

DPM[™] | Central Station

Central Monitoring System

Operator's Manual

mindray

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For this Operator's Manual, the issue date is 2013-07.

 **WARNING**

-
- **Federal Law (USA) restricts this device to sale by or on the order of a physician.**
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WARNING

- **This device must be operated by skilled/trained clinical professionals.**
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-

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Preface

Manual Purpose

This manual provides the instructions necessary to operate the DPM Central Station in accordance with its function and intended use. Observance of this manual is a prerequisite for proper performance and correct operation, and ensures patient and operator safety.

This manual is written based on the maximum configuration. Part of this manual may not apply to your DPM Central Station. If you have any question about the configuration of your DPM Central Station, please contact our Customer Service.

This manual is an integral part of and should always be kept close to your DPM Central Station, so that it can be obtained conveniently when necessary.

Intended Audience

This manual is geared for the clinical medical professionals. Clinical medical professionals are expected to have working knowledge of medical procedures, practices and terminology as required for monitoring of critically ill patients.

Illustrations and Names

All illustrations in this manual are provided as examples only. They may not necessarily accord with the graph, settings or data displayed on your DPM Central Station.

All names appeared in this manual and illustrations are fictive. It is a mere coincidence if the name is the same with yours.

Conventions

Italic text is used in this manual to quote the referenced chapters or sections.

The terms danger, warning, and caution are used throughout this manual to point out hazards and to designate a degree or level of seriousness.

FOR YOUR NOTES

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FOR YOUR NOTES

1 Safety

1.1 Safety Information

The safety statements presented in this chapter refer to the basic safety information that the operator of the central monitoring system (hereinafter referred to as CMS) shall pay attention to and abide by. There are additional safety statements in other chapters or sections, which may be the same as or similar to the followings, or specific to the operations.

DANGER

- Indicates an imminent hazard situation that, if not avoided, will result in death or serious injury.
-
-

WARNING

- Indicates a potential hazard situation or unsafe practice that, if not avoided, could result in death or serious injury.
-
-

CAUTION

- Indicates a potential hazard or unsafe practice that, if not avoided, could result in minor personal injury or product/property damage.
-
-

NOTE

- Provides application tips or other useful information to ensure that you get the most from your product.
-
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1.1.1 Dangers

There are no dangers that refer to the product in general. Specific “Danger” statements may be given in the respective sections of this operation manual

1.1.2 Warnings

WARNING

- **The device is intended for use only by clinical professionals or under their guidance. It must only be used by persons who have received adequate training in its use. Anyone unauthorized or untrained must not perform any operation on it.**
 - **The CMS is a clinical information device. Except for using such components as the mouse and keyboard to perform normal operations, do not touch or disassemble any other component, especially the power component; otherwise, it may result in personnel injury.**
 - **The computer running the CMS software must comply with local relevant regulations. The CMS is intended to connect our monitors only. Connecting the monitors made by other manufacturers may cause the values displayed on the CMS inaccurate.**
 - **The service life of the CMS depends on its hardware, so violence, drop or collision should be avoided in the operation on the keyboard, mouse and computer; otherwise, the service life of the CMS may be shortened.**
 - **Components of the CMS, such as the keyboard and mouse, may be contaminated by microorganism during transport, storage and use. Before removing them from their packaging, the packaging should be inspected for damage. In case of any damage, contact the carrier or our company immediately.**
 - **The CMS can construct a wireless local area network (WLAN) by connecting monitors. When data is transmitted via wireless radio frequency (RF) signals, it may impair the environment or the use of other equipment. Therefore, the wireless RF equipment must comply with CE, FCC and other local relevant standards and regulations.**
 - **When the CMS is transmitting data via wireless RF signals, loss of patient data may be caused by the interference of other RF signals.**
-
-

1.1.3 Cautions

CAUTION

- **Federal Law (USA) restricts this device to sale by or on the order of a physician.**
- **Hospitals without stable power source should use an Uninterruptible Power Supply (UPS) to power the CMS. When there is a power failure, the system should be shut down by following the specified shutdown procedure before the UPS is turned off. If the system has a sudden power failure, system failure may occur and consequently the system will not work correctly next time or even have a serious result.**
- **Never start or transport the system under the condition other than that specified; otherwise, the system may be damaged. We shall assume no responsibility for such damages.**
- **System time should be set before the CMS is put into use. If the system time is modified when the CMS is running, the data that has been stored may get lost or the network may be interrupted.**
- **Be sure to use standard thermal recorder paper only; otherwise, the recorder may show poor quality on record, or may be unusable, or the print head of the recorder may be damaged.**
- **The CMS is capable of connecting up to 32 monitors and telemetry transmitters. The cable connecting the monitor to the hub or exchange shall not exceed 100m; otherwise, it may result in network overload or weak network signals and consequently errors will occur during data transmission or displaying.**
- **The host of the CMS should be maintained every three to six months. Its long time continuous operating may lead to failure of the operating system.**
- **The host of the CMS should be installed with the original Microsoft Windows's system and standard upgrade program, such as the service package. Illegal software may lead to abnormal or incorrect system operating.**
- **If Windows® XP® Professional Embedded OS is used, please make sure that it is only used for the CMS software rather than other purposes, such as office use, entertainment. The Microsoft Office that you have installed shall only be used for the CMS software.**
- **Using the "Show Desktop" feature in Windows is prohibited. Installing or using any other software not provided by Minddray DS is prohibited. Softwares that have not been tested or verified by Minddray DS may cause the instability of the system. Minddray DS assumes no responsibility for this.**

 **CAUTION**

- **If Windows® XP® Professional Embedded operating system is installed, please do not use the system until you have read the end user license agreement (“EULA”). Any use of the system will constitute your agreement to the EULA.**
 - **When printing data through an external printer, be sure to follow the printer’s instructions. In case any problem occurs during printing, consult the printer’s instructions.**
 - **To ensure the safety and stability of the network, the LAN connecting the CMS and the monitors should be a closed network which is not connected with the internet or other external networks.**
-

1.1.4 Notes

NOTE

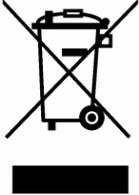
- **Keep this manual close to the CMS so that it can be obtained conveniently when necessary.**
 - **Choose a location that affords an unobstructed view of the CMS’s screen and easy access to the operating and maintaining.**
 - **If the computer installed with the CMS can not work normally due to its hardware failure or the operating system failure, contact our local service representative.**
-

1.2 Equipment Symbols

NOTE

-
- Some symbols may not appear on all equipment.
-

	Caution (Attention, consult accompanying documents)
	CAUTION: To reduce the risk of electric shock, do NOT remove cover. Refer servicing to qualified service personnel.
	Alternating current
	Power switch
	Keyboard port
	Mouse port
	Serial communication (COM) port
	Display port
	Printer port
	USB port or device
	Network port

	Sound output port
	Sound input port
	Microphone port
	DATE OF MANUFACTURE
	MANUFACTURER
	Serial number
	Equipotentiality
	<p>The following definition of the WEEE label applies to EU member states only.</p> <p>This symbol indicates that this product should not be treated as household waste. By ensuring that this product is disposed of correctly, you will help prevent bringing potential negative consequences to the environment and human health. For more detailed information with regard to returning and recycling this product, please consult the distributor from whom you purchased it.</p> <p>* For system products, this label may be attached to the main unit only.</p>

2 The Basics

2.1 Intended Use

The CMS network transfers information between DPM Central Station and other networked devices. It also allows information transfer between several CMS. Network connections consist of hardwired network cables and/or WLAN connections. CMS can be used for remote monitor management, storing, printing, reviewing or processing of information from networked devices, and it is operated by medical personnel in hospitals or medical institutions.

WARNING

- **The device is intended for use only by clinical professionals or under their guidance. It must only be used by persons who have received adequate training in its use. Anyone unauthorized or untrained must not perform any operation on it.**
-

2.2 Application Scope of the Manual

For the central monitoring system connecting monitors which use “CMS network protocol” or connecting defibrillator, the following sections of this manual may not be applicable.

- 5.1.1 Admitting Patient through CMS
- 5.1.2 Admitting Patient through the Monitor
- 5.4 Modifying Patient Information
- 7.3 Parameter Setup
- 7.4.1 Alarm Setup
- 7.4.2 Silencing Alarms on Monitors
- 7.4.3 Pausing Alarm Sound on Monitors
- 7.4.4 Silencing a Bedside Monitor
- 7.4.5 Pausing Alarms on Monitors
- 7.4.6 STANDBY
- 7.4.7 Controlling a Bedside Monitor to Exit STANDBY
- 7.4.8 NIBP Measurement
- 8.4 Alarm Setup
- 8.5 Pausing Alarms
- 8.6 Silencing Alarms
- 8.7 Pausing Alarm Sound on Monitors
- 8.8 Silencing the Monitors
- 8.9 Latching Alarms

2.3 Contraindications

None.

2.4 Functions

The CMS comprises powerful system software and high-performance computer components. It constructs a monitoring network by connecting monitors and telemetry transmitters. By collecting, processing, analyzing and outputting the information coming from monitors and telemetry transmitters, the CMS can achieve centralized monitoring over multiple patients so as to greatly promote the efficiency and quality of the monitoring work.

The CMS:

- Is capable of connecting up to 32 monitors that supports the CMS or CMS+ network protocol.
- Is capable of connecting up to 32 telemetry transmitters.
- Supports any bed's (1-32 bed) frequency setup by each telemetry monitoring system.
- Supports multi-screen display mode, including up to four local displays and multiple remote displays; supports remote large screen display.
- Is capable of displaying information from 16 monitors in the single-screen mode and 32 monitors in the dual- or multi-screen mode.
- Allows you to view a single patient emphatically.
- Supports the networking between multiple CMSs and the "Remote CMS".
- Allows you to review up to 240 hours of trend data for each online patient.
- Allows you to review up to 720 events for each online patient.
- Allows you to review up to 100 OxyCRG events for each online patient.
- Allows you to review a 4-hour dynamic short trend for each online patient.
- Allows you to review up to 240 hours of ST segments for each online patient.
- Allows you to review up to 240 hours of waveforms for each online patient.
- Allows you to review up to 240 hours of compressed waveforms for each online patient.
- Allows you to review up to 240 hours of NIBP measurements for each online patient.
- Is capable of storing discharged patients' full disclosure waveforms, parameters, alarms and so on ; allows you to search and review the data of up to 20,000 discharged patients.
- Provides the patient information management function.
- Provides audible and visual alarms.
- Provides the functions of drug calculations, titration table calculations, hemodynamics calculations, oxygenation calculations, ventilation calculations and renal calculations.

-
- Provides the functions to record, print and save data.
 - Provides comprehensive help information, prompts and operational guide.
 - Provides 1280×1024 high display resolution.
 - Provides two waveform display modes: color and mono.
 - Facilitates the setup of language, waveform and parameter color.
 - Supports such peripherals as the keyboard, mouse, thermal recorder, laser printer, speaker, etc.
 - Supports wired and wireless network..
 - Provides data output meeting the HL7 protocol. Refer to *eGateway HL7 Reference Manual* for details. To obtain this protocol, contact local Mindray DS service representative or Mindray DS Customer Service Department.
 - Supports receiving the data generated during interruption from networked monitors and combining the data.
 - Supports CMS' running on the virtual machine.
 - Supports the redundancy backup by two hard disks on the host computer.

The CMS has a USB dongle to protect the copyright. You must plug the dongle into the system's USB interface before starting the system. Otherwise, the system cannot start. Also the USB dongle is used to configure the optional system functions.

NOTE

- **If the CMS has only one USB connector, it is intended for connecting the USB dongle only. Otherwise, the system cannot start up. If the CMS has more than one USB connector, there must be one dedicated for the USB dongle and the others can be used for other purposes.**
 - **The USB dongle is used to configure the optional system functions which may be different for different CMSs, So don't exchange the USB dongles.**
 - **If you lost your dongle, please contact us to get a new one.**
-

2.5 Components

The CMS consists of system software, computer (optional), hardware dongle, network devices (optional), recorder (optional), printer (optional) and UPS (optional).

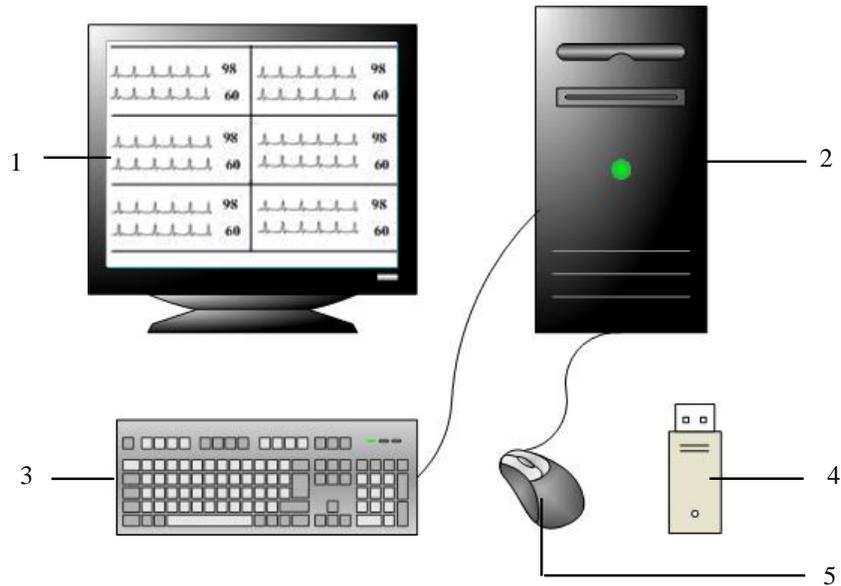


Figure 2-1 CMS

As shown above, a typical CMS mainly consists of the following components:

1. Display
2. Host
3. Keyboard
4. USB dongle
5. Mouse

You can equip a CMS with up to four displays.

This manual is written based on the maximum configuration. Some contents may not apply to your system.

2.6 Networking Mode

The typical networking diagram of a single CMS is shown below:

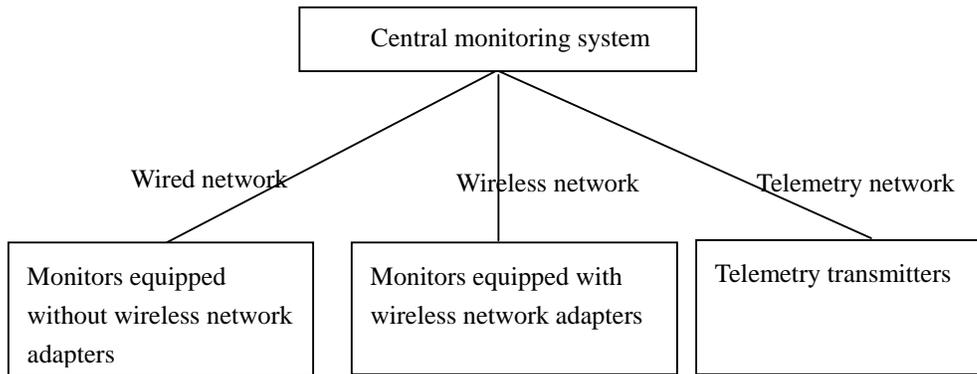


Figure 2-2 Central Monitoring Network

- Wire network

The CMS, exchange and monitors interconnect through network cable.

- Wireless network

Through network cable the CMS is connected to an AP (Access Point), which via wireless RF connects multiple monitors equipped with wireless network adapters.

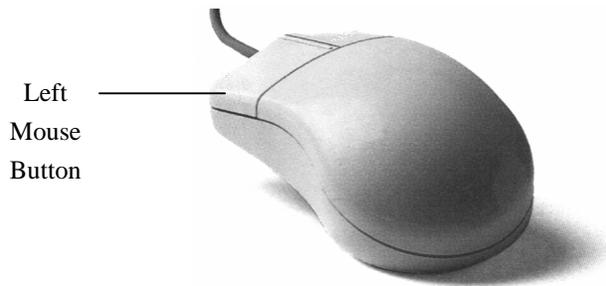
- Telemetry network

Through network cable the CMS is connected to the telemetry receiver, which via wireless RF connects multiple telemetry transmitters. For details, refer to operator's manual of the telemetry monitoring system.

The CMS supports the networking between multiple CMSs so as to the information on one monitor within one CMS can be viewed by other CMSs networked.

2.7 Controls

2.7.1 Mouse



The mouse is the primary means of user interaction with the CMS. Following are two basic ways to operate the mouse:

- Click: position the mouse pointer on a selection, and then press and immediately release the left mouse button;
- Drag: position the mouse pointer on a selection, and then hold the left mouse button down while moving the mouse pointer until your desired place is reached.

NOTE

-
- **The term “click” in this manual refers to clicking the left mouse button unless otherwise specified.**
-

Depending on your action, or the mode of operation, the mouse pointer on the screen of the CMS will be shaped differently:

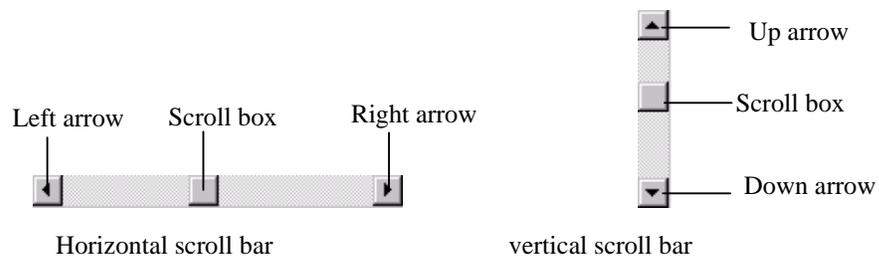
-  When the mouse pointer is arrow-shaped, you can click, drag and move the cursor.
- | The mouse pointer is shaped like an I-beam when you are in a text entry field.

2.7.2 Keyboard

The keyboard can be used to enter characters into text entry fields. To enter characters into a text entry field, position the mouse pointer inside the text entry field and then click the mouse. When the mouse pointer changes its shape from an arrow to an I-beam, it indicates that you can type, select, delete text, or reposition the insertion point.

2.7.3 Controls

Scroll Bars



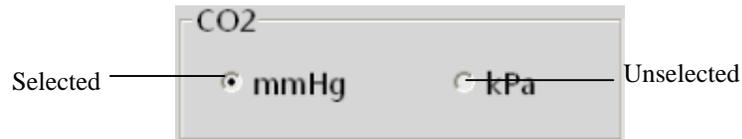
As shown in the figure above, there are two types of scroll bars: horizontal and vertical. The scroll bar can be used to position, browse and display your desired information.

Text Box

Address	<input type="text"/>
Postcode	<input type="text"/>
TEL	<input type="text"/>

The text box provides text entry fields, which can be used to edit and display text. In a text entry field, you can use the mouse and keyboard to edit text, i.e. input, select, delete, copy and paste characters.

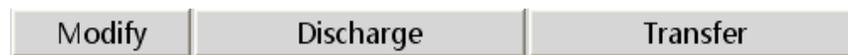
Radio Buttons



Radio buttons can be used to select one of a group of mutually exclusive options:

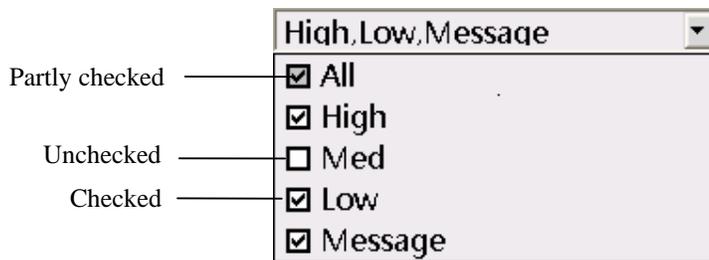
- indicates unselected
- indicates selected

Command Buttons



Command buttons can be used to execute designated operations. When a command button appears dimmed or pressed, it indicates that this command button is currently disabled.

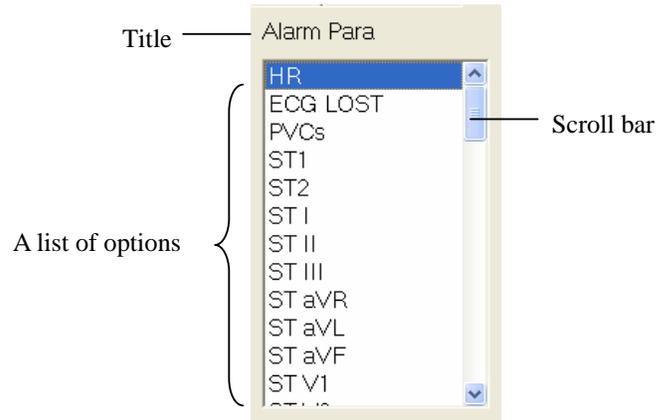
Check Boxes



Check boxes enable the users to select multiple options.

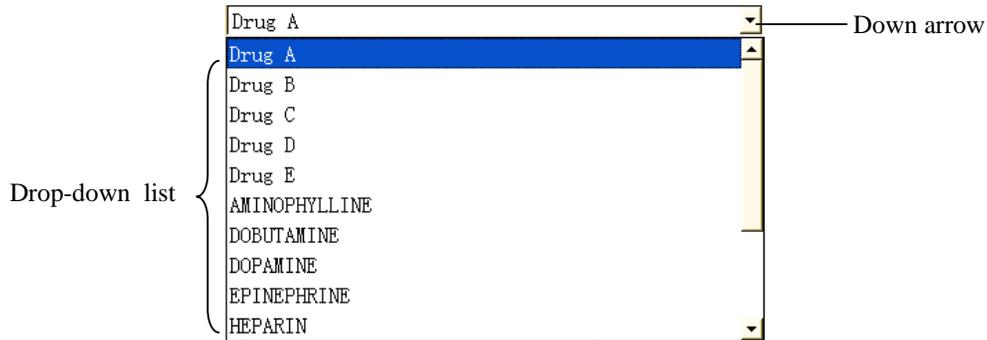
- Indicates active selection. If there are more than one sub-item, it indicates that all the sub-items are selected.
- Indicates that this item has multiple sub-items but has only part of them selected.
- Indicates that this option is not selected. If there is more than one sub-item, it indicates that none of them is selected.

List Box



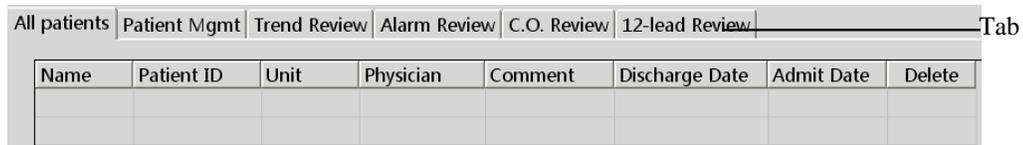
The list box contains a list of options from which the user can select one or more. If there are too many options to be displayed in the list box, you can use the scroll bar to display the hidden options.

Drop-down List Box



The drop-down list box has a down arrow button next to it, which can be used to open or close a list of options. You can make a selection from the drop-down list.

Tab Sheet



The tab sheet contains a stack of individual tab sheets. The user can switch among them by clicking the tab.

FOR YOUR NOTES

3 Installation and Maintenance

3.1 Unpacking and Inspection

Be careful to remove the host, displays and other components from their packaging and check if every item on the Packing List has been received without mechanical damage. If you have any question, contact our company immediately.

NOTE

- Please save the packaging materials for later transport or storage use.
-

WARNING

- Be sure to keep the packaging materials from children's reach.
 - Disposal of the packaging materials shall comply with your local requirements.
 - Components of the CMS, such as the keyboard and mouse, may be contaminated by microorganism during transport, storage and use. Before removing them from their packaging, the packaging should be inspected for damage. In case of any damage, contact the carrier or our company immediately.
-

3.2 Installation

WARNING

- **The CMS should be installed by manufacturer designated personnel. The copyright of the CMS software is solely owned by our company. No organization or individual shall resort to juggling, copying, or exchanging it or to any other infringement on it in any form or by any means without due permission.**
-

NOTE

- **Never place the CMS within a patient environment.**
 - **Place the CMS in an environment that the system can be easily viewed, operated and maintained.**
-

3.2.1 Environmental Requirements

Each component of the CMS must work under the specified environment.

The environment where the CMS is installed should be reasonably free from noises, vibration, dust, corrosive, flammable and explosive substances. If the CMS is installed in a cabinet, sufficient space in front and behind should be left for convenient operation, maintenance and repair. Moreover, to maintain good ventilation, the CMS should be at least 2 inches (5cm) away from around the cabinet.

When the CMS is moved from one place to another, condensation may occur as a result of temperature or humidity difference. In this case, never start the system before the condensation disappears.

3.2.2 Power Requirements

Each component of the CMS must be powered by the specified power source.

To protect the hospital personnel from electric shock, the CMS (including the host and displays) and its recorder must have their casings properly grounded. The host of the CMS is provided with a 3-wire power cable, which must be plugged into a properly grounded 3-wire receptacle. If a 3-wire, grounded receptacle is not available, consult the hospital electrician.

WARNING

- **Make sure that the operating environment and power source of the CMS meet the specific requirements; otherwise, unexpected consequences, e.g. damage to the equipment, may result.**
 - **Appropriate power supply must be selected according to the setup of the system power voltage; otherwise, serious damage may be caused to the system.**
 - **Never use a 3-wire to 2-wire adapter with any unit of the CMS.**
-

3.2.3 Installation

Manufacturer designated personnel will install the CMS for you. If you want to move your system to another place, contact our company.

WARNING

- **We shall assume no responsibility for any loss caused by installing or moving the CMS without our permission.**
-

3.2.3.1 Installation for Remote Display

The CMS supports the display of local video on remote display through VGA video extension device.

Transmitter

1. Receive the VGA signal of the CMS into the VGA interface of INPUTS of transmitter.
 2. Connect the local display of the CMS with the VGA interface of OUTPUTS of transmitter.
 3. Connect one end of network cable with the RJ45 OUT interface of transmitter.
 4. Connect the power adapter with the POWER interface of transmitter.
-

Receiver

1. Connect the input port of remote equipment (such as a display or a LCD TV) with the VGA interface of OUTPUT1 or OUTPUT2 of receiver.
2. Connect one end of network cable with the RJ45 IN interface of receiver.
3. Connect the power adapter with the POWER interface of receiver.
4. The brightness and contrast on the remote display equipment can be finely adjusted through “Brightness” and “Contrast” buttons on receiver.

NOTE

- **The CMS supports VGA video extension. For specific equipment recommendations, contact your Mindray sales representative.**
 - **If multiplex video signals are required to be displayed in separate screens, use other types of transmission equipment.**
 - **The remote display equipment is required to support a resolution of 1280×1024 pixels.**
 - **Please refer to the accompanying documents for the detailed operations, installation, specifications and precautions of VGA video transmission equipment.**
-

3.2.3.2 Installation for Remote USB Control

The CMS can achieve the control for remote USB through USB twisted pair cable transmission device.

1. Firmly connect the USB-B port of remote USB control device with USB port of the CMS through USB 2.0 wire.
2. Connect the transmission device (such as keyboard/mouse) with the user-end equipment of remote USB control device.
3. Connect the host with user-end equipment by network cable.
4. Check if the LED lamp (green) of RJ45 interface is lit. If the lamp is lit, it indicates that the equipment is already powered on for normal use.

NOTE

- **The CMS supports the remote transmission of USB control. For specific equipment recommendations, contact your Mindray sales representative.**
 - **When the user-end USB device is installed, it needs 1 to 2 minutes to implement USB self-test. Please wait for a while.**
 - **Please refer to the accompanying documents for the detailed operations, installation, specifications and precautions of USB transmission equipment.**
-

3.3 Starting the System

Follow this procedure to start your system:

1. Perform safety checks before starting your system. For details, refer to **3.5.1 General Inspection**.
2. Connect the USB dongle to the USB interface of the host. (If the dongle has been connected, skip this step.)
3. Turn on the UPS and power on the system.
4. Press the power switches on the host and displays to start the operating system.
5. The system will perform a series of self-tests with corresponding information displayed on the screen.
6. If the self-tests pass, the system will beep three times and enter the main screen immediately.

If there is a self-test failure, the system will beep and give an error message.

CAUTION

- To prevent unexpected errors or consequences from a sudden power failure, it is recommended that your CMS is equipped with an UPS.

NOTE

- If the computer beeps during self-tests or startup, consult the manual provided with the computer.
-

3.4 Shutting down the System

It is important to shut down the system properly. Follow this simple procedure to properly shut down your system. This prevents inadvertent errors from occurring during system shut down.

1. Click “System Setup” button.
2. Select “Shutdown” from “General Setup”.
3. The system will check if any patient is being monitored.
 - If no patients are being monitored, directly enter the next step.
 - If there are still some patients being monitored, the message box “× patients are being monitored. Are you sure you want to shut down?” will be displayed. You can either select “Yes” to enter the next step, or select “No” to close the message box and not continue the shutdown process.
4. A message box asking whether to shut down the system will be displayed. Select “Yes” from the message box.
 - If no shutdown password is required, the CMS will quit with the operating system shut down and the host powered off.
 - If a shutdown password is required, a dialog box will pop up. You should enter the required password and select “OK”. The CMS will quit with the operating system shut down and the host powered off
5. If an UPS is used, turn it off.
6. Disconnect the power cord of each device from the power outlet.

CAUTION

- **Hospitals without a stable power source should use a UPS to provide power to the CMS. The UPS must not be turned off. When there is a power failure, the system should be shut down by following the specified shutdown procedure before the UPS is exhausted. When the system has a sudden power failure, system failure may occur and consequently the system will not work correctly next time or even have a serious result.**
-

3.5 Maintenance

WARNING

- **Failure on the part of the responsible hospital or institution employing the use of the CMS to implement a satisfactory maintenance schedule may cause undue equipment failure and possible health hazard.**
 - **The safety checks or servicing involving any disassembly or decomposition of devices should be performed by professional servicing personnel; otherwise, it may lead to undue equipment failure and possible health hazards.**
 - **Turn off the CMS if no patients are to be monitored. If the system has been running for half a year continuously, restart the system.**
 - **In the period of the CMS restarting, patients' data will not be stored. To prevent any loss, please restart your system without any patient under monitoring.**
-
-

3.5.1 General Inspection

Whenever your system is repaired, upgraded or has been used for 6-12 months, a thorough inspection should be performed by qualified service personnel to ensure the reliability.

Before the CMS is put into use and when it is in use, follow these guidelines to inspect it:

- Inspect the equipment and its accessories for mechanical damage.
- Inspect if the environment and power supply meet the specific requirements.
- Inspect all power cords and signal lines for fraying or other damages, and if they are properly connected and insulated.
- Inspect if the sound system functions normally.
- Inspect if each function of the system is in good condition.

In case of any damage or abnormality, do not use the CMS. Contact the hospital biomedical engineers or our service personnel immediately.

