Central Monitoring System

PC-1000A

User Manual

The Manual describes, in accordance with the Central Monitoring System's features and requirements, its main structure, functions, specifications, correct methods for transportation, installation, usage, operation, repair, maintenance and storage, etc. as well as the safety procedures to protect both the user and equipment. See the respective chapters for details.

The Manual is published in English and we have the ultimate right to explain the Manual.

Version of the Manual: V1.5

Issued date: October 25, 2019

Manufactured date: See label on device

Service life: 5 years

Marks in the Manual:

- **Caution: must be followed to avoid endangering the operator and the patient.**
- **Attention: must be followed to avoid causing damage to the device.**
- **Note: contains some important information and tips about operations and application.**

3502-2090011

Instructions to User

Dear Users,

Thank you very much for purchasing our product. Please read this page very carefully before using this system.

In order to ensure a stable and reliable operating environment for Central Monitoring System (CMS), the following should be followed strictly:

- **Never set up the CMS or use it in an environment with toxic or inflammable gas.**
- **The input/output signal parts of the devices in this system can only be connected to the specified equipment, without the company's permission, any other devices shall not be connected to this system.**
- **The Class I medical electrical equipment which is connected to the system must be connected to the mains power supply with the common protective earth. Additional protective earth is required for connecting the non-medical electrical equipment (e.g. Central Work Station).**
- **All the accessories of the Patient Monitors should NOT be replaced at will. Please always use the accessories provided by the manufacturer or those with the same model and specification as that specified by the manufacturer if necessary, otherwise, negative effects concerning safety and biocompatibility etc. may be caused.**
- **Do NOT open the cover of the device or the central work station within the CMS without authorization. Covers should only be opened by qualified service personnel. Opening device cover may cause electric shock hazard which can result in serious injury to persons and damage of instrument components.**
- **If the monitor falls off accidentally, please do NOT operate it until its safety and technical indexes have been carefully tested and positive testing results obtained.**
- **Before maintenance, please switch off the power supply.**
- **This system is a professional medical electric system, it can only be operated by trained personnel with qualification.**
- **Only the medical devices (e.g. Patient Monitors) in the CMS can be used in patient environment.**
- **Please peruse the relative content about the clinical restrictions and contraindication.**
- **The CMS can only connect the Patient Monitors provided by the same manufacturer;**
- **The computer used as the work station should ONLY be used for this Central Monitoring System and NOT for any other purpose;**
- **DO NOT install any software of the third party onto the work station;**
- **DO NOT move the work station when it is in operation;**
- **DO NOT forget to connect the additional protective earth to the work station;**
- **DO NOT connect or disconnect the software-key, serial cable connector, etc. while the wok station is powered on;**
- **Only one user account can operate the work station at the same time;**
- **When disposing of the devices and its accessories, the local law should be followed.**

Table of Contents

CHAPTER 1 OVERVIEW

1.1 Features

- ✧ User account management in the work station with multi-level authentication.
- ✧ Flexible display layout setting with dynamic bed No. binding.
- ✧ Multiple key-monitoring views.
- ✧ Adaptive choosing display of different physiological parameter set by automatic query of device configuration.
- ✧ Switching system language without re-starting the system.
- ✧ Remote setting function for bedsides monitors.
- ✧ Patient database capable of automatic creating or switching patient ID and bed No. binding.
- ✧ Patient data review with waveform recall, trend data list and statistical chart display, etc.
- ✧ Import and export of patient data records.
- ✧ Capable to exchange data with CIS/HIS by HL7 protocol.
- ✧ Medicine calculation function is available.
- ✧ System logging is available.
- ✧ Up to 240 hours data storage for all physiological parameters.

1.2 Product Name and Model

Name: Central Monitoring System

Model: PC-1000A

Software name/version: PC-1000A Multi-parameter Central Monitoring System V6.X

Detailed configuration see below form 1-1 and 1-2

Model	Parameter Configuration						
	HR	TEMP	RESP	IBP/NIBP	SpO_2	PR	CO_2
PC-1000A	√	√	√	√	√	√	--

Form 1-1

Model	Parameter Configuration			
	CSI	EMG%	EEG	BS%
PC-1000A	--	--	--	--

Form 1-2

NOTE: "√" means this function is available, and "--" means this function is not available.

1.3 Application and Scope

Central Monitoring System (hereinafter referred to as CMS) can work together with bedside monitors or remote monitoring devices through cable LAN or WLAN to monitor simultaneously the physiological parameters such as ECG, RESP, TEMP, NIBP, SpO_2, PR, $EtCO_2$, adult IBP, EEG, BS%, Cerebral State Index (CSI), EMG% and EMG % , so as to perform central data monitoring , displaying, recording and printing.

It is applicable for use in hospitals. The operation should be performed by qualified professionals only.

Note: your CMS will not cover all features and accessories because of the different configuration.

1.4 Working Principle

CMS collects all the data from each bedside monitor and display them in a collective way. It monitors the real-time signal waveforms and parameters to provide necessary alarms, the trend data and/or ECG waveform data and other parameters, can be stored as well for further recall and analysis.

1.5 Composition

CMS consists of work station (server), communications accessories, installed software platform (OS), copyright protection devices, display monitor, external printer (optional) and external uninterruptible power supply (optional) and CSM application software.

1. Hardware Requisite

Desktop computer: 1 set, see form 1-3 for its basic requirement.

Item	Computer Configuration	Remark
Motherboard	With PCI slot and INTEL chipset	
CPU	INTEL I3 3.0GHz with dual core or higher	It's recommended to use INTEL I3 CPU if the CMS is connected with less than 16 bedside monitors, use INTEL I5 CPU if the CMS is connected with 16 to 32 bedside monitors, while use INTEL I7 if bedside monitors are more than 32.
RAM	4GB or larger	
Hard Disk	160GB or larger, free space up to 20GB	It's recommended to use Solid State Drives.
Monitor	(4:3) 17 inch LCD Color Display (resolution 1280*1024 or higher) (16:9) 20 inch or larger LCD Color Display (resolution 1920*1080 or higher)	
Display Card	Dual-output display Card (1GB or higher)	
CD-ROM	Yes	
Power Supply	Input 220V/50Hz, 3.0A Output 220V/50Hz, 2.5A	
Cabinet	Vertical or Horizontal	
Sound Card	Yes (independent sound card is preferred)	

Form 1-3

2. Software Dependency

   Operating system: Windows 7 + SP1or higher / Windows XP + SP3 or higher

   Database component: Firebird V2.5.9

   Others: DotNetFX40Client(only for Windows XP), Software-key

3. Application Software Name/Version

   “Central Monitoring System”, please click the "About system" button in toolbar of the main menu to see the version and issue date of the software.

CHAPTER 2 INSTALLATION AND CONNECTION

Note: the user installing this Central Monitoring System should be authorized by the Administrator.

2.1 Installation

2.1.1 Opening the Box and Check

1. Open the package, take out the device and accessories from the box carefully and place it in a safe stable and easy to watch position.
2. Open the user manual to sort the accessories according to the packing list.
   - ◆ Inspect the accessories for any mechanical damages
   - ◆ Check all the exposed leads and inserted accessories
   - ◆ Check whether any risk or abnormity exists in the device and its accessories before using.

Please contact the local dealer or our company in case of any problems. We will offer the best solution for your satisfaction.

2.1.2 External Connection of Work Station

1. Power Supply Connection Procedure

- ◆ Ensure the AC power supply specification: AC 220V/50Hz.
- ◆ Use the prepared power cable. Insert one end of it to the power port of the computer and the other end to the grounded one-phase power jack

2. Install Software Packages

- ◆ Please see the software installation in Computer User's Instruction for details when installing Windows 7 or Windows XP (the Windows operating system is normally pre-installed in work station before shipping).
- ◆ Install “Central Monitoring System” software: put the provided installation CD into CD-ROM drive and it will

auto-run the installation program. Follow the instructions and complete the installation. (this software is normally pre-installed in work station before shipping)

Note: 1. DotNetFX40Client should be installed for Windows XP (it is under directory "SOFTWARE" in the provided installation CD).

2. The hard disk of the computer should be divided into at least 2 partitions. The operating system and all drivers should be installed in the primary partition and the CMS software should be installed in the extended partition.

- Install database software FireBird 2.5 (it is under the directory "SOFTWARE" in the provided installation CD).

Note: For Windows 7 (32bits) or Window XP system, please run the file "Firebird-2.5.9.27139_0_Win32.exe".

For Windows 7 (64bits) system, please run the file "Firebird-2.5.9.27139_0_x64.exe".

- Install the driver for software-key (it is under the directory "Softdogdrv" in the provided installation CD).
- Insert the Software-key into USB port.

Note: In order to protect the software "Central Monitoring System", a software-key is used for authentication, and only the authorized user account can operate this system. Besides, do NOT plug and unplug the software-key while the software is running, or the software-k will be damaged and the software will fail to run.

3. Initial System Configuration

1. Run the MConfigure.exe under the installed directory (by administrator account).
2. On "System Data" setting tab, set the file path for DataBase and Waveform,, the duration time for ShortTrends, then click "Save" to confirm settings, as shown in figure 2.1. On "Other" setting tab, set the bed number, language and telemetry device information (eg. Number of devices, start No. of COM port, and numbers of used COM ports) then click "Save" to confirm settings, as shown in figure 2.2.

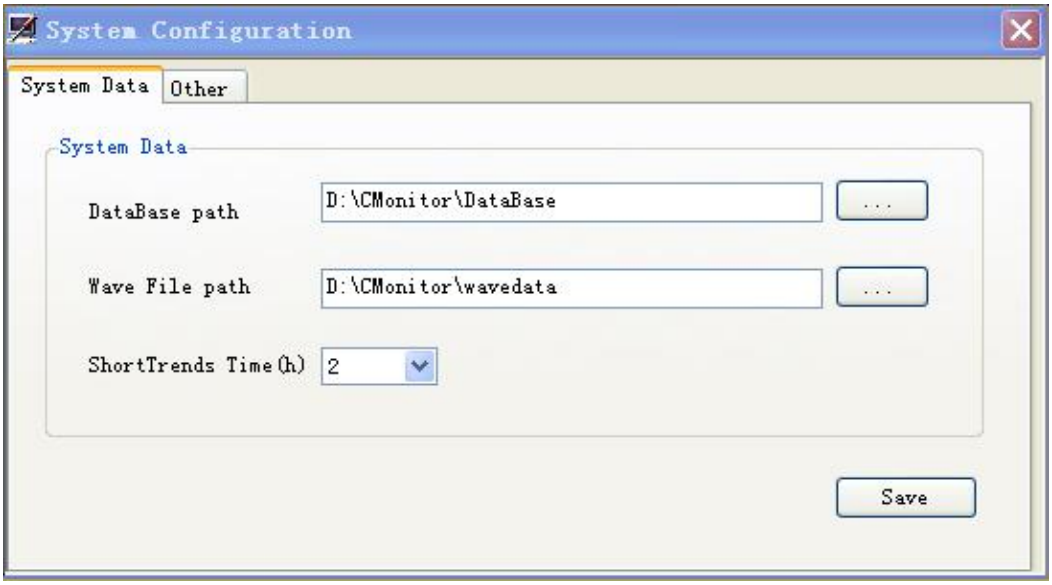


Figure 2.1 System Data setting

Figure 2.2 Other setting

3. Please double confirm the setting before you exit from the System Configuration screen. Please note that the IP address should be assigned already, and other items are set as shown in figure 2.2.

4. After finishing setting, you need to re-start the operating system to complete the installation, so that the CMS can run normally.

2.1.3 Starting

The system performs self-detection and enters "Windows" display screen after power on the computer. Set the system configuration, and then runs CMS software. Check the communication with patient monitor whether is in normal condition.

Note: 1) If the screen display is abnormal, please check the display resolution is 1280 x1024 or higher for 17 inch LCD screen (1920x1080 or higher for 20 inch or bigger LCD screen), the display resolution setting screen is as shown in figure 2.3.

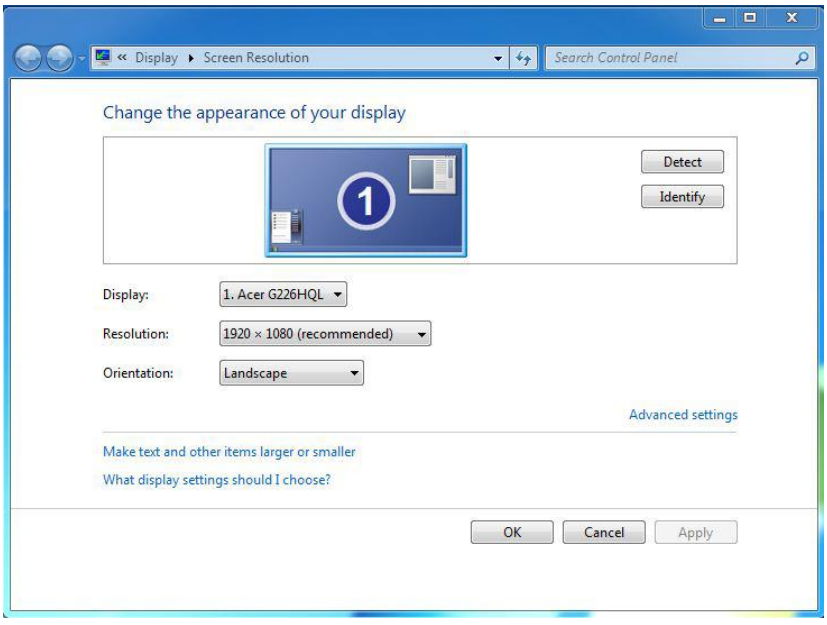


Figure 2.3 Resolution setting screen

2) If the text or content can not be displayed completely, please check the displaying font is “Smaller-100%”, the displaying font setting screen is as shown in figure 2.4.

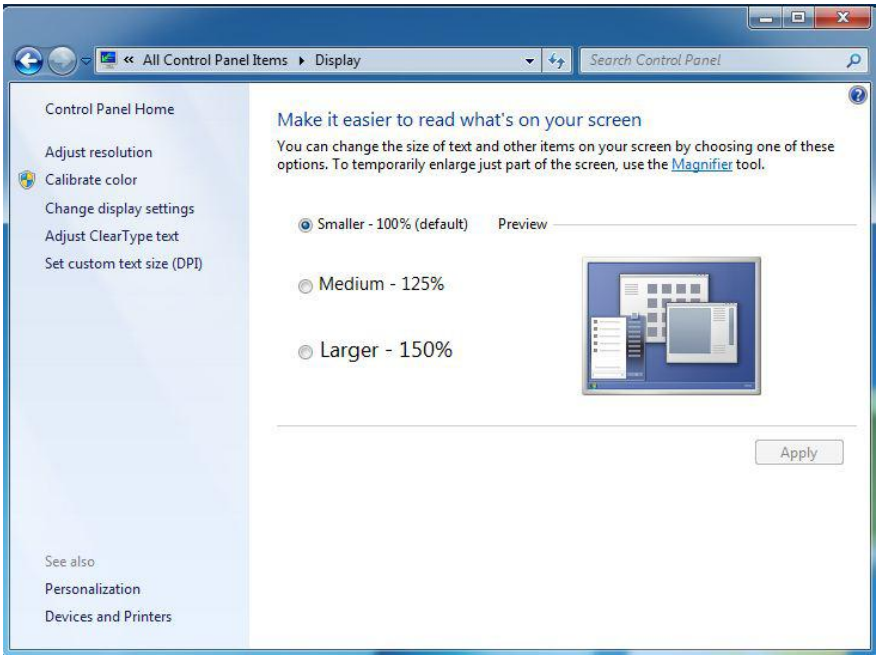
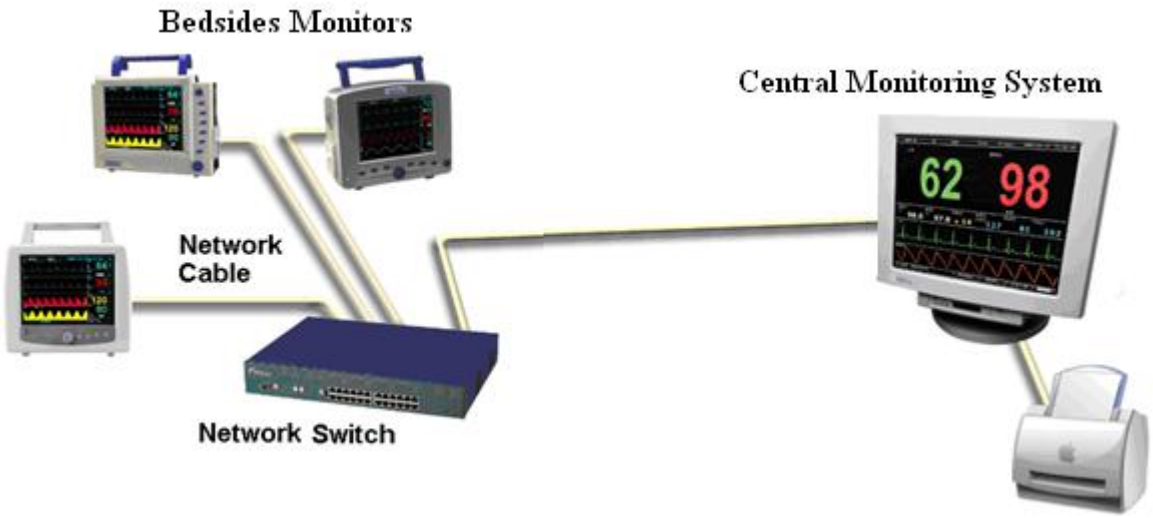


Figure 2.4 Displaying font setting screen

If any error appears or any abnormality is checked in CMS, please contact the dealer or our company.

