CUBEscan

User's Manual

Man, Machine & Medicine

Mcube Technology Co., Ltd.

Safety Summary

1. Since the surface of the Probe affects the result of data, users should keep as follows;
   (1) Clean the cap of probe with tissue before using the device.
   (2) Apply gel on the top of probe, position the probe on the abdomen of patient, and start scanning.
   (3) Try to scan at least 2 ~ 3 times to get more accurate results.
   (4) Remove and re-apply gel after scanning 4 ~ 5 times, to scan again.
   (5) Remove the residual gel on the probe's surface after scanning finished.
   (6) Move carefully not to drop the probe off.

2. The device can be used as being charged. In case of using the device as being charged, users should assure if the device is connected to the charger.

3. The device should be made its adapter parted from the main unit with the charging lamp(Yellow) off.

4. The indication lamps (Green, Yellow) are turned off automatically in SCAN mode and turned on as the SCAN mode is terminated, which users should not be misconceived for an equipment failure.

5. In case the error message appears, users can refer to the operation manual and take a proper action. [p. 30, 3.9 Error Message]

6. The device should be used after ultrasonic gel applied on the probe or patient's abdomen. Thus, users should avoid using this device against patients with skin disease or injury.

7. In order to get more accurate data, the probe should be positioned toward patient's bladder during examination.

8. The device is turned off automatically in 7 minutes if not used, which is set as default and can be changed as adjusting the value of 'Auto Power' in 'Maintenance Mode'.

9. Do not decompose by yourself if a failure is detected as it may cause additional failure.

10. The device must not be used without the battery module of main unit.

11. When you scan the bladder of patient, you must place the scan button on the probe to the right side of patient.

1. Introduction

BioCon-500™ is the device that measures the volume of bladder and the residual urine using echo effect of ultrasound. **BioCon-500™** is composed of the main unit processing data and the ultrasonic probe. Main unit consists of LCD for display, thermal printer for output results and USB terminal for transferring the measured data to PC.

Fig 1.1 BioCon-500

2. Composition of BioCon-500

BioCon-500 consists of the main unit and the ultrasonic probe.

2.1. Functions of each part of the main unit

Fig. 2.1 Front of main unit

No.	Item	Function	Remark
1	LCD	Displays menu, indicates current state	
2	Thermal printer	Prints out measured data.	
3	Indication lamp	Green lamp(left) : Adaptor connection status Yellow lamp(right) : Charging status	
4	Select button	Function menu selection	
5	Power button	Turns on / off main unit power	
6	PRINT button	Prints measured data to thermal printer	
7	SCAN button	For SCAN function	

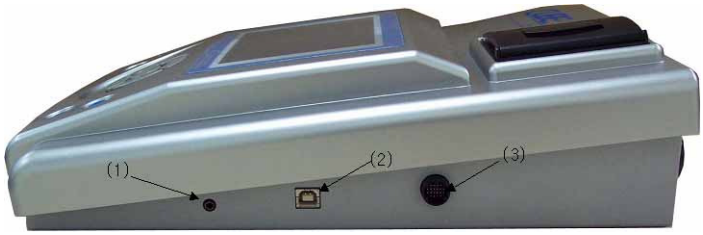


Fig. 2.2 Right-side view of main unit

No.	Item	Function	Remark
1	Phone terminal	Updates software of system	RS232
2	USB terminal	Transmits measured data to PC	Will be expanded hereafter
3	Probe terminal	Connects probe to main unit.	

Fig. 2.3 Left-side view of main unit

No.	Item	Function	Remark
1	Adapter terminal	Connects charging DC adapter to main unit.	

Fig. 2.4 Rear view of main unit

No.	Item	Function	Remark
1	Handle	When Carrying to a close distance.	

2.2 Probe

Fig. 2.4 Ultrasonic probe and cable

No.	Item	Function	Remark
1	Probe cap	Transmits and receives ultrasound signal	
2	Cable	Connects between probe and main unit.	
3	Connector	Junction part between ultrasonic cable and main probe terminal	
4	SCAN button	The same function as SCAN button of main unit.	

2.3 System diagram

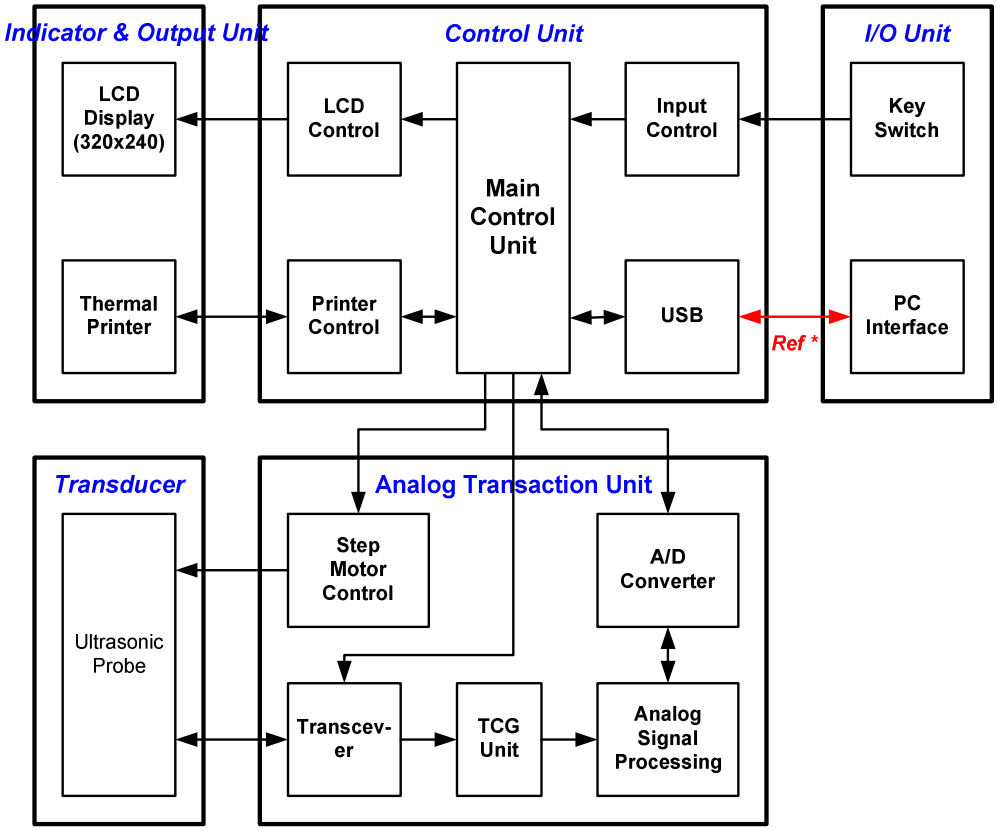


Fig. 2.5. System Diagram (excluding power unit)

* PC software will be expanded hereafter.

3. How to use

3.1 Preliminary preparation for use

3.1.1 Check charging status of device.

3.1.2 Check the connection between main unit and probe.

3.1.3 Apply ultrasonic gel on probe cap evenly.

3.1.4 The probe should be placed on the lower abdomen at 4 cm away from the pubis and positioned toward the bladder.

3.1.5 The probe should be placed in the direction of scan button toward the right side of patient.

3.2 Explanation about 2 modes

The device can be operated in 2 modes, which are standard mode and advanced mode.