3.5.2 General Cleaning

WARNING

- **Be sure to shut down the system and disconnect all power cords from the outlet before cleaning the equipment.**
-

Your equipment should be cleaned on a regular basis. If there is heavy pollution in your place or your place is very dusty and sandy, the equipment should be cleaned more frequently. The equipment to be cleaned includes the host, displays, printer, recorder, keyboard and mouse. Before cleaning the equipment, consult your hospital's regulations for cleaning, disinfecting and sterilizing equipment

Cleaning Agents

The exterior surfaces of the equipment may be cleaned with a clean and soft cloth, sponge or cotton ball, dampened with a non-erosive cleaning solution. Drying off excess cleaning solution before cleaning the equipment is recommended. Following are examples of cleaning solutions:

- Hydrogen peroxide (3%)
- Ethyl alcohol (70%)
- Workstation/server cleaning solutions
- Liquid crystal display (LCD) detergent

To avoid damage to the equipment, follow these rules:

 **CAUTION**

- **Failure to follow these rules may melt, distort, or dull the finish of the case, blur lettering on the labels, or cause equipment failures.**
-
- ALWAYS dilute the solutions according to the manufacturer's suggestions.
 - ALWAYS wipe off all the cleaning solution with a dry cloth after cleaning.
 - NEVER SUBMERGE the equipment into water or any cleaning solution, or POUR or SPRAY water or any cleaning solution on the equipment.
 - NEVER permit fluids run into the casing, switches, connectors, or any ventilation openings in the equipment.
 - NEVER use abrasive materials and erosive or acetone –based cleaners.
-

 **WARNING**

- **Disinfection or sterilization may cause damage to the equipment; therefore, when preparing to disinfect or sterilize the equipment, consult your hospital's infection controllers or professionals.**
 - **The cleaning solutions above can only be used for general cleaning. If you use them to control infections, we shall assume no responsibility for the effectiveness.**
-
-

FOR YOUR NOTES

4 Display

4.1 Overview

The central monitoring system can support single-, dual- and multi- screen display modes. The main screen and auxiliary screen vary in different display modes.

4.2 Single-Screen Mode

4.2.1 Main Screen in Single-Screen Mode

In single-screen mode, up to 16 monitors can be viewed simultaneously. The figure below shows the main screen in the single-screen mode.

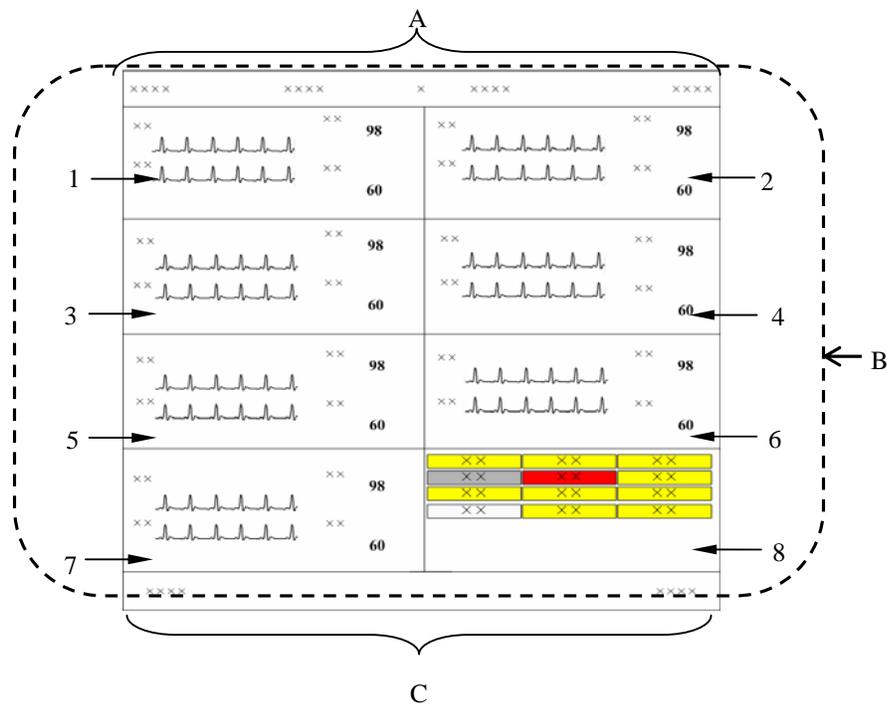


Figure 4-1 Main Screen in Single Screen Mode

- A. System information area
- B. Patient window area
- C. System buttons and icons area

NOTE

- In single-screen mode, maximum 16 monitors can be viewed simultaneously. If monitors connected to a CMS are more than 16 but less than 32, we recommend you to use dual- or multi- screen mode.
-

System Information Area

In this area, the following information is displayed:

- 1 Hospital information: Displays the hospital and office where the CMS is located.
- 2 System alarm icon area: Display icon  if in system silence or icon  if in system alarm audio off.
- 3 System alarm area: Displays the prompts or alarms coming from the system itself. If more than one message occurs, they will be displayed circularly. Please refer to the *Appendix B* for all the system alarms.
- 4 Current time: Displays the current time.

Patient Window Area

For details, refer to *6.2 Patient Window*.

System Buttons and Icons Area

System buttons include:

- 1 Silence: Click to silence the CMS. For details. Refer to *8.10 CMS System Silence*.
- 2 Admit Patient: Click it to enter the “Connected patient list” screen.
- 3 System Setup: Click it to enter the “System Setup” window.
- 4 Discharged Pat.: Click it to enter the “Discharged Patients” window.
- 5 Remote CMS: Click it enter the “Remote CMS” window.
- 6 Main Screen/ViewBed: Click it to close the auxiliary screen and return to the main screen/ Click it to enter the “ViewBed” tab sheet.

System icons include:

No.	Icon name	Icon	Description
1	Alarm List		Show the alarms of all being monitored patients within the specified time range.
2	USB state		Indicates that the system connects other USB storage device besides the USB dongle.
3	Printer state		Indicates that the printer is normal.
			Indicates a printer error.
			Indicates that no printer is connected.
4	Recorder state		Indicates that the recorder is normal
			Indicates that the recorder is under test.
			Indicates a recorder error.
			Indicates that no recorder is connected.
5	Networking prompt		Flash: indicates new monitors log on.
			Not flash: indicates no new monitor logs on.
6	Network status		Indicates that the network is normal.
			Indicates that the network is disconnected.
7	Storage system status		Indicates that the storage system is normal.
			Indicates that the storage system is in a warning state and data may be at risk.
			Indicates that the storage system is in an error state and data may be lost.
			Indicates that the storage system is in a busy state while an operation is in progress.

4.2.2 Auxiliary Screen in Single-Screen Mode

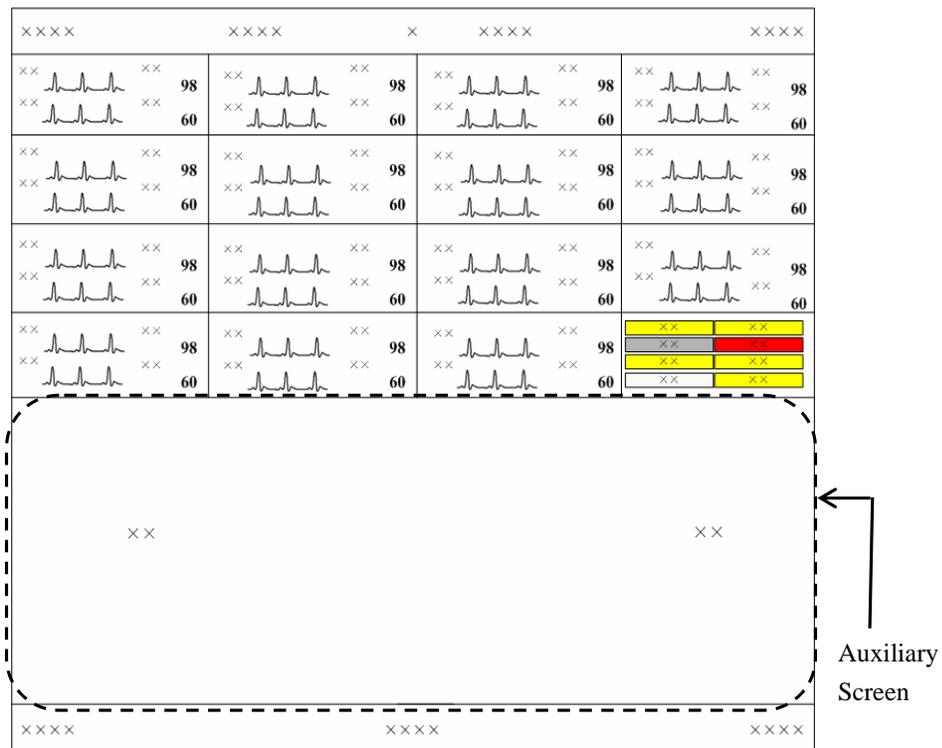


Figure 4-2 Auxiliary Screen in Single-Screen Mode

In single-screen mode, you can enter the auxiliary screen by clicking the patient window, system buttons or icons area. As shown in the figure above, the auxiliary screen will occupy the lower half part of the screen and the system will automatically adjust the size and number of patient windows.

You can:

- Click “Admit Patient” to enter the “Connected patient list” screen
- Click “System Setup” to enter the “System Setup” window.
- Click “Discharged Pat.” to enter the “Discharged Pat.” window.
- Click “Remote CMS” to enter the “Remote CMS” window.
- Click “ViewBed” to enter the “ViewBed” tab sheet.
- Click a patient window to enter the “ViewBed” tab sheet.

NOTE

- For more information about the tab sheet, refer to *2.7.3 Controls – Tab Sheet*.

4.3 Dual-Screen Mode

As to the CMS which supports dual-screen mode, two displays can be connected to the host, and the two displays are respectively called primary display and secondary display. The dual-screen mode is classified into two main screens and one main screen.

■ Two Main Screens

As shown below, both displays have the main screen by default if the number of main screen is configured to 2. The primary display's screen is on the left and the secondary display's screen on the right. The system buttons and icons are located on the secondary display's screen.

Click a patient window, and the secondary display will change to show the auxiliary screen of single bed window of this patient. To go back to the main screen, click the "Main Screen" button at the bottom of auxiliary screen.

In the mode of two main screens, a maximum of 32 monitors can be viewed at one time.

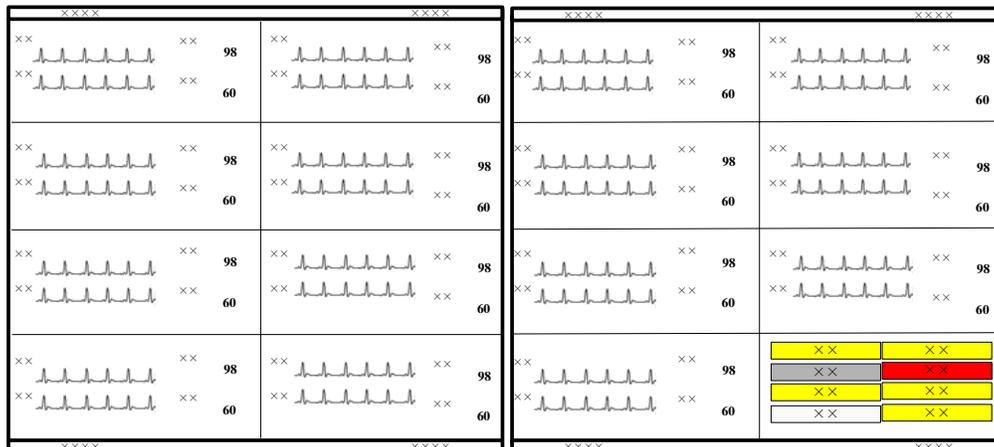


Figure 4-3 Two Main Screens (Default)

■ One Main Screen

As shown below, if the number of main screen is configured to 1, the primary display on the left always shows main screen and secondary display on the right always shows auxiliary screen. In this mode, up to 16 monitors can be viewed at one time.

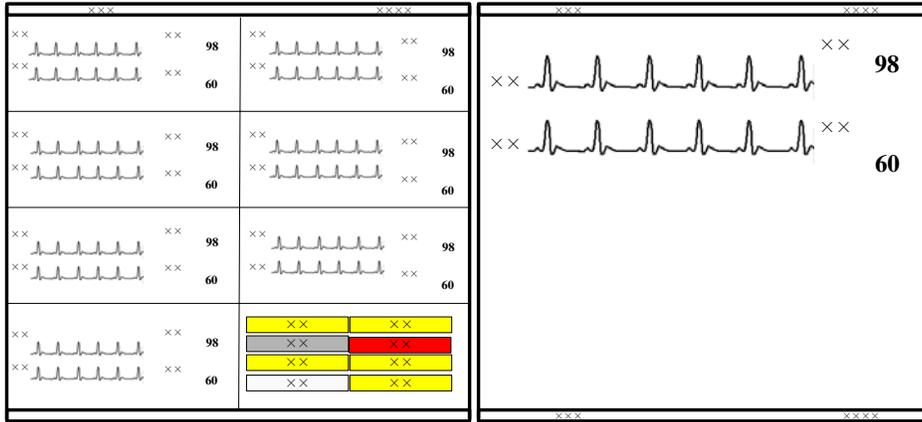


Figure 4-4 One Main Screen

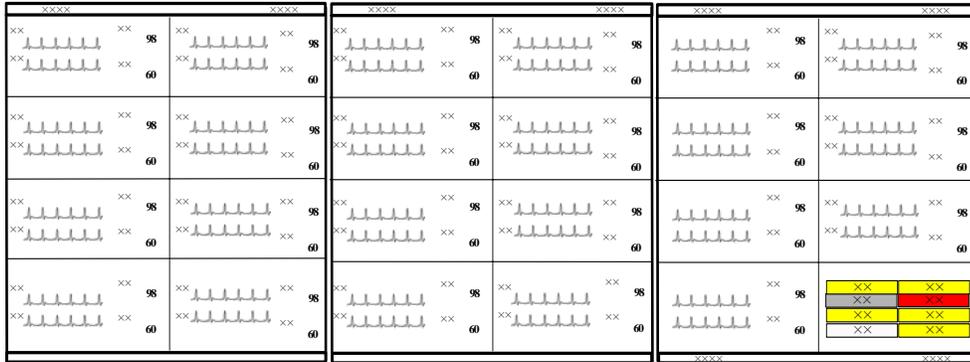
Comparing with the auxiliary screen in single-screen mode, the auxiliary screen in dual-screen mode enables you to view more information conveniently.

As to the configuration for the above two modes, please refer to *12.2.2 Display Setup-Number of Main Screen / Display Layout* for details.

4.4 Multi-Screen Mode

As to the CMS which supports multi-screen mode, three or four displays can be connected to the host. In the mode of tri-screen or quad-screen, a maximum of 16 monitors can be viewed at one time on each display.

The following picture shows the tri-screen mode, in which all the displays show the main screen. The system buttons and icons are located at the bottom of the right display's screen.



Click a patient window, and the right display will change to show the single bed screen of this patient. To go back to the main screen, select  in system icon area.

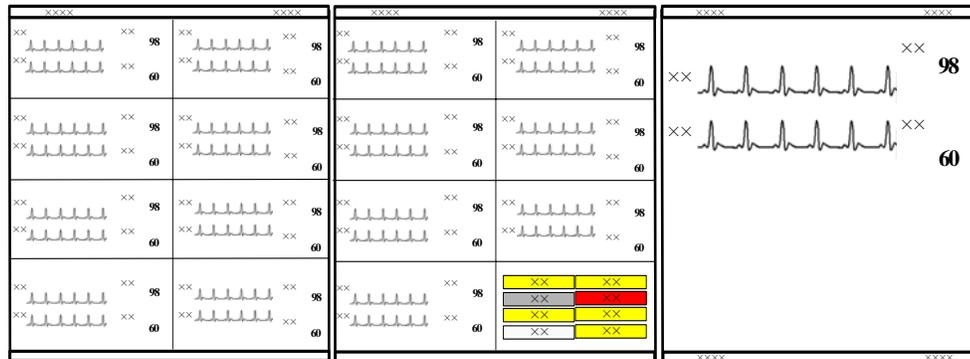


Figure 4-5 Tri-Screen Mode

4.5 Screen Layout

The setting for multibed screen layout directly decides each patient window's size, and the total number and layout of patient windows. Please refer to *12.2.2 Display Setup* for details.

WARNING

- **If the monitors connected to the CMS are more than the patient windows that can be displayed on the screen, some monitors will be displayed in the non-spot patient window in which only alarm status can be displayed. To view the waveforms and parameters of a non-spot patient, you can switch it to spot patient window.**
-

5 Patient Management

The CMS enables you to manage patients by:

- Admitting patient
- Obtaining patient information
- Patient information synchronization
- Modifying patient information
- Discharging patient
- Switching patient window
- Changing to idle sector
- Transferring patient

5.1 Admitting Patient

A patient can be monitored only after it is admitted by the CMS. Then the CMS can display the physiological parameters, waveforms and alarm messages and store the data related to this patient. You can admit a patient either at a monitor or at the CMS. After a patient is admitted, the patient window is bound with a monitor and patient data from this monitor will be displayed in the same patient window if it admits a patient next time. For details on patient window, refer to **6.2 Patient Window**.

If the admitted patient's number has reached the upper limit, the corresponding message will be displayed. At this time, the CMS cannot admit one more patient. If you really want to admit a patient, perform the "Discharge Patient" operation first. For details, refer to **5.5 Discharging a Patient**.

NOTE

- **A patient can be monitored on the CMS only after the patient monitor is first admitted by the CMS and then the patient is admitted. Refer to 12.2.5 Monitor List on how the monitor is admitted by the CMS.**
 - **A defibrillator is not bound with a patient window. Patient information from this defibrillator will be displayed in an idle patient window selected by the CMS according to the sequence of top to bottom and left to right when it admits a patient next time.**
-

5.1.1 Admitting Patient through CMS

When a monitor which has not admitted a patient is connected to the network, you can admit a patient either by:

- Clicking a patient window with no patient or an idle sector and selecting “Admit Patient” in the pop-up menu. This is applied to admit patient to a spot patient window. For detail, refer to **6.2 Patient Window**, or
- Clicking  in the icon area or the “Admit Patient” button in the button area and admitting the patient in the open window.

When icon  or the “Admit Patient” button is selected, a window is open, in which “Connected Patient List” is displayed at the left side and “Patient Info” at the right side. The “Connected Patient List” includes the information of all the monitors using “CMS+ network protocol” and telemetry transmitters connected to the LAN. The information includes monitoring status, monitor name, unit, bed number, patient name, patient ID and details through which you can know more about monitoring status.

NOTE

-
- **If a patient is admitted by CMS with the idle bedside monitor in the state of standby, the bedside monitor will automatically exit the standby mode.**
-

The monitoring status and corresponding details are shown in the following table.

Monitoring status	Details
No Patient Admitted	<p>The monitor is in this CMS monitor list.</p> <p>The monitor is in CMS XX monitor list.</p> <p>The monitor is not in any CMS monitor list.</p>
Monitored by this CMS	The monitor has admitted a patient and is being monitored by this CMS.
Monitored by CMS XX	The monitor has admitted a patient and is being monitored by CMS XX.
Cannot be monitored by CMS	<p>The monitor has admitted a patient but is not in this CMS monitor list.</p> <p>The monitor has admitted a patient but is not in CMS XX monitor list.</p> <p>The monitor is in this CMS monitor list and has admitted a patient but the ECG algorithm of the transmitter does not match that of the CMS.</p> <p>The monitor is in this CMS monitor list and has admitted a patient but the CMS has reached its maximum number of beds.</p> <p>The monitor is in this CMS monitor list and has admitted a patient but failed to connect to the network.</p> <p>The monitor is in this CMS monitor list and has admitted a patient but the patient was monitored by other CMS.</p> <p>The monitor is in this CMS monitor list and has admitted a patient but another patient with the same bed No. in this CMS is being monitored.</p> <p>The monitor is in CMS XX monitor list and has admitted a patient but the ECG algorithm of the transmitter does not match that of the CMS.</p> <p>The monitor is in CMS XX monitor list and has admitted a patient but the CMS has reached its maximum number of beds.</p> <p>The monitor is in CMS XX monitor list and has admitted a patient but failed to connect to the network.</p> <p>The monitor is in CMS XX monitor list and has admitted a patient but another patient with the same bed No. in CMS XX is being monitored.</p>

For the monitor with the monitoring status of “No Patient Admitted” and the details of “The monitor is in this CMS monitor list”, the Patient Info area is enabled and you can click the “Admit Patient” button to admit a patient.

NOTE

- **If you directly click on the Admit Patient button before inputting patient information, the patient information will be blank. In this case, you can modify the patient information by referring to *5.4 Modifying Patient Information*.**
 - **When there is no monitor online, an alarm message “No New Bed Online” will be shown.**
 - **When a patient is admitted, his bed number can not be identical to that of any other bed under monitoring. Otherwise, the patient can not be admitted.**
 - **In the LAN, a monitor can be admitted by any but only one of the CMSs.**
-

5.1.2 Admitting Patient through the Monitor

When a patient is admitted by a monitor, it will be admitted by the CMS synchronously.

5.1.3 Auto Waveform Storage

By default, the CMS will store five waveforms with the descending priority of ECG 1, ECG2, ECG 7, Pleth and Plethb each time a patient is admitted.

If waveforms ECG 1, ECG 2, ECG 7, Pleth and Plethb are not available, no waveform will be saved automatically. To change the waveforms to be saved, refer to *9.1.3 Waveform Review* for detail.

NOTE

- **If you change ECG lead type through bedside monitor after the waveforms have been automatically saved, the waveforms stored in the above-mentioned ECG channels may also change.**
 - **When a patient is discharged, the waveform storage configurations are saved. Waveforms are stored automatically as per the same configurations next time a patient is admitted.**
 - **If you discharge a patient and set the bed as an idle sector, the waveform storage settings are cleared, and the waveform configurations restore to the system defaults.**
-

5.2 Obtaining Patient Information

Obtaining patient information means to obtain patient information from the HIS system through Gateway and display such information on the current CMS.

There are two ways to obtain patient information:

- ADT Query:
 1. Click the “Obtain Patient Information” button and the “ADT System Patient Information” menu pops up.
 2. Input query condition and click the “Query” button. The queried patient information is displayed.
 3. Select a patient from the patient information list. Click the “Import the Patient to CMS” button. The corresponding patient information in the CMS will be updated.
 4. Click the “Exit” button to exit the “ADT System Patient Information” menu.

NOTE

- **The “Obtain Patient Information” button is available on the patient management screen only when the CMS is configured with the “ADT Query” function as “Enable” in the “Service Setup” tab of “Gateway Communication Setting” menu.**
 - **For settings of “Service Setup”, refer to *12.2.8 Other- Gateway Communication Setting*.**
-

- Patient Information Quick Query:

Enter patient keywords in “Patient Mgmt” tab sheet, and click “Modify” button. The CMS will automatically search the patient. If the patient is found, the patient information will automatically be updated to the CMS.

NOTE

- **For the definition of patient keywords, refer to *eGateway Integration Manager Installation Guide*.**
-

5.3 Patient Information Synchronization

When the CMS is associated with HIS system, the CMS will automatically synchronize and update the patient information with HIS system.

5.4 Modifying Patient Information

There are two ways to modify patient information:

- Modify patient information through the monitor. For more information, refer to the monitor's operation manual.
- Modify patient information through the CMS.

When the network is properly connected, either party (the monitor or the CMS) will inform the other party (the CMS or the monitor) to make modifications accordingly, so that the patient information is kept consistent between the monitor and the CMS.

For telemetry patient monitoring, the patient information can only be modified from the CMS.

5.4.1 Modify Procedure

1. Open the "Patient Mgmt." tab sheet.
To open the patient management tab sheet, you can click in the patient window for a spot patient or on the block in the non-spot patient window for a non-spot patient, and then select "Patient Mgmt." tab from the multiple tabs.
2. In this tab sheet, you can modify patient information, such as name, gender and height etc.
3. After modification, select "Modify" to save the changes. The CMS will inform the monitor to make modifications accordingly:
 - ◆ If two patients with the same bed No. are in one CMS, a message box will pop up and indicate bed conflict. Select "OK" to return to the Patient Mgmt screen.
 - ◆ If patient category has been changed, a message box will pop up. Select "OK" to save the changes or "Cancel" to cancel the changes.
 - ◆ If "Nurse Call" and/or "Event" in telemetry system is set to "Off", a message box will pop up. Select "OK" to save the changes or "Cancel" to cancel the changes.

If the monitor is offline, the CMS will directly save the modifications into database other than inform it to make modifications accordingly.

NOTE

- **If you have changed patient category through the CMS, patient category on the monitor will be changed accordingly.**
 - **When a CMS has connected monitors of different models, the listing items on “Patient Mgmt” screen may vary.**
-

5.4.2 Inconsistent Patient Information between Monitor and CMS

If patient information is modified when the monitor is disconnected from the CMS, and then the monitor is re-connected to the CMS, inconsistent patient information may occur between the CMS and monitor. If this happens, low priority technical alarm will be displayed in the technical alarm area and prompt message on the patient management screen. In this case, you need to confirm whether to use patient information in the CMS or monitor.

5.5 Discharging a Patient

Discharging a patient is to terminate monitoring a patient and admit a new patient. There are two ways to discharge a patient:

- Discharge a patient through the monitor. In this case, the patient will also be discharged by the CMS and all the patient’s data will be saved by the CMS.
- Discharge a patient through the CMS. In this case, the patient will also be discharged by the monitor.

For telemetry patient monitoring, discharging a patient can only be performed through the CMS.

If you discharge a patient through the monitor, refer to the monitor’s Operation manual. If you discharge a patient through the CMS, you can follow either of the two procedures:

- Procedure 1 (applied to spot patients):
 1. Click the drop-down menu in corresponding patient window and select “Discharge Patient”.
 2. In the pop-up dialogue box, select either “Discharge patient and save data” or select “Discharge Without Saving Data”. If “Discharge patient and save data” is selected, the system will automatically save all reviewing data of this patient. If “Discharge Without Saving Data” is selected, the system will delete all data about this patient after he is discharged.

-
3. Optional- If the monitor belonging to some monitor series (for example, BeneView, iPM, iMEC, T1) is connected, there is an option “The monitor enters the Standby mode after the patient is discharged”. If the checkbox before the item is selected, the monitor will directly enter Standby status after a patient is discharged.
 4. Click the “OK” button. The patient will be discharged automatically.
- Procedure 2 (applied to both spot patients and non-spot patients):
1. Click the patient window for a spot patient or the block in the last patient window for a non-spot patient.
 2. Select “Patient Mgmt.” tab sheet.
 3. Click the “Discharge” button in the “Patient Mgmt.” tab sheet.
 4. Perform Steps 2 through 4 of Procedure 1.

 **CAUTION**

- **When “The patient data storage space is nearly full. Please delete some discharged patients.” appears at the system information area, please follow the instruction. Otherwise, the system will automatically delete some earliest discharged patients’ data when the discharged patient storage space is full.**
-

NOTE

- **When a patient is discharged, the waveform storage configurations are saved. Waveforms are stored automatically as per the same configurations next time a patient is admitted.**
 - **If you discharge a patient and set the bed as an idle sector, the waveform storage settings are cleared, and the waveform configurations restore to the system defaults.**
-

5.6 Switching Patient Windows

To switch patient windows, click the drop-down menu in the patient window and select “Move Zone to”, then select desired department and bed number.

5.7 Changing to Idle Sector

In a patient window with no admitted patient, click the drop-down menu and select “Change to idle sector” and make confirmation on the pop-up window, the patient window will be released as an idle sector.

NOTE

-
- **Whether the “No Patient Admitted” patient window can be set to an idle sector is dependent on the setting in “Display Setup” of “Admin Setup” menu. Refer to 12.2.2 *Multibed Display*.**
-

5.8 Transferring a Patient

In the process of monitoring, a patient may be transferred from one bed (source bed) to another (destination bed). In this case, the function of patient transference can ensure the continuity of monitoring data. After transference, the patient will be monitored in destination bed.

5.8.1 Transferring a Patient on CMS

The CMS provides the patient transfer function.

NOTE

-
- **If the patient of destination bed has not been discharged, selecting “Discharge destination bed patient with data saved” and then transferring a patient will discharge him/her automatically. In this case, make sure the patient of destination bed can be discharged before you transfer a patient to it.**
-

Transfer Procedure

1. Enter the “Patient Mgmt.” tab sheet.
 2. Click on the “Transfer” button. The system will open the “Transfer” dialog box.
 3. You can select the desired “Destination CMS” and “Destination Bed”.
 4. You can select either “Combine with Destination Bed Patient Data” or “Discharge Destination Bed Patient with Data Saved”. These two options will be invalid if the destination bed has not admitted any patient.
- **Combine with Destination Bed Patient Data.**

The system will transfer the patient data at source bed to the destination bed and combine with the data at destination bed.

-
- Discharge Destination Bed Patient with Data Saved.

The system will discharge destination bed patient with data saved before transferring the source bed patient data to the destination bed.

5. Click on the “Continue” button.
6. Select “OK” in the popup dialog box. Then the patient is transferred to the destination bed. When transferring patient between different CMSs, you need to accept the source CMS’s transfer request at the destination CMS.

NOTE

- **Transferring patient and combining with destination bed patient data may cause some patient data loss if the system time is inconsistent between the source and destination CMS.**
 - **Ensure that the same patient is monitored by both the source and destination beds when transferring patient and combining with destination bed patient data. Otherwise, select the function of discharging destination bed patient with data saved.**
 - **When a patient is transferred from one bed to another, the CMS will interrupt bedside monitoring temporarily. However, whether to continue monitoring the patient depends on the doctor’s decision.**
 - **When a patient is transferred within one CMS, all the monitored data will be transferred along; if the patient transfer is among different CMSs, only the full-disclosure waveforms and other data of the latest 3 days are transferred along.**
 - **If there is version difference between two CMSs, patient transfer may not be enabled.**
 - **When a defibrillator is connected to the CMS, patient transfer is disabled.**
-

5.8.2 Transferring a Patient on Monitor

When a patient is transferred between monitors by a transferring device, the monitor will inform the CMS of the transference. The CMS will automatically operate as follows:

- Discharge the patient from source bed;
- Combine the patient data at source bed with the data at destination bed.

6 Multibed Screen

6.1 Overview

The multibed screen of the CMS displays as follows:

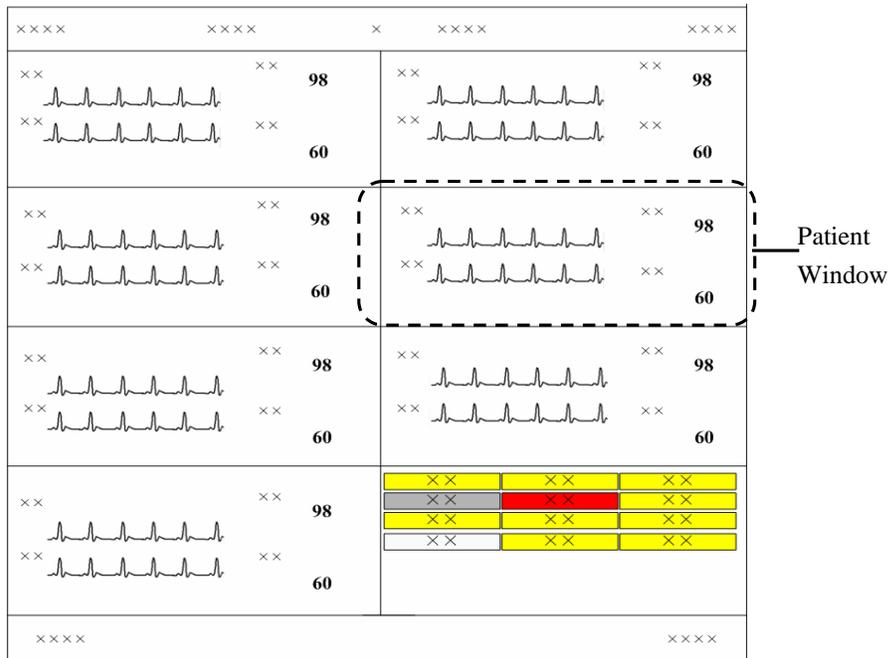


Figure 6-1 Multibed Screen

Each screen of the CMS can display up to 16 patient windows. If the number of the bedside monitors connected to the CMS is no more than the maximum of patient windows, all the patient windows can be used for spot observation; if not, the last patient window will be used for non-spot observation.