2.2 Network Connection

The Central Monitoring System performs communication (TCP/IP protocol) via local area network (Ethernet infrastructure). The Bedside Patient Monitors are all connected to a network switch, which is further connected to the work station as illustrated in below figure.



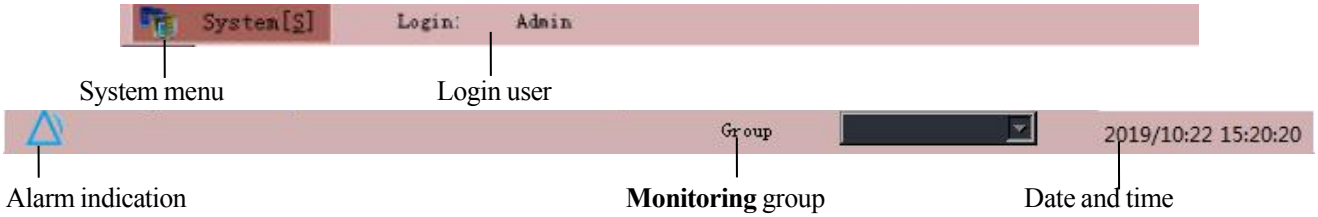
CHPTER 3 OPERATING INSTRUCTIONS

3.1 Main Screen

After the CMS software is installed on the work station successfully, the software can be run by double-clicking the icon "  " on desktop, the user login dialog appears, at this same, select the user and enter the correct password. If password is entered correctly, then the system enters into main screen, as shown in figure 3.1

Figure 3.1 Main screen

- **Menu Info. area**



System menu" 

": a button for system setting and user manager etc., refer to chapter 4 for details.

Login: the name of current user who logged in is displayed here.

Alarm indication: an icon to indicate alarm status, "  " means the alarm sound is enabled, and "  " means the alarm sound is disabled.

Group: if the monitoring group is configured, click "  " to choose a given group of bedside monitors for central monitoring.

Date and time: the current system date and time.

- **Bedside monitoring info. area**

The bedside monitoring info. area consists of the monitoring information for one or more beds (bedside monitors), figure 3.1 shows (4*2) 8 beds in total. The bed number and its arrangement can be set in "Layout Setting" in Section 4.7.

On the main screen, the lower left corner (as shown in figure 3.2) displays the connection status of the each bedside monitor. For example, "1","3" and "5" are the highlighted number which means that the bed No. 1, No. 3 and No. 5 are successful linked to the bedside monitors (Patient Monitors), and the rest is in disconnection status, as shown in figure 3.1.

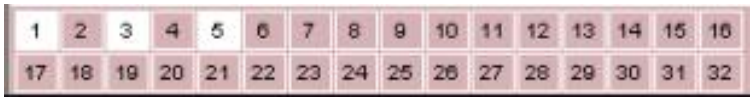


Figure 3.2

- **Shortcut buttons**

The shortcut buttons include "Patient", "Key Monitor", "Monitor", "History" and "Medicine Calculator". Click each icon can enter into the corresponding setting window, refer to Chapter 6 for details.

3.2 Bedside Monitor Information Area

Bedside monitor information area includes information bar, waveform area and parameter area, as shown in figure 3.3. The bedside monitor information area displays data information means this bedside monitor is monitoring, and receiving the corresponding patient information.

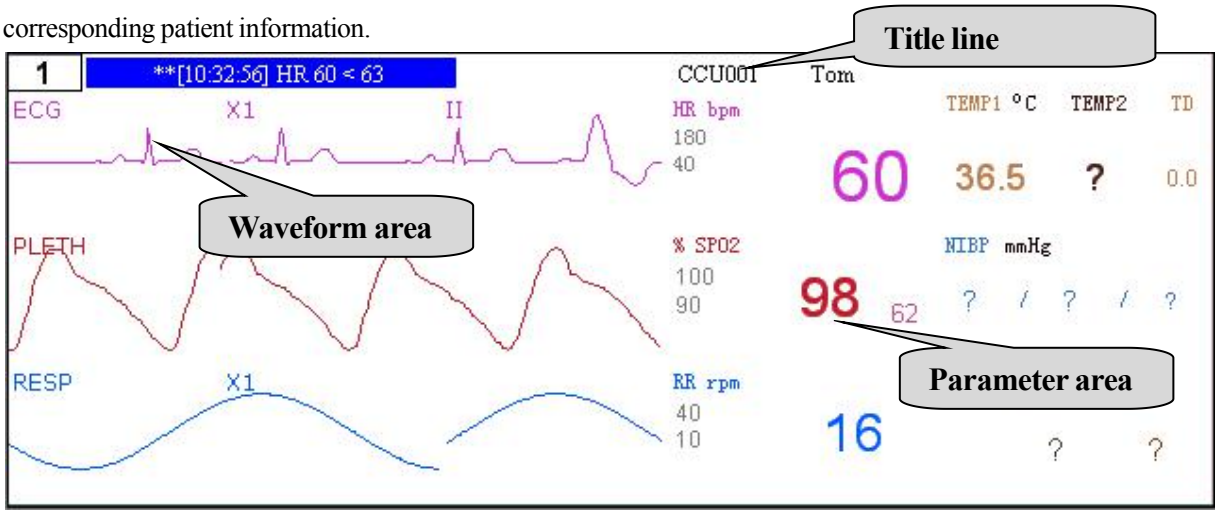


Figure 3.3 Bedside monitor information

- **Title line**

The numeric value "1" at the upper left corner is the ID number of bedside monitor (device number), if you click on it, then the

operating menu pops up on the screen. Please refer to Chapter 6 for detailed operation. If the monitor identifies alarm event, the alarm information will be displayed with the setting color on the title line and the color of bed number will be changed to the same as that of the alarm information, as shown in Figure 3.3.

Besides, the patient name and bed number will be displayed on the title line as shown in Figure 3.4, "CCU001" is the bed ID number and "Tom" is the patient name.

Note: If the patient archive has been created in the bedside monitor, then the corresponding patient name and bed number will be displayed here, otherwise, it will be blank.

- **Waveform area**

Physiological signal waveforms for the monitored patient will be real-time displaying on the waveform area.

The symbols and descriptions on waveform area:

Waveform and symbol	Description
	**ECG area** ECG: ECG signal X1: gain=1 II: Lead II
	**SpO_2 area** PLETH: Plethysmogram
	**Respiration area** RESP: Respiratory signal X1: gain=1

- **Parameter area**

Physiological parameter values (such as HR, SpO_2, TEMP and NIBP etc.) of the monitored patient will be real-time displaying on the parameter area.

If the foreground and background color of the parameter value is reversed (eg.. white turns to black), it means the measured parameter value exceeds the alarm limit (the alarm event is activated).

3.3 Shortcut Button

The 5 shortcut buttons include "Patient", "Key Monitor", "Monitor", "History" and "Medicine Calculator", which is respectively used to set patient information, monitoring the key patient, set bedside monitor's parameters, recall the history record and make medicine calculation. Refer to Chapter 5 for details.

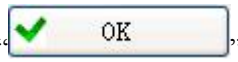
3.4 Function Descriptions for Frequently used Buttons

“ 

”：click it to return to the main screen.

“ 

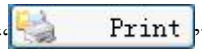
”：click it to do the default setting.

“ 

”：click it to confirm the setting.

“ 

”：click it to select the bedside monitor for key monitoring, eg. Bed 1.

“ 

”：click it to print the on-line strip chart or history data report for the current patient under key monitoring.

“☑”: select it to turn on the certain function in the current window.

“☐”: un-select it to turn off the certain function in the current window.

CHPTER 4 SYSTEM MENU

We will introduce the menu functions listed in the following figure 4.1.

Figure 4.1

Click " 

" icon to enter into system menu screen.

4.1 User Login

Each time the user start up this system, the system will auto enter into the "User Login" window, as shown in figure 4.2. Only entering the correct User Name and Password can the user be logged in the system successfully.

Figure 4.2 User Login

Note: the default user is Admin, and the default password is 888888. The user can change this default password.

4.2 Change Password

On System Menu screen, click "Change password" to change the current login user's password. Please entering the old password and the new password, then click "OK" button to confirm and complete the changing.

Figure 4.3 Change password

4.3 Logout

While the patient monitoring task is end or the medical staff needs to shift work, it is necessary to logout this user account. On system menu screen, click on "Logout", a window pops up on the screen, as shown in figure 4.4, then click on "Yes", and the User can be logged out when the correct password is entered.

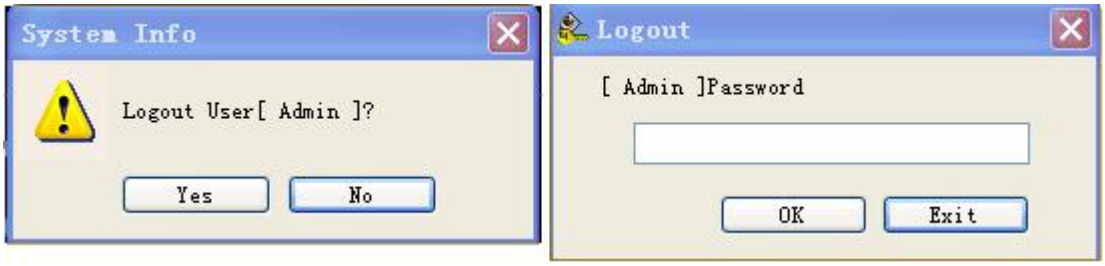


Figure 4.4 Logout

4.4 Change Login

If the user needs to switch the current Login account to another Login account, then the user should click on "Change Login" on system menu screen, and select user on the pull-down menu firstly, then input correct password, as shown in figure 4.5, at last, click "OK" button to complete the changing.

Figure 4.5 Change login

4.5 User Manager

On System Menu screen, click on "User Manager" to enter into User Manager screen, as shown in figure 4.6.
There are 4 kinds of users (with 4 different permission levels) in total: Administrator, Super User, Operating User and General User. Each user has different access permission, but the Administrator has been authorized for all operations including System setting, System Log, Monitor setting, User Manager and History.

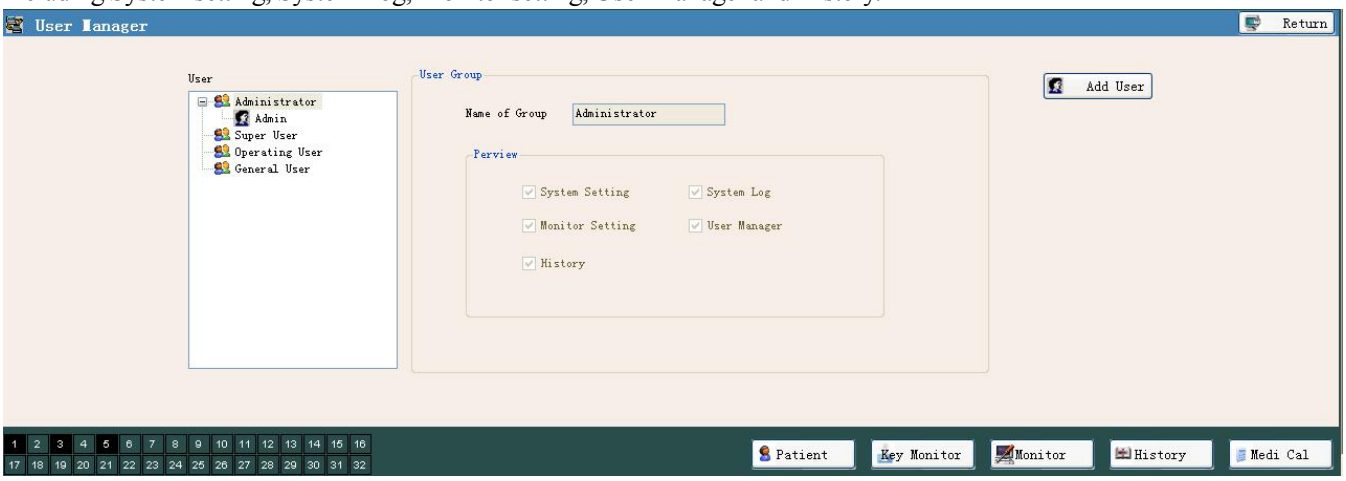
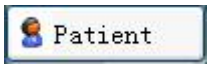
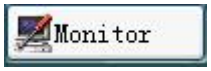
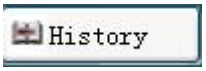
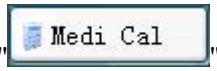


Figure 4.6 User Manager

Notes:

1) The most of user manager window is displayed on the lower screen, so we will not cover them in detail again.

2) Click on "  ", "  ", "  ", "  ", and "  " can enter into the corresponding window. Please refer to Chapter 5 for details.

- Add new user

Click on "Add User" button, then a user information window pops up on the screen, as shown in figure 4.7.

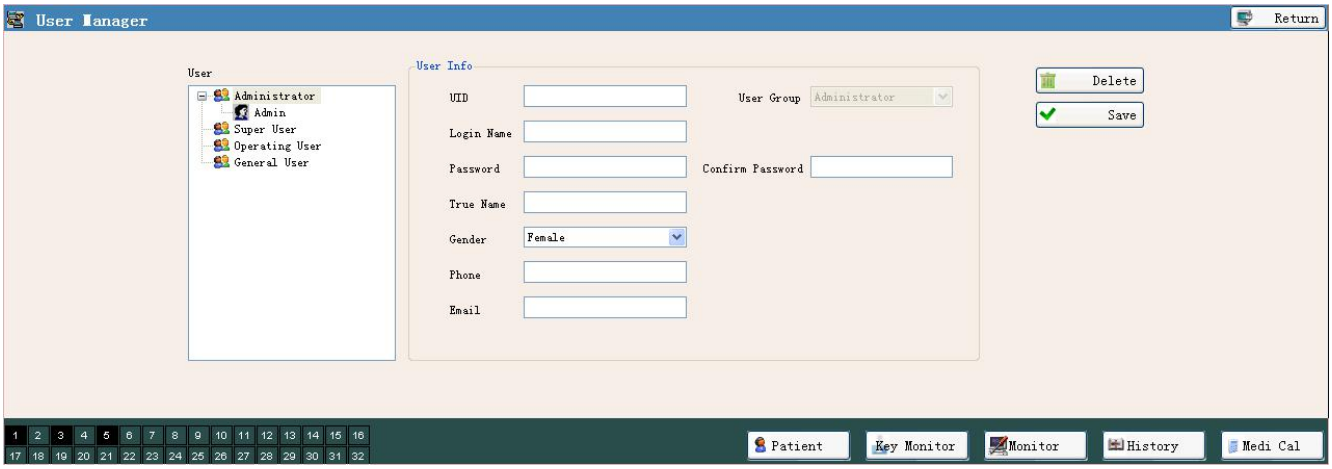


Figure 4.7 Add user

Description:

- ✧ UID: enter the user's (medical personnel's) ID.
- ✧ User Group: select the user group in the pull-down menu.
- ✧ Login Name: enter the login name, this item is required.
- ✧ Password: enter the login password, this item is required.
- ✧ Confirm Password: enter the login password again, this item is required.
- ✧ True name: enter the user's true name

- ✧ Gender: select the user's gender for the pull-down menu, options: "M" for male and "F" for female.
- ✧ Phone: enter the user's telephone number
- ✧ Email: enter the user's email address.

If you want to delete a given user, select the user you want to delete and click on "Delete" button to delete it.

4.6 System Setting

➢ **System Setting**

On system setting screen, click on "System Setting" to enter into the general system setting, as shown in figure 4.8.