3.2.1 Standard Mode

1) General view

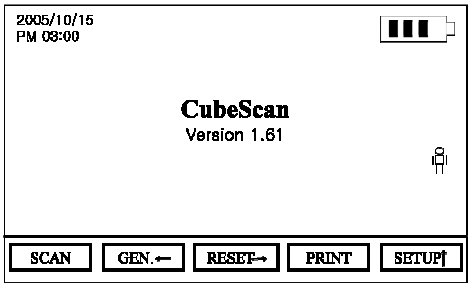


Fig.3.1
Initial page of Standard Mode

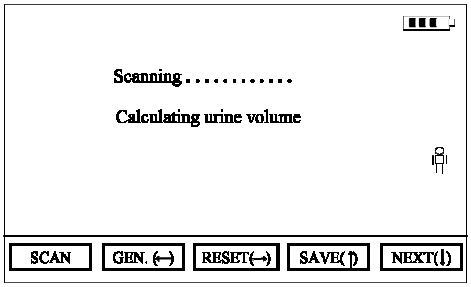


Fig.3.2
SCAN function screen in standard mode

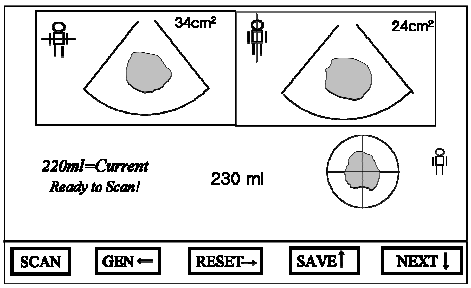


Fig.3.3
SCAN result screen in standard mode

Fig. 3.4
Image of printer output in standard mode
(Print Option : Raw Image)

2) Functions in Standard Mode

Function	Description
GEN. (←)	Push the left arrow key to change the gender as fig.3.5.
RESET(→)	Push the right arrow key to go to initial page as Fig.3.1 in any status.
PRINT	Print out the current SCAN results in one session as Fig.3.4. "NO DATA AVAILABE" message appears if pressing PRINT button without having any measured data.
SETUP(↑)	Push the up arrow key to go to SETUP page (See page 16, 3.4.1 SETUP in Standard Mode)

Down Key(↓)	To review next plane images, press down key
SAVE(↑)	In result screen to save the data which has the maximum volume in current session, press up arrow key.

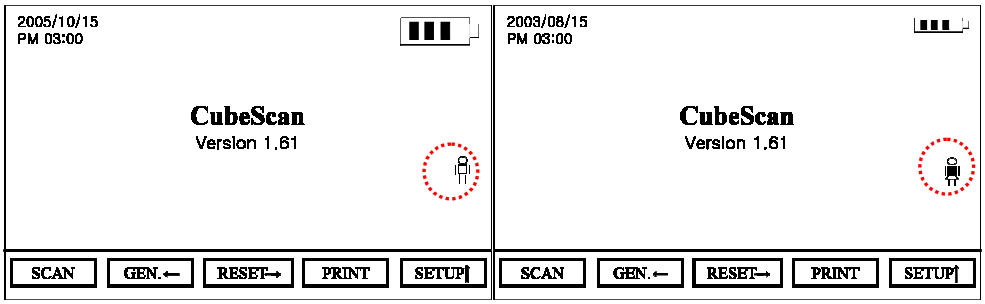


Fig. 3.5 Selection of gender in standard mode

3.2.2 Advanced Mode

1) General view

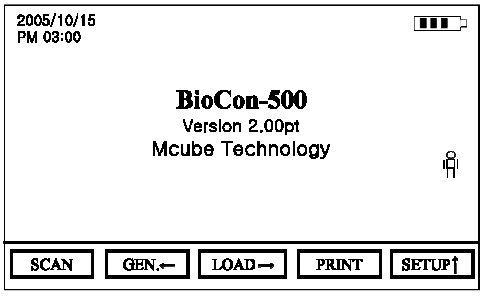


Fig.3.6
Initial page of Advanced Mode

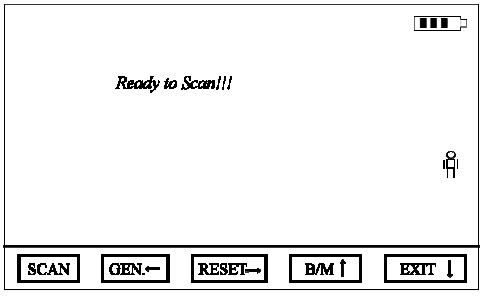


Fig.3.7
Advanced SCAN standby

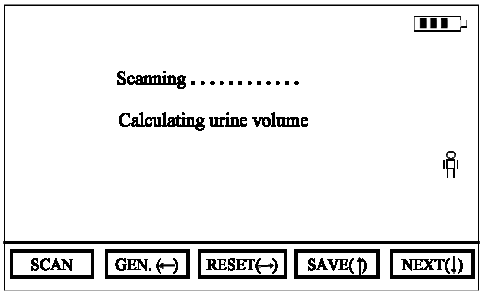


Fig.3.8
Image of scanning in advanced mode

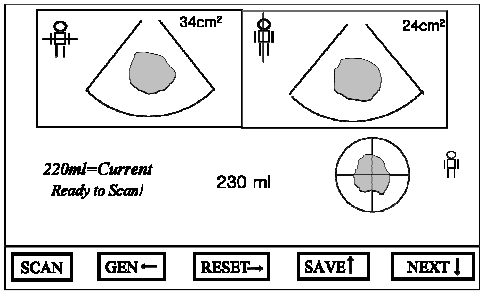


Fig. 3.9
Advanced mode scan result
(Scan Result : B-Mode)

Fig.3.10
Advanced Mode PRINT sheet

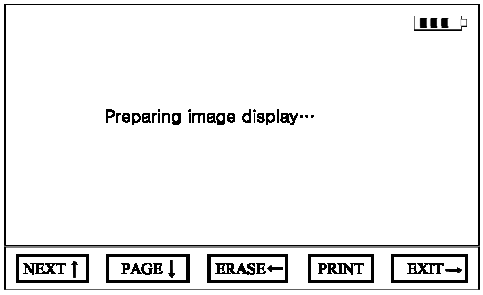
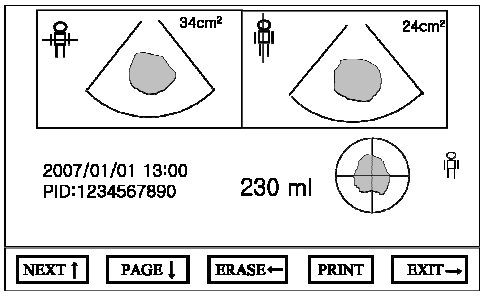
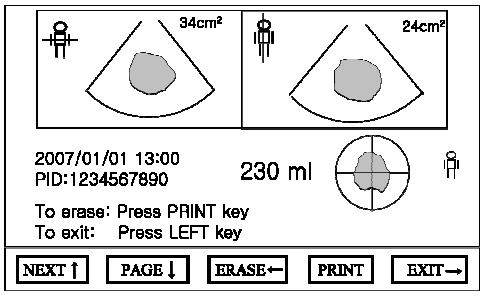
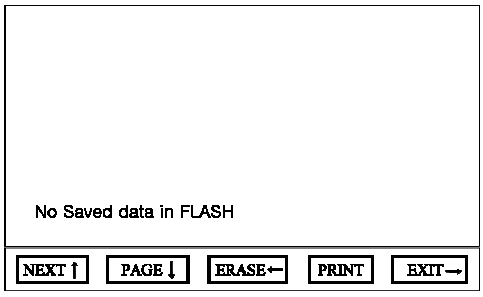


Fig.3.10.a1
Load saved data

	Fig.3.10.a2 The data loaded
	Fig.3.10.a3 When I press "ERASE" to delete saved data.
	Fig.3.10.a4. When there is no saved data, this screen will be dsiaplayed.

2) Functions in Advanced Mode

Figure Number	Function	Key	Description
3.6	SCAN	SCAN	Start the scan action.
	GEN. ←	LEFT	Change the gender.
	LOAD→	RIGHT	Load saved data in flash ROM.
	PRINT	PRINT	Go to advanced PRINT menu as in Fig.3.37 Refer to 3.6 Print function in Advanced Mode for detailed information.
	SETUP↑	UP	Push the up arrow key to go to SETUP page (See page 20, 3.4.2 SETUP in Advanced Mode)

Figure Number	Function	Key	Description
3.7	SCAN	SCAN	Start the scan action.
	GEN. ←	LEFT	Change the gender.
	RESET→	RIGHT	No operation
	B/M↑	UP	Toggle between image/outline display in result screen(Fig.3.9).
	EXIT↓	DOWN	Go to initial page as Fig. 3.6.

Figure Number	Function	Key	Description
3.8	SCAN	SCAN	Do not respond any key in this screen.
	GEN. ←	LEFT	
	RESET→	RIGHT	
	SAVE↑	UP	
	NEXT↓	DOWN	

Figure Number	Function	Key	Description
3.9	SCAN	SCAN	Start the scan action.
	GEN. ←	LEFT	Change the gender.
	RESET→	RIGHT	Go to Advanced ready page as Fig. 3.7.
	SAVE↑	UP	Save the data which have maximum volume in current session.
	NEXT↓	DOWN	To review next plane images.