The patient windows used for spot observation will be hereinafter referred to as the spot patient windows, and their bed numbers and patients respectively as the spot bed numbers and spot patients. Likewise, the patient windows used for non-spot observation will be hereinafter referred to as the non-spot windows, and their bed numbers and patients respectively as the non-spot bed numbers and non-spot patients.

In single-screen mode, you can view 16 patients on the spot at one time; in dual- or multi-screen mode, you can view 32 patients on the spot at one time. The number of the patient windows to be displayed depends on the display mode defined for the multibed screen. Refer to **12.2.2 Display Setup- Multibed View Window Layout** for additional information.

6.2 Patient Window

6.2.1 Non-Spot patient window

The non-spot patient window shows information including bed number and status for each monitor displayed in it. If a monitor has no such information defined, its corresponding block will turn blank. For the monitors displayed in this window, different background colors represent different statuses.

xx	xx	xx

The following table shows each status of the non-spot patient monitor and the corresponding block's indication.

Non-spot patient monitor status	Corresponding block's Indication
It is connected and no alarm is present.	Background is black.
It is connected and a low- or medium-priority alarm(s) is present.	Background is flashing yellow.
It is connected and a high-priority alarm(s) occurs.	Background is flashing red.
Disconnection alarm occurs.	 is displayed. Background is flashing yellow.
Disconnected	 is displayed. Background is black.
Standby	 is displayed. Background is black.
Nurse call occurs.	 is displayed. Background is flashing red.
Event occurs.	 is displayed. Background is flashing red.

NOTE

- Since a non-spot patient window presents neither waveform nor parameter to the clinician, it should not be used for monitoring patients.
 - The user can adjust the display layout at any time so as to restore the non-spot patient windows to the spot ones and therefore view their realtime waveforms and parameters.
-

6.2.2 Spot Patient Windows

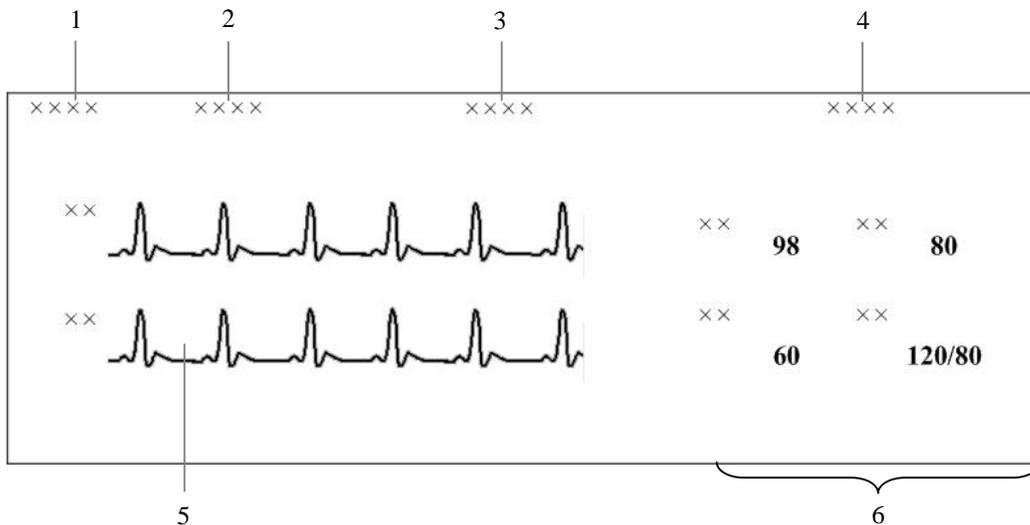
In the process of monitoring, the spot patient window may stay in one of the following statuses:

- “No Patient Admitted” indicates that no patient is admitted by the monitor corresponding to this patient window.
- “Offline” indicates that this patient window has admitted a patient but its corresponding monitor may be turned off or disconnected from the CMS.
- Patient Window in Monitoring Status: This patient window indicates that the monitor has admitted a patient. The corresponding bedside monitor is monitoring the patient and transferring the data to the CMS.
- “STANDBY” indicates that the monitor or telemetry transmitter enters the standby mode.
- “Idle sector. Click to admit a patient” indicates that the CMS can admit a new patient in this patient window.

The spot patient window may stay in other statuses. We will not introduce them in this manual.

6.2.3 Patient Window in Monitoring Status

In the monitoring status, a patient window displays real-time patient data transmitted from the monitor, including a maximum of 4 waveforms and 5 parameters as shown in the figure below. In an individual patient window, the number of waveforms and the layout of parameters are subject to the display format set for the multibed screen.



- 1. Drop-down menu button
- 2. Alarm icons
- 3. Technical alarm area
- 4. Physiological alarm area
- 5. Waveform area
- 6. Parameter area

Figure 6-2 Patient Window in Monitoring Status

When a telemetry system is connected, relevant telemetry icons will appear on this screen.

6.2.3.1 Bed Mark

You can modify bed number and bed mark color on the patient management screen to identify the specific bed. For details, refer to *5.4 Modifying Patient Information*.

6.2.3.2 Drop-down Menu Button

Clicking this button will open a drop-down menu, in which you can perform these operations:

- **Monitor Silence:** In the normal status, you can select it to silence current bedside monitor. In the case that the bedside monitor is silenced, you can select it to reactivate the bedside monitor's audible prompts.
- **Audio Paused:** In the normal status, you can select it to pause the alarm sound of the current bedside monitor for a period of time, which can be set on the monitor. Please refer to *8.7 Pausing Alarm Sound on Monitors* for the patient window's alarm sound pause.
- **Silence:** You can select it to acknowledge the ongoing alarm. Both the monitor and corresponding patient window will enter the alarm silence status. Please refer to *8.6 Silencing Alarms* for the patient window's alarm silence status.
- **Alarm Pause:** In the normal status, you can select it to pause all alarms of the current patient for a period of time, which can be set on the monitor. The default alarm pause time is 2 minutes. During the alarm pause, you can select it to reactivate the paused alarms.
- **STANDBY:** If a telemetry transmitter is connected, in the normal monitoring status, you can select it to have an exit from displaying, analyzing, storing or recording the current patient's physiological waveforms and data, with all alarms and sounds disabled and the icons of Nurse Call, Event, Battery Capacity and Received Signal Strength remained on the screen. In the Standby mode, you can select it to restore the normal monitoring mode. If a bedside monitor is connected, selecting it enables the bedside monitor to exit the state of standby.
- **Freeze:** In the normal status, you can select it to freeze the dynamic waveforms with freeze time and time scales displayed in the waveform area. In the frozen status, clicking it will restore the dynamic waveforms.
- **Print:** You can select it to start real-time printing.
- **Record:** You can select it to start real-time recording.
- **ViewBed:** You can select it to enter the "ViewBed" tab sheet.
- **Discharge Patient:** You can select it to open the "Discharge" dialogue box.
- **Patient Mgmt.:** You can select it to enter the "Patient Mgmt" Tab sheet.
- **Display Setup:** You can select it to enter the "Display Setup" tab sheet.
- **Alarm Setup:** You can select it to enter the "Alarm Setup" tab sheet
- **Big Numerics:** In Big Numerics screen, major parameters are displayed in big numerics for better viewing. In this case, you can switch to normal screen by selecting "Normal Screen" from the drop-down menu.
- **Privacy Mode:** Open the "Multibed" menu, select and set current bed or all beds to Privacy Mode.

-
- Night Mode: Open the “Multibed” menu, select and set current bed or all beds to Night Mode, and choose whether to stop NIBP measuring.
 - ST Select: Access the “ST Select” of the telemetry system.
 - Start/Stop NIBP Measurement: Used to start or stop NIBP measurement.
 - Move zone to: Selecting it to switch over the current patient window to any destination window.

NOTE

-
- **One type of monitor can support only one of the following functions: Monitor Silence, Audio Paused, and Silence (Please refer to the corresponding operation manual for more information). Therefore, these features’ corresponding controls and buttons do not exist at the same time.**
 - **Any of the operations of Monitor Silence, Audio Paused and Silence will set the corresponding patient windows on the CMS to silence status.**
-

6.2.3.3 Alarm Icons

- No icon: Indicates that the system sound of the monitor is normal.
- : Indicates that the alarm of the monitor is paused.
- : Indicates that the alarm of the monitor is turned off.
- : Indicates that the system sound of the monitor is silenced.
- : Indicates that the alarm sound of the monitor is switched off.
- : Indicates that the alarm sound of the monitor is paused or the monitor is in alarm silence status.
-  is the icon of defibrillator, which indicates that a defibrillator is currently connected to the bed.

NOTE

-
- **When an alarm icon appears, the defibrillator icon will not be displayed.**
-

6.2.3.4 Technical Alarm Area

The Technical Alarm Area displays:

- The technical alarms and messages coming from monitor or CMS;
- The work mode and initiated events of a defibrillator.

When multiple messages occur, they will be displayed circularly.

6.2.3.5 Physiological Alarm Area

The physiological alarm area displays:

- Physiological alarms coming from monitor;
- The message indicating the alarm or physiological state. For example, “Alarm Pause”, “CPB Mode”.

When there are multiple messages, the messages will be displayed circularly. When alarms are latched, alarm time is displayed; otherwise, the alarm time is not displayed.

NOTE

-
- **Different alarm priorities are indicated by different background colors in the alarm area. Refer to Part 8.2 Alarm Mode for details.**
 - **You can view all physiological or technical alarms by positioning the mouse pointer inside the physiological or technical alarm area and pressing the left mouse button.**
 - **For unknown technical alarms, the message is “XX Technical Alarm”, XX representing high, medium or low.**
 - **For unknown physiological alarms, the message is “XX Phys. Alarm”, XX representing high, medium or low.**
-

6.2.3.6 Waveform Area

- Display waveforms transmitted from the monitor.
- Display the patient’s name above the first waveform.
- When one or all lethal arrhythmia alarms are set to off, a message of “Lethals Off” will be displayed under the first ECG waveform.
- When the nurse call and/or event function of the telemetry system is switched off, a message will display the status under the first ECG waveform.
- If a patient’s paced status has not been set on the monitor, the  icon will flash in the waveform area when pacer pulse is detected. Click the icon, the “Patient Mgmt” sheet will pop up. The item of “Paced” can be configured there.

6.2.3.7 Parameter Area

This area is to display parameter values transmitted from the monitor.

The icon  beside the parameter indicates that alarms of this parameter are turned off.

6.2.3.8 Telemetry Icons

The following icons are visible only for telemetry transmitter.

Icon name	Icon	Description
Nurse Call		<ul style="list-style-type: none"> ■ After the Nurse Call button is pressed on the transmitter, the Nurse Call icon will continuously flash and meanwhile corresponding prompt tone will sound. The prompt tone will automatically terminate after a while. ■ If you use the mouse to click this icon, this icon will be cleared and the prompt tone will stop. ■ An auto recording will be triggered if the Nurse call's record switch is set to "ON" in "Alarm Setup" menu. ■ The nurse call will be stored in "Event Review". Please refer to 9.1.5 Event Review for viewing, recording and printing in "Event Review".
Event		<ul style="list-style-type: none"> ■ After the Event button is pressed on the transmitter, the Event icon will continuously flash and meanwhile a beep will sound. ■ If you use the mouse to click this icon, this icon will be cleared. ■ An auto recording will be triggered if the Event's record switch is set to "ON" in "Alarm Setup" menu. ■ The event will be stored in "Event Review". Please refer to 9.1.5 Event Review for viewing, recording and printing in "Event Review".
Battery Capacity		<p>This icon tells the remaining battery capacity in the transmitter. With the battery wearing, the solid part and the color of the icon will change accordingly.</p> <ul style="list-style-type: none"> ■ White: indicates the battery is in normal condition. ■ Yellow: indicates the battery is low. ■ Red: indicates the battery is nearly used up.

Icon name	Icon	Description
Received Signal Strength		<p>This icon tells the received signal strength for corresponding channel. With the received signal strength changing, the number of the signal bars and the color of the icon will change accordingly.</p> <ul style="list-style-type: none"> ■ White: indicates the received signal strength is normal. ■ Yellow: indicates the received signal strength is weak. ■ Red: indicates no signal is received.
Transmitter Number	TEL XXXX	Shows the transmitter number corresponding to this channel.

6.3 Display Setup

Clicking the “Display Setup” in the drop-down menu of a patient window will enter a tab sheet, in which you can perform “Multibed Waveform Setup” and “Multibed Numeric Setup” for the current patient window.

6.3.1 Multibed Waveform Setup

On the left of the “Display Setup” tab sheet, you can designate which waveforms are to be displayed in the current patient window.

- By ticking a “Waveform Name”, you can select or deselect this waveform. Only the selected waveforms can be displayed in the current patient window.
- By clicking the “Sweep Speed”, you can have a list of available wave speeds (i.e. 6.25 mm/s, 12.5 mm/s, 25 mm/s and 50 mm/s), from which you can select either.
- Select a waveform by clicking on its name and change its order by clicking “Move First”, “Move Up”, “Move Down” or “Move Last”. Waveform displaying order can be saved.
- When monitoring ECG with the monitor, the lead to be monitored is optional. If you are monitoring with a 3-lead set, you can select any one lead to be displayed in 1 channel. If you are monitoring with a 5-lead set, you can select any two or three leads to be displayed. If you are monitoring with a 12-lead set, you can select up to eight leads to be displayed. For details, refer to operation manual of the bedside monitor.
- When monitoring ECG with the telemetry transmitter, the lead to be monitored is fixed. With a 3-lead set, you can only monitor the lead II in 1 channel. With a 5-lead set, you can only monitor the leads II, V and I in 3 channels. For details, refer to operation manual of the bedside monitor.

NOTE

- **When a patient is discharged, the multibed settings in “Waveform Selection and Order” are saved. The waveforms will be shown as per the same configurations by default when a patient is admitted next time.**
 - **If you discharge a patient and set the bed to an idle sector, the multibed settings in “Waveform Selection and Order” are cleared, and the waveform configurations restore to the system defaults.**
-

6.3.2 Multibed Numeric Setup

Default numeric group cannot be modified or deleted. To change the parameters to be displayed and their order in the current patient window, you can follow this procedure:

1. Click on the “New Group” button, and “New Group 1” will appear under “Default Group”.
2. Select the “New Group 1” to open the “Select & Order” list.
3. Select a parameter from the “Select & Order” list. The “Numeric Preview” area will show the parameter you have just selected. A maximum of 5 parameters are allowed to be selected.
4. Select a parameter by clicking on its name and change its order by clicking “Move First”, “Move Up”, “Move Down” or “Move Last”.
5. Click the “Save Group” button and then select the “New Group 1”. The current patient will show parameters according to the setup of “New Group 1”.

To delete the “New Group 1”, you can select the “New Group 1” and then click the “Delete Group” button.

NOTE

- **When a patient is discharged, the selection of the numeric group is saved. The numeric group will be shown as per the same configurations by default when a patient is admitted next time.**
 - **If you discharge a patient and set the bed to an idle sector, the selection of the numeric group is cleared, and the waveform configurations restore to the system defaults.**
-

7 Viewbed

7.1 Overview

The CMS allows you to view a single patient through the “ViewBed” screen, in which you will have an enlarged view of that single patient’s information, waveforms and values. In this screen, you can freeze waveforms, review dynamic short trends, view multi-lead ECG waveforms and record waveforms, etc.

To access the “ViewBed” screen, follow the instructions below:

- For a spot patient, click the left mouse button in its corresponding patient window. The “ViewBed” screen for that patient will open.
- For a non-spot patient, click on its corresponding block in the non-spot patient window. The “ViewBed” screen for that patient will open.

When the “ViewBed” window is open, you can switch among different patients by clicking in the patient window of a spot patient, or clicking on the block of a non-spot patient, or selecting another bed number in the bed drop-down list of single bed window.

NOTE

- **In the single-screen mode, the CMS uses the lower half screen to accommodate the “ViewBed” screen.**
 - **In the dual- or multi- screen mode, the CMS uses the secondary display screen to accommodate the “ViewBed” screen.**
-

7.2 ViewBed Screen

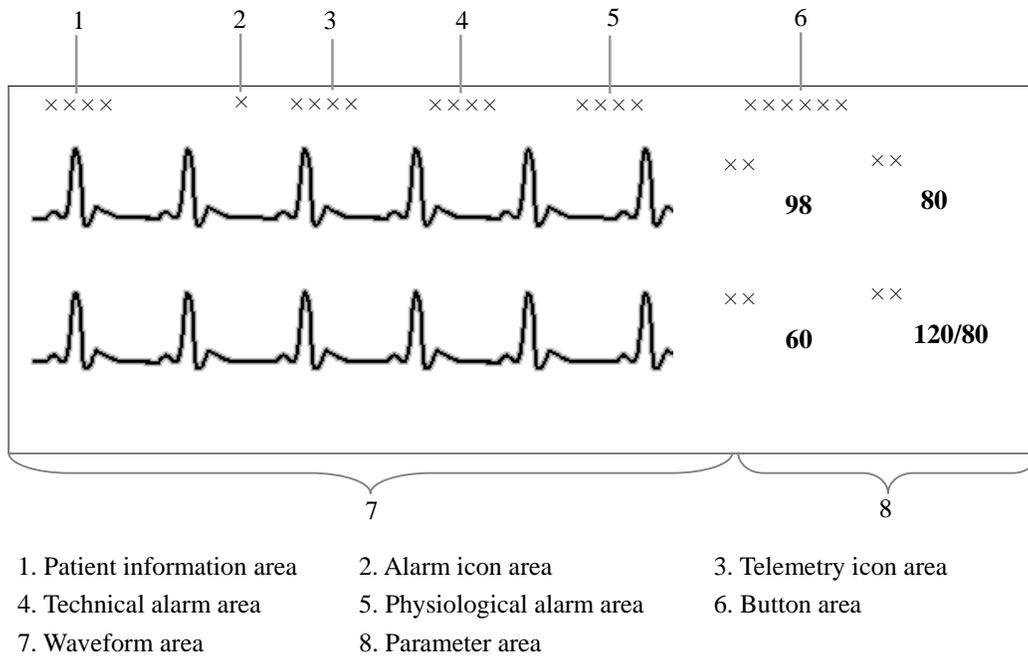


Figure 7-1 ViewBed Screen

In patient information area, bed number, patient name, gender and type are displayed. For description on physiological alarm area, alarm icon area, technical alarm area and telemetry icons, refer to Part **6.2.3 Patient Window in Monitoring Status**.

7.2.1 Button Area

Icon	Name	Description
	Alarm Silence	Used to enter alarm silence status.
	Audio Paused	Used to enter or exit audio paused status. The pause time is subject to the monitor settings.
	Monitor Silence	Used to silence current bedside monitor or reactive the audible prompts of the silenced bedside monitor.
	Alarm Pause	Used to enter or exit alarm paused status. The pause time is subject to the monitor settings.
	STANDBY	Used to enter or exit the STANDBY mode. This option is available only in the telemetry mode.
	NIBP measurement	Used to start NIBP measurement
	NIBP measurement	Used to stop NIBP measurement
	Freeze	Used to freeze and unfreeze waveforms.
	Alarm Limits	Used to show/hide alarm high/low limits.
	Dynamic Trends	Used to show/hide dynamic short trend.
	Parameter Order	Used to open the “Parameter Order” window, in which, you can set the display order of modules.
	Record	Used to open the “Record” dialog box.
	Record	Used to stop recording.
	Print	Used to open the “Print” dialogue box
	Multi-lead ECG	Used to show/hide multi-lead ECG.
	OxyCRG	Used to show/hide OxyCRG graph.
	NIBP Table	Used to show/hide NIBP groups.
	Alarm Setup	Used to enter the “Alarm Setup” tab sheet.
	BIS Expand View	Used to show/hide BIS Expand View.
	EEG Expand View	Used to show/hide EEG Expand View.
	Device Integration Expand View	Used to show/hide Device Integration Expand View.

For details about each button, refer to *7.4 Basic Operations*.

7.2.2 Waveform Area

This area is to display parameter waveforms transmitted from the monitor. In the single-screen mode, this area can only accommodate part parameter waveforms due to space confines of the screen. However, you can drag the vertical scroll bar to view more.

7.2.3 Parameter Area

This area is to display parameter values transmitted from the monitor. Each parameter module occupies a rectangular area, which is hereafter called parameter window. In the single-screen mode, this area can only accommodate part parameter values due to space confines of the screen. However, you can drag the vertical scroll bar to view more.

Click in a parameter window. The border of the window will highlight when the window is selected. Clicking on it again will enter the “Parameter Setup” tab sheet. For details, refer to Part 7.3 *Parameter Setup*.

NOTE

-
- **The waveforms and parameters are consistent between the CMS and the monitor.**
 - **If you change the display order of waveforms and parameters on the monitor, the display order of waveforms and parameters on the CMS will not change automatically. Vice versa.**
 - **In case a module of the monitor is turned off or a parameter is not being monitored, its corresponding waveforms and parameters displayed on the CMS’s screen will disappear at the same time.**
-

7.3 Parameter Setup

Click in a parameter window, and the border of this window will appear highlighted. Clicking again will open the “Parameter Setup” window. The current tab sheet depends on the parameter window you have selected. For example, if you click in the ECG parameter window, the Parameter Setup window will open, with the “ECG” tab sheet at the front.

In this tab sheet, you can set alarm, record switch and sweep speed for all parameters of ECG, SpO₂, C.O., etc. For details on alarms, refer to Part 8.4 *Alarm Setup*.

7.4 Basic Operations

7.4.1 Alarm Setup

Clicking the  button will enter the “Alarm Setup” tab sheet, in which you can set parameter alarms, arrhythmia alarms, arrhythmia alarm threshold and alarm-related aspect. For details, refer to [8.4 Alarm Setup](#).

7.4.2 Silencing Alarms on Monitors

By clicking the Silence icon , you can acknowledge the ongoing alarms. Both the monitor and telemetry transmitter enter the alarm silenced status. The corresponding patient window on the CMS also enters the alarm silenced status.

Please refer to [8.6 Silencing Alarms on Monitors](#) for the patient window’s alarm silence status.

7.4.3 Pausing Alarm Sound on Monitors

By clicking the Audio Paused icon , you can pause the alarm sound of a bedside monitor. The corresponding patient window on the CMS will enter the alarm silenced status. You can also release the audio paused status by clicking the Audio Paused icon  again.

7.4.4 Silencing a Bedside Monitor

By clicking the Monitor Silence icon , you can silence current bedside monitor. The corresponding patient window on the CMS will enter the alarm silenced status. You can reactivate the audible prompts of the silenced bedside monitor by clicking the Monitor Silence icon  again.

7.4.5 Pausing Alarms on Monitors

By clicking the Alarm Pause icon , you can pause all alarms of the current patient for a period of time, which is subject to the bedside monitor settings. The alarm pause time for the telemetry transmitter is fixed to 2 minutes. After the alarm pause time ends, the system will automatically release the alarm pause. You can also release the alarm pause by clicking the Alarm Pause icon again.

7.4.6 STANDBY

The STANDBY icon  is applicable to the telemetry transmitter only. Clicking this icon will have the current patient to enter the STANDBY mode. In the STANDBY mode, you can click this icon again or click any place in the ViewBed to exit the STANDBY mode. For details about the STANDBY mode, refer to the manual of the telemetry monitoring system.

7.4.7 Controlling a Bedside Monitor to Exit STANDBY

If a bedside monitor is in the state of STANDBY, click any place in the ViewBed window. Then a dialog box of prompt information will pop up. Select “Yes” in the dialog box and the monitor will exit the state of standby and start normal monitoring.

NOTE

-
- **The CMS can control the monitor to exit STANDBY mode only when the monitor supports this function.**
-

7.4.8 NIBP Measurement

Once the  icon is clicked, the corresponding bedside monitor will start a NIBP measurement. During measuring process, this icon turns to be . At this time, you can click this icon to stop the measurement. This icon changes accordingly when the bedside monitor starts or stops a NIBP measurement.

WARNING

- **Before starting an NIBP measurement by a bedside monitor at the CMS side, be sure that patient type set on the bedside monitor is correct and NIBP cuff applied is proper.**
-

7.4.9 Freeze/Unfreeze Waveforms

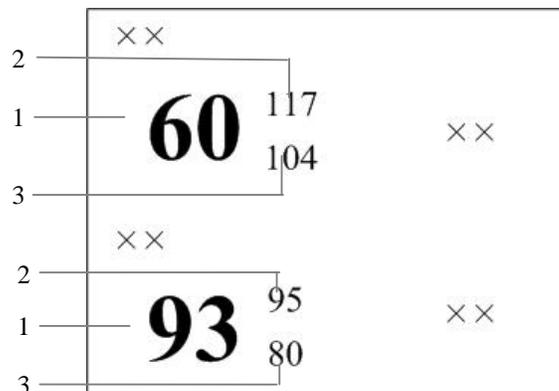
By clicking the  button, you can freeze all dynamic waveforms in the waveform area.

In this area, freeze time is displayed at the topmost and time scale (unit: s) below the first waveform. Clicking  or  will move the waveforms backward or forward one unit (s), and the time scale will change accordingly. You can view more frozen waveforms by dragging the vertical scroll bar in *Figure 7-1*.

In the frozen status, clicking the  button will restore the dynamic waveforms.

7.4.10 Show/Hide Alarm Limits

Clicking the  button will show or hide alarm high/low limits set for all physiological parameters. As shown in *Figure 7-2*, the alarm high/low limits are located to the right of the parameters, with the alarm high limit above the alarm low limit.



1 Measured parameter values 2 High alarm limits 3 Low alarm limits

Figure 7-2 Alarm High/Low Limits

7.4.11 Show/Hide Dynamic Trends

Clicking the  button will show or hide dynamic short trends for each physiological parameter. For details on dynamic short trend, refer to Part **9.1.1 Dynamic Short Trend**.

7.4.12 Parameter Order

Clicking the  button will open a dialog box, in which you can set the waveforms and parameters displaying order.

The parameters to be set depend on the configuration of the monitor. Select a parameter and then click “Move Up”, “Move Down”, “Move First” or “Move Last” to adjust its position. Its waveforms and digitals will change their positions accordingly. Clicking the “Default” button will restore the default display order of modules. The settings of display order can be saved.

NOTE

-
- **When a patient is discharged, the configuration of parameter order is saved. The parameters will be shown as per the same configurations when a patient is admitted next time.**
 - **If you discharge a patient and set the bed to an idle sector, the configuration of parameter order is cleared, and the waveform configuration restores to the system defaults.**
-

7.4.13 Record

Clicking the  button will open the Record dialog box, in which you can select up to two waveforms. In case that the recorder is unusable or no recorder is connected, this button is disabled.

In the frozen status, the recorded waveforms and parameters are the waveforms and parameters recorded at time of freezing but not at current time. Please refer to **11.1.3 Recording Control** about the settings of recording general options.

7.4.14 Print

Printing in Real-time

Click the  button, the “Print Setup” dialog box will pop up. In this dialog box, you can select the waveforms to be printed. In the case that the printer is unusable or no printer is connected, this button will be disabled. Please refer to *11.2.4 Printing Control* about the settings of printing general options.

Printing 12-lead ECG

When performing 12-lead ECG monitoring and 12-lead ECG analysis using a bedside monitor, you can press the  button to display the 12-lead ECG waveforms. Then click the  button, the “Print Setup” dialog box will pop up. In this dialog box, you can set the waveform layout as 12*1, 6*2 or 3*4. In the case that the printer is unusable or no printer is connected, this button will be disabled.

Printing Multi-lead ECG

When a patient is under 5-lead ECG monitoring by a bedside monitor, select the  button to display the multi-lead ECG waveforms. Then click the  button, to print ECG waveforms. In the case that the printer is unusable or no printer is connected, this button will be disabled.

7.4.15 Show/Hide Multi-lead ECG

Click the  button to show or hide multi-lead ECG waveform. The Multi-lead ECG screen is shown as below:

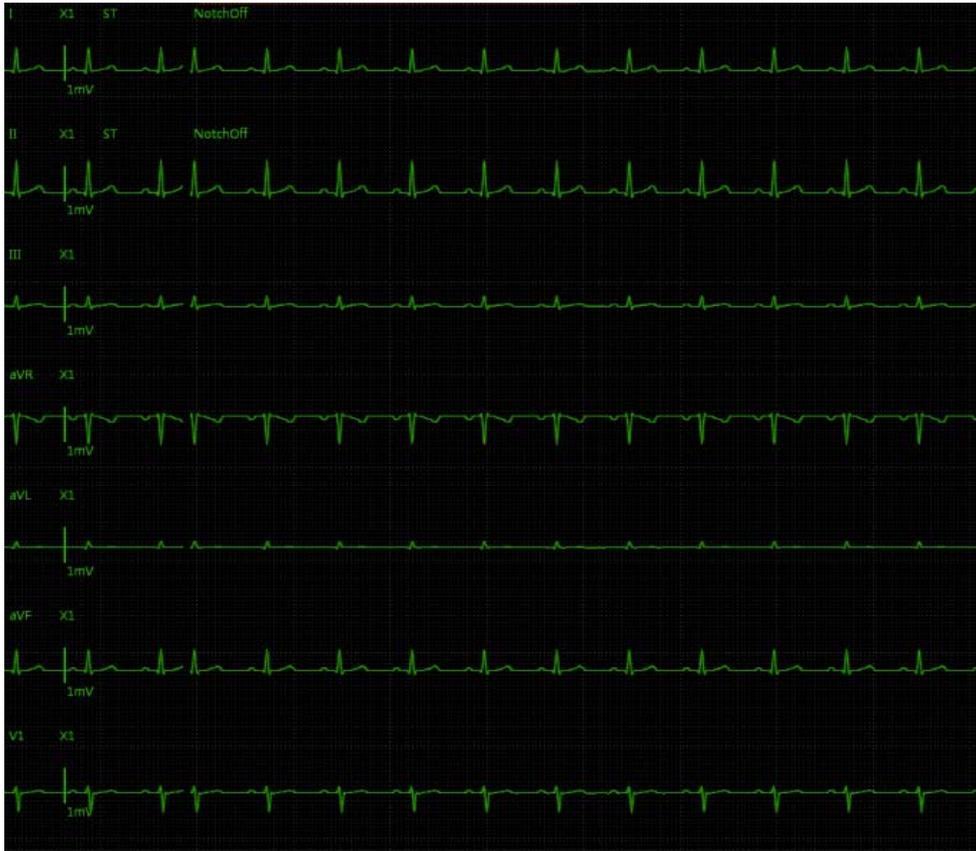


Figure 7-3 Multi-lead ECG

In case there is no ECG waveform, or the monitor is set to 3-lead, or your CMS does not support multi-lead ECG, the multi-lead ECG waveforms will not be displayed.