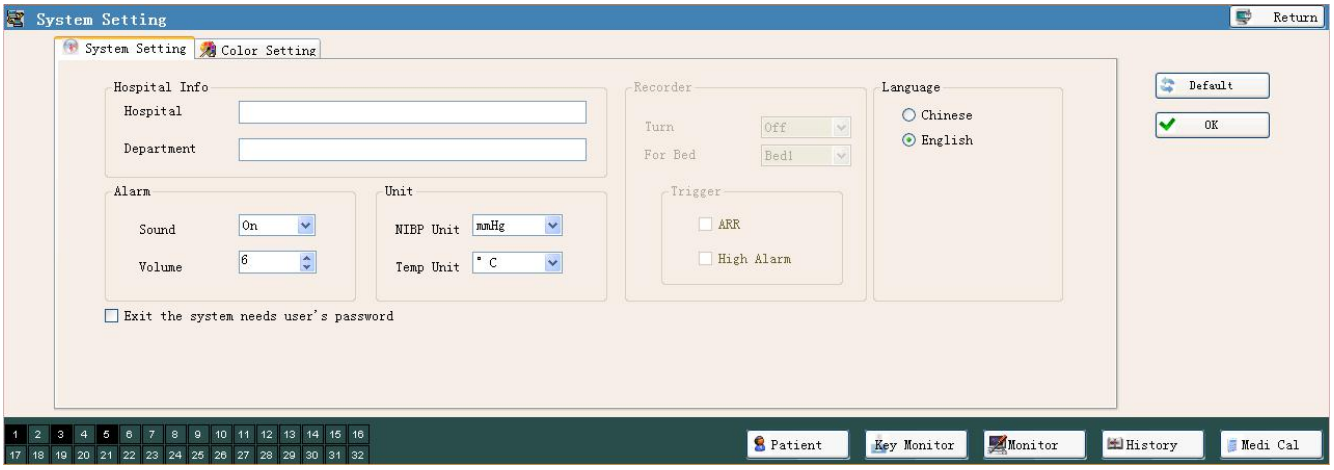
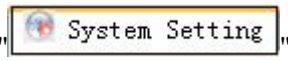


Figure 4.8 System setting

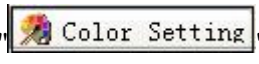
Description:

- ✧ **Hospital Info.**
  Hospital: enter into hospital name.
  Department: enter into the department name.
- ✧ **Alarm**
  Sound: turn on or off the alarm sound.
  Volume: select the alarm sound volume.
- ✧ **Unit**
  NIBP unit: mmHg and kPa for optional
  TEMP unit: °C (Celsius) and °F (Fahrenheit) for optional
  Note: setup the NIBP unit and TEMP unit of the all bedside monitors connected with this system.
- ✧ **Recorder** (optional)
  Note: this item can be selected only when the recorder is connected with this system, or it will display in gray and can not be set.
- ✧ **Language:** can set between Chinese and English.

Definition of Functional Buttons

" 

": click on this icon to enter into the system setting window (as shown in figure 4.8).

" 

": click on this icon to enter into the system color setting window.

" 

": select this check-box means the user needs to enter the password when he/she exits the system.

➢ **Color Setting**

Click on "Color Setting" to enter into system color setting, as shown in figure 4.9.

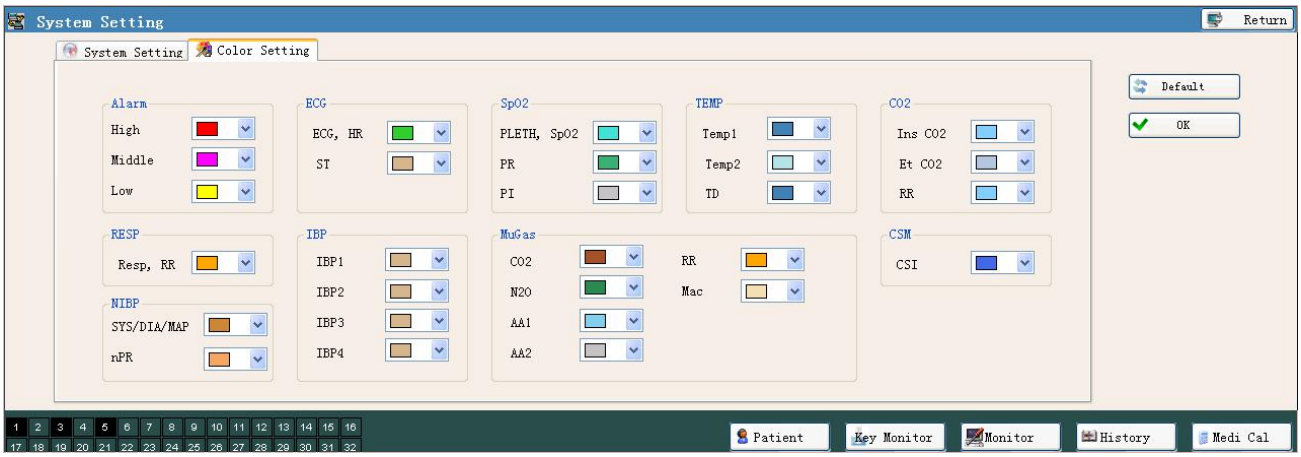


Figure 4.9 Color setting

Description

✧ **Alarm**

High level: set the indication color of high priority alarm.

Middle level: set the indication color of middle priority alarm.

Low level: set the indication color of low priority alarm.

✧ **ECG**

ECG, HR: set the displaying color of ECG waveform and HR value.

ST: set the displaying color of parameters related with ST.

✧ **SpO_2**

PLETH, SpO_2: set the displaying color of plethysmogram and SpO_2 value.

PR: set the displaying color of PR value.

✧ **TEMP**

TEMP1: set the displaying color of TEMP1 value.

TEMP2: set the displaying color of TEMP2 value.

TD: set the displaying color of the absolute value of temperature difference between TEMP1 and TEMP2

✧ **CO2**

InsCO_2: set the displaying color of InsCO_2 value

EtCO_2: set the displaying color of EtCO_2 value.

RR: set the displaying color of RR value

✧ **RESP**

Resp,RR: set the color of respiratory waveform and RR value.

✧ **NIBP**

SYS/DIA/MAP: set the displaying color of systolic/ diastolic/mean arterial pressure value.

nPR: set the displaying color of nPR value

✧ **IBP (optional)**

IBP1: set the displaying color of IBP1.

IBP2: set the displaying color of IBP2.

IBP3: set the displaying color of IBP3.

IBP4: set the displaying color of IBP4.

✧ **MuGas (optional)**

CO_2: set the displaying color of CO_2.

N_2O： set the displaying color of N_2O.

AA1： set the displaying color of primary anaesthesia agent.

AA2： set the displaying color of secondary anaesthesia agent.

RR： set the displaying color of respiration rate.

Mac: set the displaying color of the minimum alveolar concentration.

✧ **CSM (optional)**

CSI: set the displaying color of cerebral state index.

4.7 Layout Setting

Click on "Layout Setting" to enter into layout setting screen, as shown in figure 4.10.

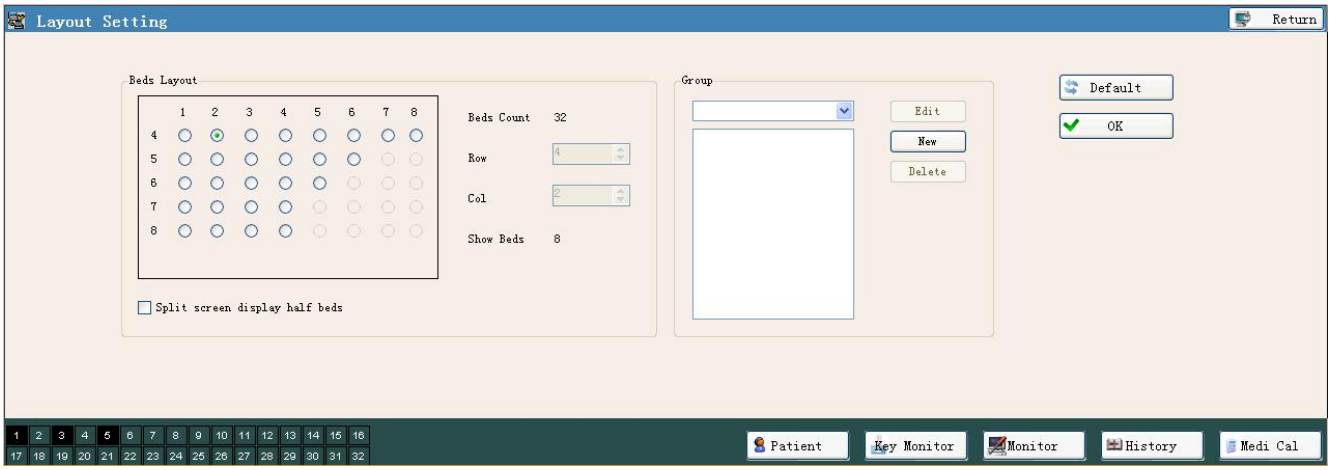


Figure 4.10 Layout setting

Description

✧ Beds layout (bedsides monitor layout)

Select icons "○" of the row and column indicates, the corresponding layout is the selected layout which will be displayed on the right side.

For example, as shown in figure 4.10, the selected layout is (4*2) 8 beds, including 4 rows and 2 columns. The default layout is (4*2) 8 beds.

✧ Beds group

Set the bedsides monitor group.

Definition of Functional Buttons

"Split screen display half beds": each screen (for dual display screens) displays 1/2 of the total beds if your click it.

Operation Description

❖ Click the corresponding "○" in the rectangle can set the beds layout.

❖ Add/edit/delete the bed group

Add: add a new bed group. Select the bed and name it, click "Save" to save the bed group.

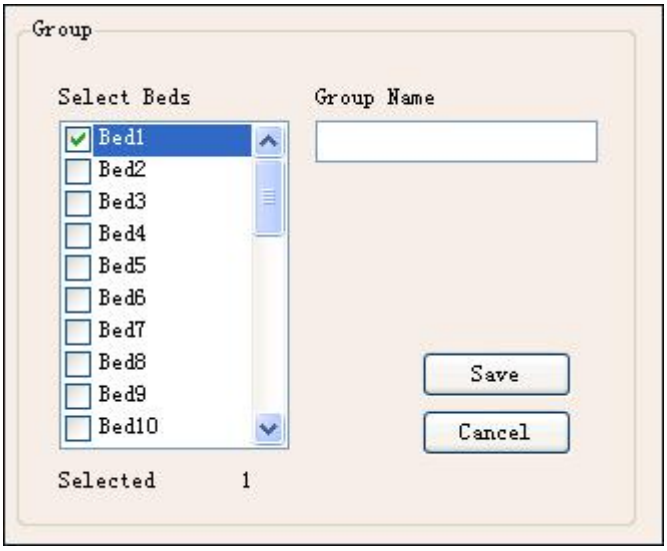


Figure 4.10A Add new bed group

Edit: edit the existed bed group. Select the group you need to edit, then click "Edit" to edit.

Delete: delete the existed bed group. Select the group you need to delete, then click "delete".

4.8 System Log

Click on "System Log" on system menu can enter into system Log window, as shown in figure 4.11.

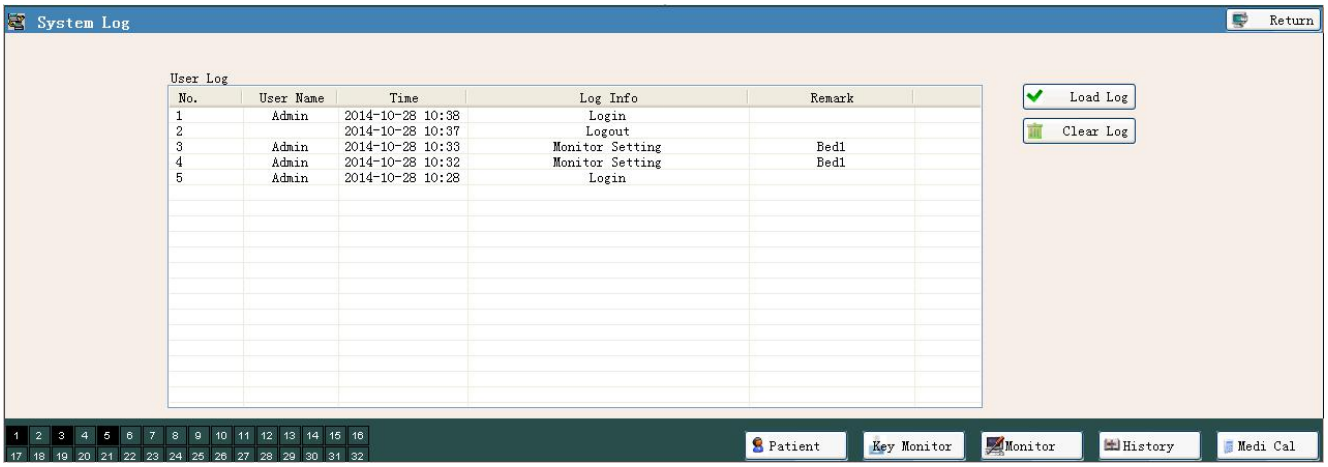


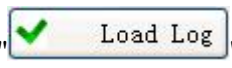
Figure 4.11 System log

All system operations, including logout, quit, system setting, login and bed monitor, will be recorded in system log.

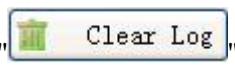
Description

The user logs will be listed by numbers, the information in user log includes user name, operating time, and monitoring setting etc..

Definition of Functional Buttons

" 

": click it to refresh the logs.

" 

": click it to delete all logs.

4.9 About system

Click on "About" on system menu to view the system information including software version, disk space etc.. as shown in figure 4.12.

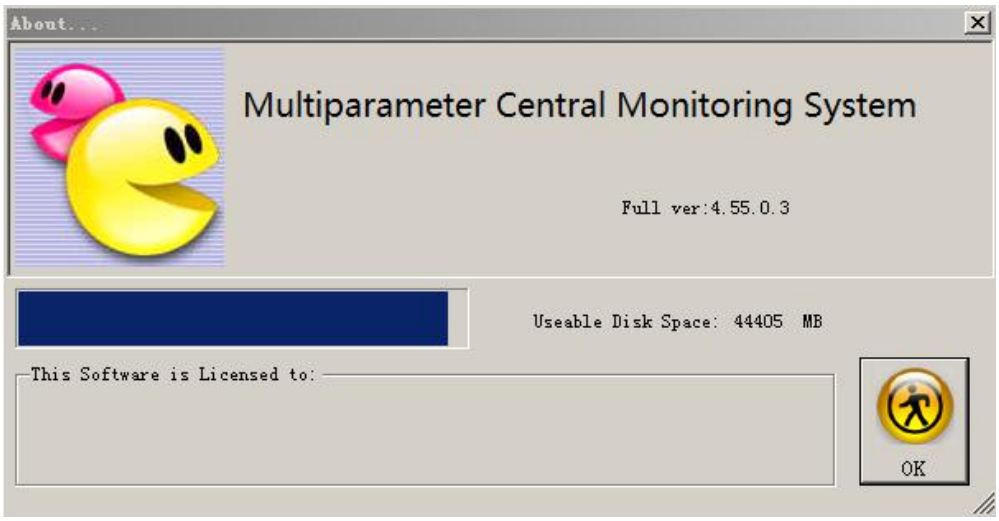
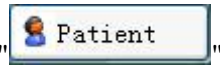


Figure 4.12 About system

CHAPTER 5 SHORTCUT BUTTONS

The shortcut buttons are locating at the lower right corner, as shown in figure 5.1, including "Patient", "Key Monitor", "Monitor Setting", "History" and "Medi Cal (Medicine Calculation)".

5.1 Monitoring Patient

Add or edit the patient archive for a bedside monitor. Click on patient icon " 

" on lower right corner to enter into the patient information window, as shown in figure 5.1.

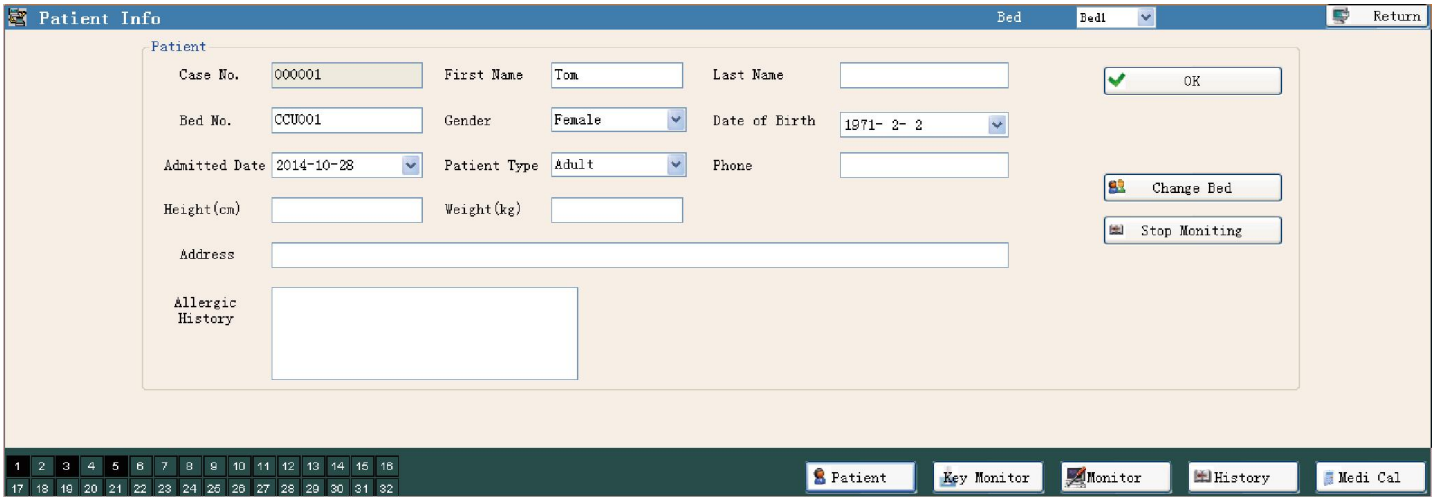


Figure 5.1

Operation Procedures

1) Select bed: click on the pull-down menu " 

" to select the bedside monitor.