Figure Number	Function	Key	Description
3.10.a1	NEXT↑	UP	Only for display message to wait a moment. Do not respond any key input.
	PAGE↓	DOWN	
	ERASE←	LEFT	
	PRINT	PRINT	
	EXIT→	RIGHT	

Figure Number	Function	Key	Description
3.10.a2	NEXT↑	UP	Display next saved data.
	PAGE↓	DOWN	Display next two images in current data.
	ERASE←	LEFT	Display erase menu.
	PRINT	PRINT	Print current saved data according to print option set previously.
	EXIT→	RIGHT	Go to initial page as Fig. 3.6.

Figure Number	Function	Key	Description
3.10.a3	Erase	PRINT	Erase current saved data. After erasing next saved data is displayed.
	Exit	LEFT	Redisplay current saved data.

Figure Number	Function	Key	Description
3.10.a4	NEXT↑	UP	No operation.
	PAGE↓	DOWN	No operation.
	ERASE←	LEFT	No operation.
	PRINT	PRINT	No operation.
	EXIT→	RIGHT	Go to initial page as Fig. 3.6.

3.3 Positioning of Ultrasonic Probe

(1) Push the scan button one time and enter into the pre-scan function. Through the pre-scan function, try to have the bladder placed in the center of scan section and try to get the biggest image. Then push the scan button one more time to start measuring the residual urine.

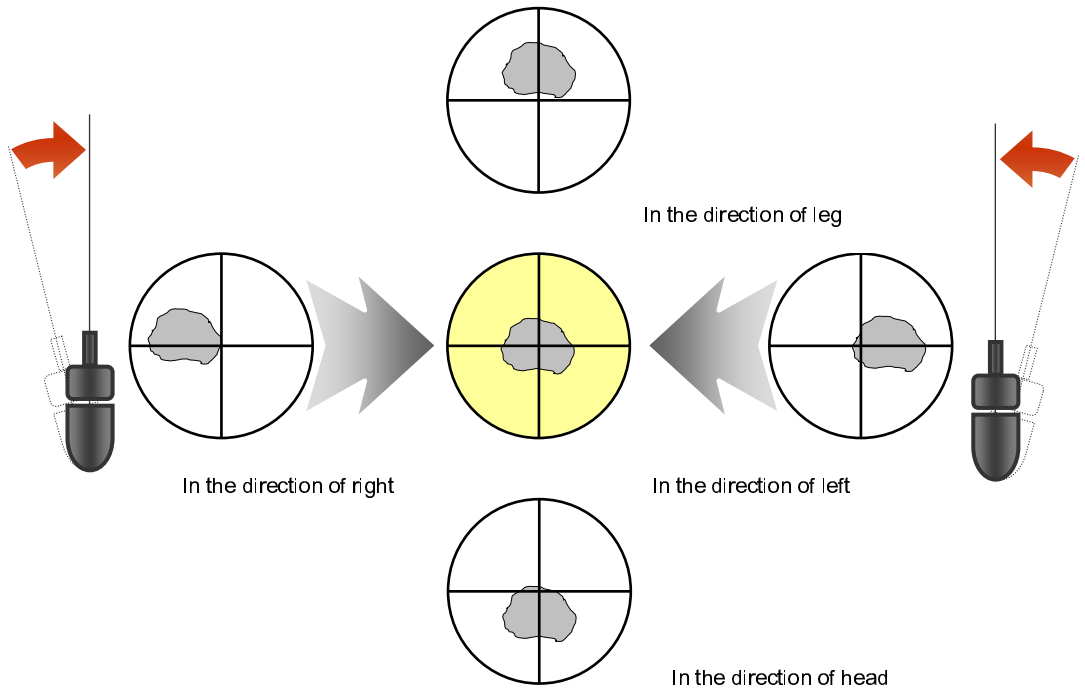
(2) Scanning time is around 4 seconds and the probe should be kept steady.

(3) After scanning finished, LCD displays the measurement result.

(4) If the center of the bladder image leans toward a certain area(up, down, left, and right), go back to the step (1) and start again from pre-scan.

(5) To make the bladder in the center of circle, keep the probe location and adjust the angle of the probe as below.

※ After pushing the scan button one time as (1) above, you can stop the pre-scanning and come back to the initial page when pushing the Down Key(↓) for a while(more than 1 second).



(6) When LCD displays as 'Fig. Result a', the sign '(<?)' above the current value means that part of the whole bladder is located out of scan range in the previous scanning attempt.

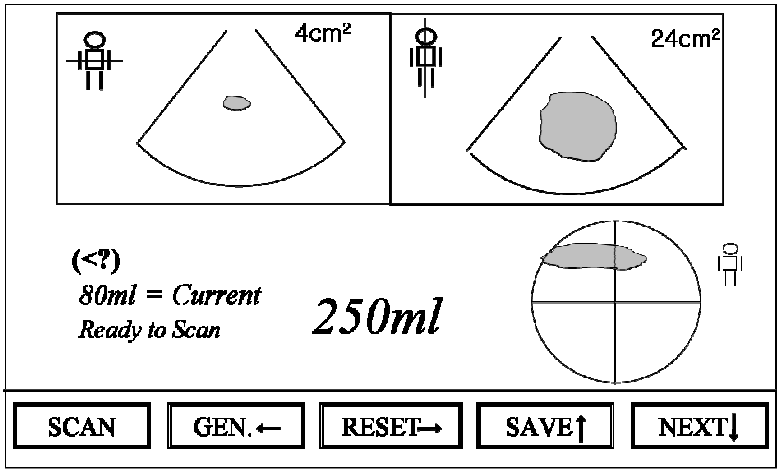


Fig. result a

(7) When LCD displays as 'Fig. Result b', the sign '(<?)' above the maximum value means that part of the whole bladder is located out of scan range in the maximum value among all the scanning attempts in current session.

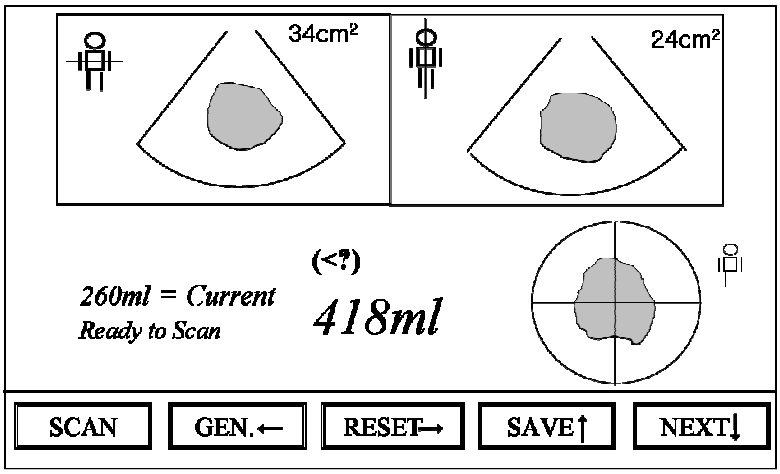


Fig. result b

(8) When LCD displays as 'Fig. Result c', the sign '(<?)' above the current value means that part of the whole bladder is located out of scan range in the previous scanning attempt, as (6), and at the same time the sign '(<?)' above the maximum value means that part of the whole bladder is located out of scan range in the maximum value among all the scanning attempts, as (7).

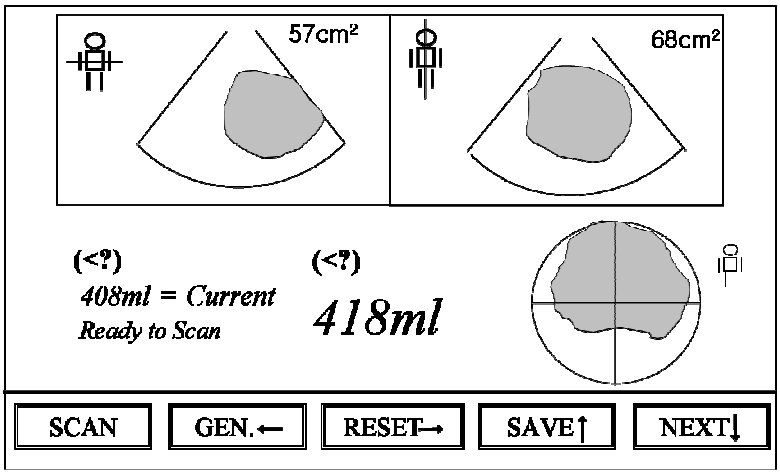


Fig. result c

3.4 SETUP in 2 modes

3.4.1 Standard Mode

There are some kinds of setup in standard mode. In SETUP mode, all arrow keys are used to move a cursor.