Click the  button to turn on or turn off 12-lead ECG waveform display when the bedside monitor enters full-screen 12-lead screen, as shown below.

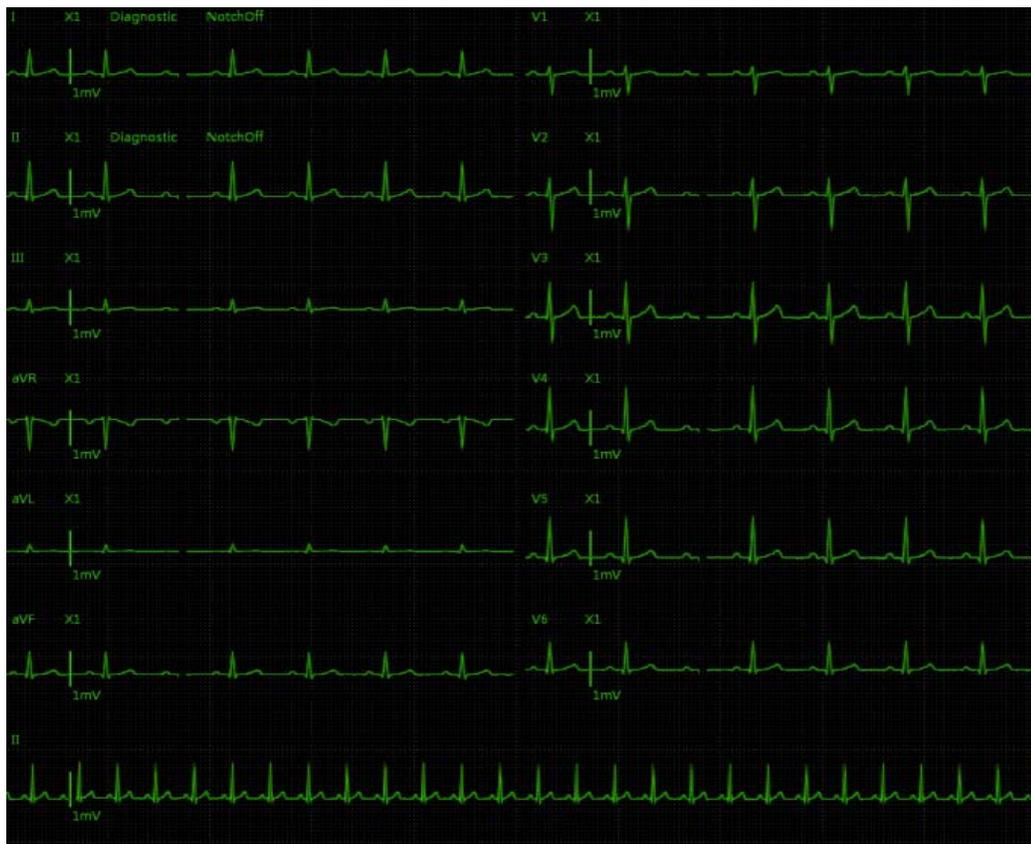


Figure 7-4 12-lead ECG

7.4.16 Show/Hide OxyCRG

Clicking the  button will show or hide OxyCRG window in the waveform area. The OxyCRG window can display 20-minute trend and waveform.

Two trends and one compressed waveform are displayed in the OxyCRG window:

- The trend 1 can be one trend among HR trend, RR trend and HR+RR.trend
- The trend 2 can be one trend among SpO₂ trend, SpO₂b trend and SpO₂+SpO₂b trend.
- Compressed waveform can be one waveform from RESP and CO₂.

In OxyCRG window, the operations are shown as following:

- Click “OxyCRG Review” button to show the OxyCRG review screen.
- Click “Auto Scale” button, and the scale will be automatically adjusted to its most suitable state according to the current trend or waveform.
- Click “Zoom” to set the time range of the currently displayed trends and waveform.
- Click “Setup” button to set which trend or waveform to be displayed in the OxyCRG window, and to manually set the scale.
- Click “Record” button to record OxyCRG graph.
- Click “Print” button to print OxyCRG graph.

7.4.17 Show/Hide NIBP Table

Clicking the  button will show or hide NIBP table in the waveform area. Each measurement includes Measure Time, NIBP values and PR.

7.4.18 Show/Hide BIS Expand View

You can click  button to show or hide BIS Expand View. In BIS Expand View, you can select to view EEG waveforms, BIS trend and DSA graph. This button is enabled only when networked monitor supports BISx4 monitoring; otherwise, this button is disabled.

7.4.19 Show/Hide EEG Expand View

You can click  button to show or hide EEG Expand View. In EEG Expand View, you can select to view EEG waveforms, EEG parameter, EEG trend, CSA and DSA.

7.4.20 Show/Hide Device Integration Expand View

Clicking the  button will show or hide Device Integration Expand View. This button is enabled only when networked monitor supports device integration; otherwise, this button is disabled. All text in Device Integration Expand View appears in white.

You can select to view an individual device or all devices in the Device Integration Expand View:

- Click one of the individual device tabs and access its corresponding tab sheet. Each tab sheet provides “Parameter Display” and “Alarm Setup” button.
 - ◆ Parameter Display: You can use the button to select the desired parameters to be displayed.

- ◆ Alarm Setup: Configure the alarm priority on the CMS for the alarms which occur on the integrated device.

Alarm Setup	Alarm Priority (on the CMS)
Default	Be consistent with the alarm priority on the monitor
Low	Low priority alarm
Message	Message

- Click “Multi Devices” tab and access the tab sheet. In this sheet, you can view the parameters from all devices at same time.

NOTE

- There is no “Multi Devices” tab in Device Integration Expand View when only one device is integrated with the monitor.
- The Device Integration Expand View can include a maximum of 4 individual tab sheets.
- When the alarm priority is configured to “Low” or “Message”, the alarm priority on the CMS may be different from that on the monitor.

7.4.21 Display ST Segments

Display Real-time ST Segments

In the ECG parameter setup menu, select “Display ST Segments”. In the ViewBed window, the ECG waveform display area will display ST segments.

- Displays ST segments of one lead in case of 3-lead type;
- Displays ST segments of three leads in case of 5- and 12-lead types.

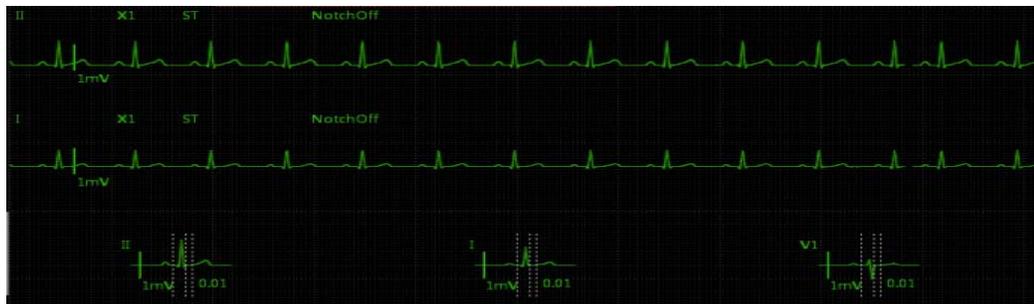


Figure 7-5 Display ST Segments of Three Leads

As shown in the above figure, real-time ST segments and reference segments are overlapped. Real-time ST segments and current ST values are displayed in the ECG parameter color. Reference segments and ST reference values are displayed in white. The ST segment displays the positions of ISO point, J point and ST point. These three analysis points can be set in the CMS if necessary, or set on the bedside monitor. For details, refer to the operation manual for the monitor.

Display ST-segments on the Multi-lead ECG Screen

If multi-lead ECG screen is accessed, corresponding ST segments are displayed after the lead waveforms on the multi-lead or 12-lead screen, as shown below:



Figure 7-6 Display ST Segments on 12-lead ECG Screen

8 Alarm Control

8.1 Alarm Structure

Alarms, triggered by a vital sign that appears abnormal or by technical problems of the monitor, are sent to the CMS by the monitors and then indicated to the users by the CMS. Most of the alarms originally come from the monitors. The alarms coming from the CMS itself are displayed in the patient window's technical alarm area or system alarm area on the upper screen. Please refer to *Appendix B Central Monitoring System Alarms* for the alarm messages.

By nature, the alarms are classified into two categories:

- Physiological alarms, and
- Technical alarms.

By severity, the alarms are classified into:

- High priority alarms,
- Medium priority alarms, and
- Low priority alarms

NOTE

-
- **For details on alarms, refer to the monitor's operation manual.**
-

8.2 Alarm Mode

The CMS gives audible and visual alarms in compliance with international standards.

WARNING

- **The audible and visual alarms given by the CMS comply with the IEC 60601-1-8 standard. The hospital or institution employing the use of the CMS should give adequate training to the operators.**
-

8.2.1 Audible Alarms

This system has three choices of alarm tones and patterns: ISO, Mode 1 and Mode 2. For each pattern, the alarm tones identify the alarm levels as follows:

- ISO pattern:
 - ◆ High level alarms: triple+double+triple+double beep.
 - ◆ Medium level alarms: triple beep.
 - ◆ Low level alarms: single beep.
- Mode 1:
 - ◆ High level alarms: high-pitched triple beep.
 - ◆ Medium level alarms: double beep.
 - ◆ Low level alarms: low-pitched single beep.
- Mode 2:
 - ◆ High level alarms: high-pitched triple beep.
 - ◆ Medium level alarms: double beep.
 - ◆ Low level alarms: low-pitched single beep.

NOTE

-
- **When multiple patients have alarms of different priorities at the same time, the system will select the alarms of highest priorities and give alarm tones accordingly.**
 - **When the system is set to “silence”, giving alarm tones is disabled. In case of a new alarm, the silenced state will be released automatically. You can also release the silenced state manually. For details, refer to 8.10 CMS System Silence.**
 - **In the “General Setup” screen of “System Setup”, when the alarm volume is set to 0, the CMS alarm sound is turned off., and the CMS will switch off the alarm tone permanently and give no audible alarm even if a new alarm occurs. Be careful to configure the alarm volume to 0.**
-

8.2.2 Reminder Tone

In the status of CMS system silence or audio alarm off, the CMS can give a kind of reminder tone in case of an active alarm condition. The Reminder Tone is same as the highest alarm tone. You can set the reminder volume in the “General Setup” tab sheet. You can set the reminder interval and switch on/off the reminder tone in the “Admin Setup” menu.

8.2.3 Alarm Messages

The CMS alerts the users by giving alarm messages in the physiological or technical alarm area. Before the alarm messages, asterisks are used to indicate different alarm priorities:

- High priority alarms: triple asterisks “***”.
- Medium priority alarms: double asterisks “**”.
- Low priority alarms: single asterisk “*”.

When alarms are latched, alarm time is displayed; otherwise, the alarm time is not displayed. The high priority alarm messages are in white font and medium/low priority alarm messages are in black font. Besides alarm messages, the technical alarm area also displays prompt messages coming from monitors. The prompts are in white font.

8.2.4 Color Changes

If a spot patient has an alarm, its corresponding patient window will give an alarm message, with different background colors indicating different alarm priorities:

- High priority alarms: red
- Medium priority alarms: yellow
- Low priority alarms: yellow

If a non-spot patient has an alarm, its corresponding block will appear in red indicating a high-priority alarm or yellow indicating a medium-or low-level alarm.

Additionally, the spot patient window will display the parameters in alarm with different background colors and flashing frequency indicating different alarm priorities:

- High priority alarms: red, quickly flashes
- Medium priority alarms: yellow, slowly flashes
- Low priority alarms: yellow, without flashing

8.2.5 Parameter Flashes

In ViewBed screen, if a physiological parameter of the patient generates an alarm, this parameter will flash in the parameter area. If the alarm high/low limits of the parameter are displayed in the “ViewBed” screen, either the alarm high or low limit will also flash indicating that the parameter exceeds the alarm high or low limit.

8.3 Alarm Volume

By clicking “System Setup” then “General Setup”, you can enter a tab sheet. The CMS provides up to 11 volume levels, increasing from 0 to 10. You can drag the volume control key to your desired volume. While dragging the volume control key, the corresponding sound will also be played.

The alarm volume can be configured in the range from Minimum Alarm Volume to 10. Please refer to *12.2.3 Alarm - Minimum Alarm Volume*.

In the “General Setup” tab, you can set high alarm volume. High alarm volume can be set equal to or louder than the alarm volume. The options are “alarm volume +0”, “alarm volume+1” and “alarm volume+2”. When a high level alarm occurs, the alarm will sound with the specified high alarm volume. For example, if the high alarm volume is set to “alarm volume+1”, and the current level of alarm volume is 5, then the high alarm volume is 6.

NOTE

-
- If the alarm volume is set to 0, the system information area displays alarm audio off icon .
 - If high alarm volume level is greater than 10, the monitor will sound it in the volume of 10.
-

8.4 Alarm Setup

In either the “Parameter Setup” or “Alarm Setup” tab sheet, you can define alarm switch, alarm high/low limits and alarm priority for each parameter.

8.4.1 Parameter Setup Tab Sheet

Click in a parameter window. The border of the window will appear highlighted when the window is selected. Clicking again will enter a tab sheet.

Take the ECG module as an example; you can set the HR alarm switch, limit and priority.

NOTE

- When the “Alarm Setup” at “Remote Control Settings” menu is ticked, the settings of the parameter alarm switch, limit and level are controlled bidirectionally. For example, if the alarm switch of a parameter is set to “Off”, the alarm switch of this parameter will change to “Off” on the monitor. Refer to *12.2.8 Other* for the details of remote alarm setup.
 - When you change the alarm limits of the monitor via the CMS, make sure that the alarm limits settings are appropriate for your patient. Setting alarm limits to extreme values may cause the alarm system to become ineffective.
-

- Default: Click this button to restore CMS-related settings to factory default.
- Alarm Setup: Click this button to enter the Alarm Setup tab sheet. Refer to Section **8.4.2 Alarm Setup Tab Sheet** Alarm Setup Tab Sheet for details.

For telemetry transmitter, the parameter setup tab sheet is different. For details, refer to the manual of telemetry monitoring system.

8.4.2 Alarm Setup Tab Sheet

Clicking the  button in the “ViewBed” screen will enter the “Alarm Setup” tab sheet, in which you can set parameter alarms, arrhythmia alarms, arrhythmia alarm threshold and other aspect of alarms.

8.4.2.1 Setting Parameter Alarm

In the “Parameter Alarm Settings” tab sheet, you can set the alarm properties of ECG, HR, SpO₂ and other parameters. Take the HR as an example; you can use the keyboard to modify its alarm high/low limits by clicking “HIGH LIMIT” or “LOW LIMIT”, as well as use the mouse to make a selection by clicking “Alarm Priority”, “Activation State”, “Record On Alarm” or “Print On Alarm”.

8.4.2.2 Setting Arrhythmia Alarms

In the “Arrhythmia Alarms” tab sheet, the alarm for asystole, tachy and other kinds of arrhythmia can be set here.

- Alarm priority: The alarm level can be set to “High”, “Med”, “Low” or “Message”. Specifically, the “Message” level only has text, without the indication by audio, background color and ‘*’.
- Activation state: The activation state of each arrhythmia can be set individually. In addition, the activation state of some arrhythmias can be set as a whole with the buttons of “All Alarm On”, “All Alarm Off” and “Lethals Only”. If click “Lethals Only” button, only the lethal arrhythmia alarms are set to “ON” and other alarms are set to “OFF”; if click “All Alarm On”, all arrhythmia alarms are set to “ON”; if click “All Alarm Off”, all arrhythmia alarms are set to “OFF”.
- Record, Print On Alarm: Set the switch of record in real-time and print in real-time when arrhythmia alarms occur..

NOTE

-
- If a bedside monitor is connected and the “Lethal Arrh. Off” item in its “Admin Setup” menu is set to “Disable”, the “All Alarm Off” button in the arrhythmia alarm settings of the CMS is inactive.
 - If a telemetry monitoring system is connected and the “Lethal Arr. Off” item in “Telemetry” sheet under “Admin Setup” menu is set to “Disable”, the “All Alarm Off” button in the “Arrhythmia Alarm” of the CMS is inactive.
-

8.4.2.3 Setting Arrh. Threshold

The threshold of PVCs high limit, tachy and others can be set in “Arrh. Threshold Setup” sheet.

8.4.2.4 Others

In “Others” tab sheet, the alarm latch can be set here. Please refer to **8.9 Latching Alarms** for details.

8.5 Pausing Alarms

For the monitors supporting bidirectional control of alarm pause, you can click the Alarm Pause icon  in the viewbed screen or Alarm Pause in the drop-down menu in the multibed screen to pause all alarms of current monitor for a period of time, which can be set on the monitor. After alarm pause time ends, the system will automatically release the alarm pause. You can also release the alarm pause by clicking the icon  or Alarm Pause in the drop-down menu again.

You can enable or disable the remote alarm control function on the CMS. When remote alarm control is disabled, the icon  is inactive and the “Alarm Pause” control is not available in the drop-down menu in the multibed screen. Refer to Section **12.2.8 Other** to see how to enable or disable the remote alarm control function.

8.6 Silencing Alarms

For the monitors supporting bidirectional control of alarm silence, you can enter the status of Silence through following ways:

- In the CMS viewbed screen, click the Silence icon .
- In the multibed screen, you can click the right button of mouse when the cursor is in the window where the patient needs the setting of Silence, or select the option ‘Silence’ in its drop-down menu.

When Silence is selected, both the monitor and corresponding patient window on the CMS will enter the alarm silenced status: after the physiological alarm is silenced, ✓ appears before the alarm message; for some technical alarms, ✓ appears before the alarm message after the alarm is silenced; for some technical alarms, the alarm message changes to prompt message after the alarm is silenced; for some other technical alarms, the alarm message is cleared after the alarm is silenced.

As for the monitor’s alarm silenced status and the classification of technical alarms, please refer to the monitor’s Operator’s Manual.

The alarm silenced status will be automatically cancelled when a new alarm occurs.

You can enable or disable the remote alarm control function on the CMS. When remote alarm control is disabled, the icon  is inactive and the “Silence” control is not available in the drop-down menu in the multibed screen. Refer to Section **12.2.8 Other** to see how to enable or disable the remote alarm control function.

8.7 Pausing Alarm Sound on Monitors

For the monitors supporting bidirectional control of alarm sound pause, you can enter the status of Audio Paused of bedside monitor through following ways:

- In the CMS viewbed screen, click the Audio Paused icon .
- In the multibed screen, you can click the right button of mouse when the cursor is in the window where the patient needs the setting of Audio Paused, or select the option 'Audio Paused' in its drop-down menu.

When Audio Paused is selected, the sound of technical alarms and physiological alarms on the monitor will be paused, but the alarm lamps and alarm messages remain active. If a new alarm occurs, the monitor will exit the audio paused status automatically and return to its normal alarm status. You can also release the audio paused status by clicking the icon  or select the option Audio Paused again.

You can enable or disable the remote alarm control function on the CMS. When remote alarm control is disabled, the icon  is inactive and the "Audio Paused" control is not available in the drop-down menu in the multibed screen. Refer to Section **12.2.8 Other** to see how to enable or disable the remote alarm control function.

8.8 Silencing the Monitors

For the monitors supporting bidirectional control of monitor silence, you can enter the status of Monitor Silence of bedside monitor through following ways:

- In the viewbed screen, click the monitor silence icon .
- In the multibed screen, you can click the right button of mouse when the cursor is in the window where the patient needs the setting of Monitor Silence, or select the option 'Audio Paused' in its drop-down menu.

When Monitor Silence is selected, all the sounds given by the monitor, including the alarm sounds, will be silenced. If a new alarm occurs, the monitor will exit the silenced status automatically. All the sounds, including the alarm sounds, will restore their statuses when the Monitor Silence is not set yet. You can also release the monitor silence status by clicking the icon  or the Monitor Silence option again.

You can enable or disable the remote alarm control function on the CMS. When remote alarm control is disabled, the icon  is inactive and the “Monitor Silence” control is not available in the drop-down menu in the multibed screen. Refer to Section **12.2.8 Other – Remote Control Setting** to see how to enable or disable the remote alarm control function.

8.9 Latching Alarms

If an alarm is latched, the alarm message remains and the alarm start time is also displayed in the alarm area when the alarm condition ends.

Enter “Alarm Setup” window, select “Others” tab sheet and then set the “Alarm Latch” by the options of “Off”, “High”, “Hi & Med” and “All”: Alarm latch function supports bidirectional control.

- If “Off” is selected, no alarm will be latched
- If “High” is selected, the alarms in the high level will be latched
- If “Hi & Med” is selected, the alarms in the high and medium levels will be latched
- If “All” is selected, all the alarms will be latched.

You can enable or disable the alarm latch function on the CMS. When alarm latch is disabled, the “Alarm Latch” control in the “Alarm Setup” tab sheet is inactive. Refer to Section **12.2.8 Other** for details.

8.10 CMS System Silence

CMS system silence only silences the CMS system sounds. Alarms from the monitors will not be affected. The CMS’ system sounds include alarm sound, nurse call, event, etc.

To silence or reactivate CMS system sounds, click System Setup; then click Admin Setup; enter required password. In the Admin Setup tab sheet, select Alarm and select the “Silence Hotkey” as desired.

Clicking the “Silence” button on the main screen, or pressing the Silence hot key if the Silence Hotkey check box is selected will enter the CMS system silenced status.

When the system sounds are silenced, the icon  will appear on the main screen.

In the system silenced status, the CMS gives no audible alarm, but other alarm indications, such as alarm message, remain being presented. If a new alarm occurs, the system silenced status will be automatically released.

In the system silenced status, clicking the “Silence” button on the main screen again, or pressing the Silence hot key again if the Silence Hotkey check box is selected will the exit CMS system silenced status.

8.11 CMS Alarm Audio Off

CMS Alarm Audio Off only switches off the audible alarms from CMS. Alarm audio from the monitors will not be affected.

In “General Setup”, when the alarm volume is set to 0, the CMS audio is turned off. Refer to *8.3 Alarm Volume*.

When audible alarms are switched off, the icon  will appear on the main screen. In this case, the CMS gives no audible alarm, but other alarm indications and audible signals remain being presented.

NOTE

- **Be careful to configure the alarm volume to 0. If Alarm volume is set to 0, the alarm audio is turned off, and the CMS will switch off the alarm tone permanently and give no audible alarm even if a new alarm occurs.**
-

The CMS can be in either system silenced or alarm audio off status at same time.

NOTE

- The  icon will appear on the main screen if the CMS is in the system silenced status.
 - The  icon will appear on the main screen if the CMS is in the alarm audio off status.
-

9 Review

9.1 Online Review

Online review is to review the dynamic short trends, C.O. measurements, waveforms, trends, events, OxyCRG graph and ST segment of a patient that is currently monitored by the CMS.

9.1.1 Dynamic Short Trend

Clicking the  button in the Viewbed screen will show graphic short trends for the parameters. The colors and order are subject to their respective parameter modules.

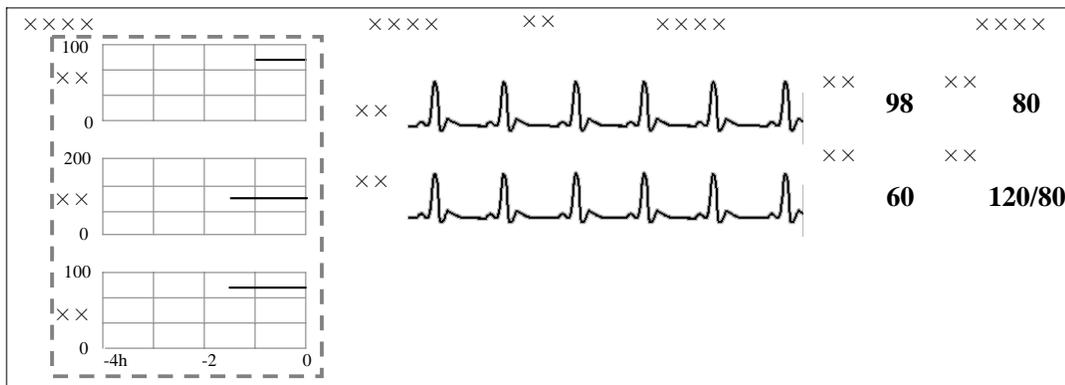


Figure 9-1 Dynamic Short Trend

The dynamic short trends will update every minute automatically, and the total display time is 4 hours. Below the bottommost short trend window is a time scale, with scales in -4, -2, and 0 hour and each vertical line representing an interval of 1 hour.

Click in a parameter's dynamic short trend window, and the parameter's graph will be selected. Clicking again will enter the dynamic short trend setup window. The default selected parameter is the currently displayed parameter. You can select other parameter in the window to view the corresponding dynamic short trend graph.

Additionally, you can view more parameters' short trends by dragging the vertical scroll bar.

9.1.2 Trend Review

9.1.2.1 Overview

Clicking the “Trend Review” tab will enter a tab sheet, through which you can store and review up to 240 hours of trend data. Change of trends can be observed through the graphic and tabular. You can switch between the tabular and graphic by simply clicking their buttons.

In the tabular, the parameters from the integrated devices are indicated with “+” mark before the parameter name; in the graphic, in addition to the “+” mark before the parameter name, the relevant parameter information of the integrated devices is shown in white,

9.1.2.2 Operation

In this tab sheet, you can:

- Set resolution or zoom
- View parameter values at a certain time
- Select trend group
- Refresh data
- Print
- Save as

For details about print and save as, refer to *11 Record, Print and Save as*.

Setting Resolution or Zoom

In the tabular trends, you can set resolution to a time interval to display the tabular trends as required. When the resolution is set to “NIBP” or “TEMP”, up to 240 hours measured values and other parameter values which NIBP or TEMP measurement time corresponds to can be displayed. When the resolution is set to “Manually Saved”, all the manual data can be displayed. If your CMS software does not support to review full-disclosure waveforms, no measurement data is available in the 1 sec and 5 sec tabular trends.

In the graphic trends, you can set the desired zoom for reviewing graphic trends. Options for zoom include 15 min, 30 min, 1 Hour, 2 Hours, 4 Hours, 8 Hours, 12 Hours, 24 Hours and 48 Hours.

Viewing Parameter Values at a Certain Time

Clicking at a place in the graphic, you can position the cursor at that place and view parameter values at the time corresponding to that place, and the cursor in the tabular is positioned in the row corresponding to that time. Contrarily, if you select a row in the tabular, the cursor in the graphic will be positioned at the time corresponding to that row.

You can further position the time at which the cursor is located by clicking these buttons:

Buttons	Graphic
	Clicking this button will turn to the previous page of graphic.
	Clicking this button will move the graph to left by a time range of one resolution.
	Clicking this button will move the graph to right by a time range of one resolution.
	Clicking this button will turn to the next page of graphic.

Buttons	Tabular
	Clicking this button will turn to the next page of tabular.
	Clicking this button will move the cursor down one line.
	Clicking this button will move the cursor up one line.
	Clicking this button will turn to the previous page of tabular.

Selecting Trend Group

Click the “Trend Group” drop-down list. You can select the desired trend group to review.

For details about setting trend groups, refer to *12.2.4 Trend Group*.

NOTE

- **In the trend review window, selecting different trend groups views different trend parameters.**

Refreshing Data

Trend data will not update automatically. Therefore, if you want to view up-to-date trend data, you have to refresh them manually. Clicking the “Refresh” button will open a dialog box, through which you can input a start time and then select “OK” to re-read data. After refreshing, the select status and order of parameters remain unchanged.

9.1.3 Waveform Review

The CMS can store 240 hours' waveforms of all patients.

9.1.3.1 Overview

In the Waveform Review window, you can review compressed or normal waves as required.

9.1.3.2 Compressed Waveform Review

Compressed Waveform Review Screen

Click the "Waveform Review" tab sheet to open the following window, through which, you can review the latest 240 hours' waveforms of the patient. In the single screen mode, up to 10 lines of compressed waveforms are displayed. In the dual- or multi- screen mode, up to 32 lines of compressed waveforms are displayed.

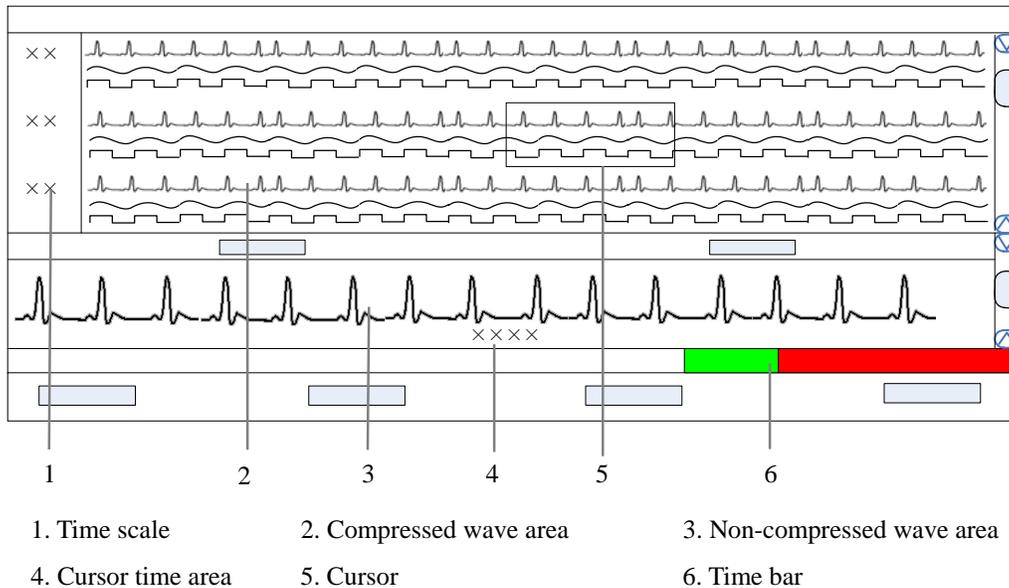


Figure 9-2 Compressed waveform review

■ Time Scale

Displays the time moment to which the waveform group of each line in the compressed waveform area corresponds.

- Compressed Waveform Area

Displays compressed waveforms. If some waveform's signal is not detected within a specific time period, square waves is displayed.

- Non-compressed Wave Area

Displays compressed waveforms where the cursor is located with normal wave size, or displays the patient's parameter information.

- Cursor time area

Displays the time where the cursor is located.

- Cursor

By moving the cursor, you can select six seconds, a total of 12 seconds of compressed waveforms before and after the central cursor point.

- Time Bar

Same functions with that in the normal waveform review. Refer to *9.1.3.3 Normal Waveform Review-Normal Waveform Review Window*.

Compressed Waveform Operation

In the compressed waveform review window, you can:

- Select waveforms to be saved
- Select waveforms
- Mark arrhythmia
- View arrhythmia statistic
- Refresh
- Show/hide parameter
- Zoom
- ICP waveform scale
- Print
- Save as

For details about print and save as, refer to *11 Record, Print and Save as*.

- Selecting waveforms to be saved

By clicking the “Wave Save” button, you can select waveforms to be saved for each patient as desired following this procedure:

1. Select a patient from “Patient Info” list.
2. Select waveforms to be saved for this patient from the “Waveform” list.
3. Repeat Step 1 and Step 2 to select waveforms to be saved for other patients.
4. Select “OK” and the system will save all the selected waveforms.