2) Enter the patient information:

- ✧ Case No.: case number of the patient.
- ✧ First name: patient's first name.
- ✧ Last name: patient's last name.
- ✧ Bed no.: patient's bed number.
- ✧ Gender: select the patient's gender.
- ✧ Date of birth: select the patient's birthday (Year/ Month/Day).
- ✧ Admitted date: select the date when the patient enters into the hospital (Year/ Month/Day).
- ✧ Patient type: select the patient type among adult, pediatric and neonate.
- ✧ Phone: enter the patient's phone number.
- ✧ Height: enter the patient's height.
- ✧ Weight: enter the patient's weight.
- ✧ Address: enter the patient's address.
- ✧ Allergic history: enter any allergic history the patient suffered from.

Definition of the functional buttons

" 

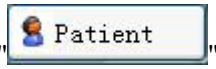
": click this button to perform operation when the patient changes to another bedside monitor.

" 

": Click this button to stop monitoring the current patient. The information of this selected

patient will be saved on history records.
Note: the "Case No." can not be modified when modifying the patient's information.

5.2 Key Monitoring

Click on key monitor icon " 

" on lower right corner to enter into the key monitoring window, as shown in figure 5.2.

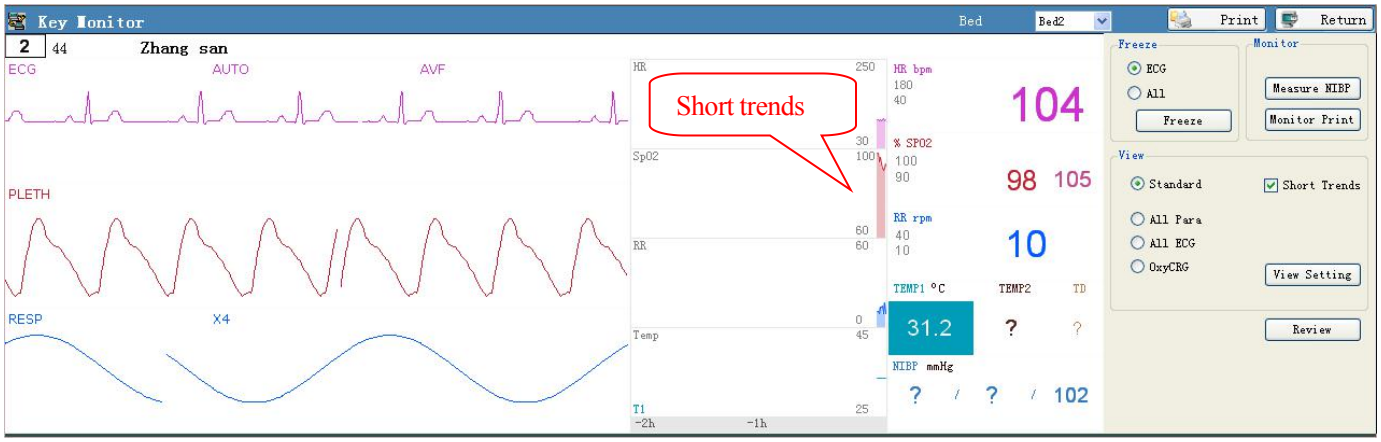
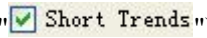
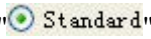


Figure 5.2 A Key monitoring (standard view)

Note: if the view is set as "Standard", then the Short trends icon (" 

") pops up automatically on the side of Standard (" 

") icon, and the short trends display on the middle of the screen view, as shown in figure 5.2A.

There are 4 kinds of screen views for key monitoring, including standard view, all parameters view, all ECG view and OxyCRG, as shown in figure 5.2. If an alarm event is detected, the alarm information will be displayed on key monitoring screen, as shown in figure 5.2C, if you click the alarm icon "  ", then the alarm for the current event will be disabled. And if the next alarm occurs, the alarm resumes.

Figure 5.2B Key monitoring (all parameters view)

Figure 5.2C Key monitoring (all ECG view)

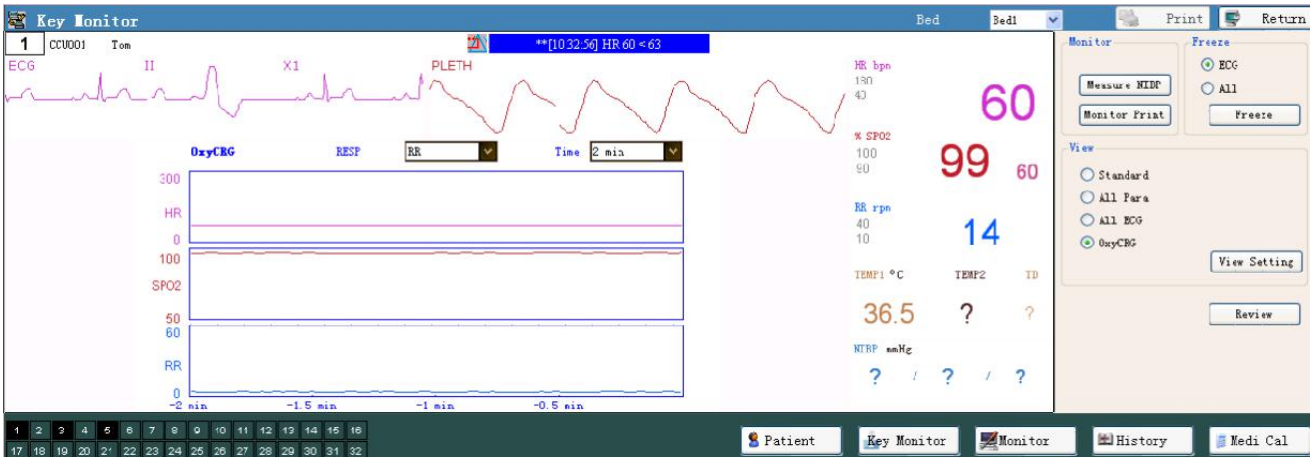


Figure 5.2C Key monitoring (OxyCRG view)

Description

➢ **Waveform area**

It displays bed number, patient name, waveform and parameter value of the key monitoring patient.

✧ ECG: ECG signal waveform, it displays the display gain (eg. X1) and Lead name (eg. II).

✧ PLETH: plethysmogram.

✧ RESP: respiratory waveform.

✧ IBPn: IBP channel (n=1, 2, 3, 4).

✧ OxyCRG: oxycardio respiration graph (SpO_2/HR/RR trend graph)

➢ **Parameter area**

It displays the measured parameters for the patient under key monitoring.

(A) ECG parameter

(B) SpO_2 parameter

(C) RESP parameter

(D) TEMP parameter

(E) NIBP parameter

✧ ECG parameter

HR bpm: the symbol and unit of the heart rate.

180: the high alarm limit for heart rate.
40: the low alarm limit for heart rate.
60: value of heart rate.

✧ SpO_2 parameter

%SpO_2: the symbol and unit of the SpO_2.
100: the high alarm limit for SpO_2.
90: the low alarm limit for SpO_2.
99: measured SpO_2 value.
60: value of pulse rate.

✧ RESP parameter

RR rpm: the symbol and unit of the respiration rate.
40: the high alarm limit for respiration rate.
10: the low alarm limit for respiration rate.
16: the measured respiration rate

✧ TEMP parameter

TEMP1: the symbol of temperature 1.
TEMP2: the symbol of temperature2.
℃: the unit of temperature.
TD: the absolute value of temperature difference between TEMP1 and TEMP2.
36.5: the measured temperature value.
?: value is not available.

✧ NIBP parameter

NIBP mmHg: the symbol and unit of the NIBP.

➢ **Operating area**

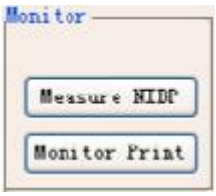


Figure 5.4A

Figure 5.4B

Figure 5.4C

✧ **Monitor**

"Measure NIBP": click it to start/cancel NIBP measurement on the bedside monitor.

"Monitor Print": click it to start/cancel the printing on the bedside monitor.

✧ **(Waveform) Freeze**

ECG waveform or all waveforms can be chosen to be frozen. Click "ECG" to freeze ECG waveform, and click "All" to freeze all waveforms on key monitoring window.

Click "Freeze" to confirm the setting.of freezing ECG waveform or All waveform.

✧ **View**

4 kinds of display views can be selected, they are Standard view, all parameter view, ECG parameter view, OxyCRG

view and Multi-gas view. select a certain view and click on "View Setting" to enter into the view setting for this selected view. Refer to the operation description for details. (Note: if "Standard" screen view is selected, then the tick of "Short trends" ("Short Trends") will appear automatically on the side of "Standard" ("Standard") selected item.

Definition of the functional button

"Review": click on this button to review the measured parameter data of the current patient. Refer to Section 6.3 for details.

Operation Description

❖ For meet the different needs, the system provides different monitoring views whose layout can be set. Please refer to the following procedures:

① Click and choose the monitoring view, for example, choose "Standard".

② If you need to change the current layout, click on "View Setting" to enter into the setting window. The figure 5.5 shows the view setting for the standard view.

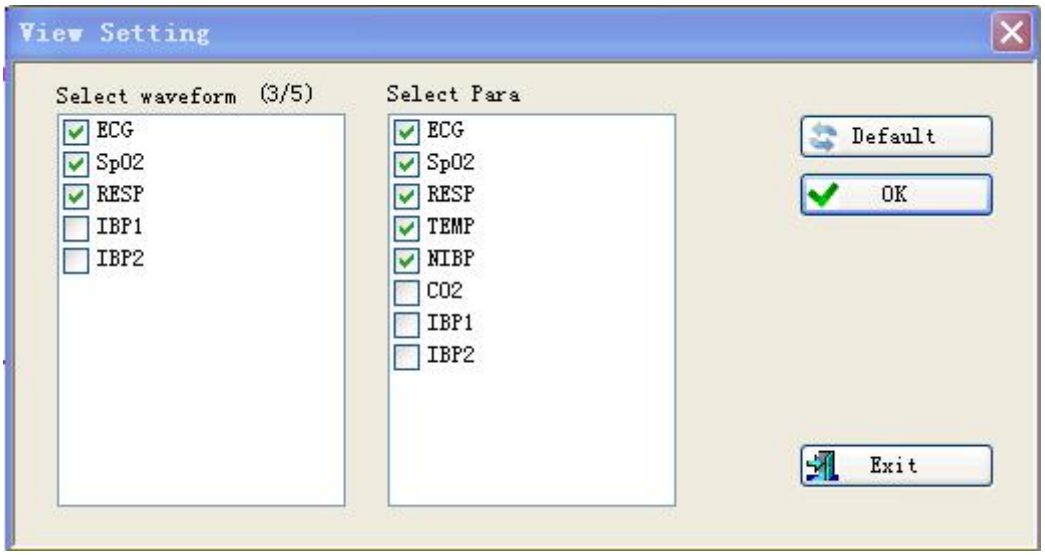


Figure 5.5 View setting

Select waveform: select the displaying waveform, options: ECG,SpO_2, RESP, IBP1 and IBP2.

Select parameter: select the displaying parameter, options: ECG,SpO_2, RESP, REMP, NIBP, CO_2, IBP1 and IBP2.

③ Click on "OK" button to complete the setting; Click on "Exit" button to quit the setting.

❖ If you need to change the bed monitor for key monitoring, click on "Bed Bed1" to choose the bed.

5.3 Monitor Setting

Click on "Monitor" icon at lower right corner to enter into the monitor setting window.

1) When the version of communication protocol between central server and bedside monitor is selected as V2.5 or lower version, then the monitor setting window is as shown in figure 5.6A.

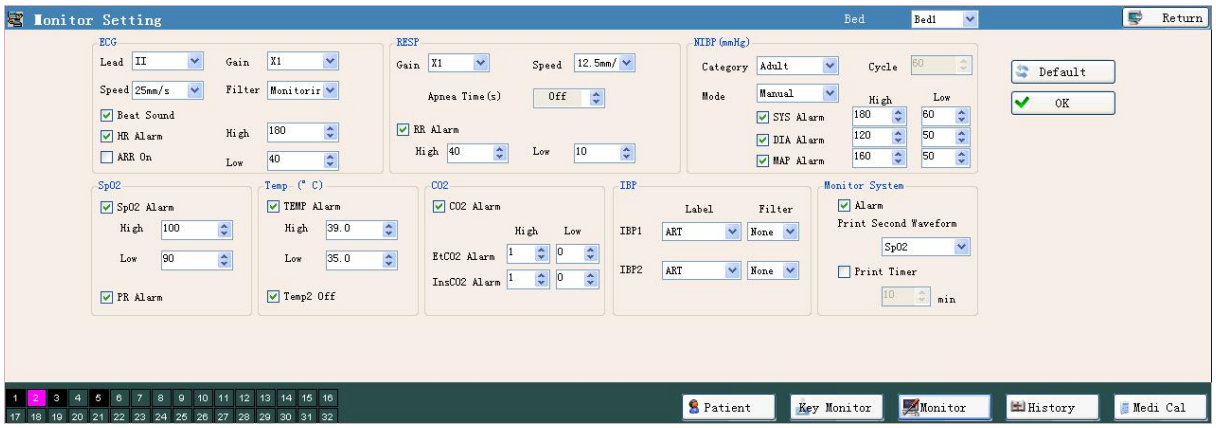


Figure 5.6A (Bedside) Monitor setting----for the communication protocol earlier than V2.5

Description

ECG

- ✧ **Lead:** Can be chosen among lead I, II, III, aVR, aVL, aVF, and V.
- ✧ **Gain:** The ECG display gain. 4 options: x1/2, x1, x2 and Auto.
- ✧ **Speed:** ECG waveform sweeping speed. 4 options: 12.5 mm/s, 25 mm/s and 50 mm/s.
- ✧ **Filter:** ECG filtering mode. Three options: MON, DIA, and OPE
- ✧ **Beat sound:** The pulse beat sound during monitoring. Select it to turn on the pulse beep, un-select it to turn off it.
- ✧ **HR Alarm:**Select it to turn on HR alarm, un-select it to turn off it.
- ✧ **ARR on:** Arrhythmic detection. Select it to turn on arrhythmic detection function, un-select it to turn off it.
- ✧ **High/Low:** The high/low alarm setting for heart rate, setting range is 0~350, the default for adult is 180 and 40 respectively.

RESP

- ✧ **Gain:** Respiration display gain, 4 options, ×1/2, ×1, ×2, ×4.
- ✧ **Speed:** Respiration waveform sweeping speed. 2 options: 6.25mm/s and 12.5 mm/s..
- ✧ **Apnea:** The timeout setting for apnea alarm (in second), the specified time is 5-80 seconds.
- ✧ **RR High/Low:** The high alarm limit setting for respiration rate, adjustable 1~150, the default is 40 and 10 respectively.

NIBP

- ✧ **Category:** patient type for NIBP measurement. 3 categories: adult, pediatric and neonate.
  NOTE: "Adult" mode can NOT be used on Pediatric or Neonatal patient. Otherwise limbs may be damaged due to highly inflated pressure and even ischemic necrosis may occur on the measured limb in the serious case.
- ✧ **Mode:** The measuring mode, manual or automatic for optional. If the "Manual" mode is chosen, the operator needs to press the NIBP button to perform blood pressure measurement. If the "Auto" mode is chosen, the operator needs to set an cycle interval as well. Refer to "Cycle" for details.
- ✧ **Cycle:** The time interval between measurement when the measuring mode is set as Auto. Setting range is 0~480min. If the cycle is set as "0", and measuring mode is set as "STAT" (STAT can only be used for adult), and pressing the NIBP measurement key, then the system will do NIBP measurement again and again for 5 minutes.
- ✧ "☑ SYS Alarm": the over-limit alarm function for systolic pressure.
  High/Low: different range for different patient category, refer to form 5-1.
- ✧ "☑ DIA Alarm": the over-limit alarm function for diastolic pressure.
  High/Low: different range for different patient category, refer to form 5-1.
- ✧ "☑ MAP Alarm": the over-limit alarm function for mean arterial pressure.
  High/Low: different range for different patient category, refer to form 5-1.