-. Chang the date and time
-. System mode setup
-. Print option setup
-. Prescan Enable setup

1) Changing the date and time

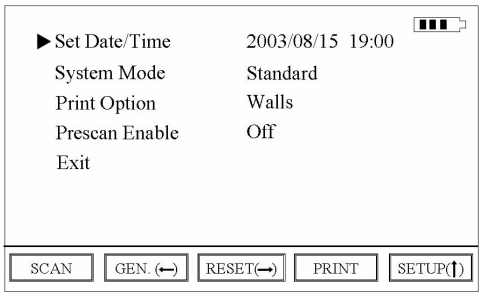


Fig. 3.11

a. Move the cursor at **Set Date/Time** by up or down key

b. Push the Enter key (inside arrow keys)

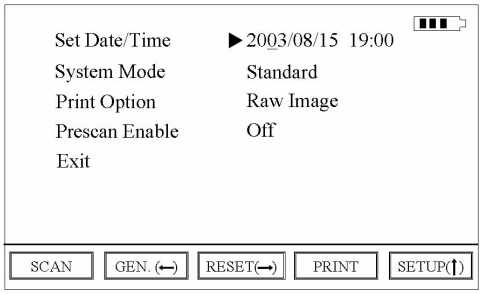


Fig. 3.12

c. Move the cursor to the position by left or right arrow key, push up or down key for selecting digits.

d. Push the Enter key after changing date / time.

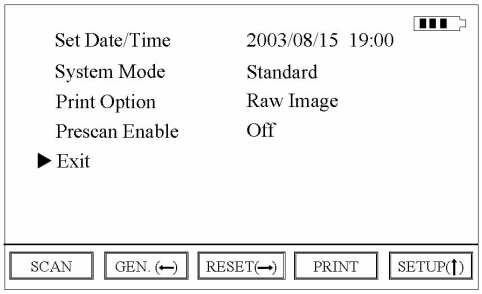


Fig. 3.13

e. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page

2) System Mode SETUP

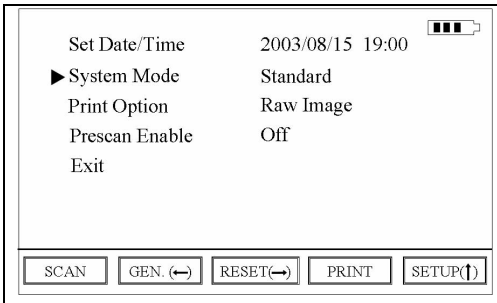
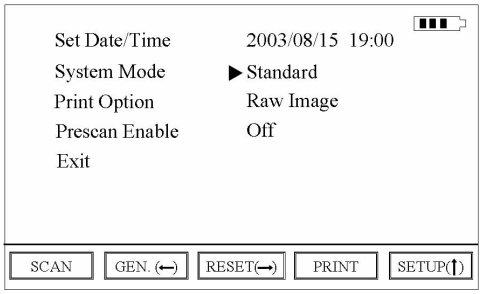


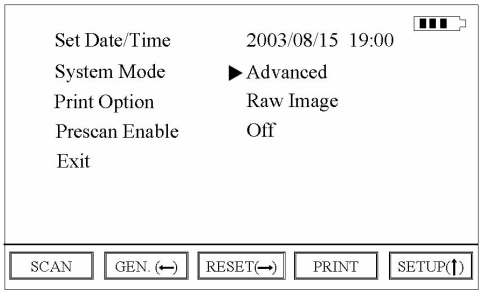
Fig. 3.14

a. Move the cursor to **System Mode** by up or down key

b. Push the Enter key (inside arrow keys)

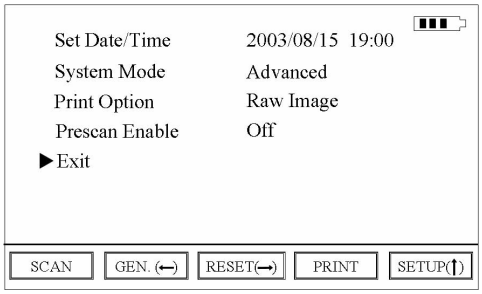


c. Push the left or right arrow key to select a desired mode
   - Standard
   - Advanced



d. Push the Enter key after changing system mode.

Fig. 3.15



e. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page

Fig. 3.16

3) Print Option SETUP

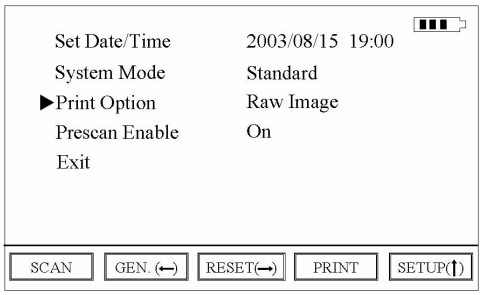


Fig. 3.17

a. Move the cursor at **Print Option** by up or down key

b. Push the Enter key (inside arrow keys)

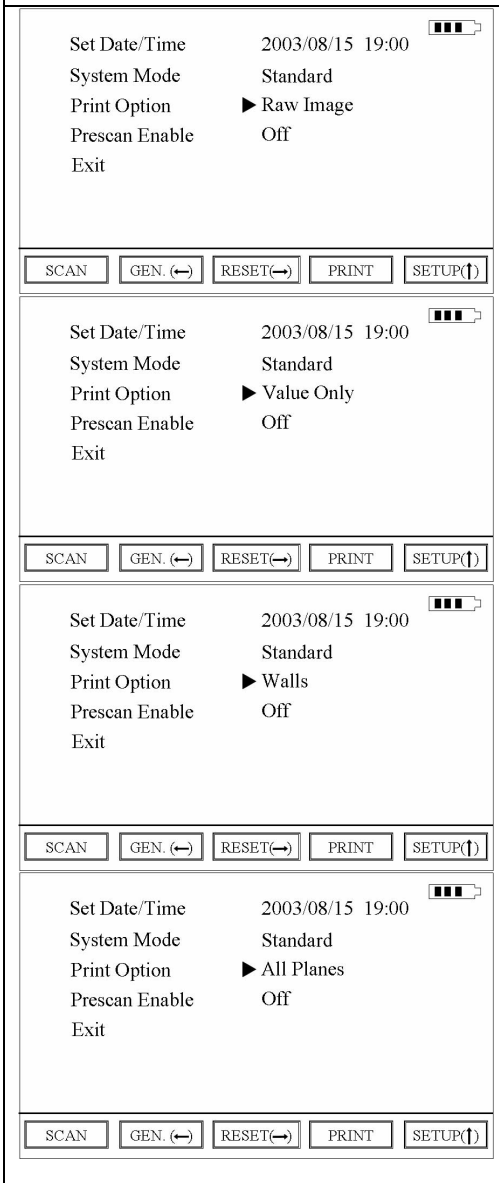


Fig. 3.18

c. Push the left or right arrow key to select a desired mode.
   - Value Only
   - Raw Image
   - Walls
   - All Planes

.

d. Push the Enter key to finish print option change.

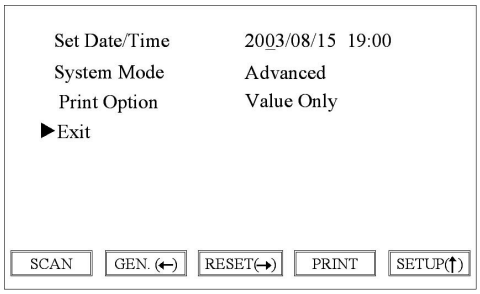


Fig. 3.19

e. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page.

4) Prescan Enable SETUP

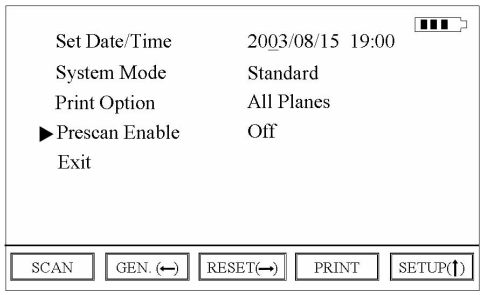


Fig. 3.20

a. Move the cursor to Prescan Enable.

b. Push the enter key.