The CMS can save up to 240 hours’ waveforms of all patients. If you did not select waveforms for a patient, no waveforms and parameter values can be reviewed from the “Waveform Review” window.

For details about automatic waveform storage, refer to *5.1.3 Auto Waveform Storage*.

- Selecting Waveforms

Click the “Wave Select” button to pop up the menu of waveforms for your selection. Tick the checkbox before the desired wave (at most four waves) and the compressed waveform area will display the selected waves.

Select a waveform by clicking on its name and change its order by clicking “Move First”, “Move Up”, “Move Down” or “Move Last”.

Click “Save as Default” to save the current configuration as user’s default configuration; click “Load Configuration” to load the user’s default configuration on current patient.

NOTE

- **The waveform selection of new admitted patient is the user’s default configuration.**
-

- Marking Arrhythmia

You can mark any alarmed arrhythmia waveform with color in compressed waveform area. From the “ARR Mark” drop-down list, you can select the types of arrhythmia to be marked. Please refer to *12.2.1 Setting Color* for how to set desired color for each type of arrhythmia.

NOTE

- **If multiple arrhythmia alarms occur at the same time, only the alarm(s) of highest level will be marked; if the arrhythmia alarms are of the same level, the alarm of highest priority will be marked.**
-

■ Viewing Arrhythmia Statistic

Click the “ARR Statistic” button and in the pop-up menu you can view the statistic about the HR value and the number of each arrhythmia type during a certain time range. You can set the time range as 24 hours, 12 hours, or 8 hours.

For details about print, refer to *II Record, Print and Save as*.

■ Showing/hiding Parameter

Click the “Numerics Data” or “Hide Numerics” button, the non-compressed waveform area will respectively display the patient’s parameter information or compressed waveforms where the cursor is located with normal wave width.

■ Zoom

Set the time span of each line in the compressed waveform window. The options are 15s, 30s, 45s, 1min and 2min. The longer the time span of each line sets, the more the lines of compressed waveform display on the screen. In single-screen mode, up to 10 lines of waves can be displayed; in dual- or multi- screen mode, up to 32 lines of waves can be displayed.

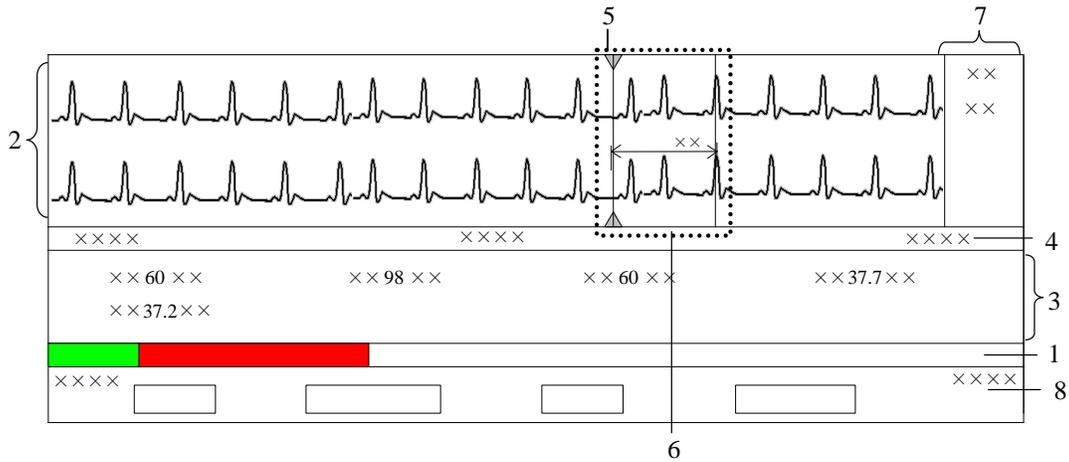
■ ICP Waveform Scale

When ICP is displayed in compressed waveform area, you can right click the mouse to adjust ICP waveform amplitude. Each time the right key you click, the scale is adjusted in the preset order. There are four levels of the scale: 0-15 mmHg, 0-20 mmHg, 0-30 mmHg and 0-40 mmHg. After change, the scale level displays above the ICP waveform.

9.1.3.3 Normal Waveform Review

Normal Waveform Review Screen

Click the “Waveform Review” tab sheet. Click the “Full Size” button to open the following window, through which, you can review the latest 240 hours’ waveforms about the patient.



- | | | |
|-------------------------------|-------------------|-------------------|
| 1. Time bar | 2. Waveform area | 3. Parameter area |
| 4. Waveform time display area | 5. Current cursor | 6. Caliper |
| 7. Caliper measurement area | 8. Button area | |

Figure 9-3 Waveform Review Tab Sheet

■ Time Bar

The time bar adopts different colors to identify the alarm status of different time periods:

- ◆ White: indicates that there are no waveforms and values.
- ◆ Green: indicates that there are waveforms and all monitored parameters are normal, no alarms occur.
- ◆ Yellow: indicates that some parameters have low- or medium-level alarms but there are still waveforms.
- ◆ Red: indicates that some parameters have high-level alarms but there are still waveforms.

Within the time bar, there is a black line indicating the time moment to which the current cursor corresponds. While moving the cursor along the time bar, the time corresponding to the cursor location will appear above the time bar. By clicking the mouse, you can confirm the time moment to which the current cursor corresponds. In addition, you can further adjust the black line by using these buttons and the waveform will also move accordingly.

-
- ◆ : Clicking it will move the black line to the leftmost, i.e. the review start time.
 - ◆ : Clicking it will move the black line left, so that the waveforms in the waveform area move left at the length of one screen.
 - ◆ : Clicking it will move the black line left a little.
 - ◆ : Clicking it will move the black line right a little.
 - ◆ : Clicking it will move the black line right, so that the waveforms in the waveform area move right at the length of one screen.
 - ◆ : Clicking it will move the black line to the rightmost, i.e. the review end time.

■ **Waveform Area**

This area is to display the waveform strips over a specific period. Click in the waveform area, and the grey triangles on the top of and at the bottom of the waveform area will appear indicating the current time corresponding to the cursor location.

Caliper Measurement

Left click the mouse at a place in the waveform area and then hold it on while dragging the cursor until another your desired place is reached. During dragging, a caliper with two arms and a middle measurement line, marking the real time measurement, will appear on the waveforms. During dragging, if you move the mouse horizontally, the right arm will be moved accordingly; if you move the mouse vertically, the measurement line will be moved accordingly.

When a caliper is formed, you can adjust the caliper by the following operations to measure the time difference between any two points:

- ◆ When the cursor is positioned at caliper arm, and the cursor turns to , you can horizontally move the arm.
- ◆ When the cursor is positioned at measurement line, and the cursor turns to , you can vertically move the measurement line.
- ◆ When the cursor is positioned between the two arms, and the cursor turns to , you can move the whole caliper.

In waveform area, right click mouse, and select “PR”, “QRS”, “RR” or “QT” in the pop-up menu, the corresponding measurement will be shown above the first ECG waveform. In the calliper measurement area, the above-mentioned value can be acquired as well. Refer to ***9.1.3.3 Normal Waveform Review –Normal Waveform Review Screen*** for additional information of caliper measurement area.

NOTE

- The current caliper measurements can be manually saved as an event.
 - The waveform review does not include caliper measurements.
-

ECG Waveform Gain

You can set the ECG waveform gain in the waveform area by either way:

- ◆ When the cursor is positioned at any ECG waveform, the buttons  and  will display at the left end of the waveform. Click  button can increase the gain, and click  button can decrease the gain.
- ◆ Right click mouse, and select “Zoom in ECG Gain” or “Zoom out ECG Gain” in the pop-up menu.

Sweep Speed

You can set the sweep speed by either way:

- ◆ In waveform area, right click mouse, and select “Zoom in Sweep Speed” and “Zoom out Sweep Speed” to adjust the speed.
- ◆ In button area, click “Sweep Speed” to set the waveform sweep speed. Refer to *9.1.3.3 Normal Waveform Review –Normal Waveform Review Screen* for additional information of selecting sweep speed.

■ Caliper Measurement Area

The caliper measurement area is hidden by default. If the check box before “Caliper” is ticked at the right bottom corner of the screen, this area will be shown; otherwise it will be hidden.

There are five measurement buttons and one “Clear” button. When the caliper is operated in the waveform area, click “PR”, “QRS”, “RR”, “QT” buttons in caliper measurement area, the corresponding measurement will display; the QTC value is calculated after RR and QT value have been acquired. You can clear all the values by click “Clear” button.

- Parameter Area

By default, the parameter area is hidden. Clicking the “Numerics Data” button will show the parameter area. If parameter area is displayed, clicking the “Hide Numerics” button will hide the parameter area.

Parameter area shows all current parameter values. For parameters having high-level alarms, they are highlighted in red and “***” is shown in front of the parameter values; for parameters having medium level alarms, they are highlighted in yellow and “**” is shown in front of the parameter values for parameters having low level alarms, they are highlighted in yellow and “*” is shown in front of the parameter values; for parameters having message, they are shown with black as the background color, but no indication by “*” before parameter values; for the parameters from integrated devices, they are shown in white and indicated with “+” before the parameter name.

- Waveform Time Display Area

In this area, waveform start time and end time are respectively shown at leftmost and rightmost; the current cursor time is shown in the middle. By clicking the “Refresh” button, you can update the end time to current system time and the start time changes accordingly.

- Button Area

Refer to **9.1.3.3 Normal Waveform Review –Normal Waveform Operation** for additional information of button function.

Normal Waveform Operation

In the normal waveform review window, you can:

- Select waveforms to be saved
- Select waveforms
- Select Sweep Speed
- Save Event
- Auto play
- Record
- Print
- Save as
- Export to EMR

For details about record, print and save as, refer to **11 Record, Print and Save as**.

■ **Selecting waveforms to be saved**

By clicking the “Wave Save” button, you can select waveforms to be saved for each patient as desired following this procedure:

1. Select a patient from “Patient Info” list.
2. Select waveforms to be saved for this patient from the “Waveform” list.
3. Repeat Step 1 and Step 2 to select waveforms to be saved for other patients.
4. Select “OK” and the system will save all the selected waveforms.

The CMS can save up to 240 hours’ waveforms of all patients. If you did not select waveforms for a patient, no waveforms and parameter values can be reviewed from the “Waveform Review” window.

For details about automatic waveform storage, refer to *5.1.3 Auto Waveform Storage*.

■ **Selecting Waveforms**

Click the “Wave Select” button, and a list of available waveforms will be shown. By default, all waveforms are selected. You can deselect a waveform by ticking its check box. Besides, you can drag a waveform name to change its display order.

■ **Selecting Sweep Speed**

By clicking the “Sweep Speed” button, you can set the width of waveforms displayed in the waveform area. Available options are 6.25 mm/s, 12.5 mm/s, 25 mm/s and 50 mm/s.

Changing sweep speed will affect the time length of the waveform area. At the 1280×1024 resolution, the sweep speed and time length correlate as follows:

Sweep Speed	Time length (approximate)
6.25 mm/s	52.0s
12.5 mm/s	26.0s
25 mm/s	13.0s
50 mm/s	6.5s

■ **Saving Event**

Clicking the “Save Event” button will enter a dialog box. Select the waveforms can be saved and input necessary event description. Then, select “OK” to save the currently displayed waveform stripe. The saved event can be viewed in the “Event Review” screen.

■ **Auto Play**

By clicking “Auto Play” and then the stepping buttons, you can review waveforms in the auto mode.

-
- Export to EMR

By clicking “Export to EMR” button, you can export 20-second waveform data after the start time of current waveform to other systems.

NOTE

- **When the item “Export Waveform Data” in “Service Setup” tab sheet from “Admin Setup” – “Other” – “Gateway Communication Setting” is enabled, the function of Export to EMR can be used.**
-

9.1.4 C.O. Review

9.1.4.1 Overview

Clicking the “C.O. Review” tab will enter a tab sheet, through which you can view up to 720 C.O. measurement curves and parameter values of a patient

Below the C.O. review windows are the average C.O. and C.I. If you switch to the “Hemo Calcs” tab sheet from a C.O. review window, the system will take the average C.O. and C.I. corresponding to that C.O. review window as the inputs of hemodynamics calculation.

9.1.4.2 Operation

In the C.O. review window, you can:

- Select measurements
- Delete a set of measurements
- Print
- Record
- Save as

For details about record, print and save as, refer to *11 Record, Print and Save as*.

Selecting Measure Results

The time corresponding to each measurement is listed in the “Measure results list”, from which you can select up to 6 measurements. To the right of the “Measure results list”, there are 6 C.O. review windows, displaying the C.O. curves and parameter values measured at 6 different times.

Click in a C.O. review window. The border of the window will highlight in blue when it is selected.

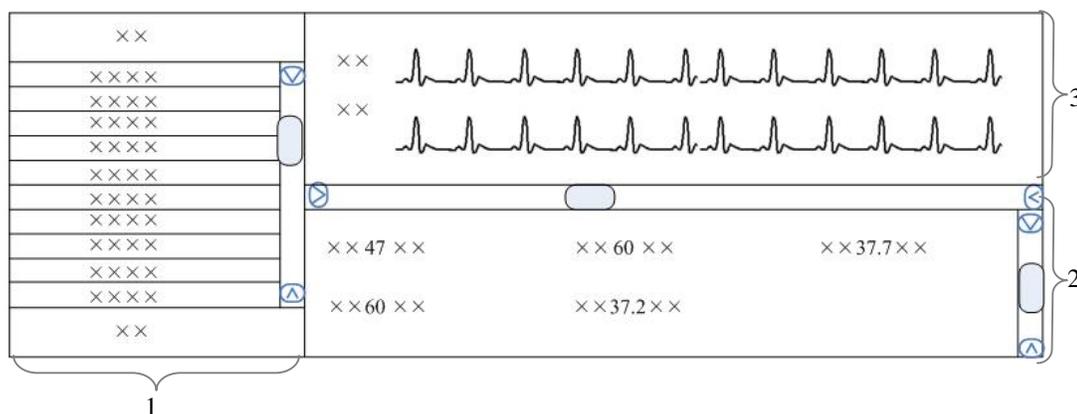
Deleting a Set of Measurements

1. Select the time or C.O. review window corresponding to the measurement you want to delete.
2. Click the “Delete” button, and a dialog box for you to confirm the deletion will pop up.
3. Select “Yes” to delete the measurement.

9.1.5 Event Review

9.1.5.1 Overview

Clicking the “Event Review” tab will enter the following tab sheet, through which you can view all event parameters and waveforms of a patient.



1 Event list 2 Event parameter area 3 Event waveform area

Figure 9-4 Event Review Tab Sheet

1. Event list: displays event status (locked or not), time, message, priority, and description.
2. Event parameter area: displays all parameter values for each event time. The parameters from integrated devices are indicated with “+” before the parameter name, and the relevant text is shown in white. The CMS prompts if an alarm occurs to a specific parameter and indicates the alarm priority by using different background colors.
 - ◆ Black: no alarm generated;
 - ◆ Red: high level alarm generated;
 - ◆ Yellow: medium or low level alarm generated.
3. Event waveform area: displays relevant parameters’ waveforms within ± 16 seconds around the event time. Please refer to **9.1.3.3 Normal Waveform Review –Normal Waveform Review Screen –Waveform Area** for how to use caliper, how to adjust ECG waveform gain and how to adjust sweep speed in waveform area.

Select an event from the event list, and you will view its corresponding parameter values and waveforms in the event parameter area and event waveform area.

NOTE

- For the event from integrated devices, there is no corresponding waveform in the event waveform area.
-

9.1.5.2 Operation

In the “Event Review” window, you can:

- Select event type and alarm priority
- Sequence the event list
- Make selection
- Lock and unlock
- Delete
- Sweep speed
- Print
- Record
- Save as
- Export to EMR

For details about sweep speed, refer to *9.1.3.3 Normal Waveform Review –Normal Waveform Operation*.

For details about record, print and save as, refer to *11 Record, Print and Save as*.

Selecting Event Type and Alarm Priority

Above the event list, there are two drop-down list boxes: “Filter by Event” and “Filter by Priority”. By clicking the down arrow buttons next to them, you can select event type and level. The selected events will be listed in the event list.

Options for event type are “All”, “ECG”, “SpO₂”, “RESP”, “NIBP”, “IBP”, “C.O.”, “TEMP”, “CO₂”, “GAS”, “ICG”, “BIS”, “RM”, “CCO”, “SvO₂”, “ScvO₂”, “Arr”, “ST Analysis”, “Saved Events”, “Anesthesia”, “Ventilator”, “Unknown Phys. Alarm”, “User Initiated”(only for defibrillator), “Event” (only for telemetry monitor), and options for alarm priority include “All”, “High”, “Med” or “Low” or “Message”. By default, “All” for alarm type and “All” for alarm priority are selected.

Sequencing the Event List

You can sequence all alarms ascendingly or descendingly by clicking the heading of any column:

- Time: Clicking it will sequence all alarms ascendingly or descendingly by time.
- Message: Clicking it will sequence all alarms ascendingly or descendingly by parameter.
- Description: Clicking it will sequence all alarms ascendingly or descendingly by description.
- Priority: Clicking it will sequence all alarms ascendingly or descendingly by level.

At the same time, one of the following symbols will appear to the left of the heading:

-  for ascending sequence, and
-  for descending sequence.

By default, all events are sequenced descendingly by time.

Making Selection

You can select single, multiple or all events in event list:

- Select one event: Click one event you wish to select.
- Select multiple events: You can select more than one event with Ctrl or Shift keys.
 - ◆ Select the first event and then press and hold the Ctrl key. While holding down the Ctrl key, select each of the other events you wish to select. This will select multiple events that are not grouped together
 - ◆ Select the first event and then press and hold the Shift key. While holding the key down, click the last event. This will select all the events in-between the first and last event.
- Select all events: Click any event in the list, and then press Ctrl and A keys down together and then all the events in the event list will be selected.

Locking and Unlocking Event

Select an event from the event list and then click the “Lock” button. The  icon will appear to its left when the event is locked. The locked event cannot be deleted automatically, but can be deleted manually.

When a locked event is selected, the button “Lock” will change to “Unlock”. You can click the “Unlock” button to unlock the locked event.

NOTE

- **If events are all locked, the CMS will subsequently delete the oldest locked event with each addition of a new event when system storage reaches capacity automatically.**
-

Deleting Event

1. Select the event you wish to delete from the event list.
2. Click the “Delete” button.
3. Select “OK” from the pop-up dialog box. This event will be deleted.

Export to EMR

Select one event from event list, and then click “Export to EMR” button. The event related data can be exported to other systems.

NOTE

- **When the item “Export Waveform Data” in “Service Setup” tab sheet from “Admin Setup” – “Other” – “Gateway Communication Setting” is enabled, the function of Export to EMR can be used.**
-

9.1.6 OxyCRG Review

Clicking the “OxyCRG Review” tab will enter the following tab sheet, through which you can view all Oxygenation events and the relevant waveforms of a patient.

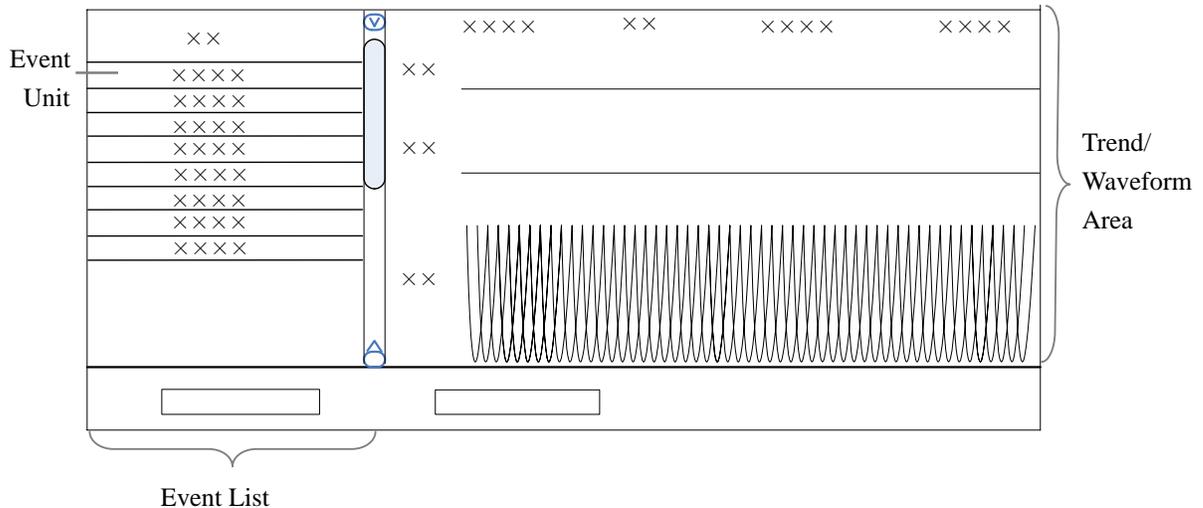


Figure 9-5 OxyCRG Review Tab Sheet

1. Event list: display event time and message. The list will update automatically if a new event occurs. Each event unit can include one event, or an event group. Event group refers to a group of events (coming from ECG, Resp or SPO2) which occur within one minute.
2. Trend/Waveform area: display the trend and compressed waveforms within ± 3 minutes around the event time.

9.1.6.1 Operation

In the “OxyCRG Review” screen, you can:

- Select event type
- Make selection
- Delete
- Set zoom
- Setup
- Print
- Record
- Save as

For details about selecting event type, making selection, deleting, refer to **9.1.5 Event Review**.

For details about record, print and save as, refer to **11 Record, Print and Save as**.

Zoom

Click “Zoom” button to set the time rang of currently displayed trend and compressed waveforms in Trend/Waveform area. The options are 2 min, 3 min and 6 min.

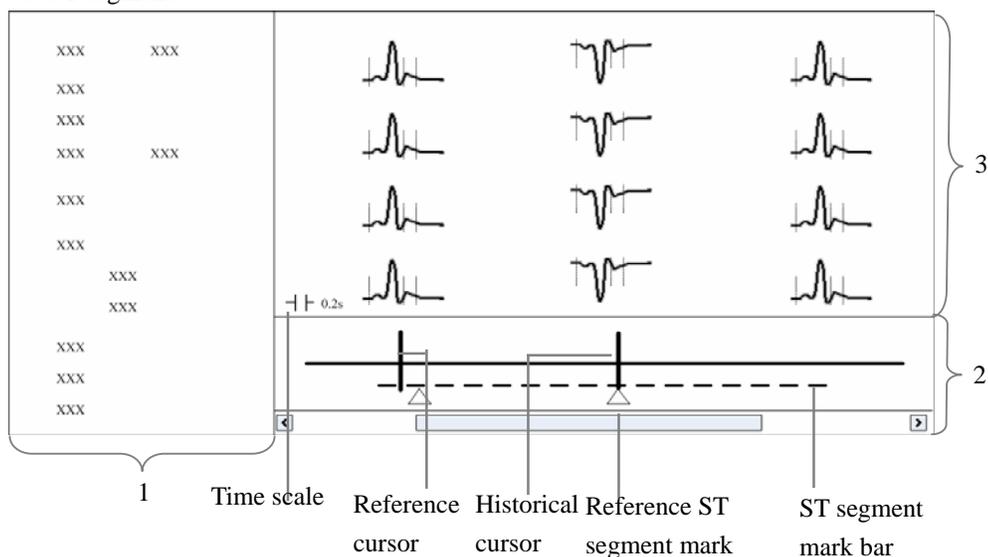
Setup

Click “Setup” button to set which trend and waveforms to be displayed in Trend/Waveform area.

9.1.7 ST Review

9.1.7.1 Overview

Click “ST Review” to open the ST review window as shown below. In this window, you can view real-time ST segments and review historical ST segments. You can also record and print out ST segments.



1. Setting control area 2. Trend parameter area 3. ST segment area

Figure 9-6 ST review

1. Setting control area: sets up ST segments and trend parameters.
2. Trend parameter area: displays trended parameters, reference cursor, historical cursor and ST segment mark.
3. ST segment area: displays real-time or historical ST segments and reference ST segment.

9.1.7.2 Operation

In the ST review window, you can:

- View ST segment
- Set reference ST segment
- Select reference ST segment
- Delete reference ST segment
- Set waveform speed
- Set trend parameter
- Print
- Record

For details about record and print, refer to *II Record, Print and Save as*.

Viewing ST Segment

In the setting control area, you can select “Realtime” to view real-time ST segments, “Historical” to view historical ST segments by using the “View Hist.” buttons. You can also view historical ST segments by clicking any position in the parameter trend area.

Setting Reference ST Segment

When viewing real-time ST segments, click “Set as Ref.” to set the real-time ST segment to reference ST segment. When viewing historical ST segments, click “Set as Ref.” to set the ST segment located at the historical cursor to the reference ST segment.

Selecting Reference ST Segment

You can click the “Change Ref.” buttons to set the reference ST segment located at the reference cursor to the current reference ST segment.

Deleting Reference ST Segment

You can click the “Delete Ref.” button to delete the reference ST segment located at the reference cursor.

Setting Waveform Speed

You can click the “Sweep Speed” drop-down list to set different waveform speeds. The time scale in the ST segment area is related to the waveform speed set. The greater the waveform speed, the smaller the time scale.

Setting Trend Parameter

You can click the “Trend Parameter” drop-down list to select two different trend parameters and “Zoom” drop-down list to set different time lengths.

The parameter trend data is not refreshed automatically. You can click the “Refresh” button and set start time in the pop-up window, and then click “OK” to read the data again.

NOTE

- **There is no data displayed in the trend parameter area when viewing real-time ST segments.**
-

9.2 Discharged Patients

The CMS is capable of searching and reviewing the history data of up to 20,000 patients. It includes all patients, patient management, waveform review, trend review, event review, OxyCRG review, ST review and C.O. review. By clicking the “Discharged Pat.” tab, you can enter the tab sheet, which contains six tabs as follows:

- All patients
- Patient Mgmt.
- Waveform Review
- Trend Review
- Event Review
- OxyCRG Review
- ST Review
- C.O. Review

NOTE

- **The patient management, waveform review, trend review, event review, OxyCRG review, ST review and C.O. review for discharged patients are basically the same with that for online patients. For details, refer to *9.1 Online Review*.**
-

9.2.1 All Patients

9.2.1.1 Overview

In the “All patients” tab sheet, you can view discharged patients’ data of all CMSs on the network. Brief information of discharged patients on the selected CMS is shown in the patient list, with each line for one discharged patient.

NOTE

-
- **The discharged patients on a CMS can be viewed only when the IP address of a CMS is added in the “System Setup” menu. Please refer to *12.2.8 Other - Multi-CMS Communication Settings* for adding an IP address.**
-

9.2.1.2 Operation

In the “All patients” tab sheet, you can:

- Sequence discharged patient
- Change column order
- Search discharged patient
- Delete discharged patient
- Refresh

Sequencing Discharged Patient

You can sequence all discharged patients ascendingly or descendingly by clicking the heading of any column. At the same time, one of the following symbols will appear to the left of the heading:

-  for ascending sequence, and
-  for descending sequence.

By default, all discharged patients are sequenced ascendingly by name.

Searching Discharged Patient

1. Click the  button at the left of the “All patients” tab sheet, and the “All patients” tab sheet will show an area for inputting search conditions at its left.
2. Input search conditions, e.g. “Name” and “Patient ID”. You can click the “More Options” to input more search conditions.
3. Click the “Search” button. The system will search and display the discharged patients that meet the search conditions.

Deleting Discharged Patient

1. In the “Delete or not” column, select the check box corresponding to the patient that you want to delete.
2. Click the “Delete” button.
3. Select “Yes” from the pop-up dialog box.

Refreshing Data

Clicking the “Refresh” button will update the discharged patient list.

NOTE

-
- **Only after selecting a discharged patient from the “All patients” tab sheet, you can switch to other tab sheets for review.**
 - **If a patient is allowed to be viewed by remote CMS during monitoring, his physiological data can be viewed in the “Discharged Pat.” window of other CMSs after he is discharged.**
-

FOR YOUR NOTES

10 Calculation

NOTE

- If the version of currently used CMS system software is lower than 3.0, some of calculation results will be deleted or refreshed due to the update of calculation formula.
-

10.1 Drug Calculation

Clicking the “Drug Calcs” tab will enter the tab sheet.

The “Calculated Results List” shows the time corresponding to a maximum of 75 calculations. The drug parameter area is for you to enter parameter values and to display calculations. The titration table is to show titrated results.

The button area contains the following buttons:

- Calc.
- Save Results
- Delete
- Record
- Print
- Save As

For details about “Record”, “Print” and “Save as”, refer to *11 Record, Print and Save as*.

Calculate

From the “Name” drop-down list below, you can select one to calculate its amount, liquid volume, concentration, etc.

- Drug A
- Drug B
- Drug C
- Drug D
- Drug E
- AMINOPHYLLINE
- DOBUTAMINE
- DOPAMINE
- EPINEPHRINE
- HEPARIN
- ISUPREL
- LIDOCAINE
- NIPRIDE
- NITROGLYCERIN
- PITOCIN

NOTE

-
- **Drug A through Drug E are user-defined drugs.**
-

Procedure

1. Confirm whether the patient type is correct and the weight entered.
2. Select a drug to be calculated.
3. The system will give a set of values automatically. You cannot take them as the calculations. Instead, you should input correct parameter values under the direction of a doctor.
4. Select “Reference”, “Step” and “Dose Type” for titration table.
5. Click the “Calc.” button. The calculations will be displayed in the drug parameter area and titration table.

 **WARNING**

- **Be sure to input correct parameter values. The user must verify the correctness of the calculations displayed on the screen before using them.**
 - **The calculations in the titration table are subject to the drug calculations, therefore, the correctness of the drug calculations must be ensured. Besides, the reference, step and dose type should be ensured correct.**
 - **We assume no responsibility for the results arising from incorrect inputs and operations.**
-

Save Results

The CMS is capable of saving 75 calculations for each patient. To save calculations, you can click the “Save Results” button after calculation is finished.

If the drug you select is a user-defined drug, the system will open the “Enter drug name” dialog box. Input a drug name and click “OK”. The system will remember this name and collect it into the Name drop-down list for later use.

All the saved calculations and their respective calculate time are displayed in the “Calculated Results List”, from which you can select one to view its corresponding calculations in the drug parameter area. At this time, all parameters in the drug parameter area are unchangeable but the reference, step and dose type in the titration table can be changed, and the “Calc.” button converts to “New Calc.”. Clicking the “New Calc.” button, you can input new parameter values for another calculation.

Delete

To delete the unnecessary or wrong calculations, follow this procedure:

1. Select the time corresponding to the calculation you want to delete from the “Calculated Results List”.
2. Click the “Delete” button below the “Calculated Results List”.
3. Select “Yes” in the message box. The calculation will be deleted.

10.2 Hemodynamics Calculation

Clicking the “Hemo Calcs” tab will enter the tab sheet.

The “Calculated Results List” shows the time corresponding to a maximum of 100 calculations. The “Input Item” area allows you to enter parameter values and the “Calculated Results” area is to display calculations.

In this tab sheet, you can:

- Calculate
- Save results
- Delete
- Print
- Record
- Save as.