Pressure （Unit）mmHg		Adult	Pediatric	Neonate
SYS	High	（30～350）	（30～200）	（30～135）
	Low	（29～349）	（29～199）	（29～134）
	Default	（High 180，Low 60）	（High 130，Low 50）	（High 110，Low 50）
DIA	High	（11～350）	（11～200）	（11～135）
	Low	（10～349）	（10～199）	（10～134）
	Default	（High160，Low 50）	（High 90，Low 40）	（High 90，Low 30）
MAP	High	（21～350）	（21～200）	（21～135）
	Low	（20～349）	（20～199）	（20～134）
	Default	（High120，Low 50）	（High 110，Low 40）	（High 100，Low 30）

Form 5-1 NIBP High/ Low alarm limit setting range and default value

SpO_2

✧ SpO_2 Alarm: the over-limit alarm function for SpO_2.
High/Low: alarm range is0 ~100, the default for adult is 100 and 90 respectively.

✧ PR Alarm: the over-limit alarm function for PR. Note: the high/low alarm value for PR is the same as that for HR.

TEMP

✧ TEMP Alarm: the over-limit alarm function for temperature.
High/Low: alarm range is0 ~60, the default is 35.0 and 39.0 respectively.

✧ TEMP2 off: TEMP2 can be selected to turn off, because some monitors have no such function.

CO_2

✧ CO_2 Alarm: the over-limit alarm function for CO_2.

✧ High/Low EtCO_2 Alarm: alarm setting range is 0~160, the default is 70 and 10 respectively.

✧ High/Low InsCO_2 Alarm: alarm setting range is 0~60, the default is 10 and 0 respectively.

IBP (optional)

✧ IBP1: invasive blood pressure channel 1 setting
Label: the name of blood pressure to be measured.it has the following options:

ART---artery pressure PA---pulmonary pressure
CVP---central vain pressure RAP---right atrium pressure
LAP---left atrium pressure ICP---intracranial pressure
AUXP1---Auxiliary pressure 1 AUXP2---Auxiliary pressure 2

Filter: there are 4 options for the IBP1 waveform filtering: 12.5Hz and 20Hz

✧ IBP2: invasive blood pressure channel 2 setting
Label: the name of blood pressure to be measured.it has the following 6 options:

ART---artery pressure PA---pulmonary pressure
CVP---central vain pressure RAP---right atrium pressure
LAP---left atrium pressure ICP---intracranial pressure
AUXP1---Auxiliary pressure 1 AUXP2---Auxiliary pressure 2

Filter: there are 4 options for the IBP2 waveform filtering: 12.5Hz and 20Hz

Monitor System

✧ Alarm: the alarm sound switch for bedside monitor, select it to turn on the alarm sound.

✧ Print second waveform: 4 options: SpO_2, RESP, IBP1 and IBP2.

✧ Print Timer: the cycle setting for print timer.
The cycle setting range is 1~240min, the default is 60min.

<u>On Monitor Setting window, the operator can perform parameter setting on each bedside monitor when they are connected with this system.</u>

2) When the version of communication protocol between central server and bedside monitor is selected as V3.2 or higher, then there are several tabs in monitor setting window, including standard 6 parameters (ECG, SpO_2, PR, RESP, TEMP and NIBP), IBP, CO_2 (optional) and CSM (optional), as shown in figure 5.6B,5.6C, 5.6D and figure 5.6E.

Note： All parameters setting is similar to that in Patient Monitor, refer to the related setting in User Manual of the corresponding Patient Monitor.

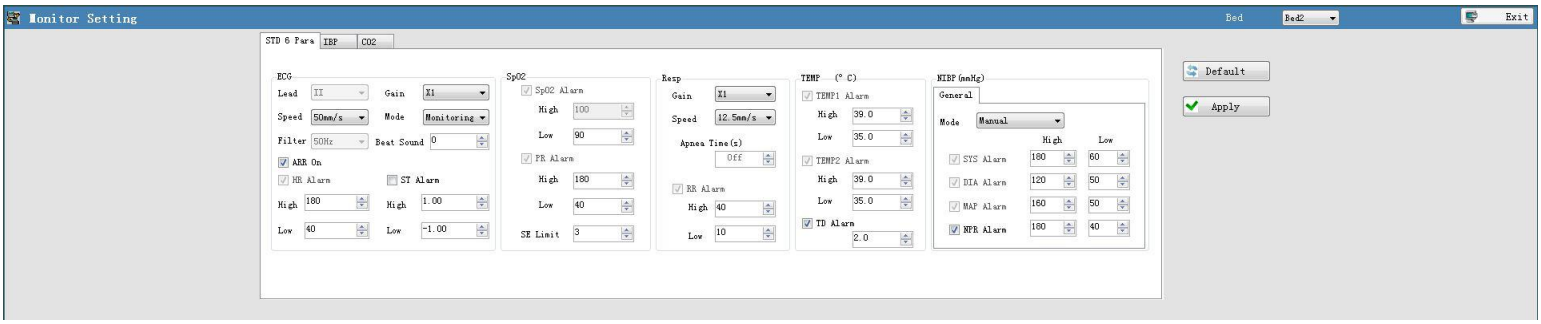


Figure 5.6B (Bedside) Monitor setting (standard 6 parameters)----for the communication protocol is V3.2 or higher

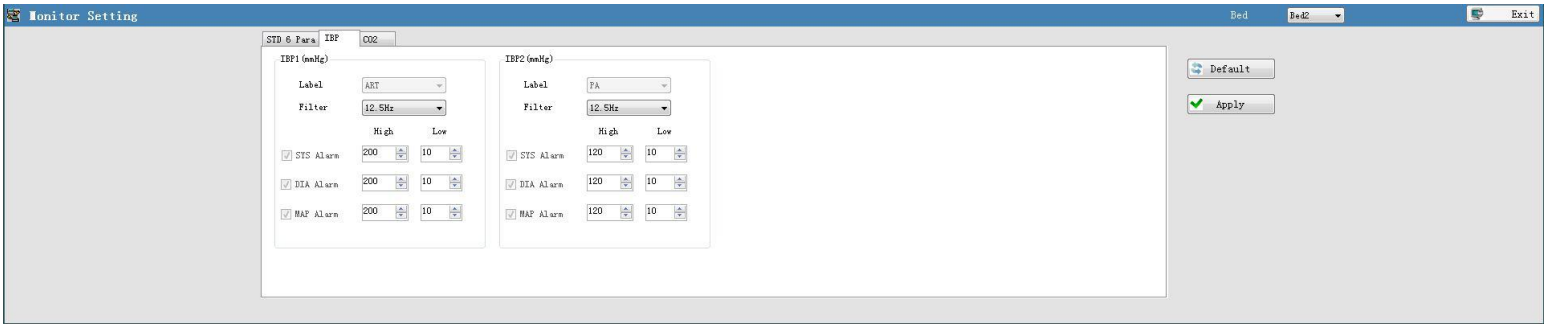


Figure 5.6C (Bedside) Monitor setting (IBP)----for the communication protocol is V3.2 or higher

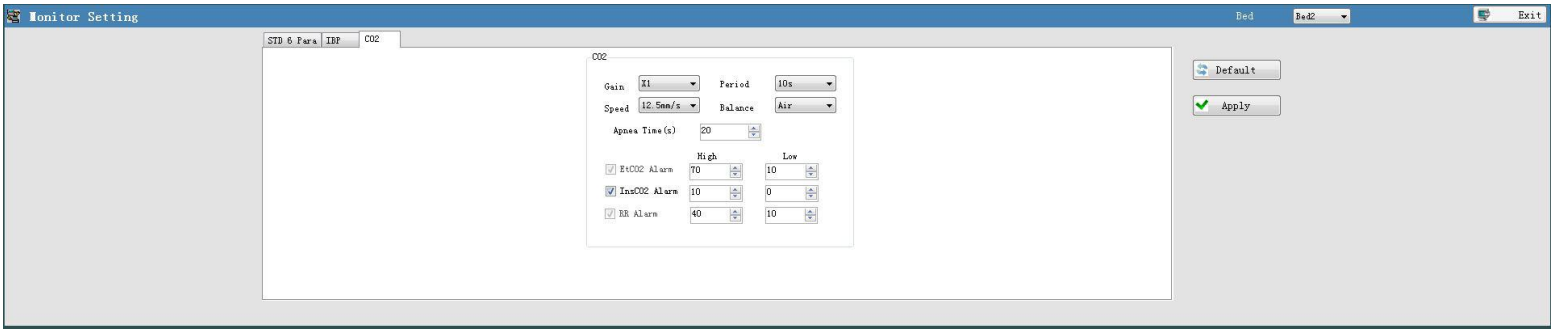


Figure 5.6D (Bedside) Monitor setting (CO_2)----for the communication protocol is V3.2 or higher

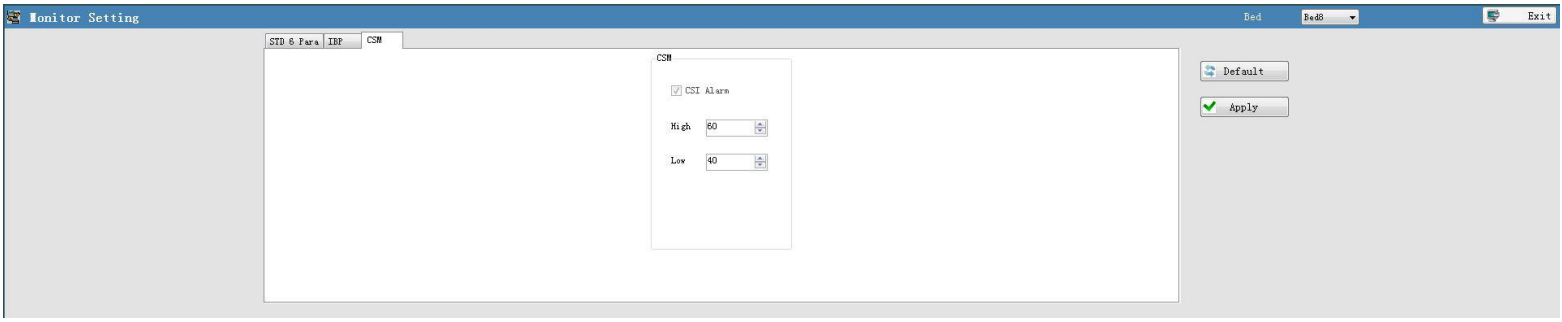


Figure 5.6E (Bedside) Monitor setting (CSM)----for the communication protocol is V3.2 or higher

CSM (optional)

CSI alarm: the over-limit alarm function for CSI.
High: setting range is from 1 to 100, the factory default is 60.
Low: setting range is from 0 to 99, the factory default is 40.

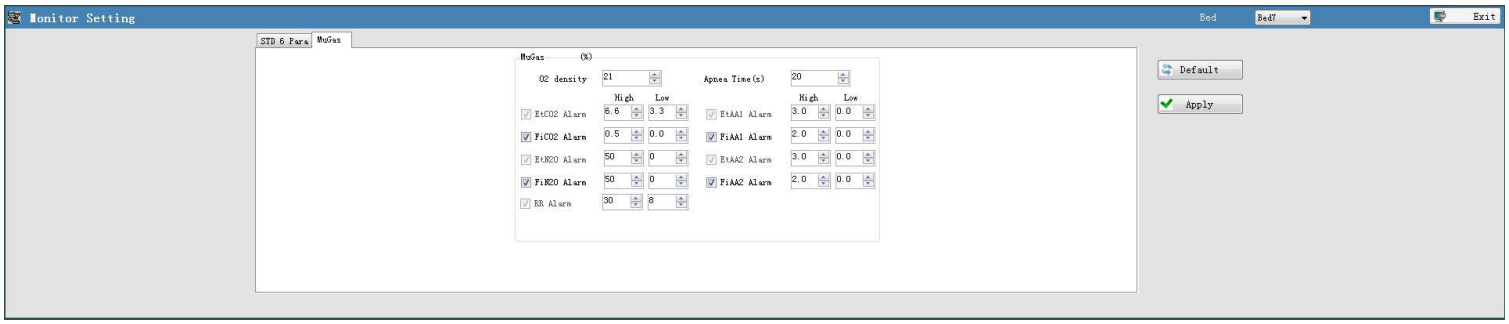
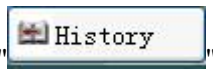


Figure 5.6F (Bedside) Monitor setting (Multi-gas)----for the communication protocol is V3.2 or higher

Multi-gas (optional)

- ✧ O_2 density: to set the oxygen density. Setting range: 0~100(%), the factory default is 21.
- ✧ Apnea time(s): to set the apnea time of triggering alarm. Setting range:2 0~60(s), the factory default is 21.
- ✧ $EtCO_2$ Alarm: the over-limit alarm function for $EtCO_2$.
  High: Setting range:1~15(%), the factory default is 5(%).
  Low: Setting range: 0~14.9(%), the factory default is 2(%).
- ✧ $FiCO_2$ Alarm: the over-limit alarm function for $FiCO_2$.
  High: Setting range: 1~15, the factory default is 0.5.
  Low: Setting range: 0~14.9(%), the factory default is 0.
- ✧ EtN_2O Alarm: the over-limit alarm function for EtN_2O.
  High: Setting range: 1~100(%), the factory default is 55(%).
  Low: Setting range: 0~99(%), the factory default is 0.
- ✧ FiN_2O Alarm: the over-limit alarm function for FiN_2O.
  High: Setting range: 1~100(%), the factory default is 53(%).
  Low: Setting range: 0~99(%), the factory default is 0.
- ✧ RR Alarm: the over-limit alarm function for RR.
  High: Setting range: 1~150(rpm), the factory default is 40 for adult.
  Low: Setting range: 0~149(rpm), the factory default is 10 for adult.
- ✧ EtAA1 Alarm: the over-limit alarm function for EtAA1.
  High: Setting range: 1~15(%), the factory default is 2.1(%).
  Low: Setting range: 0~14.9(%), the factory default is 0.
- ✧ FiAA1 Alarm: the over-limit alarm function for FiAA1.
  High: Setting range: 1~15(%), the factory default is 2.1(%).
  Low: Setting range: 0~14.9(%), the factory default is 0.
- ✧ EtAA2 Alarm: the over-limit alarm function for EtAA2.
  High: Setting range: 1~15(%), the factory default is 2.1(%).
  Low: Setting range: 0~14.9(%), the factory default is 0.
- ✧ FiAA2 Alarm: the over-limit alarm function for FiAA2.
  High: Setting range: 1~15(%), the factory default is 2.1(%).
  Low: Setting range: 0~14.9(%), the factory default is 0.

5.4 History Data Management

Click on " 

" icon to enter into history data management window, as shown in figure 5.7.

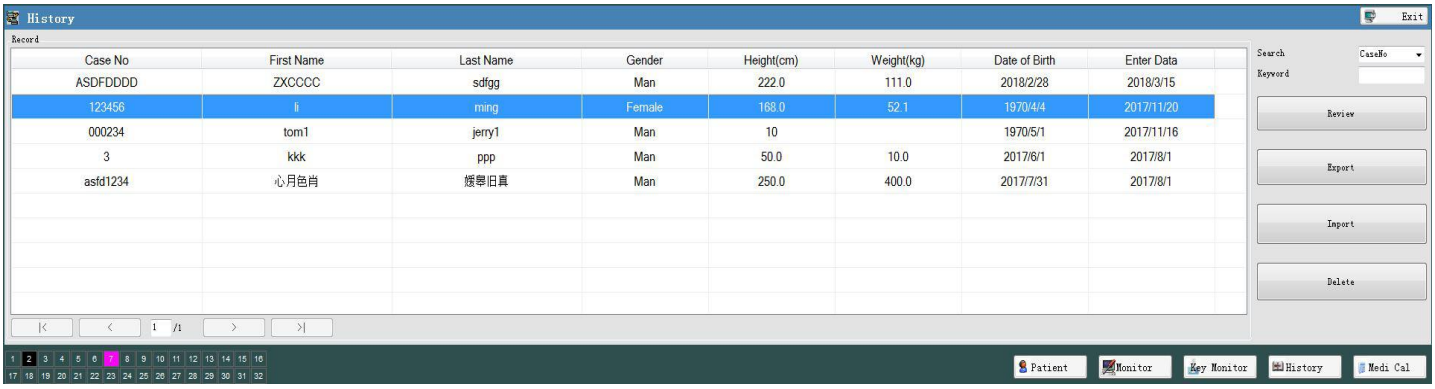


Figure 5.7 History management

Description

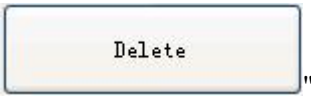
Each record shows the patient's case No., first name, last mane, gender, height, weight, date of birth and enter date.

Definition of the functional buttons

- " 

": click on this button to enter into "Review" window (details see Section 6.3), the current patient' record can be reviewed in this window.
- " 

": click on this button to export patient data, as shown in figure 5.8. It's recommended that the patient's data should be saved and exported time to time.
- " 

": click on this button to import data, as shown in figure 5.9. Open the file folder to select the data need to import, click "Open" to complete importing.
- " 

": select the record need to delete, click on this button to delete it.
- " 
", " 
", " 
", " 
": click them can turn to the first page, precious page, next page and the last page respectively.