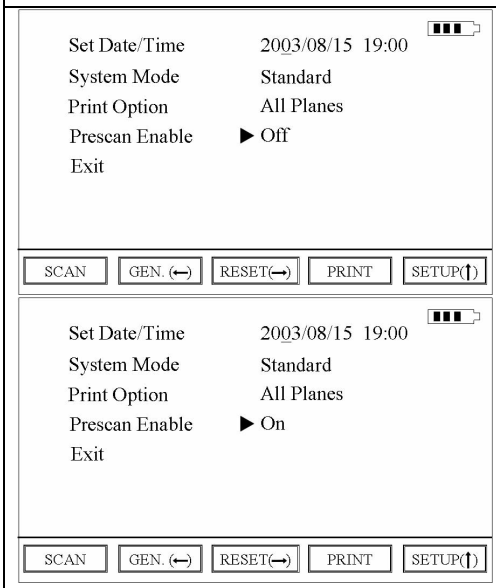


Fig. 3.21

c. Choose On or Off with the left or right key.

d. Push the enter key after finishing selection.

3.4.2 Advanced Mode

There are some kinds of setup in advanced mode. In SETUP mode, all arrow keys are used to move a cursor.

-. Input Hospital Name
-. Scan Result SETUP
-. Flash Store SETUP
-. Test Print

Changing Date/Time, System mode and Print option in advanced mode follows the same procedure as in standard mode.

1) Input Hospital Name

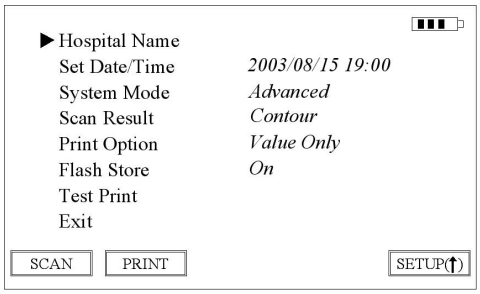


Fig. 3.22

a. Move the cursor at **Hospital Name** by up or down key
b. Push the Enter key (inside arrow keys)

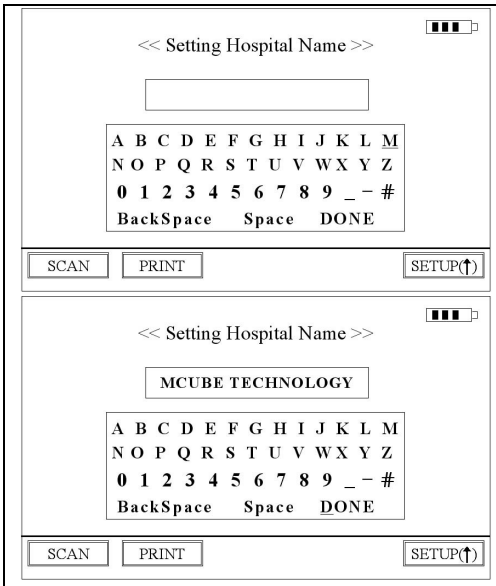


Fig. 3.23

c. Move the cursor to a desired position and push the Enter key. (e.g. M)

d. After finish input the name, move the cursor to **DONE.** Push the Enter key.

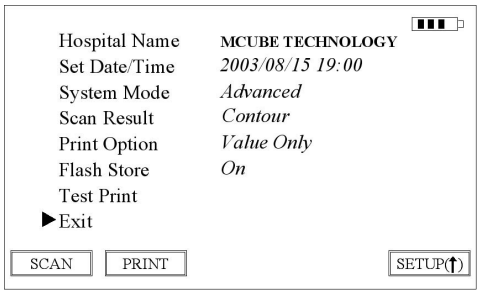


Fig. 3.24

e. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page.

2) Scan Result SETUP

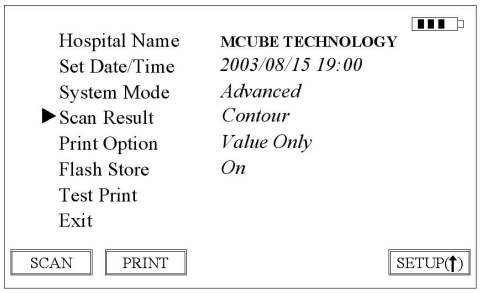
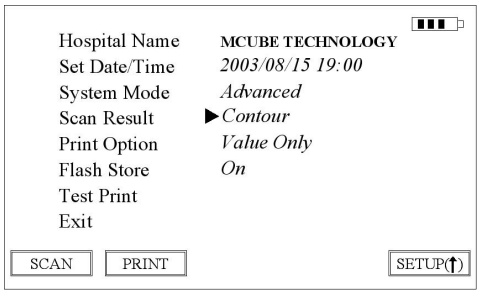


Fig. 3.25

a. Move the cursor at **Scan Result** by up or down key

b. Push the Enter key (inside arrow keys)



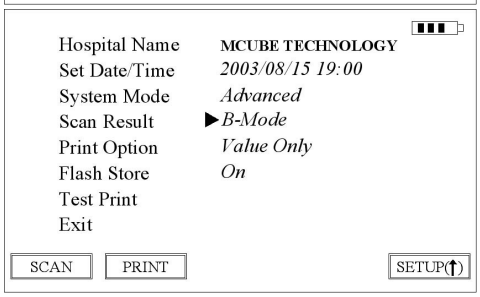


Fig. 3.26

c. Move the cursor by left or right key to a desired scan result and push the Enter key.
   - Contour
   - B-Mode

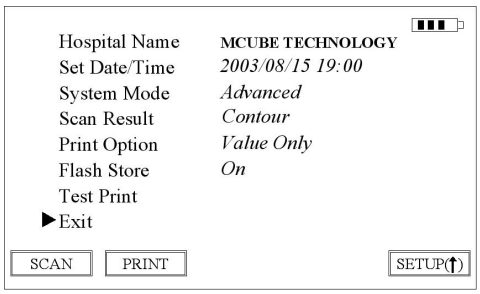


Fig. 3.27

d. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page

3) Flash Store SETUP

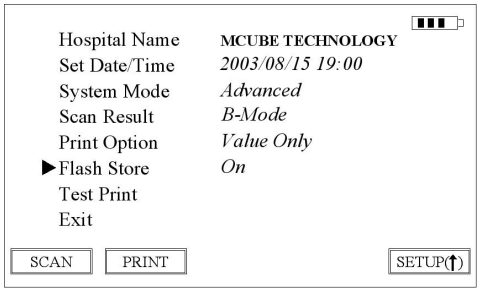
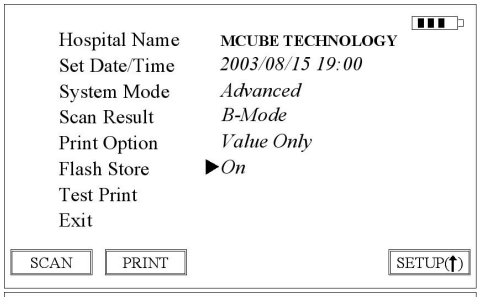


Fig. 3.28

a. Move the cursor at **Flash Store** by up or down key

b. Push the Enter key (inside arrow keys)



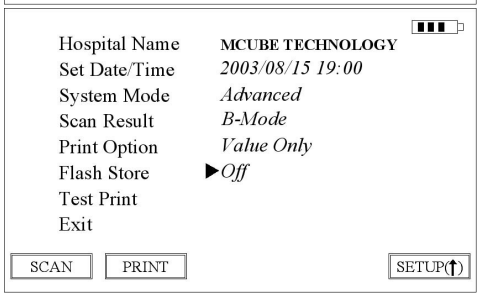


Fig. 3.29

c. Move the cursor by left or right key to ***on*** or ***off*** and push the Enter key.

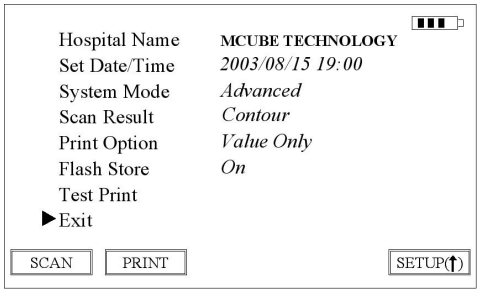
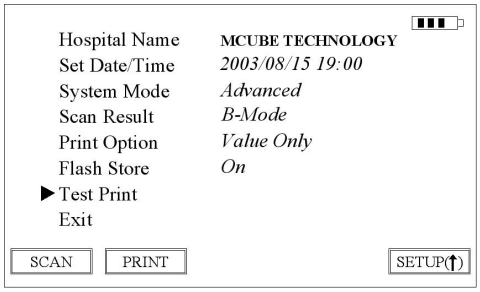
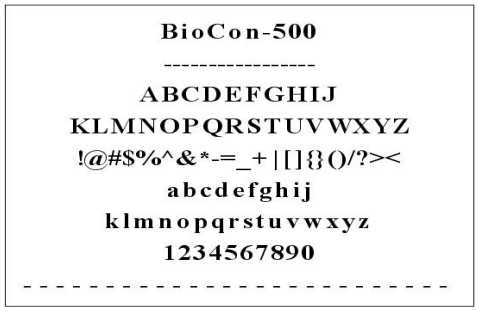
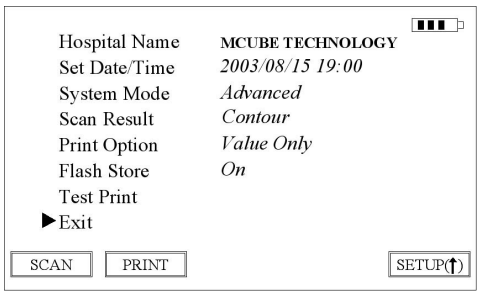


Fig. 3.30

d. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page.

