, and then press the 『Set』 key.
2. The measurement includes the L.THY-L, L.THY-W and L.THY-H measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of L.THY-L, L.THY-W and L.THY-H are completed, the value of L.THY-V will be displayed on the screen.

## 8.1.2 R.THY-V

The details of operations are the same as the L.THY-V measurement described above. Please refer to it.

## 8.2 Thyroid Exam Report




Move the cursor to the [Print] button in the [Thyroid Exam Report] window and press the 『Set』 key to print the report. Refer to the section “Obstetric Exam Report” for detailed procedure.

## 8.3 Others

Users can enter other application measurements through [Others] item of the [B-SML MEAS] menu.

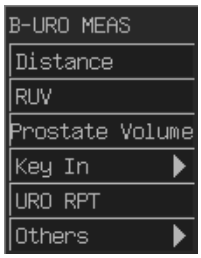
# 9 Urology Measurements & Calculations

Urology measurements and calculations are usually performed on B mode image.

Select [B-URO MEAS] in [Others] submenu from [B MEAS] or other application measurement menus.

The default is “Distance” measurement.

The menu of urology measurements details as below:




The measurement & calculations items of urology exam are included in the following table:

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| RUV | Residual urine volume | RUV[$mm^3$]=K×RUV-L[mm]×RUV-W[mm]×RUV-H[mm]<br>K is a presettable factor, the default of which is 0.523. | $mm^3$ |
| RUV-L | RUV length | Distance measurement | mm |
| RUV-W | RUV width | Distance measurement | mm |
| RUV-H | RUV height | Distance measurement | mm |
| PV | Prostate volume | PV[$mm^3$]=K×PV-L[mm]×PV-W[mm]×PV-H[mm]<br>K is a presettable factor, the default of which is 0.52. | $mm^3$ |

| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| PV-L | Prostate length | Distance measurement | mm |
| PV-W | Prostate width | Distance measurement | mm |
| PV-H | Prostate height | Distance measurement | mm |
| PPSA | Prediction of prostate special antigen density | PPSA=0.12×PV[ml] | ng/ml |
| SPSA | Serum prostate special antigen | Keyed in (0.01ng/ml≤SPSA≤100ng/ml) | ng/ml |
| PSAD | Prostate special antigen density | PSAD=SPSA[ng/ml]/PV[ml] | / |

## 9.1 RUV

1. Move the cursor to the [RUV] item of the [B-URO MEAS] menu and press the 『Set』 key.
2. The measurement includes the RUV-L, RUV-W and RUV-H measurements. The details of operations are the same as “Distance measurement” in B general measurement mode. Please refer to it.
3. When the measurements of RUV-L, RUV -W and RUV-H are completed, the value of RUV will be displayed on the screen automatically.

## 9.2 Prostate Volume

1. Movet the cursor to the [Prostate Volume] item of the [B-URO MEAS] menu and press the 『Set』 key.
2. The measurement includes the PV-L, PV-W and PV-H measurements. The details of operations are the same as “Distance measurement” in B general measurement mode.
3. When the measurements of PV-L, PV-W and PV-H are completed, the values of PV and PPSA will be displayed on the screen automatically.
4. If the value of SPSA has been keyed in before the measurement of PV, the value of PSAD will also be displayed.