For details about “Record”, “Print” and “Save as”, refer to *II Record, Print and Save as*.

Calculate

1. Input parameter values needed into the “Input Item” area.
2. Click the “Calc.” button. The calculations of other parameters will be displayed in the “Calculated Results” area. Values which are beyond the normal range will be displayed on a yellow background.

WARNING

- **Be sure to input correct parameter values. The user must verify the correctness of the calculations displayed on the screen before using them. We assume no responsibility for the results arising from incorrect inputs and operations.**
-

Save Results

The CMS is capable of saving 100 calculations for each patient. To save calculations, you can click the “Save Results” button after calculation is finished.

NOTE

-
- **If you continue to perform the “Save Results” operation when the number of calculations exceeds 100, the system will delete the earliest calculation and its corresponding time from the “Calculated Results List” before saving the new one.**
-

Delete

To delete unnecessary or wrong calculations, follow this procedure:

1. Select the time corresponding to the calculation you want to delete from the “Calculated Results List”.
2. Click the “Delete” button below the “Calculated Results List”.
3. Select “Yes” in the message box. The calculation will be deleted.

10.3 Oxygenation Calculation

Clicking the “Oxygenation Calc.” tab will enter the tab sheet.

The “Calculated Results List” shows the time corresponding to a maximum of 100 calculations. The “Input Item” area allows you to enter parameter values and the “Calculated Results” area is to display calculations.

In this tab sheet, you can:

- Calculate
- Save results
- Delete
- Print
- Record
- Save as.

For details about “Record”, “Print” and “Save as”, refer to *II Record, Print and Save as*.

Calculate

1. Input parameter values needed into the “Input Item” area.
2. Pressure unit, Hb unit and Oxygen content unit can be changed by scrolling the pull-down lists at the right side of “Press Unit” or “OxyCont Unit”. Parameter values will automatically change and refresh accordingly.
3. Click the “Calc.” button. The calculations of other parameters will be displayed in the “Calculated Results” area. Parameter values which are beyond the normal range will be displayed on a yellow background.

WARNING

- **Be sure to input correct parameter values. The user must verify the correctness of the calculations displayed on the screen before using them. We assume no responsibility for the results arising from incorrect inputs and operations.**
-

Save Results

The CMS is capable of saving 100 calculations for each patient. To save calculations, you can click the “Save Results” button after calculation is finished.

NOTE

- **If you continue to perform the “Save Results” operation when the number of calculations exceeds 100, the system will delete the earliest calculation and its corresponding time from the “Calculated Results List” before saving the new one.**
-

Delete

To delete unnecessary or wrong calculations, follow the procedure:

1. Select the time corresponding to the calculation you want to delete from the “Calculated Results List”.
2. Click the “Delete” button below the “Calculated Results List”.
3. Select “Yes” in the message box. The calculation will be deleted.

10.4 Ventilation Calculation

Clicking the “Ventilation Calc.” tab will enter the tab sheet.

The “Calculated Results List” shows the time corresponding to a maximum of 100 calculations. The “Input Item” area allows you to enter parameter values and the “Calculated Results” area is to display calculations.

In this tab sheet, you can:

- Calculate
- Save results
- Delete
- Print
- Record
- Save as.

For details about “Record”, “Print” and “Save as”, refer to *II Record, Print and Save as*.

Calculate

1. Input parameter values needed into the “Input Item” area.
2. Pressure unit can be changed by scrolling the pull-down list at the right side of “Press Unit”. Pressure values will automatically change and refresh accordingly.
3. Click the “Calc” button. The calculations of other parameters will be displayed in the “Calculated Results” area. Parameter values which are beyond the normal range will be displayed on a yellow background.

WARNING

- **Be sure to input correct parameter values. The user must verify the correctness of the calculations displayed on the screen before using them. We assume no responsibility for the results arising from incorrect inputs and operations.**
-

Save Results

The CMS is capable of saving 100 calculations for each patient. To save calculations, you can click the “Save Results” button after calculation is finished.

NOTE

- **If you continue to perform the “Save Results” operation when the number of calculations exceeds 100, the system will delete the earliest calculation and its corresponding time from the “Calculated Results List” before saving the new one.**
-

Delete

To delete unnecessary or wrong calculations, follow the procedure:

1. Select the time corresponding to the calculation you want to delete from the “Calculated Results List”.
2. Click the “Delete” button below the “Calculated Results List”.
3. Select “Yes” in the message box. The calculation will be deleted.

10.5 Renal Calculation

Clicking the “Renal Calc.” tab will enter the tab sheet.

The “Calculated Results List” shows the time corresponding to a maximum of 100 calculations. The “Input Item” area allows you to enter parameter values and the “Calculated Results” area is to display calculations.

In this tab sheet, you can:

- Calculate
- Save results
- Delete
- Print
- Record
- Save as.

For details about “Record”, “Print” and “Save as”, refer to *II Record, Print and Save as*.

Calculate

1. Input parameter values needed into the “Input Item” area.
2. Click the “Calc” button. The calculations of other parameters will be displayed in the “Calculated Results” area. Parameter values which are beyond the normal range will be displayed on a yellow background.

WARNING

- **Be sure to input correct parameter values. The user must verify the correctness of the calculations displayed on the screen before using them. We assume no responsibility for the results arising from incorrect inputs and operations.**
-

Save Results

The CMS is capable of saving 100 calculations for each patient. To save calculations, you can click the “Save Results” button after calculation is finished.

NOTE

- **If you continue to perform the “Save Results” operation when the number of calculations exceeds 100, the system will delete the earliest calculation and its corresponding time from the “Calculated Results List” before saving the new one.**
-

Delete

To delete unnecessary or wrong calculations, follow the procedure:

1. Select the time corresponding to the calculation you want to delete from the “Calculated Results List”.
2. Click the “Delete” button below the “Calculated Results List”.
3. Select “Yes” in the message box. The calculation will be deleted.

FOR YOUR NOTES

11 Record, Print and Save as

11.1 Record

As shown in the figure below, the CMS can be equipped with a thermal recorder, which, with a separate power supply, is connected with the host of the CMS via the general interface.

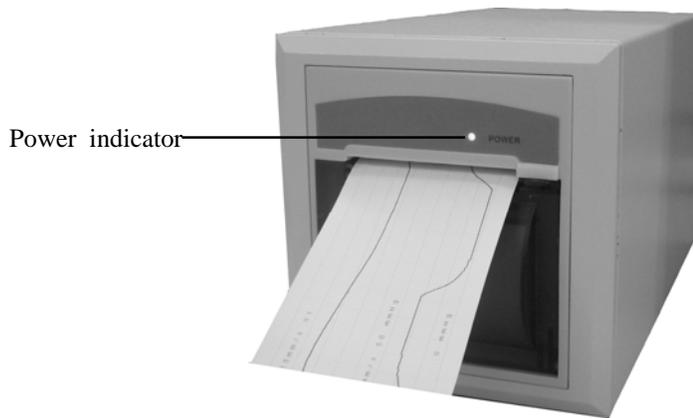


Figure 11-1 Front Panel

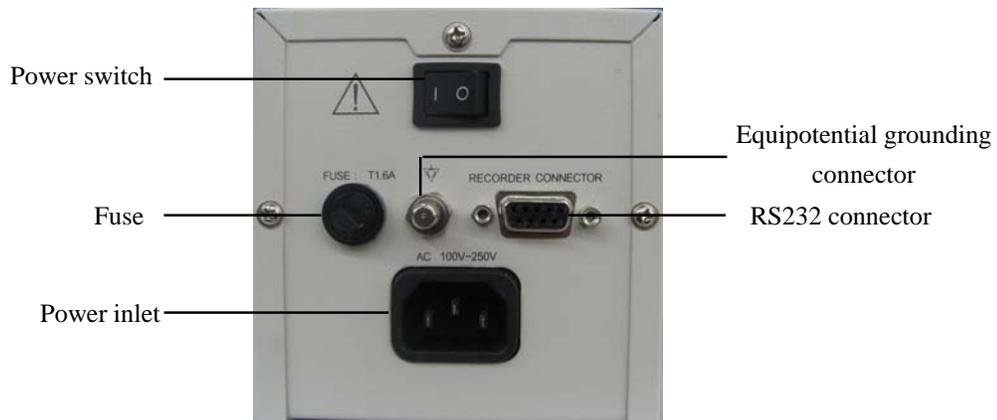


Figure 11-2 Back Panel

Recording can be divided into manual recording and auto recording. The former requires you to press the “Record” button before recording. The latter, also called real-time recording, means that the system will automatically initiate a recording in case of an alarm. The CMS can print out the following information through the recorder:

-
- Patient Information
 - Drug Calculations
 - Hemodynamics Calculations
 - Oxygenation Calculations
 - Ventilation Calculations
 - Renal Calculations
 - Waveforms
 - Events
 - C.O. Measurements
 - ST Review
 - ICG Hemodynamic Parameters
 - CCO Hemodynamic Parameters
 - SvO₂/ScvO₂ Oxygenation Parameters
 - OxyCRG Graph
 - OxyCRG Event
 - Real-time Waveforms
 - Real-time Frozen Waveforms
 - Real-time Alarms.

11.1.1 Installing Recorder Paper

 **WARNING**

- **Be sure to use standard (50mm) thermal recorder paper only; otherwise, the recorder may show poor quality on record, or may be unusable, or the printer head of the recorder may be damaged.**
 - **Be careful to avoid damaging the printer head when installing recorder paper. Never pull open the paper bail at the upper left corner of the recorder except you prepare to replace the recorder paper or remove a trouble.**
-

Installing Procedure

To install recorder paper, follow the steps shown in *Figure 11-3* through *Figure 11-8*:

1. Open the recorder door, and open the paper bail at the upper left corner of the recorder.
2. Insert a new roll of recorder paper into the paper compartment
3. Insert the paper with the thermal page facing the printer head.
4. Pull the paper out and adjust it in position.
5. Push down the paper bail.
6. Close the recorder door.

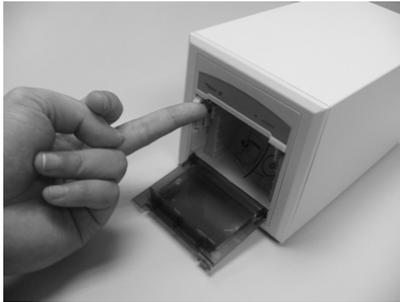


Figure 11-3 Installing Recorder Paper -1

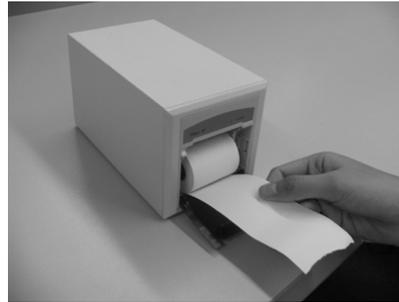


Figure 11-4 Installing Recorder Paper -2

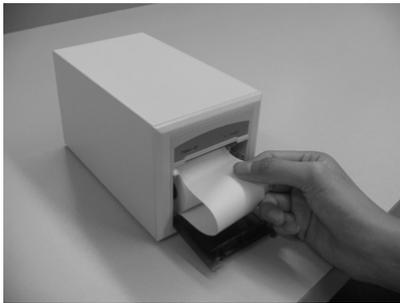


Figure 11-5 Installing Recorder Paper -3



Figure 11-6 Installing Recorder Paper -4



Figure 11-7 Installing Recorder Paper -5

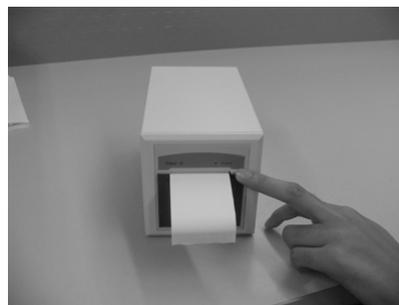


Figure 11-8 Installing Recorder Paper -6

11.1.2 Recorder Operations

Recording Patient Information

1. Enter the “Patient Mgmt.” tab sheet.
2. Make sure that the patient information is correct.
3. Click the “Record” button to print out the patient information.

Recording Drug Calculations

1. Enter the “Drug Calcs” tab sheet.
2. Perform drug calculation as per part *10.1 Drug Calculation*.
3. Click the “Record” button to print out the drug calculations result.

Recording Hemodynamics Calculations

1. Enter the “Hemo Calcs” tab sheet.
2. Perform hemodynamics calculation as per part *10.2 Hemodynamics Calculation*.
3. Click the “Record” button to print out the hemodynamics calculations.

Recording Oxygenation Calculations

1. Enter the “Oxygenation Calc.” tab sheet.
2. Perform oxygenation calculation as per part *10.3 Oxygenation Calculation*.
3. Click the “Record” button to print out the oxygenation calculations.

Recording Ventilation Calculations

1. Enter the “Ventilation Calc.” tab sheet.
2. Perform ventilation calculation as per part *10.4 Ventilation Calculation*.
3. Click the “Record” button to print out the ventilation calculations.

Recording Renal Calculations

1. Enter the “Renal Calc.” tab sheet.
2. Perform renal calculation per part *10.5 Renal Calculation*.
3. Click the “Record” button to print out the renal calculations.

Recording Normal Waveforms

1. Enter the “Waveform Review” tab sheet.
2. Click the “Full Size” button.
3. Click the “Record” button.
4. Select a maximum of 2 waveforms from the pop-up dialog box.
5. Select “OK”. The selected waveforms will be printed out through the recorder.

Recording Events

1. Enter the “Alarm Review” tab sheet.
2. Select an alarm from the alarm list per part *9.1.5 Event Review*.
3. Click the “Record” button. From the pop-up dialog box, you can select a maximum of 2 waveforms.
4. Select “OK” to print out the selected waveforms.

Recording C.O. Measurements

1. Enter the “C.O. Review” tab sheet.
2. Select one C.O. measurement.
3. Click the “Record” button to print out the selected C.O. measurement.

Recording ST Segment Waveform

1. Enter the “ST Review” tab sheet.
2. Click the “Record” button.
3. Select “Sweep Speed” from the pop-up dialog box.
4. Click “OK” to print out ST segment.

Recording ICG Hemodynamic Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click ICG parameter area.
3. Select the “ICG” tab sheet and click the “Hemodynamic Parameters” button.
4. Click the “Record” button from the pop-up dialog box.

Recording CCO Hemodynamic Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click CCO parameter area.
3. Select the “CCO” tab sheet and click the “Hemodynamic Parameters” button.
4. Click the “Record” button from the pop-up dialog box.

Recording SvO₂/ScvO₂ Oxygenation Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click SvO₂/ScvO₂ parameter area.
3. Select the “SvO₂” or “ScvO₂” tab sheet and click the “Oxygenation Parameters” button.
4. Click the “Record” button from the pop-up dialog box.

Recording OxyCRG Graph

1. Enter the “ViewBed” tab sheet.
2. Open the “OxyCRG” window per part *.7.4.16 Show/Hide OxyCRG*
3. Click the “Record” button to print out the current OxyCRG graph.

Recording OxyCRG Event

1. Enter the “OxyCRG Review” tab sheet.
2. Select an event from the event list per part *9.1.6 OxyCRG Review*.
3. Click the “Record” button.

Recording Real-time Waveforms

1. Enter the “ViewBed” tab sheet.
2. Click the “Record” icon at the upper right corner.
3. Select a maximum of 2 waveforms from the pop-up dialog box.
4. Click “OK” to print out the selected waveforms.

or

1. Enter the “**Multibed**” screen and select the desired patient window.
2. Click the drop-down menu button.
3. Click the “**Record**” button to print the displayed waveforms.

Recording Real-time Frozen Waveforms

1. Enter the “ViewBed” tab sheet.
2. Click the “Freeze” icon at the upper right corner.
3. Click the “Record” icon at the upper right corner.
4. Select a maximum of 2 waveforms from the pop-up dialog box.
5. Click “OK” to print out the selected waveforms.

Recording Real-time Alarms

If a parameter generates an alarm when its alarm switch and record switch are set to “ON”, the CMS will initiate a real-time alarm recording.

11.1.3 Recording Control

By clicking “System Setup” then “Recording Control”, you can enter a tab sheet.

In this tab sheet, the current tasks to be printed out are displayed. After selecting one task, you can:

- Click the “Delete” button to delete this task.
- Click the “Move Up” button to increase its priority.
- Click the “Move Down” button to decrease its priority.
- Click the “Pause” button to pause this task.
- Click the “Continue” button to resume the paused task.

In this tab sheet, you can also:

- Click the “Record Type” drop-down menu to select desired record type.
- Click the “Sweep Speed” drop-down menu to select a desired waveform sweep speed from the options of 25mm/s and 50mm/s.
- Select the check box before “Grid” to select whether to display the grid in recording.

NOTE

- A maximum of 50 tasks to be printed out can be stored in the system.
 - The paused task will not be printed out. If it is followed by other tasks to be printed out, these tasks will be printed out through the recorder. The resumed task will be printed out in correct order.
 - The real-time and ongoing recording cannot be paused.
 - The automatically stopped recordings will record two arrays of '*' at the end of reports; manually stopped or abnormally stopped recordings will record one array of '*' at the end of reports.
-

11.2 Print

11.2.1 Printing Support

The CMS can be connected with a local printer or network printer to print out reports. With a separate power supply system, the local printer is directly connected to the CMS through the general interface. The network printer is connected to the CMS through the network interface.

The recommended printer types for the CMS are listed in the following table.

Printer type	Description
HP LaserJet P1505n	Supports A4 or Letter paper type.
HP LaserJet P2035n	
HP LaserJet P2055dn	
HP LaserJet P1606dn	
HP LaserJet P4015n	
Lenovo LJ2250N	
Lenovo LJ3650DN	

You can propose purchasing request to Mindray or buy the corresponding printer by yourself. For details about how to use the printer, refer to the accompanying document provided with the printer.

11.2.2 Printing Contents

Through the printer, the CMS can print:

- Patient information
- Drug calculations
- Hemodynamics calculations
- Oxygenation calculations
- Ventilation calculations
- Renal calculations
- Graphic or tabular
- Waveforms
- Arrhythmia statistic result
- Events
- C.O. measurements
- ST segment waveform
- Real-time report
- 12-lead ECG report
- Multi-lead ECG report
- EEG report
- CSA report
- ICG Hemodynamic Parameters
- CCO Hemodynamic Parameters
- SvO₂/ScvO₂ Oxygenation Parameters
- OxyCRG Graph
- OxyCRG Event List
- OxyCRG Event
- Alarm Settings Report
- Real-time Alarm Report

11.2.3 Printing Operations

Printing Patient Information

1. Enter the “Patient Mgmt.” tab sheet.
2. Make sure if the patient information is correct. If not, click the “Modify” button to correct them.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Drug Calculations

1. Enter the “Drug Calcs” tab sheet.
2. Perform drug calculation per part *10.1 Drug Calculation*.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Hemodynamics Calculations

1. Enter the “Hemo Calcs” tab sheet.
2. Perform hemodynamics calculation per part *10.2 Hemodynamics Calculation*.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Oxygenation Calculations

1. Enter the “Oxygenation Calc.” tab sheet.
2. Perform oxygenation calculation per part *10.3 Oxygenation Calculation*.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Ventilation Calculations

1. Enter the “Ventilation Calc.” tab sheet.
2. Perform ventilation calculation per part *10.4 Ventilation Calculation*.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Renal Calculations

1. Enter the “Renal Calc.” tab sheet.
2. Perform renal calculation per part *10.5 Renal Calculation*.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Graphic or Tabular

Real-time printing:

1. Enter the “Trend Review” tab sheet.
2. Set the resolution and zoom per part *9.1.2 Trend Review*.
3. Click the  icon on the right side of the “Print” button in the tabular and select “Print Setup” to perform print setups as prompted.
4. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
5. Click the “Print” button.

Scheduled printing:

1. Enter the “Trend Review” tab sheet.
2. Click the  icon on the right side of the “Print” button, select “Scheduled Report Setup”. Then in the pop-up menu, tick “Scheduled Report” to enable the scheduled printing for this patient, and make appropriate settings.
3. Click “Close” button to exit the menu. The report will be printed since the start time you set in printing control screen, Refer to *11.2.4 Printing Control*. If you want to print the report now, click “Print Now” button.

NOTE

- **The scheduled report setup function is available in trend review only when the “Scheduled Report” is ticked in “Printing Control” tab sheet,**
-

Printing Normal Waveforms

1. Click the “Waveform Review” tab sheet. If compressed waves are displayed, click the “Full Size” button in the lower right corner of the screen.
2. Select the current review time.
3. Click the  icon on the right side of the “Print” button and select “Print Setup” to perform print setups as prompted.
4. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
5. Click the “Print” button.

Printing Waveform Segment Report

1. Click the “Waveform Review” tab sheet. If normal waves are displayed, click the “Compressed” button in the lower right corner of the screen.
2. Select the desired waveform groups by double-click to add them to one report. At most, six waveform groups can be printed on each page. You can also deselect a waveform group by double clicking it again. “Prev” and “Next” button can be used to toggle between the selected waveform groups.
3. Select “Print Preview” to preview the printout.
4. Click the “Print All” button.

Printing Compressed Waveforms

1. Click the “Waveform Review” tab sheet. If normal waves are displayed, click the “Compressed” button in the lower right corner of the screen.
2. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
3. Click the “Print” button.

Printing ARR Statistic Result

1. Click the “Waveform Review” tab sheet. If normal waves are displayed, click the “Compressed” button in the lower right corner of the screen.
2. Click the “ARR Statistic” button to enter the “ARR Statistic” menu where you can view the statistic about the HR value and the number of each arrhythmia type during a certain time range.
3. Click the “Print” button.

Printing Event List

1. Enter the “Event Review” tab sheet.
2. Click the  icon on the right side of “Print” button under the event list and select “Print Setup” to perform print setups as prompted.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing an Event

1. Enter the “Event Review” tab sheet.
2. Select an event from the event list per part *9.1.5 Event Review*.
3. Click the  icon on the right side of “Print” button under the event parameter area and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing C.O. Measurements

1. Enter the “C.O. Review” tab sheet.
2. Select one C.O. measurement.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing ST Segment Waveform

1. Enter the “ST Review” tab sheet.
2. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
3. Click the “Print” button.

Printing Real-time Waveforms

1. Enter the “ViewBed” tab sheet.
2. Click the “Print” button.
3. Select the desired waveforms from the pop-up dialog box.
4. Click the “OK” button.

or

1. Enter the “Multibed” tab sheet.
2. Click the drop-down menu button.
3. Click the “Print” button to print the displayed waveforms.

Printing 12-Lead ECG

1. Enter the 12-lead ECG analysis tab sheet from the monitor.
2. Enter the “ViewBed” tab sheet from the CMS.
3. Click the “Show Multi-lead ECG” button to display the 12-lead ECG waveforms.
4. Click the “Print” button.
5. In the pop-up dialog box, select print layout.
6. Click the “OK” button.

Printing Multi-Lead ECG

1. Enter the “ViewBed” tab sheet.
2. Click the “Show Multi-lead ECG” button to display the multi-lead ECG waveforms.
3. Click the “Print” button.

Printing EEG Waveforms (BIS module)

1. Enter the “ViewBed” tab sheet.
2. Click the “Show BIS Expand View” button to display BIS window.
3. Click “Display” button and select “EEG” from the drop-down menu.
4. Click the “Print” button.

Printing EEG Waveforms (EEG module)

1. Enter the “ViewBed” tab sheet.
2. Click the “Show EEG Expand View” button to display EEG window.
3. Click “Display” button and select “EEG” from the drop-down menu.
4. Click the “Print” button.

Printing CSA

1. Enter the “ViewBed” tab sheet.
2. Click the “Show EEG Expand View” button to display EEG window.
3. Click “Display” button and select “CSA” from the drop-down menu.
4. Click the “Print” button.

Printing ICG Hemodynamic Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click ICG parameter area.
3. Select the “ICG” tab sheet and click the “Hemodynamic Parameters” button.
4. Click the “Print” button from the pop-up dialog box.

Printing CCO Hemodynamic Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click CCO parameter area.
3. Select the “CCO” tab sheet and click the “Hemodynamic Parameters” button.
4. Click the “Print” button from the pop-up dialog box.

Printing SvO₂/ScvO₂ Oxygenation Parameters

1. Enter the “ViewBed” tab sheet.
2. Select and then click SvO₂/ScvO₂ parameter area.
3. Select the “SvO₂” or “ScvO₂” tab sheet and click the “Oxygenation Parameters” button.
4. Click the “Print” button from the pop-up dialog box.

Printing OxyCRG Graph

1. Enter the “ViewBed” tab sheet.
2. Open the “OxyCRG” window per part *7.4.16 Show/Hide OxyCRG*
3. Click the “Print” button.

Printing OxyCRG Event List

1. Enter the “OxyCRG Review” tab sheet.
2. Click the  icon on the right side of “Print” button under the event list and select “Print Setup” to perform print setups as prompted.
3. Click the  icon on the right side of the “Print” button and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing an OxyCRG Event

1. Enter the “OxyCRG Review” tab sheet.
2. Select an event from the event list per part *9.1.6 OxyCRG* .
3. Click the  icon on the right side of “Print” button under the event parameter area and select “Print Preview” to preview the printout.
4. Click the “Print” button.

Printing Alarm Settings Report

1. Enter “Alarm Setup” screen as per part *8.4 Alarm Setup* .
2. Click “Print” button.

Printing Real-time Alarm

If a parameter generates an alarm when its alarm switch and print switch are set to “ON”, the CMS will initiate a real-time alarm printing

11.2.4 Printing Control

By clicking “System Setup” and then selecting “Printing Control” tab, you can select local printer or network printer from the printer drop-down list.

In the tab sheet, the current tasks to be printed are displayed. After selecting one task, you can:

- Click the “Delete” button to delete this task.
- Click the “Pause” button to pause this task.
- Click the “Continue” button to resume the paused task.
- Click the “Delete All” button to delete all printing tasks.

You can set up “Waveform Sweep Speed” and “Grid” in the “Print Setup” area on the right side of the sheet.

- Sweep Speed: Select a sweep speed of waveform from the options of 12.5mm/s, 25mm/s and 50mm/s.
- Grid: Select if print grid is printed.

You can set up the scheduled report printing in the “Scheduled Report Setup” area on the right side of the sheet.

- Scheduled Report: Select or deselect the checkbox before “Scheduled Report” to switch on/off periodical report print.
- Start Time: Set up the start time to print.
- Interval: Set up the desired interval.

NOTE

-
- **If print fails, please restart the printer and press the button “Restart Print Service” to resume.**
 - **When network printer is selected, only printing tasks of the CMS are displayed. The printing tasks of other network are not displayed.**
 - **The "Scheduled Report Setup" function is available in trend review only when the “Scheduled Report” is ticked in “Printing Control” tab sheet.**
-

11.3 Save as

The CMS can save the following items as html files:

- Graphic trends
- Tabular trends
- Waveform review
- C.O. Review
- Event list review
- Event review
- OxyCRG event list review
- OxyCRG event review
- Drug calculations
- Hemodynamics calculations
- Oxygenation calculations
- Ventilation calculations
- Renal calculations
- BIS DSA
- EEG DSA
- CSA

With the file name defaulted as “XXXX-patient name YYYY”, in which the “XXXX” represents one of the above items. If no patient name is input, the file name will have no patient name. If it is the first time to save, the “YYYY” will be 0001, which will automatically add 1 every time data is saved.

The saved files can be browsed through the Internet Explorer on other computers.

The files can be saved to a mobile hard disk, flash or the like, which must be connected to the CMS before saving. If no storage device is connected, the system will give the “no valid storage device found in the system, please confirm!” prompt.

After a USB device is successfully connected to the CMS, the  icon will appear in the system icon area. To disconnect the USB device from the CMS, follow this procedure:

1. Click the  icon.
2. Click the “Delete disk driver safely” prompt.
3. After the  icon disappears, you can disconnect the USB device from the CMS.

Graphic Trends

1. Enter the “Trend Review” tab sheet.
2. If tabular is currently displayed on the screen, click the “Graphic” button.
3. Click the “Save As” button. A dialog box will be displayed.
4. Select a disk driver name and click “OK”. The graphic currently displayed on the screen will be saved to the designated disk (such as mobile hard disk).

Tabular Trends

1. Enter the “Trend Review” tab sheet.
2. If graphic is currently displayed on the screen, click the “Tabular” button.
3. Click the “Save As” button. A dialog box will be displayed.
4. Select a time range and click “OK”. The “Save As” dialog box will be displayed.

NOTE

-
- **The system will save the data within the time range prior to save start time.**
-

5. Select a disk driver name and click “OK”. The data in the tabular will be saved to the designated disk (such as mobile hard disk).

Normal Waveform Review

1. E Click the “Waveform Review” tab sheet. If compressed waves are displayed, click the “Full Size” button in the lower right corner of the screen.
2. For operation details, refer to *9.1.3 Waveform Review*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The waveforms currently displayed on the screen will be saved to the designated disk (such as mobile hard disk).

Compressed Waveform Review

1. Click the “Waveform Review” tab sheet. If normal waves are displayed, click the “Compressed” button in the lower right corner of the screen.
2. For operation details, refer to *9.1.3 Waveform Review*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The waveforms currently displayed on the screen will be saved to the designated disk (such as mobile hard disk).

C.O. Review

1. Enter the “C.O. Review” tab sheet.
2. Select the C.O. measurements to be saved per part *9.1.4 C.O. Review*
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The currently selected C.O. measurements will be saved to the designated disk (such as mobile hard disk).

Event List Review

1. Enter the “Event Review” tab sheet.
2. Select “Filter by Event” and “Filter by Priority”.
3. Click the “Save As” button below the event list. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The contents in the event list will be saved to the designated disk (such as mobile hard disk).

Event Review

1. Enter the “Event Review” tab sheet.
2. Select an event from the event list.
3. Click the “Save As” button below the event parameter area. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The waveforms and parameters of the event will be saved to the designated disk (such as mobile hard disk).

Drug Calculation

1. Enter the “Drug Calcs” tab sheet.
2. Perform drug calculation per *10.1 Drug Calculation*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. This set of drug calculations will be saved.

OxyCRG Event List Review

1. Enter the “OxyCRG Review” tab sheet.
2. Select “Filter by Event”.
3. Click the “Save As” button below the event list. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The contents in the event list will be saved to the designated disk (such as mobile hard disk).

OxyCRG Event Review

1. Enter the “OxyCRG Review” tab sheet.
2. Select an event from the event list.
3. Click the “Save As” button below the trend/waveform area. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. The waveforms and parameters of the event will be saved to the designated disk (such as mobile hard disk).

Hemodynamics Calculation

1. Enter the “Hemo Calcs” tab sheet.
2. Perform hemodynamics calculation per *10.2 Hemodynamics Calculation*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. This set of hemodynamics calculations will be saved.

Oxygenation Calculation

1. Enter the “Oxygenation Calc.” tab sheet.
2. Perform oxygenation calculation per *10.3 Oxygenation Calculation*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. This set of oxygenation calculations will be saved.

Ventilation Calculation

1. Enter the “Ventilation Calc.” tab sheet.
2. Perform ventilation calculation per *10.4 Ventilation Calculation*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. This set of ventilation calculations will be saved.