4) Test Print

 Fig. 3.31	a. Move the cursor at **Test Print** by up or down key b. Push the Enter key (inside arrow keys)
 Fig. 3.32	c. Printout the paper form thermal printer as the left figure.
 Fig. 3.33	d. Move the cursor to **Exit** by down arrow key. Push the Enter key to exit setup page.

3.5 Print Option

3.5.1 Value Only

The printed-out result displays the volume capacity in value only as following.

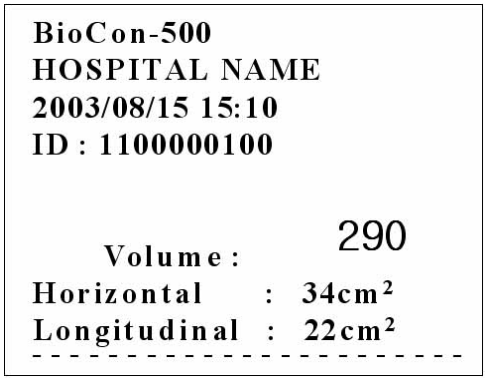


Fig. 3.34 Value only result

3.5.2 Raw Image

The printed-out result displays ultrasonic raw image as well as volume capacity as following.

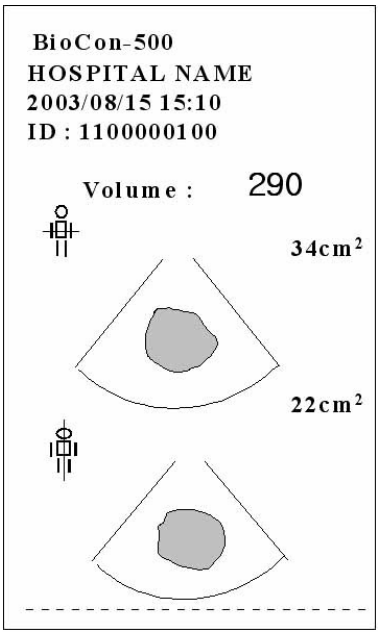


Fig. 3.35 Raw Image result

3.5.3 Walls

The printed out result displays Wall images as well as volume capacity as following.

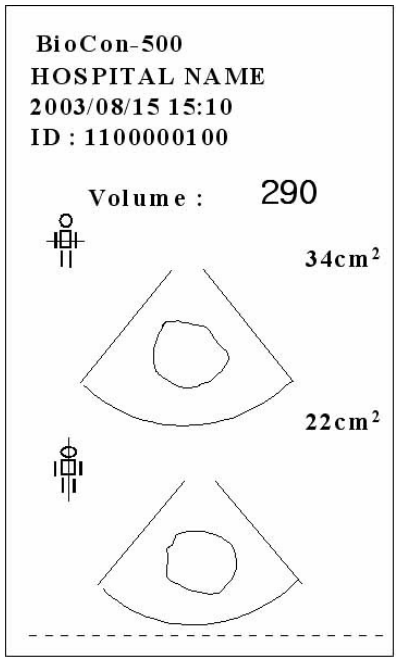


Fig. 3.36 Wall Image result

3.5.4 All Planes

The printed-out result displays 12 planes as well as volume capacity.

3.6 Print function in Advanced Mode

3.6.1 Input Patient ID

1) After one SCAN session, push the right arrow key to go to the initial page
2) Push the PRINT button to display LCD as Fig. 3.37., and input patient ID as followings.

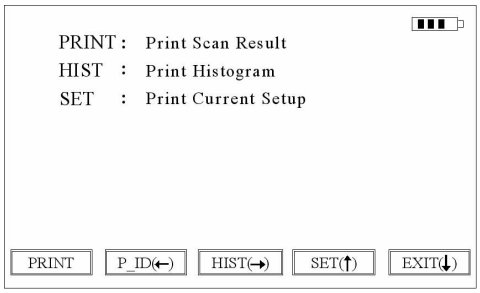
<table>
<tr>
<td> 

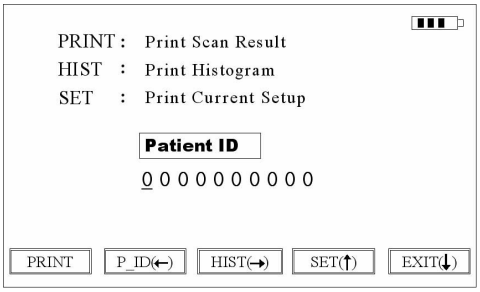
Fig. 3.37</td>
<td>a. Push the left arrow key</td>
</tr>
<tr>
<td> 

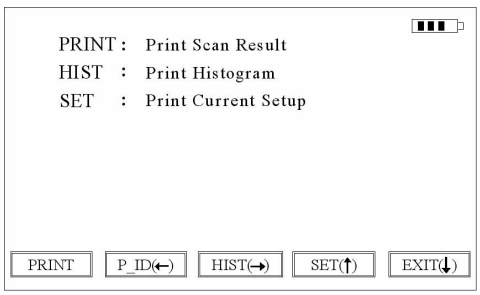
Fig. 3.38</td>
<td>b. Move the cursor by right arrow key and select a digit from 0 to 9 by up or down arrow key.
c. After fixing a 10 digit number, push the Enter key (inside arrow keys)</td>
</tr>
<tr>
<td> 

Fig. 3.39</td>
<td>d. Go to Fig. 3.37.</td>
</tr>
</table>

3.6.2 Print Function

Press the PRINT button at the state of fig. 3.6 after one scan session, to display as following.

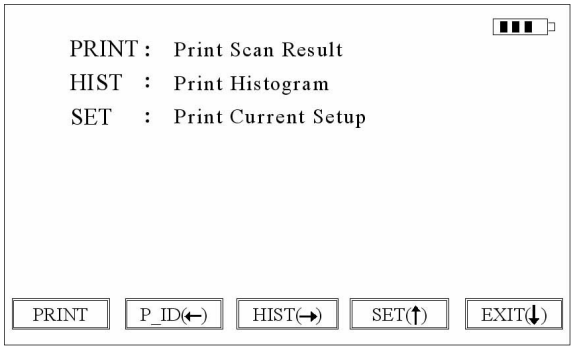


Fig 3.40 PRINT function in Advanced mode

Item	Function
PRINT	Prints out the results (including the image and the measured value) of 12 planes at the thermal printer.
HIST(→)	Prints out the frequency of each range in one session ***(currently not applicable)*** BioCon-500 HISTOGRAM Volume / No. of Scans 000-099 0 100-199 0 200-299 6 300-399 4 400-599 0 500-599 0 600+ 0 Fig 3.41 HISTOGRAM output
SET(↑)	Prints out the current SETUP status <<BioCon-500>> --Setup Status— User Mode : Advanced Print Mode : All Planes Scan Result : B-Mode Flash Store : On Fig 3.42 Setup Status output
EXIT(↓)	Exit to initial page.

3.7 Scan Result in Advanced Mode

3.7.1 B-Mode

It displays B-Mode image as SCAN result in LCD.