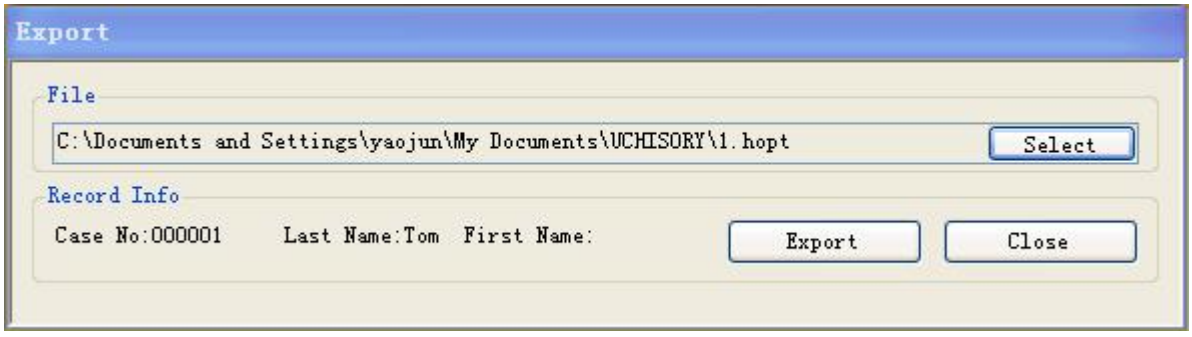


Figure 5.8 Export record

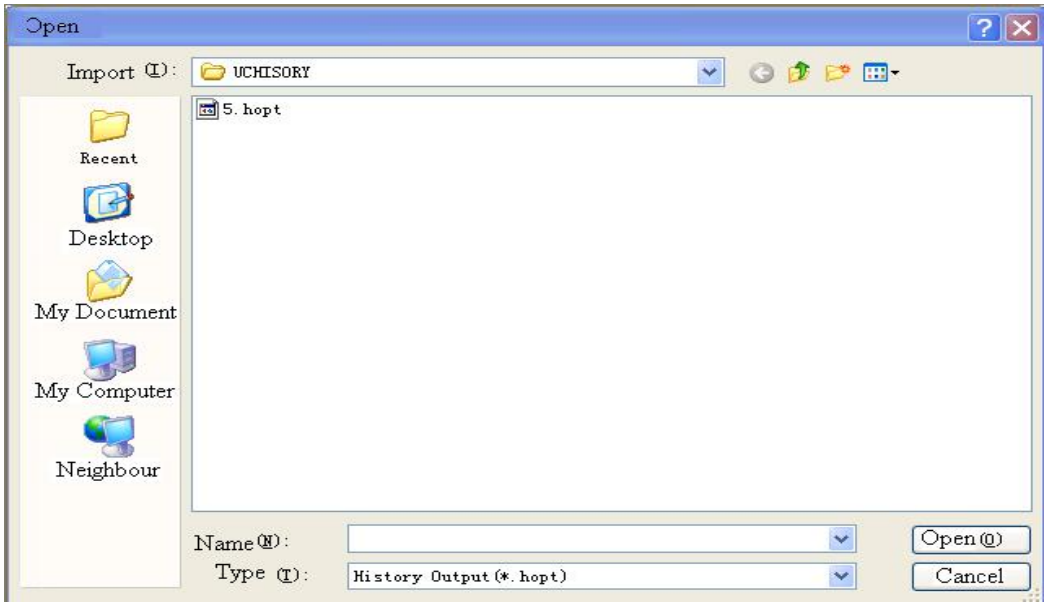


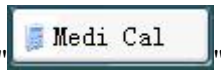
Figure 5.9 Import record

Operation Description

1) Select one patient in archive list, then this patient record can be reviewed, imported, exported and deleted.

2) If there are many history record, you can search by case No., or enter keyword to view the corresponding record.

5.5 Medicine Calculation

Click on " 

" icon to enter into medicine calculation window, as shown in figure 5.10.

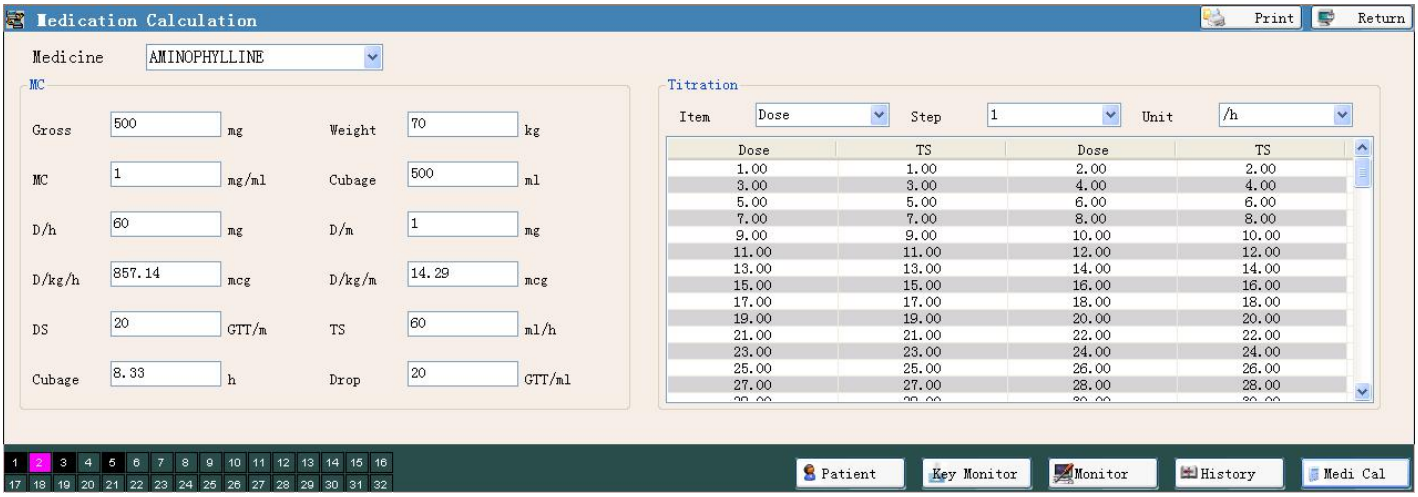


Figure 5.10 Medicine calculation

Description

There are 10 types of medicine which can be calculated to perform drug dosage: AMINOPHYLLINE, DOBUTAMINE, DOPAMINE, EPINEPHRINE, HEPARIN, ISUPREL, LIDOCAINE, NIPRIDE, NITROGLYCERIN, and PITOCIN.

✧ **Select Medicine Type:** 10 options: AMINOPHYLLINE, DOBUTAMINE, DOPAMINE, EPINEPHRINE,

HEPARIN, ISUPREL, LIDOCAINE, NIPRIDE, NITROGLYCERIN, and PITOCIN. The default is AMINOPHYLLINE.

✧ **Weight:** when enter into medicine calculation window, please enter the patient weight, the setting range is 0.5Kg~300Kg, the internal is 0.5Kg. The default are 70Kg for adult, 20Kg for pediatric and 3.0Kg for neonate .

✧ **Other items:** Generally, they are not needed to be adjusted after calculation. However, they can be fine-tuned practically. All other items results will be updated accordingly when an item fine-tuned.

🔔 The medicine applies the fixed unit, or a fixed family of units. The operator must select the appropriate unit according to doctor's advices. In a unit family, the carry between 2 adjacent units performs automatically along with the current inputs. When the space on screen for an item is not enough to display all digits of the item in a certain unit, it will be displayed as "…".

🔔 In neonate mode, "DS" and "Drop" items are ignored.

🔔 Note: the patient here has nothing to do with the current patient monitoring right now, and only for Medicine Calculation.

➢ **Medicine Calculation**

Drug Dosage Calculation adopts the following formula:

Medicine Consistency (MC) =Medicine Gross/ Cubage

(Dose/minute)= (Dose/hour) /60

(Dose/Kg/m)= (Dose/m) /Weight

(Dose/Kg/h)= (Dose/h) /Weight

Transfusion Speed (TS) = (Dose/h) /MC

Drop Speed=TS/ (Cubage/drop)

Duration=Medicine Gross/Dose/h）

☞ **Items definitions:**

MC: medicine consistency;
(D/m): dosage per minute;
(D/h): dosage per hour;
(D/Kg/m): dosage per kilogram per minute;
DS: drop speed;
TS: titration speed
(D/Kg/h): dosage per kilogram per hour;
Gross: medicine gross;

Important

1) All items in formulas above are consistent with those in the Medicine Calculation Window, as shown in figure 4.31.
2) In the Medicine Calculation Window, only "Medicine" and "Weight" are input items, all others are output items.
3) Because each output item has its own valid range, it will be displayed as "…" when the calculating result exceeds its range.

➢ **Titration**

Medicine calculation is on the left side and the right is Titration. There are 3 items on titration:

✧ **Item:** "Dose", "DS" and "TS" are selectable; if the option is "DS", the comparison table will be "Dose--DS" table and "Dose--TS" table. The operator will choose the value of "TS" and "DS" according to this table.

✧ **Step:** the value difference related with "Dose" option; setting range is from 1 to 10 (adjustable), the interval is 1.

✧ **Unit:** Dose unit; "/h", "/m", "/Kg/h" and "/Kg/m" selectable; when the unit is changed, the "TS" or "DS" are

changed correspondingly according to the former formula.

✧ **<1/25>**: the number on the lower side of data form. For example, "1/25" meas the current page/total pages.

Operation Description

1) Select the medicine type, for example, select AMINOPHYLLINE;

2) Set the patient's weight, for example, enter 70Kg;

3) If one of the item between "Medicine" and "Weight" is changed, the system will auto make calculation, and the refreshed result will be displayed on the screen.

CHAPTER 6 MONITORING MENU

Click on the bed number, then the monitoring menu pops up on the screen, as shown in figure 6.1. The menu includes "Patient Manager", "Layout Setting", "Monitor Setting", "Key Monitoring" and "Review". For "Monitor Setting" and "Key Monitoring", please refer to Section 5.3 and Section 5.2 for details.

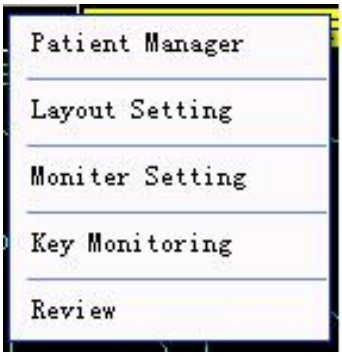


Figure 6.1 Monitoring menu

6.1 Patient Manager

Select "Patient Manager" on monitoring menu can shortcut enter into the Patient Manager Monitoring, as shown in figure 6.2.

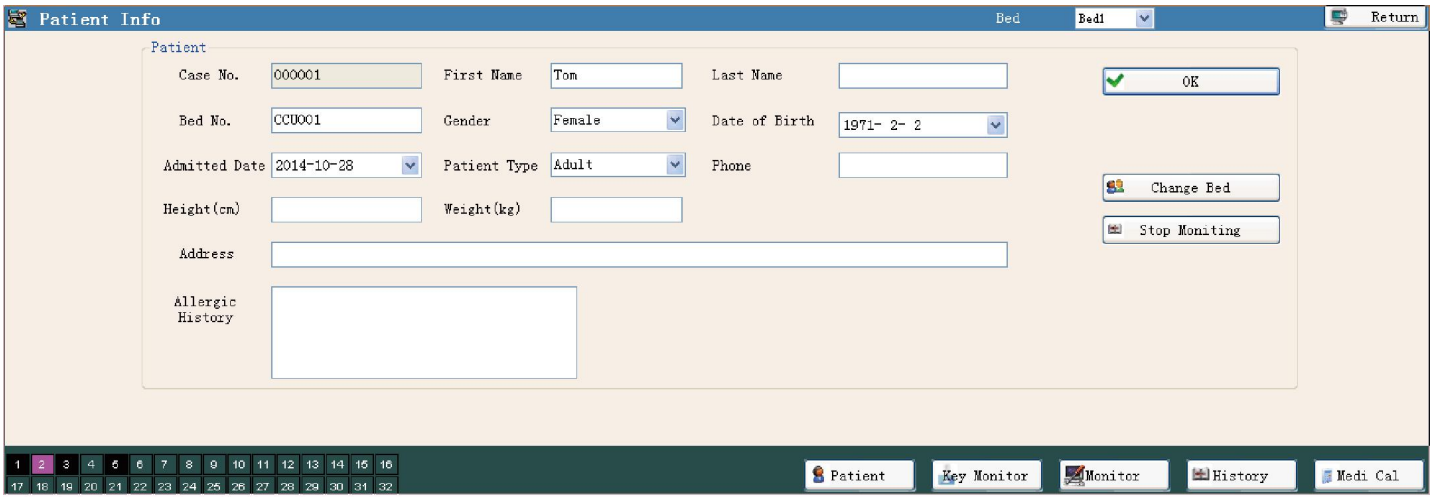


Figure 6.2 Patient manager window

Operation: click "OK" to confirm the setting. The operation and description are similar to that in Section 5.1, so we will not cover in detail again.

6.2 Layout Setting

Select "Layout Setting" on monitoring menu to enter into the Layout Setting window, as shown in figure 6.3.

Figure 6.3 Layout setting

Description

✧ **Waveform**

Waveform 1, 2, 3 and 4 can be chosen among ECG, PLETH, RESP, IBP1, IBP2 and NONE.

✧ **Parameter**

Layout type: "Single" and "Double" for optional.

Parameter 1~8 can be chosen among ECG, SpO_2, RESP, TEMP, NIBP, CO_2, IBP1, IBP2 and NONE.

6.3 Monitoring Data Review

Select "Review" on monitoring menu to enter into the Review window, as shown in figure 6.4.

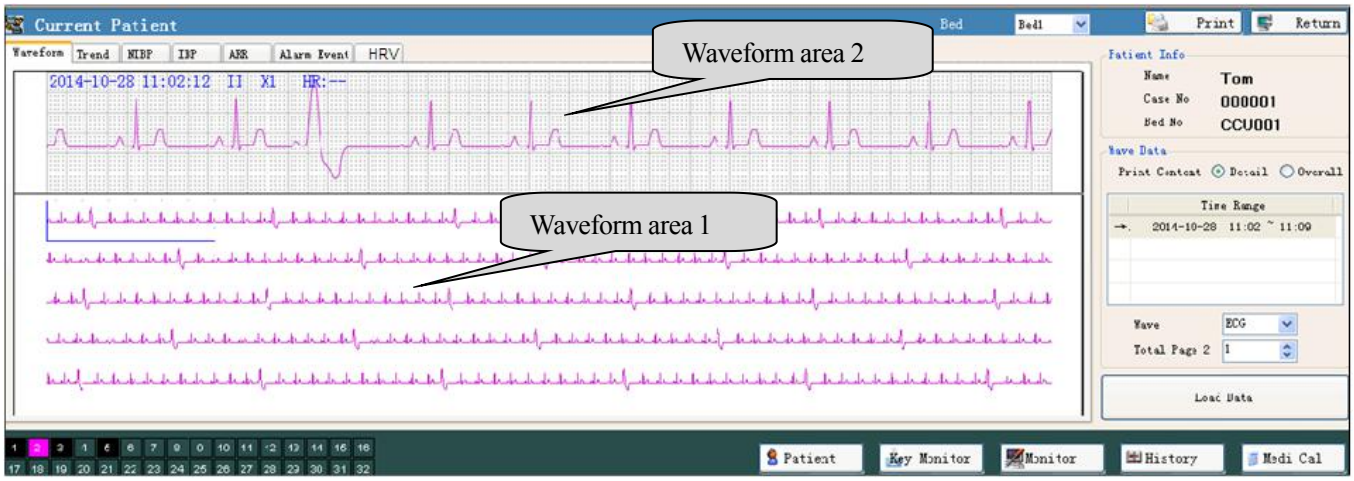


Figure 6.4 Review window

The operator can review the monitoring information of the all patients by selecting the bedside monitor; Click on "Review" button on History window to enter into review window, so as to view the information of previous patient. The operation and window in history review is similar to that in Monitoring Data Review, please see this section.

Description

✧ "Print": Click it to print out the waveform, trend, NIBP list, IBP list, ARR waveform and alarm event of the current page

✧ "Patient Info.": display the patient's name, case No. and bed No..

✧ "Load Data": click it to load data to the waveform review window. The selected waveform or list will be displayed on the window if click this button.

✧ "Review": click it to enter into / quit from detailed information reviewing window. When entering into the reviewing window, and click the mouse, then a red vertical cursor line appears, drag it with the mouse can view the detailed measured data.

➢ **Waveform review**

As shown in figure 6.4, patient information and waveform data are displayed on the right window, and left is the waveform.

✧ Wave data

Print content: "Detail" and "Overall" for optional.

Time range: select a time slice for reviewing waveform data of this patient .

Waveform: click on the pull-down menu "ECG" to select the waveform for reviewing. 3 options: ECG, RESP and SpO_2.