Renal Calculation

1. Enter the “Renal Calc.” tab sheet.
2. Perform renal calculation per *10.5 Renal Calculation*.
3. Click the “Save As” button. The “Save As” dialog box will be displayed.
4. Select a disk driver name and click “OK”. This set of renal calculations will be saved.

BIS DSA

1. Enter the “BIS Expand View” tab sheet.
2. Click the “Display” button and select “DSA” from the pop-up drop-down menu.
3. Click the “Save As” button.
4. Select a disk driver name and click “OK”. The DSA graph will be saved.

EEG DSA

1. Enter the “EEG Expand View” tab sheet.
2. Click the “Display” button and select “DSA” from the pop-up drop-down menu.
3. Click the “Save As” button.
4. Select a disk driver name and click “OK”. The DSA graph will be saved.

CSA

1. Enter the “EEG Expand View” tab sheet.
2. Click the “Display” button and select “CSA” from the pop-up drop-down menu.
3. Click the “Save As” button.
4. Select a disk driver name and click “OK”. The CSA graph will be saved.

12 System Setup

12.1 General Setup

Clicking the “System Setup” will access a tab sheet.

The CMS has three levels of setup:

- Low level: “General Setup”,
- Medium level: “Admin Setup”, and
- High level: “Factory Setup”.

Certain authority is required if you want to modify certain setups of the system or execute certain operations. The user with lower authority cannot modify the setups of the user with higher authority, but the user with higher authority can modify the setups of the user with lower authority.

When the system starts, the default setup is the “General Setup”. The “Factory Setup” is intended for use only by manufacturer-designated personnel.

In the “General Setup” tab sheet, you can:

Set Alarm Volume

The system provides 11 volume levels. You can select one as required. For details, refer to *12.2.3 Alarm - Minimum Alarm Volume* and *8.3 Alarm Volume*.

Set Reminder Volume

You can set the reminder volume as **[High]**, **[Med]** or **[Low]**.

Telemetry Alarm Delay Setup

You can set telemetry alarm delay time (6 sec by default) and ST alarm delay time (30 sec by default). The alarms include: HR too high, HR too low, SpO2 too high, SpO2 too low, PR too high, PR too low, ST too high and ST too low.

Draw Waveform Type

There are two options:

- COLOR: Selecting this option allows you to see smoothed waveforms.
- MONO: Selecting this option allows you to see unprocessed waveforms.
-

Display Grid

You can set whether to display grid in the waveform area.

Set Unit

Click “Unit Setup” button to enter the unit setup screen. You can set unit for each parameter of the following modules as required:

Module	Parameter	Options	Defaults
NIBP	NIBP	mmHg, kPa	mmHg
CO ₂	CO ₂	mmHg, kPa	mmHg
TEMP	T1, T2, TD, TB	°C, °F	°C
ECG	ST	mV, mm	mV
Vascular Resistance	SVR/PVR	DS/cm ⁵ , kPa-s/l	DS/cm ⁵
Hb	Hb	g/dl, g/l, mmol/l	g/dl
IBP	IBP	mmHg, kPa, cmH ₂ O	mmHg
GAS	CO ₂	mmHg, kPa, %	mmHg
	O ₂	mmHg, kPa, %	mmHg
Device Integration	Pressure	cmH ₂ O, mbar, hpa	cmH ₂ O
	CO ₂	mmHg, kPa, mbar, hpa	mmHg
	tcpCO ₂ /tcpO ₂	mmHg, kpa	mmHg
Glucose	Glucose	mmol/L, mg/dl	mmol/L
I/O Fluid	I/O Fluid	ml, L	ml

Enter Admin Setup

By clicking the “Admin Setup” button and inputting the required password, you can enter the Admin Setup window. For details, refer to part *12.2 Admin Setup*.

Enter Factory Setup

By clicking the “Factory Setup” and input the required password, you can enter the Factory Setup window. As the “Factory Setup” is intended for use only by the manufacturer-designated personnel, no details will be given to it in this manual.

12.2 Admin Setup

Click the “Admin Setup” button in the “General Setup” tab sheet. The “Enter Password” dialog box will pop up. After inputting the required password, select “OK” to enter a tab sheet.

12.2.1 Setting Color

On the screen of the CMS, all related information of one monitored parameter appears in the same color. The related information includes real-time waveforms (including waveform name, gain and filter mode), real-time parameter values (including high and low limits), reviewed waveforms (including waveform name, gain and filter mode), etc. you can set color for each monitored parameter and ARR mark as required.

Procedure

1. Enter the “Color” tab sheet and then select a parameter or ARR mark you want to change its color.
2. Click the color box corresponding to the parameter or ARR mark, and a list of available colors will be displayed.
3. Select your desired color from the list.
4. If you want a color that is not in the list, click “Other” to enter the window, through which you can define a color you want.
5. Select a color and click “OK”.

12.2.2 Display Setup

You can set screen size, number of main screen /display layout, multibed display, multibed window layout, and auxiliary window.

Screen Size

1. Click the “Display Setup” tab.
2. Select the display type from the “Screen Size” drop-down menu.
3. Click the “Close” button.
4. Your choice will take effect after the system restarts.

The CMS supports up to 4 displays at one time. It will check the number of displays every time it starts. When more than one display is used simultaneously, they should adopt the same screen size and resolution. To ensure the normal operation of the CMS, you should select the screen size of the display actually used and the display resolution should be set to 1280 x 1024 pixels. Setting resolution to other pixels may cause display error.

Number of Main Screen / Display Layout

Select a number for the item “Number of Main Screen” to change the displaying mode, if the CMS is equipped with 2 displays:

- If “1” is selected, there is only one main screen which always to display multibed window. The other display is the auxiliary screen, always for single bed window and system menu.
- If “2” is selected, the two screens are both able to be used as main screen. If viewing a single bed, the single bed window will be shown in the auxiliary display; if not, the two screens will both show multibed window.

If a CMS is equipped with 4 displays, select the option of “1*4” or “2*2” for “Display Layout” to change the mouse route.

NOTE

-
- **The change of display settings will be effected after the CMS restarts.**
-

Multibed Display

- Select/deselect the check box before “Measurement Units” to show/hide parameter units on the multibed screen.
- Select/deselect the check box before “Patient Name” to show/hide patient name on the multibed screen.
- In “Name Displaying Hotkey”, you can set the hotkey which can be used to display name in the first waveform area of patient window on the multibed screen. The default hotkey is F9. If the check box before “Patient Name” is not ticked, the patient’s name displays when you press the hotkey. The name does not display after 30 seconds or when you press the hotkey again.
- In “Change to Idle Sector”, you can configure the switch of setting to an idle sector in multibed screen:
 - ◆ If “Enable” is selected, the drop-down list of “No Patient Admitted” bed on multibed screen will display the option “Change to Idle Sector”;
 - ◆ If “Disable” is selected, the drop-down list of “No Patient Admitted” bed on multibed screen will not display the option “Change to Idle Sector”.

Multibed View Window Layout

You can select the number of rows and columns for multibed view window based on the actual needs. The range for the number of rows is 2 to 8 and that for the number of columns is 1 to 3. The product of the number of rows and that of columns is the number of patient sectors. The number of patient sectors on a single screen cannot exceed 16. After the number of rows and that of columns are selected, you can preview the new layout set on the right side of the screen.

After the number of rows and that of columns are selected, the setting of multibed view window layout takes effect.

ECG Lead Sequence

You can choose one option from “Standard” and “Cabrera” for “ECG Lead Sequence” to set waveform sequence in 12-lead review. The waveforms in screen, report, strip, exported XML file will be arranged according to the selected option.

The waveform sequences of each option are:

- Standard: I, II, III, aVR, aVL, aVF, V1, V2, V3, V4, V5, V6
- Cabrera: aVL, I, -aVR, II, aVF, III, V1, V2, V3, V4, V5, V6

NOTE

-
- **Only a CMS has 12-lead review, the setting of ECG lead sequence can take effect.**
-

Auxiliary Window Setup

Auxiliary window setup means to set the tab sheets on the single bed window. The six functional items of patient management, viewbed, waveform review, trend review, alarm review and display setup are fixed to be selected while OxyCRG review, ST review, C.O. review, drug calculation, hemodynamic calculation, OxyCRG calculation, renal calculation and ventilation calculation are user selectable. You can change the display order of the functional items via the “Move Up”, “Move Down”, “Move First” and “Move Last” buttons on the right side of the dialog box.

After the functional items are set, click “OK” to activate the setting.

12.2.3 Alarm

Click “Alarm” to open a dialog box.

Minimum Alarm Volume

The minimum alarm volume level can be set from 0 to 10.

Switch on/off Reminder Tone and Set its Interval

The “Reminder Tone” can be set to “On” or “Off”. When it is set to “On”, in the status of CMS system silence or audio alarm off, the CMS can give a kind of reminder tone in case of an active alarm condition. When it is set to “Off”, the reminder tone will not be produced.

You can set the reminder interval as “1 min”, “2 min” or “3 min”. The default one is “1 min”. Alarm Off Reminder Tone is same as the highest level alarm tone.

Silence Hotkey

For details, refer to *8.10 CMS System Silence*.

Set Alarm Audio Mode

You can set the alarm audio mode as “ISO”, “MODE 1” or “MODE 2”.

Set Alarm Sound Intervals

If the alarm audio mode is set as “ISO”, you can set alarm sound intervals by toggling between “High Alarm Interval (s)”, “Med Alarm Interval (s)” and “Low Alarm Interval (s)”.

You cannot change the interval between alarm tones if you choose mode 1 or 2 as your desired alarm audio mode. For these two modes, the interval between alarm tones identifies the alarm levels as follows:

- Mode 1:
 - ◆ Interval between high level alarm tones: continuously.
 - ◆ Interval between medium level alarm tones: 5 s.
 - ◆ Interval between low level alarm tones: 20 s.
- Mode 2:
 - ◆ Interval between high level alarm tones: 1 s.
 - ◆ Interval between medium level alarm tones: 5 s.
 - ◆ Interval between low level alarm tones: 20 s.

Select Stored Waveforms

In the “Alarm” tab sheet, you can select the relevant waves stored when alarms occurred to the specific parameter.

1. Click the “Alarm” tab sheet.
2. Select a parameter from the “Alarm Numeric” list. Then select the relevant wave stored from the “Related Waveform” when the alarm occurred.
3. Click “Save” to save the selected wave.
4. Click “Default” to restore all parameters to the default configuration.

NOTE

-
- **No matter how many waveforms are selected from the Related Waveform list, the system can at most save 3 waveforms and record 2 waveforms for one parameter when an alarm occurs.**
 - **Your selections are only effective for later alarms. For already existed alarms, it is unnecessary to re-select waveforms.**
-

12.2.4 Trend Group

You can set the parameters in “Trend Review” by group.

The trend group tab sheet contains system default trend groups list and custom trend groups list, and the list of corresponding trend group member parameters as well. The system provides ten (10) default trend groups, which are “All”, “Standard”, “ECG”, “GAS”, “Hemodynamic”, “RM”, “BIS”, “EEG”, “Ventilator” and “Anesthesia”. You cannot edit the default trend groups.

- **Create trend group:** click “New Group” and enter the name of custom trend group in the pop-up dialog box.
- **Edit trend group:** after selecting custom trend group, you can select/deselect the member parameters or adjust the order of member parameters in the list.
- **Save trend group:** after creating or editing trend group, click “Save Group” to save the new or modified trend group.
- **Delete trend group:** you can delete any custom trend group from the trend group list.
- **Rename trend group:** click the custom trend group to be renamed, enter the new name of the trend group in the pop-up dialog box.

12.2.5 Monitor List

Clicking the “Monitor List” will enter a tab sheet, which lists all the monitors in the LAN including the monitors admitted by this CMS. The displayed items are: monitor name, unit, bed no., IP address and monitoring status. The patient can be admitted by the CMS only after the monitor is admitted by the CMS.

Refresh

You can update the list by clicking the “Refresh” button.

Admit

You can select the monitor with the monitoring status of “Not admitted by CMS” and then click the “Admit” button to admit it to this CMS.

Cancel

You can select the monitor with the monitoring status of “Admitted by this CMS” and then click the “Cancel” button to cancel the admission.

Cancel All

You can click the “Cancel All” button to cancel this CMS’s admission of all the monitors.

Admit All Current Unit's Monitors

You can admit all current unit’s monitors to this CMS by clicking the “Admit All Current Unit's Monitors” button. If “Auto Admit All Current Unit's Monitors” is selected, the admission can be done automatically.

12.2.6 Log

Clicking the “Log” tab will enter a tab sheet, which records the operating status of the CMS providing the convenience for the service personnel to track and maintain the system. Each log includes occurrence time, log level, and log description.

Delete

You can delete all logs by clicking the “Delete All” button.

Refresh

You can update the logs by clicking the “Refresh” button.

Export

1. Click the “Export” button. The “Save As” dialog box will be displayed.
2. Select a disk to which the logs are exported. The disk can be a floppy disk, local hard disk, mobile hard disk or USB.
3. The default file name is “cmsXXXX”. If it is the first time to save, the “XXXX” will be 0001, which will automatically add 1 every time log is saved. You can change the file name as required.
4. Click “OK” to initiate exporting data.
5. Click “Cancel” to cancel exporting data.

12.2.7 Telemetry

If your CMS is connected with telemetry monitors, select the “Telemetry” tab, you can set the following items in an opened tab sheet.

Alarm Level Setup

Click the “Alarm Level Setup” button. In the popup menu, you can set the “Alm Lev of ECG Lead Off”, “Alm Lev of SpO2 Sensor Off” and “Alm Lev of No RF signal” to “High”, “Med” or “Low”. The default setting is “Low”.

Monitoring Mode Setup

Monitoring mode setup means to establish corresponding relations between the telemetry transmitter and multibed patient sector. The CMS provides two monitoring modes:

Fixed monitoring: to establish fixed corresponding relations between the telemetry transmitter and multibed patient sector. Such corresponding relations are not changed when the patient is discharged. The patient sector displays bed number and serial number of telemetry transmitter and the bed mark color is not changed. The patient sector displays “No Patient Admitted”.

Flexible monitoring: no fixed corresponding relations are established between the telemetry transmitter and multibed patient sector. The corresponding relations are relieved when the patient is discharged. The patient sector is idle and displays “Idle sector. Click to admit a patient”.

Click the “Monitoring Mode Setup” button and select the telemetry monitoring mode from the pop-up menu. The options are “Fixed Monitoring” and “Flexible Monitoring”. The setting is activated immediately.

System Information

In the “System Information” area, the mainboard software version, receiveboard software version, total run-time are displayed.

Frequency Setup

■ Select frequency range

1. You can select the appropriate frequency segment from “Freq Segment”. The minimum “Start Freq” and maximum “End Freq.” corresponding to the frequency segment will be displayed automatically.
2. You can also click the drop-down menu to select other “Start Freq” and “End Freq.”.

■ Frequency setup list

This area shows channel number, channel name, and the transmitter frequency and signal strength corresponding to each receiver channel in the tabular form.

1. Select a channel from the list. If a frequency point is currently available and it is not used by other channel, you can click the “Program...” button to program this channel.
2. If the serial port connects no corresponding transmitter at this time, the message will be displayed.
3. If the serial port is properly connected with the corresponding transmitter, the Program screen will be displayed.
 - ◆ The default value of “SN” is the serial number that has been written in the transmitter.
 - ◆ The default value of the “Frequency” is the transmitter frequency corresponding to the current receiver channel. You can either select other frequency by clicking the drop-menu button.
 - ◆ The default value of “Power” is 23. You can either select other power value by clicking the drop-menu button.
4. Select “OK”, and you will modify the configuration of this transmitter.
5. After the configuration is completed, click “OK” in the following dialog box.

■ Discharge a patient

Select a channel from the frequency setup list. If this channel has admitted a patient, you can click the “Discharge” button to discharge the patient.

Settings of Lethal Arrh. OFF

The “Lethal Arrh. Off” can be set for telemetry monitoring system.

- If it is set to “Disable”, the switches of all lethal Arrhythmia alarms are set to “ON” and unchangeable. “All Alarm Off” button is inactive.
- If it is set to “Enable”, the switches of lethal Arrhythmia alarms are able to be set. “All Alarm Off” button is active.

Nurse Call and Event Setup

To enable or disable nurse call and/or event function on telemetry monitoring system, you can make the following settings.

- If “Enable” is selected, the telemetry system will enable nurse call and event functions, and patient mgmt. screen will display the setting items of “Nurse Call” and “Event”.
- If “Nurse Call” is selected, the telemetry system will enable nurse call function, and the patient mgmt. screen will display the setting item of “Nurse Call”.
- If “Event” is selected, the telemetry system will enable event function, and the patient mgmt. screen will display the setting item of “Event”.
- If “Disable” is selected, the telemetry system will disable nurse call and event functions there are no setting items of “Nurse Call” and “Event” in the patient mgmt. screen.

Nurse Call Audio Mode

You can set the nurse call audio mode as “ISO”, “MODE 1” or “MODE 2”.

IP Address

You can set the IP address of telemetry receiver. When the IP address is changed, click “Modify” button to save the change.

12.2.8 Other

Clicking the “Other” tab will enter a tab sheet.

In this tab sheet, you can turn on or off the following options:

- Shutdown Requires Password: If this option is turned on, you need to input a password before shutting down the system.
- Change Language
- Change User Password
- Change Time
- Change Hospital Name
- Database Backup and Recovery
- Gateway Communication Setting
- Multi-CMS Communication Settings
- Remote Control Setting

Change Language

The CMS enables multiple languages, from which you can choose any one as required. When the CMS starts, the default language is the language selected at time of installation.

1. Click the “Change Language” button. The dialog box will be displayed.
2. Click the down arrow button to drop down a list of available languages, from which you can select your desired language. The available languages are the ones registered at time of installation and supported by the operating system.
3. Click the “OK” button.
4. If the language you have selected is not supported by the operating system, a message will be displayed. You can follow it.

NOTE

- **If the language you selected is inconsistent with that of the operating system, unrecognizable characters may occur to the CMS. Therefore, change the language and region settings of the operating system by following the operator’s manual of the operating system.**
-

Change User Password

1. Click the “Change User Password” button. The dialog box will be displayed.
2. Input old password and new password before selecting “OK”.
3. If the change succeeds, the “Password changed, please remember new password” message box will be displayed. Select “OK” to activate you change.
4. If the old password you have entered is incorrect or the new password is entered inconsistently, the system will give a prompt message. You can select “OK” to repeat the input procedure.

NOTE

- **If you use factory password to enter the “Admin Setup” tab sheet, you can directly input new password without inputting old password.**
-

Change Time

WARNING

- **Directly changing the system time (automatically or manually) of the operating system on which the CMS is installed may cause saved data missing on the CMS. Change the time only from the CMS.**
-

NOTE

- **After the CMS time is changed, the CMS will synchronize the time of networked monitors.**
 - **When a monitor is connected to the CMS, the CMS will synchronize the time of the monitor.**
 - **The CMS will synchronize the time of the networked monitors on its whole hours.**
 - **The system time of the defibrillator will not be synchronized by the CMS.**
-

The system time can be changed automatically or manually.

■ **Automatically change time**

1. Click “Change Time” button, and the dialog box will be displayed.
2. Set “Time Synchronization” to “On”.
3. Input master time server IP and second time server IP.
4. Click “OK.”.

■ **Manually change time**

1. Click the “Change Time” button, and the dialog box will be displayed.
2. Set “Time Synchronization” to “Off”.
3. Adjust the setting of “Set System Time”: For year, month and date, you can either click them one after another to highlight the number and then use the keyboard to enter the number you want manually, or click the down arrow button to open the time table and then select from the table.
4. For hour, minute and second, you can either click them one after another to highlight the number and then use the keyboard to enter the number you want manually, or click the up or down arrow button to make changes.
5. Click “OK”.

Change Hospital Name

1. Click the “Change Hospital Name” button.
2. Input hospital name and unit name.
3. Select “OK”.

NOTE

-
- **Hospital name should be within 128 characters, and department name be within 8 characters.**
-

Auto Shrink Database

Shrink Database provides ability to clear up the invalid data in database and release storage space. The system requires shrinking database every day. The default time of auto database shrink is set to zero hour (00:00:00). You can set to other desired time upon needs. The operation is as follows:

1. Click “Auto Shrink Database” button.
2. Input the preset time for auto database shrink.
3. Click “OK”.

Gateway Communication Setting

Gateway communication setting menu provides three (3) tabs which are Network Setup, Authorization Setup and Service Setup.

■ Network Setup

The “Network Setup” tab sheet lists the information about the network adapters configured on the CMS. One of the network adapters is for internal communication within the CMS and beside monitors; the other network adapter is for inter-communication between CMS and other systems. Select and activate one network adapter, the communication between the CMS and other systems is established.

To activate a network adapter:

1. Select the network adapter type to be activated.
2. Select one IP address as required if there are multiple IP addresses in the “IP Address” area on the right.
3. Click “OK”.

When a network adapter has been activated, the network card type and IP address background color is light gray.

- Authorization Setup

The CMS “Authorization Setup” menu lists the departments and bed numbers of all bedside monitors within the CMS. If the check boxes before the department and bed number are selected, other systems networked with this CMS are authorized to view the patient. If the check boxes before the department and bed number are not selected, other systems networked with this CMS are not authorized to view the patient.

- Service Setup

The “Service Setup” tab sheet lists CMS+ to Elan translator , Gateway Communication Settings, ADT query and data export setup items:

CMS+to Elan Translator

The options are “Enable” and “Disable”. When “Disable” is selected, all items in “Gateway Communication Settings”, “ADT Query Setup” and “Data Export Setup” are grey, and the CMS does not communicate with Gateway.

Gateway Communication Settings

You can set the CMS’ communication mode with the Gateway.

- ◆ If “Multicast” is selected, the CMS communicates with Gateway in multicast mode.
- ◆ If “Unicast” is selected, the CMS communicates with the specified Gateway in unicast mode. “IP Address” shall be the address of Gateway, and setting of “Port ” shall be consistent with that set in Gateway.

ADT Query Setup

“ADT Query” switch, and the “IP Address” and “Port” for communicating with Gateway can be set here. When “ADT Query” is set to “Enable”, the “IP Address” and “Port” can be edited. “IP Address” shall be the address of Gateway, and setting of “Port ” shall be consistent with that set in Gateway.

NOTE

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- **The "Obtain Patient Information" button is available on the patient management screen only when “ADT Query” is set to “Enable”.**
-

Date Export Setup

- ◆ Input multicast IP address and port. “IP Address” shall be the address of Gateway, and setting of “Port ” shall be consistent with that set in Gateway.
- ◆ Export Waveform Data: When configured to “ON”, the button “Export to EMR” will be displayed on the “Waveform Review” (normal waveform review screen) and “Event Review” sheets, and the waveform or event can be exported to other systems. When configured to “Off”, the waveform or event can not be exported to other systems.
- ◆ Export 12-Lead ECG Report: When configured to “On”, once the CMS receives 12-lead ECG analysis result from bedside monitor, the CMS will automatically generate a 12-lead ECG report, and send the report to other systems. When configured to “Off”, the report will not be generated.

Multi-CMS Communication Settings

Multi-CMS Communication Settings menu is used to add or delete the IP address of other CMS. You can view other beds on that CMS only when the corresponding IP address of a CMS is added.

1. Click the “Multi-CMS Communication Settings” button and open the “Communication Settings” menu.
2. Click “Add”, and then input the IP address of a CMS on which you want to proceed viewing other beds in the opened dialog box.
3. Click “OK”.

NOTE

-
- **As for the CMSs or monitors which only have broadcast mode to implement remote CMS, it is required to tick the “Broadcast send mode” checkbox.**
-

Remote Control Settings

In Remote Control Settings menu, you can make the following settings:

- **Alarm Paused & Silence:** Select the checkbox before “Alarm Paused & Silence” to switch on/off alarm paused or silence. If the checkbox is selected, you can remotely control the operations of alarm paused or silence on bedside monitors. So the corresponding controls are available in the drop-down menu of spot patient window and the icons in the button area of ViewBed screen are active. If the checkbox is not selected, you can not use those functions.

-
- Alarm Setup: Select the checkbox before “Alarm Setup” to switch on/off remote alarm setup. If the checkbox is selected, you can remotely change the settings of activation state, alarm priority, alarm high/low limit, ARR threshold, Apnea alarm time and Desat limit on the monitor. If the checkbox is not selected, you can not change those settings on the monitor.
 - Alarm Latched: Select the checkbox before “Alarm Latched” to turn on or turn off alarm latched function. When “Alarm Latched” is selected, you can remotely control to enable the alarm latched function is enabled. Click the  button in viewbed window and the “Alarm Setup” menu will pop up. The options of “Alarm Latched” in the menu are active. When “Alarm Latched” is not selected, the alarm latched function is disabled.
 - Privacy Mode: Select the checkbox before “Privacy Mode” to turn on/off this function. When “Privacy Mode” is selected, you can remotely control the bedside monitor to enter privacy mode. The corresponding control is available in the drop-down menu of spot patient window. If it is not selected, you can not use this function. The corresponding control is unavailable in the drop-down menu of spot patient window.
 - Night Mode: Select the checkbox before “Night Mode” to turn on/off this function. When “Night Mode” is selected, you can remotely control the bedside monitor to enter night mode. The corresponding control is available in the drop-down menu of spot patient window. If it is not selected, you can not use this function. The corresponding control is unavailable in the drop-down menu of spot patient window.

NOTE

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- **When the CMS restarts, the “Alarm Setup”, “Alarm Paused & Silence”, “Alarm Latched”, “Privacy Mode” and “Night Mode” checkboxes remain the same as the CMS is last turned off.**
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13 Remote CMS

13.1 Overview

In the event that there are multiple CMSs in a LAN, the CMS can view a single patient connected to the target CMS in the LAN through the Remote CMS window.

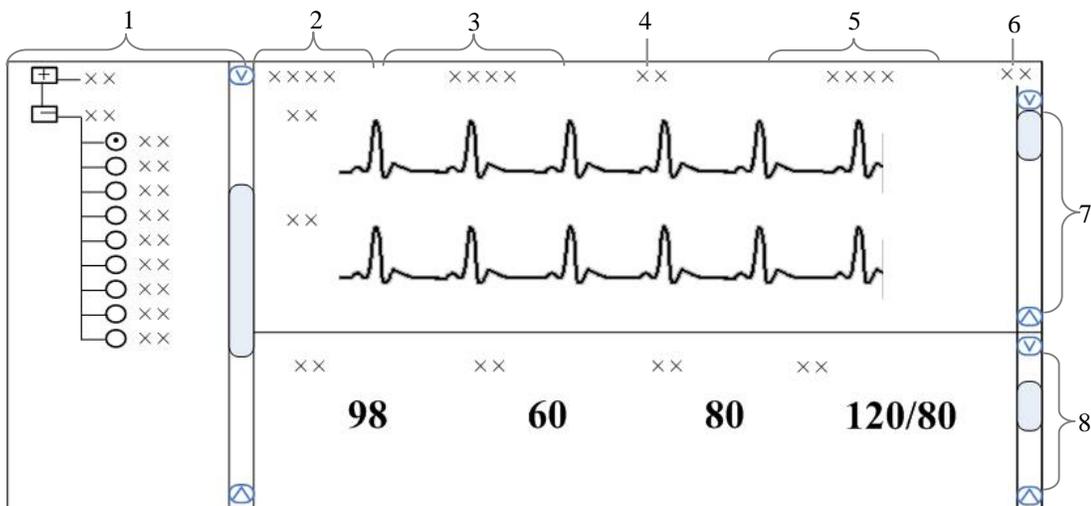
Through the Remote CMS window, you can only view the target monitor rather than setting and controlling the target CMS or monitor.

NOTE

- One CMS can be viewed by a maximum of 16 other CMSs simultaneously.

13.2 Remote CMS ViewBed Window

Click the Remote CMS button at the bottom of the screen and enter the Remote CMS window. Then select the “ViewBed” tab. The ViewBed screen is shown as below.



- | | | |
|--------------------|-----------------------------|-----------------------------|
| 1. Beds list | 2. Patient information area | 3. Physiological alarm area |
| 4. Alarm icon area | 5. Technical alarm area | 6. Button area |
| 7. Waveform area | 8. Parameter area | |

Figure 13-1 Remote CMS Viewbed Screen

13.2.1 Beds List

The beds list displays the information about all CMSs and networked bedside monitors (target monitors) in the same network segment of an LAN.

When the “Remote CMS” screen is accessed, the CMS will automatically list other CMSs which can be operated remotely. Only when the CMSs’ IP addresses are added in the Multi-CMS Communication Settings menu, the names of the corresponding CMSs will be automatically displayed in the list.

In the beds list, the first-level nodes are the unit names of the CMSs; the second-level nodes are the monitors connected to the CMSs. Generally, the name of the second-level node is department, bed number or patient name.

You can select the target monitor to be viewed by selecting the radio button before the second-level node, or the monitor.

The background color indicates the status of the target monitor.

- White: indicates that no alarm occurs to the target monitor.
- Red: indicates that a high level alarm, nurse call or event occurs to the target monitor.
- Yellow: indicates that a medium or low level alarm occurs to the target monitor.
- Grey: indicates that the target monitor is in standby status.
- Light Grey: indicates that the target monitor is in offline status.

13.2.2 Physiological Alarm Area

This area is to display physiological alarm messages and relevant text coming from the viewed target monitor circularly. The display rule is same as that in physiological alarm area of patient window. Please refer to **6.2.3.5 Physiological Alarm Area**.

Different background colors are used to indicate the alarm priorities.

- Red: indicates that a high level alarm occurs to the target monitor.
- Yellow: indicates that a medium or low level alarm occurs to the target monitor.

13.2.3 Technical Alarm Area

This area is to display technical alarm messages or prompt messages circularly coming from the viewed target monitor. The display rule is same as that in the technical alarm of patient window. Please refer to **6.2.3.4 Technical Alarm Area**.

13.2.4 Alarm Icon Area

This area displays icons for alarm pause , alarm off , alarm audio off , alarm audio paused or alarm silenced , monitor silenced  and defibrillator . Please refer to *6.2.3.3 Alarm Icons*.

NOTE

-
- **In the Remote CMS window, only the alarm messages coming from the target monitor will be displayed; the alarm messages coming from the current CMS will not be displayed.**
-

13.2.5 Button Area

Click this button to open the “Filtering Setup” menu, from which you can select your desired waves and parameters. The waveform and parameter areas will then display the corresponding waveforms and parameters.

13.2.6 Waveform Area

This area displays the waveforms on the target monitor.

13.2.7 Parameter Area

This area displays the parameters on the target monitor. Each block displays the parameters from the same parameter module.

13.3 Remote CMS Review

In the Remote CMS window, there are waveform review tab, trend review tab, event review tab, OxyCRG review tab, ST review tab and C.O. Review tab. Select a tab and then you can access the corresponding review sheet. The function of Remote CMS review is similar to that of local CMS online review. Please refer to *9.1 Online Review*.