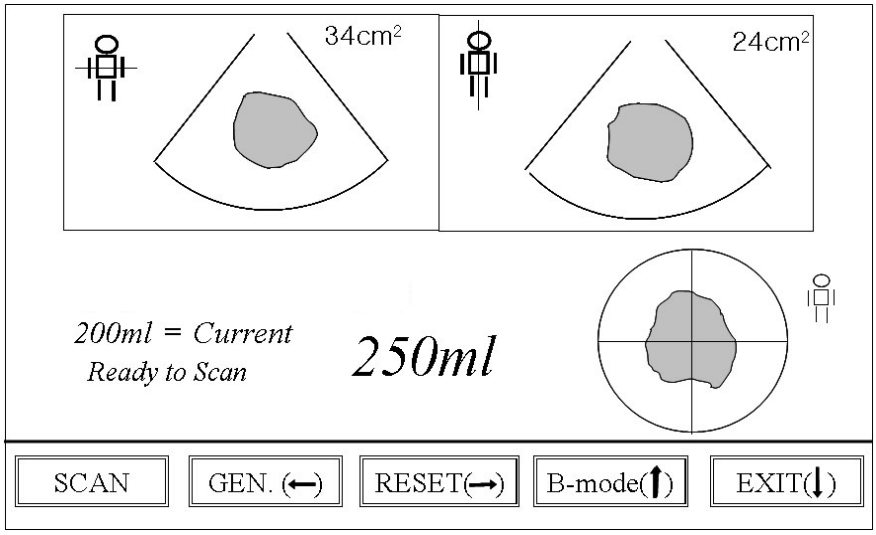


Fig 3.43 SCAN result (B-Mode)

3.7.2 Contour

It displays Contour image as SCAN result in LCD.

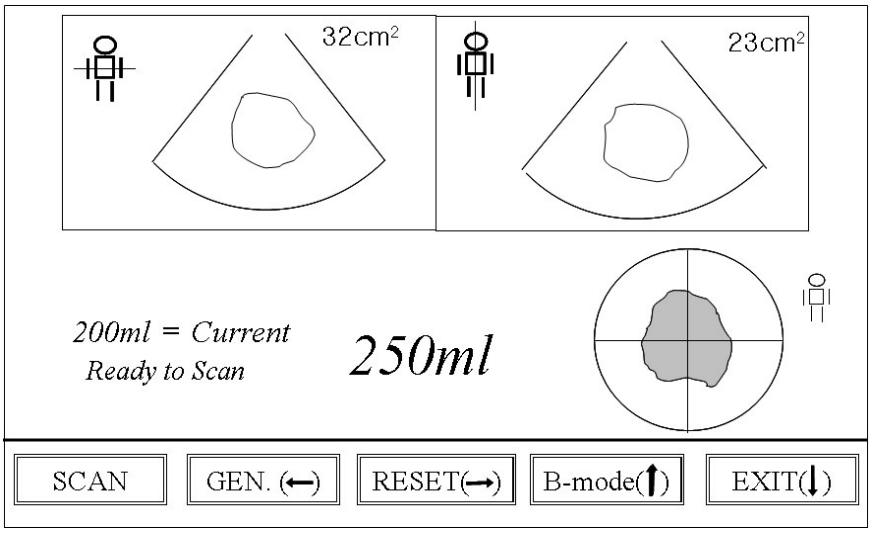


Fig 3.44 SCAN result (Contour)

3.8 Flash Store in Advanced Mode

3.8.1 On

1) Stores the maximum SCAN result of one session in Flash memory.
2) SCAN result will not be deleted if the power is put off and back on.

3.8.2 Off

1) Flash memory does not store any data.

3.9 Error Messages

Message	Situation
NO DATA AVAILABLE	No measured data or viewing B-mode image
BATTERY LOW. RECHAGE BEFORE NEXT USE SYSTEM WILL BE TURNED OFF	Power shortage
NO PAPER	No printer paper
NO SCANHEAD	No connecting probe
ERROR in Cable Connection	Transducer cable error

3.10 Short key functions

Short key	Function	Remark
↓	Turns over another images of 12 images	Displays 2 images on LCD
Enter + ←	Regulates contrast of images on 4 steps	Rotates 4 steps
Enter + ↑	Regulates LCD brightness to brighter	
Enter + ↓	Regulates LCD brightness to darker	

3.11 Changing the thermal printer paper

		a. Open the printer cover as the left image.
		b. Grab a printer paper in one hand as the left image and slightly pull out the paper to insert in the paper cart by using the other hand.
		c. Close the printer cover after inserting papers in printer cart.

3.12 After Using the device

The method of keeping the device after using

-. After using the device, users should keep the normal environment with the temperature of 10℃~ 40℃ and the humidity of 0% ~ 80% RH in a clean room not exposed to the sun.

-. Since the surface of the probe affects the result of data, users should take special caution not to scratch the surface of the Probe.

-. Probe should be protected against external impacts when users move or keep the device

4. Maintenance

Experienced service providers are available for helping you with maintenance of the apparatus. We provide best quality services at any desired time. Even after the warranty period, we provide you routine or emergency services based on the service contract or on call.

(1) Cleaning outer case (housing) of the system

- Clean the outer case of the system with a soft, little moistened cloth.
- When the case is heavily soiled by oil or dirt, use a little bit of a neutral detergent to clean.
- Do not use chemicals (hydrochloric acid, bleach).

(2) Periodically inspect the parts that are observable to you.

(3) Always keep the environment clean and tidy to thus no dirt or foreign substance is present around the apparatus.

(4) If the message, "BATTERY LOW RECHAGE BEFORE NEXT USE SYSTEM WILL BE TURNED OFF" pops up even with recharging over enough time (about 4 hours), then it indicates that the life of the battery is over. Thus, the battery should be replaced with new one.

(5) If it seems to be an error or unreasonable value in scanned results, please contact the manufacturer or the agent for following:

- Re-calibration for bladder scanning
- With no improvement from re-calibration, then it needs inspection and repair from the manufacturer or the agent.

5. Technical Descriptions

5.1 Acoustic Output Reporting Table

5.1.1 Definitions and Symbols

$p_{\_}$	MPa	The Peak Rarefactional Acoustic Pressure is the maximum of the modulus of the negative instantaneous acoustic pressure expressed as a positive number.
I_{SPTA}	mW/cm^2	The maximum value of the temporal average derived intensity in an acoustic field. For systems in combined operating mode, the time interval over which the temporal average is taken is sufficient to include any period during which scanning may not be taking place.
System settings[a]		User selectable system settings which may include Application, SV and Focal Length.
I_p	mm	This is the distance from the transducer output face to the point of maximum pulse-pressure-squared integral (or max mean square acoustic pressure for continuous pressure for CW)
w_{pb6} (||)	mm	This is the -6dB pulse beamwidth in the beam axis (X) at the point of max pulse-pressure-squared integral (or max mean square acoustic pressure for continuous pressure for CW). If the beamwidths in X and Y differ than less than 10%, there is no need to specify both. For scanning modes, the beam-widths shall correspond to the central scan line only.
w_{pb6} (_|_)	mm	This is the -6dB pulse beamwidth in the elevational axis (Y) at the point of max pulse-pressure-squared integral (or max mean square acoustic pressure for continuous pressure for CW). If the beamwidths in X and Y differ than less than 10%, there is no need to specify both. For scanning modes, the beam-widths shall correspond to the central scan line only.
Prr	kHz	Pulse Repetition Rate is the rate of successive pulses or tonebursts and applies to single element non-scanning systems and automatic scanning systems.

Srr	Hz	Scan Repetition Rate is the rate of the same identical point of successive frames, sectors, or scans and applies to automatic scanning systems (modes) only.
Output beam dimensions[b]	mm	Output beam dimensions are the dimensions of the ultrasound beam (-6dB pulse beamwidth) in a specified direction normal to the beam alignment axis and at the transducer output face. In scanning modes, these shall refer to the center scan line only.
F_{awf}	MHz	The Arithmetic-mean Acoustic Working Frequency is the arithmetic mean of the frequencies f1 and f2 at which the amplitude of the spectrum of the acoustic signal first becomes 3dB lower than the peak amplitude.
APF[c]	%	Acoustic Power-up Fraction is the ratio of the peak rarefactional acoustic pressure when the system is in Powerup mode to the maximum value of the the peak rarefactional acoustic pressure for any system settings of a specified mode of operation. This ratio is determined from measurements made at the position which yields the maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for CW)
AIF[d]	%	Acoustic Power-up Fraction is the ratio of the peak rarefactional acoustic pressure when the system is in Initialization mode to the maximum value of the the peak rarefactional acoustic pressure for any system settings of a specified mode of operation. This ratio is determined from measurements made at the position which yields the maximum pulse-pressure-squared integral (or maximum mean square acoustic pressure for CW)
Maximum power[e]	mW	This is the Maximum Temporal Average power output. For scanning modes, this shall be the total power output of all the acoustic pulses.
I_{ob}	mW/cm^2	Output Beam Intensity is the temporal-average power output divided by the output beam area
Power-up mode		With the probe connected, cycle power on the system. Write down the mode to which the system powers up. Usually, it is "B" mode.