Total page N: complete the above selection, the system displays the total pages of this waveform, for example, "Total Page 2 1", and click "" to select the page number.

Note:

1) Please click on "Load data" to load data to reviewing firstly, then perform other operation. The other reviews are similar to this, so we will not cover them in detail again.

2) Click the mouse on waveform area 1, the "□" appears, then the waveform in this rectangle will be displayed on waveform area 2.

3) Click on the icon "" on waveform area 2 to start the measurement on ECG waveform, click and drag the left cursor line and right cursor line with the mouse to the position need measuring, as shown in below figure, 326ms and 1.935mV is the time difference and voltage difference respectively between the two cursor lines. When it's done, click on "" again to end the measurement.

➢ **Trend review**

Tabular Trend is the auto-recorded data for every minute during the monitoring process, including parameters of recording time, heart rate, SpO_2, TEMP, NIBP, CO_2, etc.. Graphic Trend depicts the trending of parameters within a designated time based on the data in a tabular trend, as shown in figure 6.5. The patient information and trend check

box are displayed on the right side and the left is the detailed graphic trends and trend list.

Figure 6.5A Review --Graphic trend

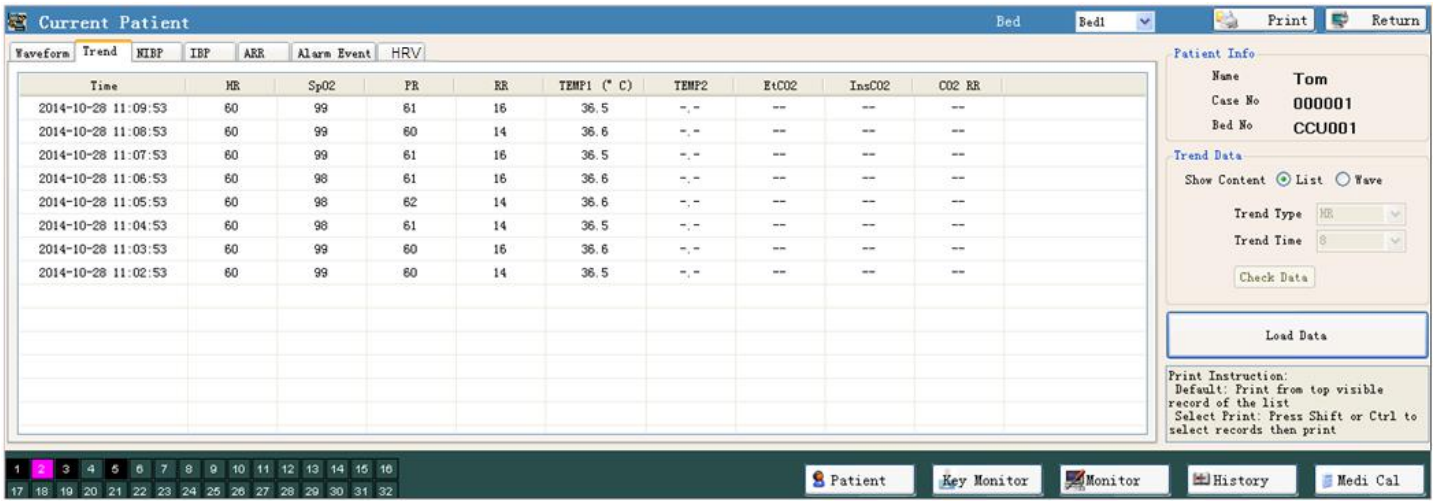


Figure 6.5B Review --Trend list

- ✧ **Trend data**

  Show content: "List" and "Waveform" can be optional

  Trend type: HR, SpO_2, RESP, TEMP, HR and CO_2 can be optional.

  Trend time: select a time slice for reviewing graphic trends, the unit is "h" for hour.
- ✧ **Load Data:** click it to review graphic trends and trend list.
- ✧ **Check Data:** click it to review the parameter recording time.

➢ **NIBP list review**

As shown in figure 6.6A, in NIBP trend graphs, the doctor can view the change of blood pressure. In the NIBP list, the data of the time for each NIBP measurement, measured systolic pressure, diastolic pressure, mean artery pressure, heart rate, SpO_2, etc. are displayed in details. If patient SpO_2 and respiration or temperature are measured simultaneously, then these measured result will be displayed on NIBP list, as shown in figure 6.6B.

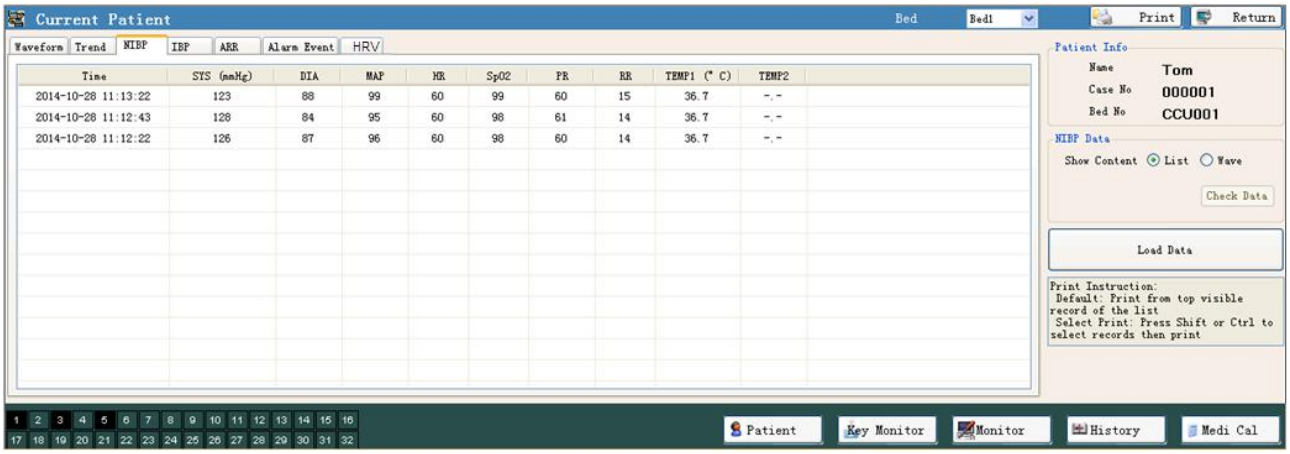


Figure 6.6A NIBP list review--Graphic trend

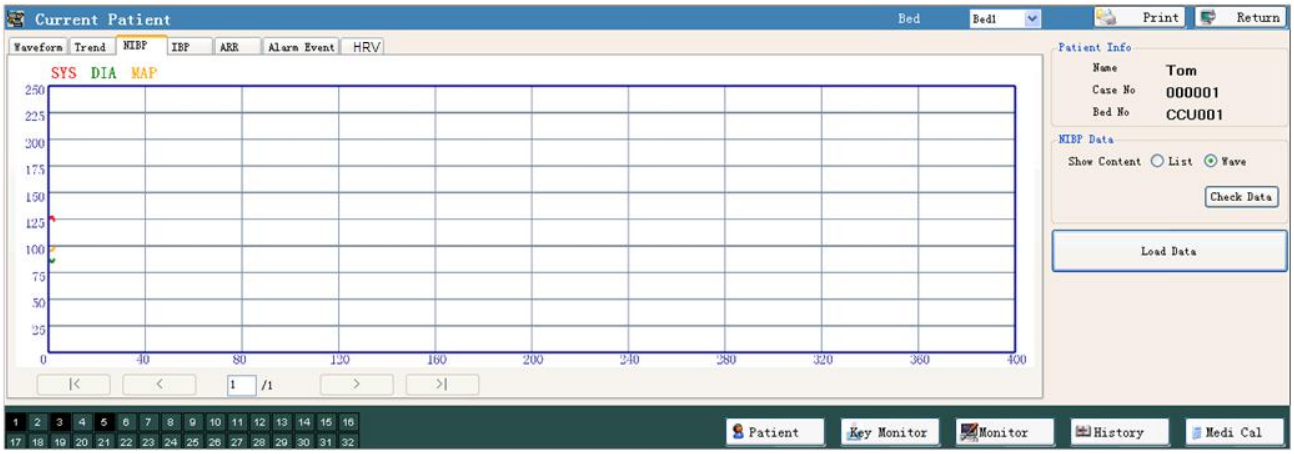


Figure 6.6B NIBP list review--List

✧ **NIBP Data**

Show content: "List" and "Waveform" can be optional.

✧ **Load Data:** click it to review graphic trends and trend list.

✧ **Check Data:** click it to review the parameter recording time.

➢ **IBP list review**

The operation is similar to that of NIBP, but it can only review IBP list, as shown in figure 6.7.

✧ **Load Data:** click it to review graphic trends and trend list.

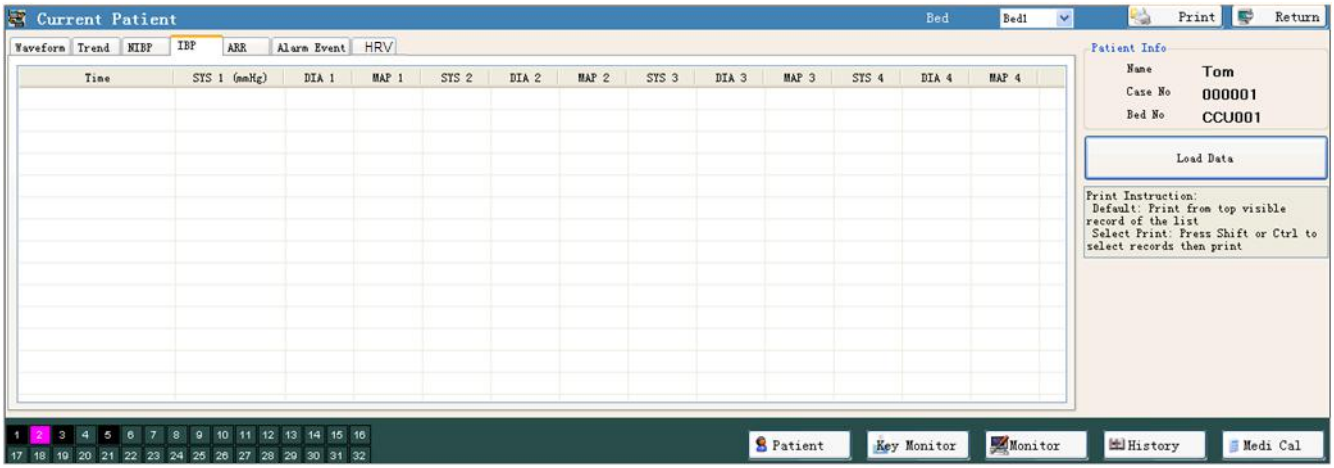


Figure 6.7 IBP list review

➢ **ARR list review**

If an ARR event is detected, the corresponding waveform, occurring time of the ARR event, ARR type, lead type and heart rate will be recorded, as shown in figure 6.8.

Figure 6.8 ARR event review

Right side of the window:

✧ **ARR Data:**

Print content: ARR "waveform" and "List" can be optional.

ARR list form: it lists the ARR data and ARR type.

✧ **Load Data:** click it to review ARR trends and list.

Left side of the window:

✧ **All Type:** it displays the ARR occurring time and ARR type. Click " ☐ " to recall the ARR waveform. Note: only 3 records can be recalled simultaneously.

➢ **Alarm event review**

Figure 6.9 Alarm event review

Right side of the window:

✧ **Load Data:** click it to review alarm event trends and list.

Left side of the window:

Click on "☐ Apply Filter " button to review the alarm events listing by alarm level and alarm type within a specific time slice.

✧ Level: "High", "Middle", "Low" and "All" for optional;

✧ Parameter: options are SpO_2, HR, TEMP1 (or TEMP2), and NIBP SYS etc..

✧ Start time: click it to select the starting time for reviewing.

✧ End time: click it to select the ending time of reviewing .

Middle of the window:

Alarm recording time, level, parameter, value, high/low limit and alarm memo will be displayed at middle of the window, as shown in figure 6.9.

ECG Waveform area: it displays the ECG waveform where there is arrhythmia event or alarm event (the event is marked with icon " "). Click on the event mark with the mouse can quick position the alarm event, that is, turn to position a specific alarm event and display the corresponding waveform.

➢ **Multi-gas**

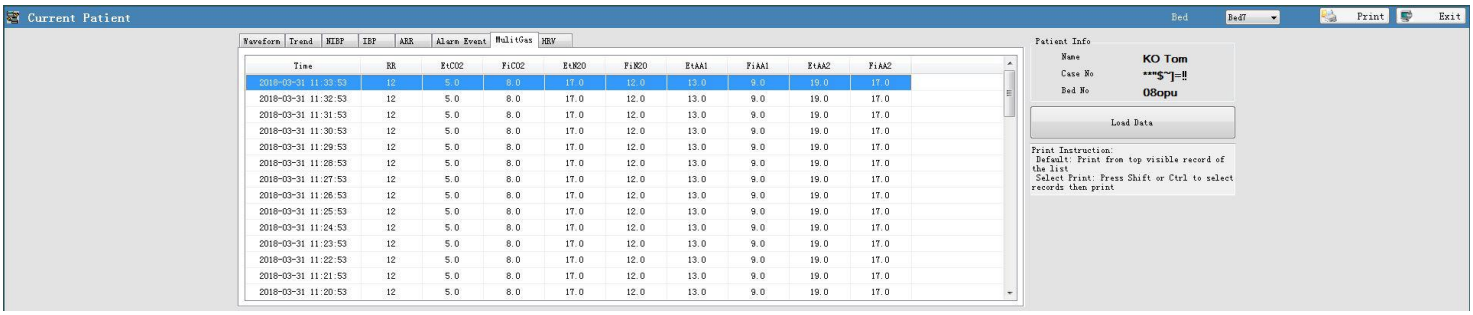


Figure 6.10

In the multi-gas data list, the time for each measurement, and measured result for RR, $EtCO_2$, $FiCO_2$, EtN_20, $FiNO_2$, EtAA1, FiAA1, EtAA2 and FiAA2 are displayed in details, as shown in figure 6.10.

➢ **HRV (Heart Rate Variability) analysis**

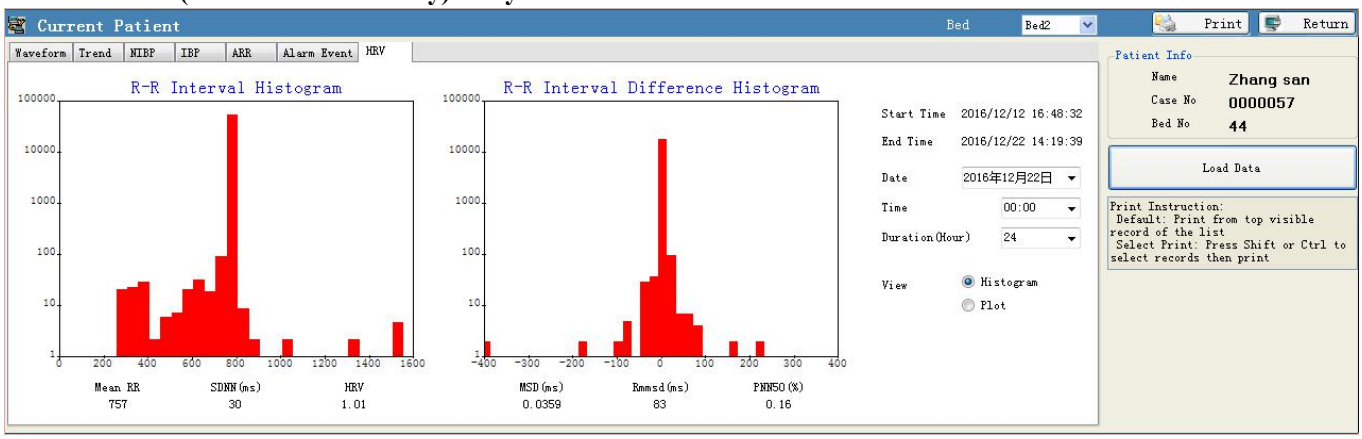


Figure 6.11 HRV analysis

In HRV analysis screen, you can view the R-R interval histogram, R-R interval difference histogram (or displays the R-R interval scatter plot and R-R interval difference scatter plot). Doctors can analyze the HRV and print out the report according to the patient's information.

Screen description:

Right side of the window:

✧ Date: the starting day of the patient data to be analyzed; the date can be selected from the pull-down list.

✧ Time: the beginning time of the patient to be analyzed, select the time from the pull-down list.

✧ Duration (Hour): start from the beginning time, select the analysis time (24 hour at most) from the pull-down list.

✧ View: select the displaying view, there are "Histogram" and "Plot" for optional.

✧ Patient Info.: the bed number, name and case No. for current patient.

✧ **Load Data:** if all items (including date, time and duration) are set, then click this button, the system will analyze this patient's data in this period.