13.4 Network Setup and Authorization

13.4.1 IP Address Setup

To implement the Remote CMS function between CMSs, each CMS needs to be equipped with at least two network adapters, one of which is for internal communication within the current CMS and the other for inter-communication between the CMSs. The typical configuration is shown below:

Current CMS A		Target CMS B		Target CMS C	
Network adapter A1	Network adapter A2	Network adapter B1	Network adapter B2	Network adapter C1	Network adapter C2
196.76.0.X1	168.168.4.X2	196.76.0.Y1	168.168.4.Y2	196.76.0.Z1	168.168.4.Z2

As shown in the table above, network adapter A1, B1 and C1 are used for the communication between the CMS and the monitors. Their IP addresses are in the same network segment with the IP addresses of respective monitors. Network adapter A2, B2 and C2 are used for the inter-communication between the CMSs. Their IP addresses belong to the same network segment and X2, Y2 and Z2 shall be different.

NOTE

-
- **The IP address shall be set by authorized personnel.**
 - **If a CMS needs to implement the Remote CMS function on other CMS, the IP address of other CMS has to be added into it. Please refer to *12.2.8 Other - Multi-CMS Communication Settings* for details.**
-

13.4.2 Setting the Network Card for Remote CMS

A CMS is configured with two network cards, one for the CMS internal communication and the other for remote CMSs. When the network card for remote CMS is activated (the network card type and IP address background color is light gray), it will transmit data via HL7 protocol. Other CMSs can view the data of the patient authorized in the “Authorization Setup” menu of the CMS. When this network card is not activated, the CMS cannot transmit data to other CMSs, and other CMSs cannot view the patient data of this CMS.

Please refer to the network setup in *12.2.8 Other - Gateway Communication Setting* for how to activate network card for remote CMSs.

13.4.3 Authorization

Please refer to *12.2.8 other - Gateway Communication Setting* for authorization setup.

NOTE

-
- Other CMSs can view the information of authorized bedside monitors within the CMS through the “Remote CMS” window only when “Network Setup” and “Authorization Setup” are correct.
-

13.5 Viewing Remote CMSs through VPN

The CMS supports being viewed by other CMSs or CMS viewers through VPN. The VPN network is shown as below: the VPN server requires a fixed IP address through a private line to connect to Internet, while the connection of other VPN clients is as follows:

- If a CMS is viewed by other CMSs, the VPN clients of all the CMSs shall connect to Internet through private lines;
- If a CMS is viewed by a CMS viewer, the VPN client of the CMS shall connect to Internet through a private line, while the VPN client of the CMS Viewer can connect to Internet through either a private line or a ADSL.

Please refer to the accompanying documents for the detailed settings for VPN equipment.

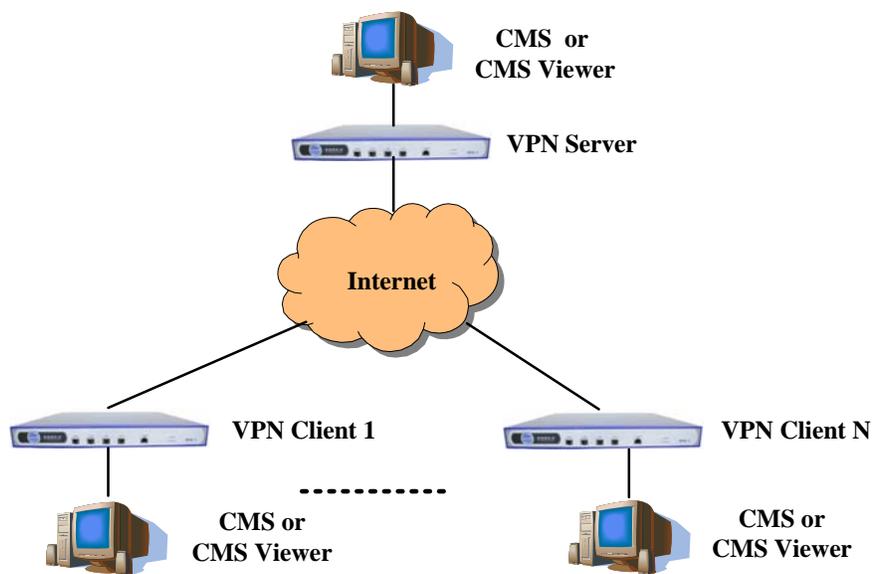


Figure 13-2 VPN Networking

When the VPN network is set up, you can directly connect one of the network interface cards of the CMS with LAN port of VPN, or connect them through switching equipment, and set correct IP address for the CMS. When you use Remote CMS function to view other CMSs in VPN network, you need to add the IP addresses of other CMSs in Multi-CMS Communication Settings menu. Please refer to *12.2.8 Other - Multi-CMS Communication Settings* for details.

NOTE

- **If there are two network cards installed on the host of the CMS, please differentiate the network card for bedside monitor from the card for multiple CMSs / CMS Viewer / other information systems, and set correct IP addresses for the corresponding network cards.**
 - **If there are two network cards installed on the host of the CMS, please respectively connect them with the corresponding network according to their specific usage.**
 - **Do not connect two network cards in the same network segment at one time. For example, you can not connect two network cards with bedside monitors' network.**
-

14 Database Backup and Recovery

14.1 Overview

The CMS provides database backup and recovery.

The CMS will shut off automatically during database backup and recovery.

You can start database backup and recovery by operating the CMS or the Windows operating system, or when you fail to log in the database.

By operating the CMS

Enter the “Admin Setup” menu; select “Other” to open a tab sheet.

Click the “Database Backup and Recovery” button and a message box will pop up. Select “Yes”, the CMS will automatically shut off and start database backup and recovery.

NOTE

- **Take care to perform database backup and recovery. This will automatically shut off the CMS.**
-

When the CMS fails to log in the database

The CMS will automatically log in the database when it starts. If it fails to log in the data base, a message box will pop up. Click the “Restart” button to restart the CMS; select the “Recover” button to backup and recover the database.

By operating the Windows operating system

Click the “Start” button of the Windows operating system; select “Programs” and then select “Database Backup and Recovery” to run the database backup and recovery program.

14.2 Backup Database

14.2.1 Select Operation Type

When you run the “Database Backup and Recovery” program, a dialog will pop up for you to select the operation type. Select “Backup Database”.

14.2.2 Select Backup Path

You can backup the database on the local hard disk or on a USB disk.

Select a path from the drop-down list. The available hard disk partitions are listed automatically and a directory in which the backup file is stored is created automatically.

NOTE

-
- **Do not modify the directory of the backup file. It is specified by the system.**
-

The directory is named YYYYMMDDhhmmbak, in which YYYY refers to the year, MM refers to the month. DD refers to the date, hh refers to the hour and mm refers to the minute.

14.2.3 Backup Database

After selecting the backup path, click the “Next” button, a dialog box will appear. Click the “Start” button to start database backup.

If database backup is overtime or an abnormal condition occurs during database backup, a message will be presented.

If the backup database is stored on the local hard disk, the old backup file will be deleted automatically so that only one backup file is stored on the local hard disk. If the backup is stored on the USB disk, the old one will not be deleted.

14.3 Recover Database

CAUTION

- The recovered database will overwrite the current one. Make sure whether you need to backup the current database before carrying out database recovery.
-

NOTE

- If the CMS cannot start normally due to database error resulting from abnormal shutoff or improper operation, recover the database.
-

14.3.1 Select Operation Type

After the “Database Backup and Recovery” program starts up, the dialog box will appear. Select “Recover Database”.

14.3.2 Select Path

You can recover the database from local hard disk or from a USB disk.

If you select local hard disk, the system will search the correct backup database for recovery on the local hard disk.

If you select the USB mobile medium, click the  button and select the backup file for recovery.

14.3.3 Recover Database

After selecting the correct path for database recovery, select the “Next” button to enter a dialog box. Then click the “Start” button to start database recovery.

If database recovery is overtime or an abnormal condition occurs during database recovery, a message will be presented.

14.4 Rebuild Database

After the “Database Backup and Recovery” program starts up, the dialog box will appear. Select “Rebuild Database”.

NOTE

-
- **All the data in the current database will be deleted during rebuilding the database.**
-

14.5 Shrink Database

After the “Database Backup and Recovery” program starts up, the dialog box will appear. Select “Shrink Database”.

If an abnormal condition occurs during database shrink, a message will be presented.

14.6 Exit Database Backup and Recovery

When you exit the “Database Backup and Recovery” program, the CMS will start automatically.

15 System Help

15.1 Overview

The CMS features a webpage-like on-line help so that you can obtain a better understanding of the system. Click the “Help” menu to enter the help screen.

There are three icons on top left of the Help screen:

- : Page down.
- : Page up.
- : Return to the screen as shown in the above figure.
- : Display copyright information, including system software version, system software and database copyright information and so on.

NOTE

- **The help information on the CMS is not only about the system itself, but also on a number of concepts and operations related to bedside monitors.**
-

You can enter corresponding help information by selecting any of the following three links:

- Introduction: Brief introduction to the CMS and its configuration.
- Operation Introduction: Introduction to various operations of the CMS, such as multi-bed and viewbed observation.
- Bio Essentials: Introduction to monitoring function of each parameter module, such as ECG, SpO₂, etc.

FOR YOUR NOTES

A Technical Specifications

A.1 Requirements

The computer of the CMS should be highly reliable and stable. The commercial computer we recommend is HP 8380 MT. Recommended configurations of HP 8380 MT are:

Components	Requirements
System	Meet the IEC60950 requirements defined for ITE equipment, and comply with CE low voltage directives (LVD) and EMC directives.
Host	Intel Core i5-2400@3.20GHz 4G minimum DDRIII 500 GB minimum SATA Hard Disk, support data redundancy by dual hard disks 1000M Network adapter, Base-T, Ethernet 802.3, RJ45 port six or more USB ports, one or more serial ports
Display	19" LCD minimum, 1280×1024, length: width 4:3 or 5:4, with CE marking.
Operating System	Support Windows® XP Professional Embedded SP3
Dual-display graphic card	Minimum 256M; NVIDIA GeForce 8500 GT or above
Audio Adapter	Analog Devices AD1884 @ Intel 82801IB ICH9 - High Definition Audio Controller
Mouse	With CE marking.
Keyboard	With CE marking.
Recorder	Mindray thermal array, serial port.
Printer	Supporting A4 and Letter paper.
Speaker	Built in the computer or the display. Give alarm tones (45 to 85 dB), alarm tones comply with IEC60601-1-8.

NOTE

- The configuration above is for reference only.
-

A.2 Recorder

Size	210×100×100 mm
Weight	1 kg
Type	Thermal recorder
Record rate:	25 mm/s, 50 mm/s
Interface	RS232 interface
Width of the recorder paper	50mm

A.3 Wire Network

Network structure	Ethernet 802.3
Transmission rate	10/100 Mbps
Network interface	RJ45
Max alarm time delay	< 2s

A.4 Wireless Network

Network structure	802.11b/g
Wireless RF	2.4000 ~ 2.4835 GHz
Transmission rate	11 Mbps/54 Mbps
Max alarm time delay	< 2s

A.5 Review

Dynamic short trend	4 hours
Trend review	240 hours
Waveform review	240 hours of full-disclosure waveforms and compressed waveforms
C.O. review	720 measurements
NIBP review	Most recent 240 hours of NIBP measurements
Event review	720 events, including the parameter name and 16s waveform respectively before and after the alarm is triggered
OxyCRG review	Most recent 100 oxygenation events
Historic review	up to 20,000 discharged patients' data
ST review	Most recent 240 hours of ST segments

A.6 Calculation

Drug calculation	75 calculations for single patient
Hemodynamics calculation	100 calculations for single patient
Oxygenation calculation	100 calculations for single patient
Ventilation calculation	100 calculations for single patient
Renal calculation	100 calculations for single patient

A.7 Save as

File format	html
Storage medium	mobile hard disk, flash drive
Contents	Graphic/table, waveform review, C.O. measurement, event review, OxyCRG review, drug calculations, hemodynamics calculations, oxygenation calculations, ventilation calculations, renal calculations, DSA graph and CSA graph.

A.8 Print

Print paper	A4 or Letter
Contents	Patient information, Graphic/table, waveform review, waveform segment report, C.O. measurement, events, OxyCRG events, drug calculation, hemodynamics calculations, oxygenation calculations, ventilation calculations, renal calculations, ST waveforms, real-time report, 12-lead ECG report, multi-lead ECG report, ARR statistic result, EEG report., ICG report, CCO report, SvO ₂ /ScvO ₂ report, alarm settings report, real-time alarm report, OxyCRG graph.

A.9 Record

Contents	Patient information, waveform review, C.O. measurement, events, OxyCRG events, drug calculation, hemodynamics calculations, oxygenation calculations, ventilation calculations, renal calculations, oxyCRG graph, real-time waveform recording, real-time alarm recording, ST review, ICG hemodynamic parameter, CCO hemodynamic parameter, SvO ₂ /ScvO ₂ oxygenation parameters
----------	--

B Central Monitoring System Alarms

The CMS alarms displayed in the system alarm area on the upper screen are shown in the table below.

Alarms	Level	Cause and solution
Printer is out of toner	Low	Install the toner.
Printer is off line	Low	Connection between printer and computer may have problem. Check the connection.
Printer paper is jammed	Low	Change the paper and then restart the printer and printing task.
Printer is out of paper	Low	Load paper and then restart the printing task.
Opening Recorder Port Failed	Med	Restart the recorder.
Recorder Paper Jam	Low	Reload the paper.
Recorder Out of Paper	Low	Reload the paper.
Recorder Out of Alignment	Low	Adjust the recorder head.
Recorder is Too Hot	Low	The recorder has worked for a long time. Wait until it cools down.
Recorder Self-check Error: CPU	Med	Restart the recorder.
Recorder Self-check Error: RAM	Med	
Recorder Self-check Error: ROM	Med	
Recorder Self-check Error: WatchDog	Med	
Recorder Not Available	Med	
Recorder S. Communication Error	Med	Check the connection cable of recorder serial port.
Network is disconnected. Please check.	High	Check the network.
Network is not configured or disabled. Please check.	High	Check the network configuration of the CMS.
No bed is online. Please check network connection.	High	Check whether the patient monitor has connected to the network.
Database service is abnormal. Please restart CMS or contact the service representative.	High	Database service has an error. Restart the CMS to restore database service or contact the service personnel.

Alarms	Level	Cause and solution
The patient storage space is nearly full. Please delete some discharged patients.	Med	The discharged patient storage space is nearly full. Please delete some discharged patients.

The CMS alarms displayed in the patient window's technical alarm area are shown in the table below.

Alarms	Level	Cause and solution
Patient information conflict.	Low	For an already-admitted patient, its monitor re-logs onto the CMS after logging off for some reason. The CMS detects the patient information is inconsistent between itself and the monitor. Prompt message will also appear in the "Patient Mgt." tab sheet. You need to decide which patient information to use.
Offline	Low	The network is interrupted. Please check.

C Units, Symbols, Terms and Formulas

C.1 Units

BPM	beats per minute
°C	centigrade
cc	cubic centimeter
cm	centimeter
cmH ₂ O	cmH ₂ O
dB	decibel
°F	Fahrenheit
g	gram
GB	giga bytes
GTT	gutta
hr	hour
hPa	hPa
Hz	hertz
"	inch
k	kilo
kg	kilogram
kPa	kilopascal
l	litre
lb	pound
m	meter, minute
M	mega
MB	mega bytes
mbar	mbar
MHz	mega hertz
mcg	micrograms
mEq	Milli-equivalents
mg	milligrams
min	minute
ml	milliliter
mm	millimeters
mmHg	millimeters of mercury

ms	millisecond
RPM	breath per minute
s	second
V	volt
W	Watt

C.2 Symbols

-	minus
%	percent
&	and
/	per, divide, or
~	to
+	Plus
<	Less than
=	Equal to
>	Greater than
±	Plus or minus
×	Multiply

C.3 Abbreviations

ABBREVIATION	DEFINITIONS
air cyl.	air cylinder pressure
AC	Alternating Current
ADT	Admission\Discharge\Transfer
AgAwRR	Anaesthesia Gas Air-way Respiration Rate
Air Flow	Air flow
AG	Anaesthesia Gas
ART	Arterial
ATMP	Atmospheric Pressure
AP MAP	Mean Artery Pressure
AUX	Auxiliary
AVF	Left Foot Augmented Lead

ABBREVIATION	DEFINITIONS
AVL	Left Arm Augmented Lead
AVR	right arm augmented lead
AWRR	Air way respiratory rate
BC	Burst count
BIS	bispectral index
CCI	Continuous Cardiac Index
Cdyn	Dynamic compliance
CE	Conformité Européenne
CFI	Cardiac Fuction Index
CH	channel
C.I.	cardiac index
CMS	central monitoring system
C.O.	cardiac output
CCO	continuous cardiac output
CO ₂	carbon dioxide
Compl	Compliance
CPI	Cardiac Power Index
CPO	Cardiac Power Output
CPU	central processing unit
CRT	cathode ray tube
Cr	Creatinine
CSA	Compressed spectral array
Cstat	Static compliance
CVP	central venous pressure
DBS	double burst stimulation
DES	desflurane
D, DIA	diastolic
dPmx	Left Ventricular Contractility
DO ₂	Oxygen Delivery
DO ₂ I	Oxygen Delivery Index
DSA	Density spectral array
ECG	electrocardiograph
EDV	End-Diastolic Volume
EE	energy expenditure
EEC	European Economic Community
EMC	electromagnetic compatibility

ABBREVIATION	DEFINITIONS
EMG	Electromyograph
ENF	enflurane
Et	end-tidal
EtAA	end-tidal anesthetic agent
EtAA 2nd	2nd Exp. Agent
EtDes	End-tidal anaesthetic agent
EtSev	End-tidal anaesthetic agent
EtEnf	End-tidal anaesthetic agent
EtIso	End-tidal anaesthetic agent
EtHal	End-tidal anaesthetic agent
EtCO ₂	end-tidal carbon dioxide
EtN ₂ O	end-tidal nitrous oxide
EtO ₂	end-tidal oxygen
EVLW	Extravascular Lung Water
ELWI	Extravascular Lung Water Index
Exp%	Inspiration termination level
Exp. Flow	expiratory flow
Exp. MAC	expired minimum alveolar concentration
f	Breath rate
fapnea	Breath rate for apnea ventilation
fCMV	CMV frequency
FEV1.0%	first second forced expiratory volume ratio
FG	fresh gas flow
Fi	fraction of inspired
FiAA	inspired anesthetic agent
FiAA 2nd	2nd Insp. Agent
FiCO ₂	fraction of inspired carbon oxygen
FiN ₂ O	fraction of inspired nitrous oxide
FiO ₂	fraction of inspired oxygen
FiDes	Inspired anesthetic agent
FiSev	Inspired anesthetic agent
FiEnf	Inspired anesthetic agent
FiIso	Inspired anesthetic agent
FiHal	Inspired anesthetic agent
fmand	Mandatory breathing frequency
FRC	fractional residual capacity

ABBREVIATION	DEFINITIONS
FreqMIN	Minimum breath frequency
fSIMV	Frequency of SIMV
fsigh	sigh rate
fspn	Spontaneous breathing frequency
ftot	Total breath rate
F-Trigger	Inspiratory trigger level (flow trigger)
FV	flow-volume
GEDV	Global End Diastolic Volume
GEDI	Global End Diastolic Volume Index
GEF	Global Ejection Fraction
HAL	halothane
Hb	Hemoglobin
Hct	Haematocrit
HR	Heart Rate
IBP	invasive blood pressure
IBW	Ideal body weight
ICP	intracranial pressure
ICU	Intensive Care Unit
ID	identification
I:E	Inspiratory time:Expiratory time ratio
IEC	International Electrotechnical Commission
Insp.Flow	inspiration flow
Insp. MAC	inspired minimum alveolar concentration
Δ int.PEEP	Intermittent PEEP
Ins, INS	inspired minimum
InsCO ₂	inspired minimum carbon dioxide
IP	Internet Protocol
ISO	isoflurane
ITBV	Intrathoracic Blood Volume
ITBI	Intrathoracic Blood Volume Index
ITE	Information Technology Equipment
LAP	left atria pressure
LCD	Liquid Crystal Display
LVD	low voltage directive
M, Mean	mean pressure
Mac, MAC	minimal alveolar concentration

ABBREVIATION	DEFINITIONS
%MinVol	percentage of minute volume to be delivered
MF	Median frequency
MV	Minute volume
MVe	Expiratory minute volume
MVLEAK	Leakage minute volume
N ₂ O	nitrous oxide
N ₂ O cyl.	N ₂ O cylinder pressure
N ₂ O Flow	N ₂ O flow
N/A	not applied
NE	Neutral electrode
NIBP	noninvasive blood pressure
NIF	Negative inspiratory force
NMT	neuromuscular Transmission
O ₂	oxygen
Δ O ₂	difference between inspiratory and expiratory O ₂
O ₂ CI	oxygen consumption index
O ₂ cyl.	oxygen cylinder pressure
O ₂ cyl.2nd	secondary oxygen cylinder pressure
O ₂ Flow	O ₂ flow
oxyCRG	Oxygen Cardio-respirogram
P0.1	100 ms occlusion pressure
PA	pulmonary artery
PA MAP	Mean Pulmonary Artery Pressure
Pair	air supply pressure
PaO ₂	Arterial Oxygen Level
PaCO ₂	Arterial Carbon Dioxide Level
Papnea	apnea pressure
Paux Mean	mean auxiliary pressure
Paux Min	minimum auxiliary pressure
Paux Peak	peak auxiliary pressure
pArt-M	Mean Artery Pressure
pArt-D	Diastolic Artery Pressure
pArt-S	Systolic Artery Pressure
PC	personal computer
pCVP	Central Venous Pressure
PeCO ₂	Mixed Expire CO ₂ Pressure

ABBREVIATION	DEFINITIONS
PEEP	Positive end-expiratory pressure
PEEP/CPAP	PEEP/CPAP
PEEPi	Intrinsic positive end-expiratory pressure
PEEPtot	total PEEP
PEF	peak expiratory flow
PGND	Patient ground
P _{high}	Upper pressure level
PIF	peak inspiratory flow
P _{insp}	Pressure control level of inspiration
PIP	peak inspiratory pressure
PLETH	plethysmogram
P _{limit}	Pressure limit level
P _{low}	Lower pressure level
P _{max}	Maximum airway pressure
P _{mean}	Mean pressure
P _{osm}	Plasma Osmolality
P _{peak}	Peak pressure
P _{plat}	Plateau pressure
PPF	Peak power frequency
PPV	Pulse Pressure Variation
PR	pulse rate
PTC	post tetanic count
PTP	pressure time product
PS/2	Personal System/2
P _{supp}	Pressure support level
P-Trigger	Inspiratory trigger level(pressure trigger)
PVCs	—
PVPI	Pulmonary Vascular Permeability Index
Ramp	Ramp
RAP	Right Atrial Pressure
RAW	Airway resistance
RC _{exp}	expiratory time constant
RC _{insp}	inspiratory time constant
Re	Expiratory resistance
Refer	reference response amplitude

ABBREVIATION	DEFINITIONS
RESP	Respiration
Ri	Inspiratory resistance
RQ	Respiratory Quotient
RR	Respiration Rate
RSBI	Rapid shallow breathing index
SaO ₂	Arterial Oxygen Saturation
SEF	Spectral edge frequency
SerNa	Serum Sodium
ST	single twitch stimulation
SV	Stroke Volume
SVI	Stroke Volume Index
SvO ₂	mixed venous oxygen saturation
ScvO ₂	central venous oxygen saturation
SVR	Systemic Vascular Resistance
SVRI	Systemic Vascular Resistance Index
SVV	Stroke Volume Variation
SEV	sevoflurane
SpO ₂	arterial oxygen saturation from pulse oximetry
SQI	Signal quality index
SR	Suppression ratio
S, SYS	systole/systolic
Supra	supramaximal current
TB	temperature of blood
TCP/IP	Telecommunication Control Protocol/Internet Protocol
tcpCO ₂	transcutaneous carbon dioxide partial pressures
tcpO ₂	transcutaneous oxygen partial pressures
TEMP	temperature
Texp	expiratory time
Thigh	Time for the upper pressure level
TI	Temperature of Injectate
Ti max	maximum inspiration time
Tinsp	Time of inspiration
Tip	inspiratory pause time
TIP:TI	Percentage of inspiratory plateau time in inspiratory time
Tlow	Time for the lower pressure level
TOF	train of four stimulation

ABBREVIATION	DEFINITIONS
TP	Total power
TRC	tube resistance compensation
Trig Window	Trigger Window
Trigger	Trigger sensitivity
Trise	Rise time
Tslope	Time for the pressure to rise to target pressure
TV	Tidal Volume
Ucr	Urine Creatinine
Uosm	Urine Osmolality
UPS	Uninterruptible Power Supply
URK	Urine Potassium
URNa	Urinary Sodium
USB	Universal Serial Bus
V	precordial lead
VAC	volts alternating current
VCO ₂	CO ₂ production
Ver	version
VO ₂	Oxygen Consumption
VO ₂ /kg	oxygen consumption per body weight
VO ₂ /m ²	oxygen consumption per body surface area
VO ₂ I	Oxygen Consumption Index
VT	Tidal volume
VTapnea	apnea tidal volume
VT _e /TV _e	Expiratory tidal volume
VT _e spn	Spontaneous breathed minute volume
VT _i /TV _i	inspiratory tidal volume
VT _{sigh}	Sigh tidal volume
WOB	work of breathing
WOBimp	Imposed work of breathing

C.4 Formulas

Drug Calculations		
Abbreviation and Unit	Description	Formula
Conc. (mcg/ml, mg/ml, g/ml, units/ml, k units/ml, m units/ml or mEq/ml)	Concentration	AMOUNT / Liquid Volume
DOSE/hr (mcg, mg, units, k units, m units or mEq)	DOSE/hr	Infusion Rate × Conc.
DOSE/min(mcg, mg, units, k units, m units or mEq)	DOSE/min	(DOSE/hr) / 60
DOSE/kg/hr(mcg, mg, units, k units, m units or mEq)	DOSE/kg/hr	(DOSE/hr) / kg
DOSE/kg/min(mcg, mg, units, k units, m units or mEq)	DOSE/kg/min	(DOSE/hr) / kg / 60
Drip Rate (GTT/min)	Drip Rate	(Infusion Rate × Drop Size) / 60
Duration (hr)	DURATION	Liquid Volume / Rate
Hemodynamic Calculations		
Abbreviation and Unit	Description	Formula
BSA (m ²)	Body Surface Area	$Wt^{0.425} \times Ht^{0.725} \times 0.007184$
CI (L/min/m ²)	Cardiac Index	C.O. / BSA
SV (ml)	Stroke Volume	C.O. / HR × 1000
SVI (ml/m ²)	Stroke Volume Index	SV / BSA
SVR (DS/cm ⁵)	Systemic Vascular Resistance	$79.96 \times (AP\ MAP - CVP) / C.O.$
SVRI (DS m ² /cm ⁵)	Systemic Vascular Resistance Index	SVR × BSA
PVR (DS/cm ⁵)	Pulmonary Vascular Resistance	$79.96 \times (PA\ MAP - PAWP) / C.O.$
PVRI (DS m ² /cm ⁵)	Pulmonary Vascular Resistance	PVR × BSA
LCW (kg-m)	Left Cardiac Work	$0.0136 \times AP\ MAP \times C.O.$
LCWI (kg-m/m ²)	Left Cardiac Work Index	LCW / BSA
LVSW (g-m)	Left Ventricular Stroke Work	$0.0136 \times AP\ MAP \times SV$

LVSWI (g-m/m ²)	Left Ventricular Stroke Work Index	LVSW / BSA
RCW (kg-m)	Right Cardiac Work	0.0136 × PA MAP × C.O.
RCWI (kg-m/m ²)	Right Cardiac Work Index	RCW / BSA
RVSW (g-m)	Right Ventricular Stroke Work	0.0136 × PA MAP × SV
RVSWI (g-m/m ²)	Right Ventricular Stroke Work Index	RVSW / BSA
EF (%)	Ejection Fraction	100 × SV / EDV
Ventilation Calculations		
Abbreviation and Unit	Description	Formula
PAO ₂ (mmHg)	Alveolar Oxygen Level	$FiO_2 / 100 \times (ATMP - 47) - PaCO_2 \times (FiO_2 / 100 + (1 - FiO_2 / 100) / RQ)$
AaDO ₂ (mmHg)	Alveolar-arterial Oxygen Difference	PAO ₂ - PaO ₂
Pa/FiO ₂ (mmHg)	Oxygenation Ratio	100 × PaO ₂ / FiO ₂
a/AO ₂ (%)	Arterial to Alveolar Oxygen Ratio	100 × PaO ₂ / PAO ₂
MV (L/min)	Minute Volume	(TV × RR) / 1000
Vd (ml)	Volume of Physiological Dead Space	TV × (1 - PeCO ₂ / PaCO ₂)
Vd/Vt (%)	Physiologic Dead Space in Percent of Tidal Volume	100 × Vd/TV
VA (L/min)	Alveolar Volume	(TV - Vd) × RR / 1000
Renal Calculations		
Abbreviation and Unit	Description	Formula
URNaEx (mmol/24h)	Urine Sodium Excretion	Urine × URNa / 1000
URKEx (mmol/24h)	Urine Potassium Excretion	Urine × URK / 1000
Na/K (%)	Sodium Potassium Ratio	100 × URNa / URK
CNa (ml/24h)	Clearance of Sodium	URNa × Urine / SerNa
Clcr (ml/min)	Creatinine Clearance Rate	Ucr × Urine / Cr / (BSA / 1.73) / 1440
FENa (%)	Fractional Excretion of Sodium	100 × (URNa × Cr) / (SerNa × Ucr)
Cosm (ml/min)	Osmolar Clearance	Uosm × Urine / Posm / 1440
CH ₂ O (ml/h)	Free Water Clearance	Urine × (1 - Uosm / Posm) / 24

U/P osm	Urine to plasma osmolality ratio	U_{osm} / P_{osm}
BUN/Cr	Blood Urea Nitrogen Creatinine Ratio	$1000 \times BUN / Cr$
U/Cr	Urine-Serum Creatinine Ratio	U_{cr} / Cr
Oxygenation Calculations		
Abbreviation and Unit	Description	Formula
VO ₂ calc (ml/min)	Calculated Oxygen Consumption	$C(a-v)O_2 \times C.O.$
C(a-v)O ₂ (ml/L)	Arteriovenous Oxygen Content Difference	$CaO_2 - CvO_2$
O ₂ ER (%)	Oxygen Extraction Ratio	$100 \times C(a-v)O_2 / CaO_2$
DO ₂ (ml/min)	Oxygen Transportation	$C.O. \times CaO_2$
PAO ₂ (mmHg)	Alveolar Oxygen Level	$FiO_2 / 100 \times (ATMP - 47) - PaCO_2 \times (FiO_2 / 100 + (1 - FiO_2 / 100) / RQ)$
AaDO ₂ (mmHg)	Alveolar-arterial Oxygen Difference	$PAO_2 - PaO_2$
CcO ₂ (ml/L)	Capillary Oxygen Content	$Hb \times 1.34 + 0.031 \times PAO_2$
Qs/Qt (%)	Venous Admixture	$100 \times [1.34 \times Hb \times (1 - SaO_2 / 100) + 0.031 \times (PAO_2 - PaO_2)] / [1.34 \times Hb \times (1 - SvO_2 / 100) + 0.031 \times (PAO_2 - PvO_2)]$
C.O. calc (L/min)	Calculated Cardiac Output	$VO_2 / (CaO_2 - CvO_2)$

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