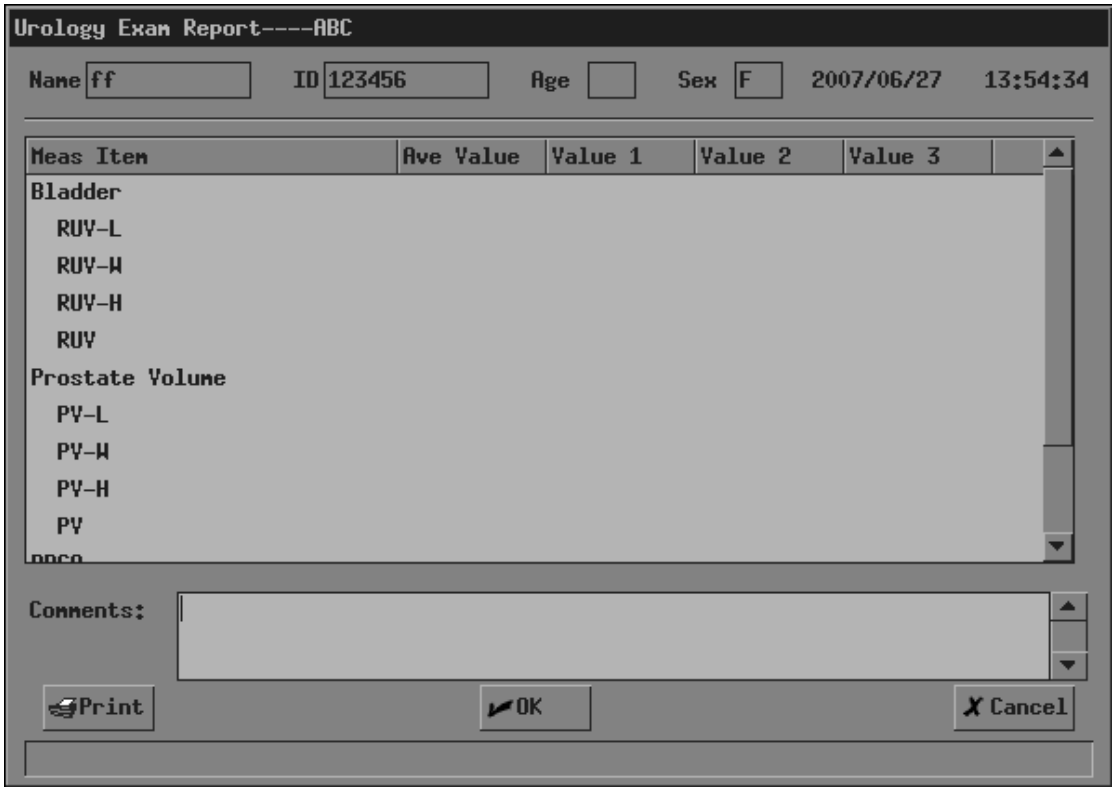
## 9.3 PSAD

1. Key in SPSA before PV measurement. When PV measurement is completed, the value of PSAD will be displayed on the screen automatically.
2. If SPSA has not been keyed in before PV measurement, the PSAD value cannot be displayed as the PV measurement is completed. After the PV measurement, key in the

SPSA and the PSAD value can be displayed on the screen.

## 9.4 Urology Exam Report

The application measurement values of urology exam are displayed in the report automatically.




Move the cursor to the [Print] button in the [Urology Exam Report] window and press the『Set』key to print the report. Refer to the section “Obstetric Exam Report” for detailed procedure.

## 9.5 Others

Users can enter other application measurements through [Others] item of the [B-URO MEAS] menu.

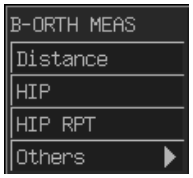
# 10 Orthopedics Measurements & Calculations

Orthopedics measurements and calculations are usually performed on B mode image.

Select [B-ORTH MEAS] in [Others] submenu from [B MEAS] or other application measurement menus.

The system accesses the orthopedics mode.

The menu of orthopedics measurements details as below:




The measurement & calculation items of orthopedics exam are included in the following table:

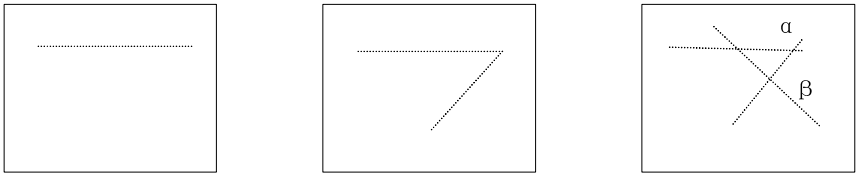
| Abb. | Description | Formula or operation | Units |
|---|---|---|---|
| HIP | / | / | / |
| α | Angle of BL and ARL | Angle measurement | º |
| β | Angle of BL and IL | Angle measurement | º |

## 10.1 HIP

1. Move the cursor to the [HIP] item of [B-ORTH MEAS] menu, and press the 『Set』 key.
2. A line appears on the screen. Use the trackball to move the line to the location of hip joint, and turn the multifunction knob to determine the position of base line. Then press the 『Set』 key.
3. And the second line appears. Use the method described above to determine the position of ARL. The value of “α” is displayed on the screen simultaneously. Press the 『Set』 key to affirm the second line.
4. Then the third line appears. Use the method described above to determine the position of IL. The value of “β” is displayed on the screen simultaneously. Press the 『Set』 key to

affirm the third line.

The procedure can be expressed as follows:




## 10.2 HIP Exam Report


Move the cursor to the [Print] button in the [HIP Exam Report] window and press the 『Set』 key to print the report. Refer to the section “Obstetric Exam Report” for detailed procedure.

## 10.3 Others

Users can enter other application measurements through the [Others] item of the [B-ORTH MEAS] menu.