Analysis plot instruction (Left side of the window):

- **R-R interval histogram:** do the R-R interval value distribution in a period of time, for example there are 100 heart beats for R-R interval between 900~950ms; and 80 heart beats for R-R interval between 1000~1050ms etc. Make interval as horizontal axis and numbers of heart beats as vertical axis, and then draw an R-R interval histogram.
- **R-R interval difference histogram:** do the distribution of the difference of 2 consecutive R-R intervals, for example, count the difference between 0~8ms, there are 2800 heart beats; the difference between 8~16ms, there are 500 heart beats. Make the interval difference as horizontal axis and number of heart beats as vertical axis, then draw an R-R interval difference histogram.
- **Mean HR:** mean HR value during the analyzed period.
- **SDNN(ms):** R-R interval standard deviation during analyzed period, the unit is "ms".
- **HRV:** HRV index value during the analyzed period.
- **MSD(ms):** Mean value of R-R interval difference during the analyzed period, the unit is "ms".
- **Rmmsd(ms):** root mean square of R-R interval difference during the analyzed period, the unit is "ms".
- **PNN50(%):** Edinburgh index value during the analyzed period.

If the "Scatter plot" is selected as the display view, please refer to the following detail explanation:

- **R-R interval plot:** choose the previous R-R intervals value (RRn) of the two consecutive R-R intervals as horizontal coordinate, and the next R-R interval value (RRn+1) as the vertical coordinate. Then the drawn picture in a period is the R-R interval scatter plot;
- **R-R interval difference plot:** obtain △RRn and △RRn+1 from 3 consecutive heart beats, that is:

  △RRn = RRn – RRn -1

  △RRn+1 = RRn+1 - RRn

  choose △RRn as the horizontal coordinate and the △RRn+1 as the vertical coordinate to draw a R-R interval difference scatter plot.

Note: The HRV analysis needs the monitoring data lasing at least 5 minutes.

CHAPTER 7 ALARM AND TECHNICAL SPECIFICATIONS

7.1 Alarm Description

Once the patient changes to another bedside monitor, please recheck if the system can work normally, alarm function works properly, and alarm setting are appropriate.

7.1.1 Alarm Condition

The Central Monitoring System has two alarm modes, respectively for the physiological alarm conditions and technical alarm conditions, the detailed define as follows:

- ✧ physiological alarm conditions: the system would give out alarm when the patient's physiological parameter value exceeds the preset limit, such as: Asystole, asphyxia, temperature over-limit and so on.
- ✧ technical alarm conditions: the system would give out alarm when system or sensor makes failures to cause abnormal monitoring function and inaccurate monitoring results, such as ECG lead off, probe off , low battery and so on.

7.1.2 Alarm Priority

There are 3 alarm levels: High priority, Medium priority and low priority. In addition, the monitor has preset alarm level about physiological alarm and technical alarm.

Related to 3 levels alarm modes, medical and nursing staff should have different response to deal with potential dangerous, the detailed demands as follows:

1. High priority alarm: medical and nursing staff should response immediately.
2. Medium priority alarm: medical and nursing staff should response quickly.
3. Low priority alarm: medical and nursing staff should response as soon as possible.

NOTE: Some models may have only Medium and Low alarm priority because of the different configuration.

7.1.3 Alarm Generation

1. When an alarm occurs, the system provides visible and audible alarm indications , which are shown by: auditory alarm, audible alarm and visual alarm (message description or numerical flash alarm). The detail is defined as follows:
   - ✧ Audible alarm: are represented by loud speaker in monitor.
   - ✧ (Visual alarm) Message description or numerical flash alarm: are represented by waveform on the left display area or parameters display on the right area of the screen respectively. The detailed alarm generation is as following:
     Low priority level of alarm: the device gives out audible and visual alarm simultaneously, and make a sound like "du" (one pulse beep sound) every 30 seconds.
     Middle priority level of alarm: the device gives out audible and visual alarm simultaneously, and make a sound like "dududu" (three continuous pulse beep sounds) every 10 seconds.
     High priority level of alarm: the device gives out audible and visual alarm simultaneously, and make a sound like "dududu...dududu" (ten continuous pulse beep sounds) every 5 seconds.
     Notes:
     1) The above alarm beeping sound "du" and time interval may be different with that in actual using, please refer to the device in your hand.

2) The higher the priority level of the alarm is, the rapider the alarm sound.

2. In order to inform the alarm quickly and accurately to users It is suggested that the distance between users and device should not exceed 4m. And the condition of clear alarm indication is when the distance within 1m (no block exists between the device and user)

3. if occurrence of multiple alarm signal at the same time, the monitor will give out alarm which has much more alarm signals alternative auditory alarm and light alarm. Meanwhile, message description or numerical flash alarm will be shown respectively in the form of words or numerical value.

4. The difference between pulse beep sound and alarm sound is shown below:

Pulse beep sound: frequency is 300Hz, including SpO_2 sound and HR beep sound.

Alarm sound: please refer to Technical Specifications description.

7.1.4 Alarm Setting

1、 Except volume of audible alarm can be adjustable, the other properties of the alarm cannot be adjusted by the user, such as alarm priority setting, alarm light flashing and so on. In addition, all alarms in this patient monitor are “non-latched” type, that is to say, when the alarm event disappears, the corresponding alarm will automatically stop. The alarm volume range is shown as below:

- ✧ High: 45dB～80dB (The distance between device front and test instrument is 1m)
- ✧ Medium: 45dB～75dB (The distance between device front and test instrument is 1m)
- ✧ Low: 45dB～70dB (The distance between device front and test instrument is 1m)

2、 When the icon displays on the screen and its color is red, that means the alarm volume is 0 (alarm is mute), at this time the user should pay more attention to the patient.

🔔 It is suggested that the users should not change the alarm volume lower than the factory default setting if close and constant attention could not be paid to the patient, otherwise the negligence of alarm event might cause irreversible harm to the patient.

🔔 During the alarm silence period, any new alarm event can activate the audible alarm again and the audible alarm function resumes normal state.

3、 Alarm settings are non-volatile, that means the previous settings will still sustain if the patient monitor is powered off (by accidental power interrupt or by normal power down) and reboot.

7.2 Technical Specifications

- ✧ Channel number: 1~16
- ✧ Power supply: a.c. 220V, 50Hz.
- ✧ Power consumption: ≤300VA (central station);
- ✧ Link Type: Cable LAN or WLAN
- ✧ Storage capacity: ≥10GB
- ✧ Communication error rate:2×10-4;
- ✧ CMS start time: ≤10s
  - ✧ CMS response time: ≤3s
  - ✧ CMS data processing time: ≤2s
  - ✧ Communication speed: Each channel 10kb/s;
  - ✧ CMS memory usage: ≤200MB
  - ✧ CMS Hard disk usage: ≤1GB (Excluding history file data)

- ✧ Display tolerance:

  HR≤±1bpm; RESP≤±1rpm

  TEMP≤±0.1℃; SPO2 ≤±1%

  NIBP≤±1 mmHg PR ≤±1bpm

  Adult IBP≤±1 mmHg EtCO2≤±1 mmHg

  CSI≤±1 EMG% ≤±1

  BS%≤ ±1

- ✧ Waveform display: can display the dynamic waveform of ECG, RESP, etc..
- ✧ Parameter display: parameters are detected by cable or wireless transmission and display on the screen.
- ✧ Graphic trend: each parameter has the trend graph on the screen, and you can zoom in or narrow the waveform in any time period by operation.
- ✧ Alarm indicator: setting the alarm limits by yourself, when the measuring value more than the limit values, the alarm would be active by the sound or light to indicate the alarm beds.
- ✧ Classification:

  The type of protection against electric shock: Class II equipment.

  The degree of protection against electric shock: Type BF and CF applied parts

  The degree of protection against harmful ingress of water: IPX2.

  The safety degree of flammable gas: Not suitable to use in the environment where flammable gas exits

  Central work station control the patient monitor through cable or wireless transmission for parameter setup, display mode, review and print etc. The central work station can also be controlled simultaneously.

  Safety: Class II ,Type BF and CF applied parts.

CHAPTER 8 PACKAGING AND MAINTENANCE

In order to ensure the central monitoring system work normally. Please pay attention to maintain the central unit for extending the service life. For the warranty period of this system, please see sales contract for more details.

8.1 Packaging and Transportation

1. Packaging

The Central Monitor System is packed in high quality corrugated cartons with foams inside to protect the apparatus against damage in the handling process.

Dimension: 606mm X 387mm X 553mm

2. Accessories

Soft-key: 1

CMS software: 1 CD

Networking cable: 1(optional)

Note: The accessories are subject to change. Detailed items and quantity see the Packing List.

3. Transportation

This Central Monitor System should be transported by land (vehicle or railway) or air in accordance with the contractual terms. Do not hit or drop it with force.

8.2 Environmental Requirement

1. Working Environment:

Surrounding: Keep the PC room tidy and clean.

Power Supply: Stable power supply with a UPS system.

Interference Prevention: Magnetic interference around the computer should be avoided. When the computer is working, the operation of switching on/off on power supply equipment nearby should also be avoided.

2. Operating Environment

Working temperature: 5~40°C

Relative humidity: 30%~80%

Air pressure: 70.0~106.0kPa

Power supply: AC 220V±22V

Frequency: 50Hz±1Hz

3. Transport and Storage:

Ambient temperature: -20~60°C

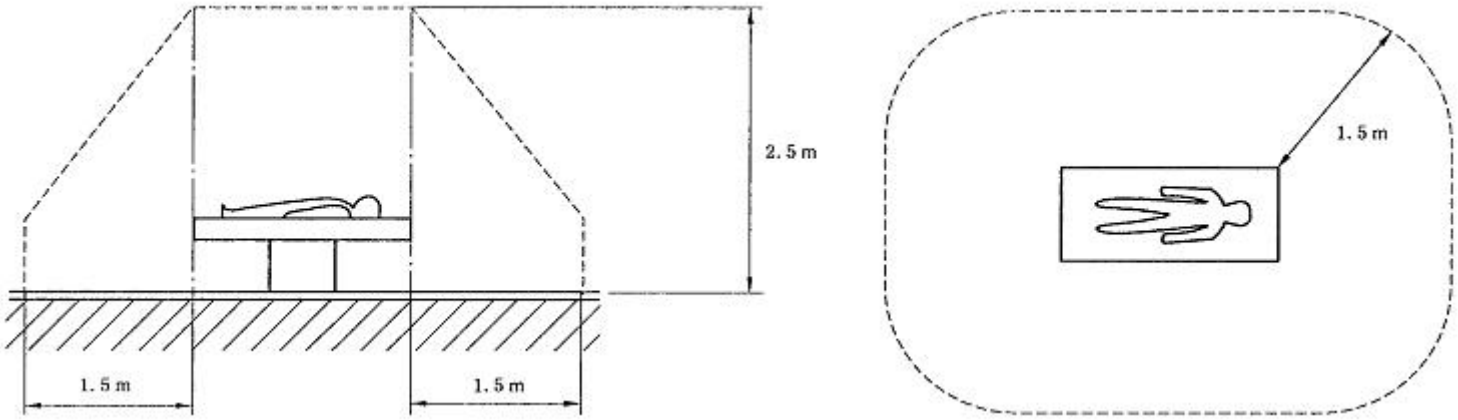
Relative humidity: 10%~95%

Air pressure: 50.0~107.4kPa

With no erosive gases and good ventilation in the normal environment

Non-medical electrical equipment shall not be used in the patient environment, but can be use outside the patient environment of the medical room, as shown in the figure 8.1.

Figure 8.1 patient environment



8.3 Maintenance of the System

This CMS is designed with life cycle of 5 years. At each routinely maintenance or the yearly maintenance, the monitor can be thoroughly inspected by qualified personnel, including performance and safety examinations.

- **The hospital using this CSM should have the ability to carry out a satisfactory maintenance program, the system may get disabled and harm the patient's safety and health.**

- **The users are not allowed to adjust or disassemble the disclosure without permission to avoid unnecessary failures that affect normal application.**

Please contact the local dealer or our company in case of any problems. We will offer the best solution for your satisfaction.

8.4 Protective Maintenance

1. Cleaning of System Hardware

Note: Before cleaning, PC must be turned off and the mains power supply powered off.

Please refer to the relevant information on computer for its cleaning.

- DO NOT let the liquid detergent flow into the socket of system connector or it may damage the device.
- DO NOT try to clean the internal part of the system connector.
- DO NOT use the undiluted detergent.
- DO NOT use any abrasive material.
- DO NOT dip any part of the system in liquid.

2. Turn the System On/Off

To turn on the system, first the surrounding equipment should be powered on, and then the main unit. To turn off the system, the main unit should be powered off firstly, and then the surrounding equipment. When it is on, do not move

the device at will. All the signal cables should be disassembled when it is powered off.

☞ Running the system for a long time may cause hardware aging occurred sooner than expected and reduce the life time of the equipment. Please keep the computer host in ventilated place and in good cooling condition. It is suggested that turning off the computer at least once a week for maintenance.

8.5 System Security

- In the case of connector error, the own logic errors application program and the errors caused by usability of system or network resource, central system may occur unforeseen software running problems simultaneously. In order to avoid the operating system in abnormal conditions which may leads to application system failure, it is recommended that do not install any other software on the computer of the monitoring system.
- When the central system in use, suddenly power off may cause loss of recent monitoring data. Please save and print or backup important data at definite time.

CHAPTER 9 TROUBLESHOOTING

9.1 Troubleshooting for Common Errors

#	Category	Error	Possible Causes	Solution
1	Black Screen	When it is turned on, no display on screen but the main unit works all right.	1. Power cable to display is not well connected; 2. Data cable between display and main unit is not well connected; 3. Display is out of order.	1. Reconnect the cable. If the light indicator on the display is not on. Change a new cable if the old one is not good; 2. Reconnect the data cable, If this does not work, display outlet or data cable may be damaged; 3. If the error is still there. Change for a new display.
2		No the display on screen and main unit cannot start.	1. If main unit utters 1 long and 2 short buzzes, it is the display card error; 2. If main unit utters a long buzz, it is the EMS memory error; 3. If main unit utters no buzz, it is CPU or motherboard error.	1. Take out the display card and clean the metal contacts with an eraser and insert it back. If it does not work, change for a new display card; 2. Take out the memory card and clean the metal contacts with an eraser and insert it back. If it does not work, change for a new memory card; 3. Take CPU out and insert it firmly in position. If there is still an error, make sure CPU is good and change for a new motherboard.
3		Black screen appears after a period of operation, move the mouse to resume display.	1. Screen Saver is activated; 2. Power Management setting is not correct.	1. Open “Properties” window, select None for “Screen Saver”, i.e. shut down Screen Saver; 2. Set all the settings in “Power Management” as “Never”.
4	Display Not Clear	Problems of color, size and font, etc. on display	1. Color setting; 2. Resolution setting; 3. Font setting.	1. Set color as “16 bit”; 2. Set screen resolution as “1024×768”; 3. Set Display Appearance as “Windows Standard”.
5		Little flicker on display screen	1. Display refreshing frequency is too slow 2. Display hardware error	4. Set display refreshing frequency as 75Hz; 5. If the error is still there, then it is the hardware problem. Change a new display.

6		The central system is not displayed in full	1. Resolution setting; 2. Taskbar Setting	1. Set display resolution as "1024×768"; 2. Set Taskbar Properties as "Auto Hide".
7	Start time is too long	Wait for long time to enter "Welcome Screen"	1. Affected virus; 2. Damaged track in hard disk.	1. Check/kill virus in the system with anti-virus software (Such a case occurs usually after user has installed other software in addition to CMS); 2. If the damaged track in hard disk is confirmed, change for a new hard disk.
8	System Halt	After running for some time, the system becomes slow until a halt	1. Affected virus; 2. Damaged track in hard disk; 3. Error in driver; 4. Disk space is full.	1. See #8 Solution 1. 2. See #8 Solution 2. 3. Reinstall the driver; 4. Clear the disk for more space.
9		When using external equipment (e.g. printer)	1. Error in mouse or keyboard; 2. Error in printer; 3. Aging of power supply.	1. Change mouse or keyboard; 2. Reinstall printer driver. If it does not work, change the printer; 3. Change for a new power supply.
10		After running for some time and it suddenly halts or restarts Windows	1. Affected virus; 2. CPU overheat; 2. Display chip overheat.	1. See #8 Solution 1.; 2. If the fan of CPU does not work, change for a new fan; 3. If the fan of display card does not work, change for a new fan.
11	No display	No waveform display but parameter display OK	1. Waveform setting is not on; 2. Error in REG.	1. Set all the waveforms on; 2. Exit CMS, run "regeit.exe" and delete Create Inc key under HKEY_LOCAL_MACHINE\SOFTWARE.
12		No waveform and parameter display	1. Error in serial link; 2. Error in MOXA serial card; 3. Bedside monitor is not connected to the network.	1. Change the serial link cable; 2. Check if MOXA card drive is properly installed or change MOXA card slot; 3. If after changing MOXA card it still does not work, then it must be an error in the bedside monitor.