Initialization mode		Write down "N/A[f] " where it denotes "system settings do not change on new patient entry"
Acoustic output freeze		Write down "YES " if the system is supplied with an output freeze facility. All Medison currently are supplied with this facility.
l_{tt}	mm	Transducer to Transducer output face distance is the distance along the beam alignment axis between the surface containing the active face of the transducer or elements and the transducer output face (usually the lens thickness)
l_{ts}	mm	Transducer Standoff distance is the shortest distance between the transducer output face and the patient entry plane. The term "contact" is used to connate direct contact between the transducer output face and the patient.
Inclusive modes		Make a note of the Inclusive Modes for this particular declaration which are not being declared separately.

5.1.2 Results

p_- (MPa)	**0.305**
I_{SPTA} (mW/cm^2)	**0.0313**
System settings[a]	
I_p (mm)	**60.0**
w_{pb6} (||) (mm) **(□) (mm)**	**4.99** **5.85**
prr (kHz)	**N/A**
srr (Hz)	**6.00**
Output beam dimensions[b] (mm)	**8.98 x 14.0**
f_{awf} (MHz)	**2.77**
APF[c] (%)	**100**
AIF[d] (%)	**<100**
Maximum power[e] (mW)	**0.279**
I_{ob} (mW/cm^2)	**0.222**
Power-up mode	**B**

Initialization mode	**N/A[f]**
Acoustic output freeze	**Yes**
I_{tt} (mm)	
I_{ts} (mm)	**Contact**
Inclusive modes	**-**

[a] FZ – Focal zone; Penetration, General, Resolution – Frequency option

[b] denotes diameter

[c] Acoustic power-up fraction

[d] Acoustic initialization fraction

[e] Controllable by the user in 10% steps

[f] System settings do not change on new patient entry

5.2 Index Value table

5.2.1 Definitions and Symbols

MI	the Mechanical Index
TIS_{scan}	the Soft Tissue Thermal Index in an auto-scanning mode
$TIS_{non\text{-}scan}$	the Soft Tissue Thermal Index in a non-auto-scanning mode.
TIB	the Bone Thermal Index.
TIC	the Cranial Thermal Index.
A_{aprt}	the area of the active aperture (square centimeters).
$p_{r.3}$	the derated peak rarefactional pressure associated with the transmit pattern giving rise to the value reported under MI (megapascals)
W_o	For TIB and TIC: time average acoustic power at the source, in milliwatts. (Also see the definitions for W_{01} and W_{01x1} that follow.) For TIS scan, $W_o = W_{o1} + W_{o1x1}$ For TIS non–scan, $W_o = W_{o1x1}$
	$W_{o1:}$ For scanning modes and/or scanning components of combinational modes: time average acoustic power at the source, per cm, in milliwatts. This is the acoustic power emitted from the central 1–cm length, in the scan direction, of the aperture corresponding to the scanned pulses.

	W_{o1x1}: For non–scanning modes and/or non–scanning components of combinational modes: time average acoustic power at the source, per cm^2, in milliwatts. This is the acoustic power emitted from the central 1 cm^2 of the active non–scanned aperture through which the highest acoustic power is being transmitted.
$W_{.3}(z_1)$	the derated ultrasonic power at axial distance z_1 (milliwatts).
$I_{TA.3}(z_1)$	the derated spatial-peak, temporal-average intensity at axial distance z_1 (milliwatts per square centimeter).
z_1	the axial distance corresponding to the location of max[min($W_{.3}(z)$, $I_{TA.3}(z)$ x 1 cm^2)], where z = z_{bp} (centimeters).
z_{bp}	$1.69\sqrt{A_{aprt}}$ (centimeters).
z_{sp}	For MI, the axial distance at which $p_{r.3}$ is measured for TIB, the axial distance at which TIB is a maximum (i.e., $z_{sp} = z_{B.3}$) (centimeters).
$d_{eq}(z)$	the equivalent beam diameter as a function of axial distance z, and is equal to $[(4/\square)(W_o/I_{TA}(z))]^{0.5}$ where $I_{TA}(z)$ is the temporal-average intensity as a function of z (centimeters).
f_c	is the center frequency (MHz). For MI, f_c is the center frequency associated with the transmit pattern giving rise to the maximum reported value of MI. For TI, for combined modes involving transmit patterns of unequal center frequency, f_c is defined as the overall range of center frequencies of the respective transmit patterns.
Dim. of A_{aprt}	the active aperture dimensions for the azimuthal and elevational planes (centimeters).
PD	the pulse duration (microseconds) associated with the transmit pattern giving rise to the reported value of MI.
PRF	the pulse repetition frequency associated with the transmit pattern giving rise to the reported value of MI (Hz).
$p_r@PII_{max}$	the peak rarefactional pressure at the point where the freefield, spatial-peak pulse intensity integral is a maximum (megapascals). See Section 6.2.4.1 of the Output Display Standard, entitled "Measurement Methodology for Mechanical and Thermal Indices".

$d_{eq}@PII_{max}$	the equivalent beam diameter at the point where the freefield, spatial-peak pulse intensity integral is a maximum (centimeters). See Section 6.2.5.1 of the Output Display Standard, entitled "Measurement Methodology for Mechanical and Thermal Indices".
FL	the focal length, or azimuthal and elevational lengths, if different (centimeters).
$I_{PA.3}@MI_{max}$	the derated pulse average intensity at the point of maximum reported MI (Watts per square centimeter).

5.2.2 Results

Index Label			M.I.	TIS scan	TIB non-scan	TIC
Maximum Index Value			0.117	0.00367		0.00551
Assoc Acoustic Parameter	$P_{r.3}$	(MPa)	0.195			
	W_o	(mW)		0.279		0.279
	min of $[W_{.3}(z_1), ITA_{.3}(z_1)]$	(mW)				
	z_1	(cm)				
	Z_{bp}	(cm)				
	Z_{sp}	(cm)	4.80			
	$d_{eq}(z_{sp})$	(cm)				
	f_c	(MHz)	2.77	2.77		2.77
	Dim of A_{aprt}	X (cm)		0.898		0.898
		Y (cm)		1.4		1.4
Other Information	PD	(μsec)	0.726			
	PRF	(Hz)	* 6			
	$P_r@PII_{max}$	(MPa)	0.305			
	$d_{eq}@PII_{max}$	(cm)				
	Focal	FL_x (cm)		2.00		2.00

	Length	FL_y (cm)		8.00		8.00
	$I_{pa.3}$ @MI_{max}	(W/cm^2)	1.25			
Operating Control Conditions	Control 1		MI			
	Control 2			TIS_as		
	Control 3					
	Control 4					
	Control 5					
	Control 6					
	Control 7					

Notes: (a) This index is not required to this operating mode.

(b) This probe is not intended for adult transcranial uses.

(c) This formulation for TIS is less than that for an alternate formulation in this mode.

(d) The maximum index value is less than 1.0

* PRF for scanning modes is the product of the frame rate and the number of pulse per line

6. Specifications

Item	Features
Power	- 16V DC Adapter (Input : AC 100~240V 50/60Hz) - 7.4V(3.7V x 2): Battery Pack battery cell: Li-polymer rechargeable, 3.7V, 5000 mAh - Scan: 3 hours – 1 scan in every 15sec Standby: 7 hours
Ultrasound Probe	- 3D sector scan - 2.8MHz ultrasound frequency - B-mode scan image - scan angle : 120°
Printer	- built in (57mm width) - speed : 5cm/sec
Display	- 5.6〃 STN LCD - 320×240 pixels - 16 ray levels
Range	- Bladder volume range: 0 - 999ml - Accuracy: ±20%,±20ml (0 - 699ml) ±25%,±25ml (700 - 999ml)
Dimension	- 340(L)×240(W)×49.9(H) mm
External Interface	- USB 2.0 basic

Symbols

		
Type BF	USB	Caution
REF		SN
Reference number	Date of manufacture	Serial number
		
DC terminal		

CUBEscan

BioCon-500

Bladder Scanner

Distributor

Mcube Technology, Co., Ltd.

Roon #803 Shinnae-technotown,
485, Sangbong-Dong, Chungnang-Gu,
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MUM-BioCon 500(Rev. 4.7)

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