BeneVision
Central Monitoring System

Operator's Manual

For this Operator's Manual, the issue date is 2019-01.

⚠️WARNING

- **Federal Law (USA) restricts this device to sale by or on the order of a physician or other practitioner licensed by U.S. state law to use or order the use of this device.**

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■ all installation operations, expansions, changes, modifications and repairs of this product are conducted by Mindray authorized personnel;

■ the electrical installation of the relevant room complies with the applicable national and local requirements;

■ the product is used in accordance with the instructions for use.

NOTE

● **This equipment must be operated by skilled/trained clinical professionals.**

⚠WARNING

● **It is important for the hospital or organization that uses this equipment to perform a reasonable service/maintenance plan. Neglecting this may result in machine breakdown or personal injury.**

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Preface

Manual Purpose

This manual contains the instructions necessary to operate the product safely and in accordance with its function and intended use. Observance of this manual is a prerequisite for proper product performance and correct operation and ensures patient and operator safety.

This manual is based on the maximum configuration and therefore some contents may not apply to your product. If you have any question, please contact Mindray.

This manual is an integral part of the product. It should always be kept close to the equipment so that it can be obtained conveniently when needed.

Intended Audience

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

Illustrations

All illustrations in this manual serve as examples only. They may not necessarily reflect the setup or data displayed on the equipment.

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 or seriousness.

FOR YOUR NOTES

Contents

1 Safety

1.1 Safety Information

The safety statements presented in this chapter refer to the basic safety information that the operator of the BeneVision Central Monitoring System (hereinafter called 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 following, or specific to the operations.

⚠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.**

1.1.1 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 physiological waveforms, parameters and alarms displayed on the CMS screen are for clinician's reference only and cannot be directly used as the basis for clinical treatment. Before giving invasive treatment to a patient, you must go to the corresponding monitor to confirm the results you have obtained from the CMS.

- If any value displayed on the screen of the CMS is abnormal or questionable, first determine the patient's vital signs by alternative means and then verify that CMS or monitor is working correctly.

- The CMS is a clinical information device. Except for using such components as the mouse, touchscreen 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 Mindray monitors or telemetries only. Connecting the monitors made by other manufacturers may cause the values displayed on the CMS to be inaccurate.

- The service life of the CMS depends on its hardware. Rough treatment, dropping or collision should be avoided in the operation of 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 microorganisms 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 CentralStation is transmitting data via wireless RF signals, loss of patient data may be caused by the interference of other RF signals.

- Data communication must be performed within a closed network for all network functions.

- If an external audio device is connected to CMS, do not turn off the external audio device or adjust the volume to zero.

- Do not block the speaker of the CMS.

- Do not rely exclusively on audible alarm system. Setting alarm volume to a low level may result in a hazard to the patient.

- A hazard can exist if different alarm presets are used for the same or similar equipment in any single area

⚠️WARNING

- **PATIENTS WITH A PACEMAKER** – **On ventricular paced patients, episodes of Ventricular Tachycardia may not always be detected. Do not rely entirely upon the system's automated arrhythmia detection algorithm. Keep pacemaker patients under close surveillance.**

1.1.2 Cautions

⚠️CAUTION

- **All CMS equipment must utilize the hospital emergency power system. Failure to do so will result in loss of monitoring during extended periods of power failure. Hospitals without an emergency power system 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 may even have a serious result.**

- **Start or transport the CMS host and display in their specified environment. Otherwise, the CMS may be damaged. We will assume no responsibility for such damages.**

- **System time should be set before the CMS is put into use. If the system time is changed when the CMS is in use, it may result in patient data loss.**

- **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.**

- **If Windows® 7 Professional Embedded SP1 (32 bits) OS is used, please make sure that it is only used for the CMS software rather than other purposes.**

- **Using the "Show Desktop" feature in Windows is prohibited. Installing or using any other software not provided by Mindray is prohibited. Software that has not been tested or verified by Mindray may cause the instability of the system. Mindray assumes no responsibility for this.**

- **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.**

1.1.3 Notes

NOTE

- **Keep this manual in the vicinity of the CMS so that it can be easily located when needed.**
- **During normal use, the operator is expected to face the front of the equipment.**
- **The CentralStation is capable of connecting up to 32 monitors and telemetry transmitters. The cable connecting the monitor to the switch or exchange cannot exceed 100 m, otherwise it may result in network overload or weak network signals and consequently errors will occur during data transmission or while displaying.**
- **All the CMS host, parts, or accessories should be from Mindray or acknowledged by Mindray.**
- **The functions through right clicking the mouse cannot be operated on the touchscreen.**

1.2 Equipment Symbols

NOTE

- **Some symbols may not appear on your equipment.**
- **This manual describes a series of typical computer symbols, which may be slightly different from what are on your computer. The computer symbols usually have their specific meanings. Refer to your computer's operator's manual or contact our service personnel if you have any question.**

Symbol	Description
	Refer to instruction manual/booklet
	CAUTION: To reduce the risk of electric shock, do NOT remove cover. Refer servicing to qualified service personnel.
	Alternating current
	Power switch
	Keyboard port

Symbol	Description
	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 MANUAFACTURE
	MANUFACTURER
SN	Serial number
	Equipotentiality
	The following definition of the WEEE label applies to EU member states only. 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. * For system products, this label may be attached to the main unit only.

FOR YOUR NOTES

2 The Basics

2.1 Intended Use

The indications for use of the BeneVision Monitoring System include:

- Real time viewing of patient clinical data and alarms

- Storage and Historical review of patient clinical data and alarms

- Printing of real time and historical patient data

- Configuration of local settings as well as synchronizing settings across the network to a remote device

- Transfer of patient clinical data and settings between several CentralStations

The BeneVision Monitoring System is a networked patient monitoring system intended for use in a fixed location, installed in a hospital or clinical environment to provide clinicians remote patient monitoring. The network connections between the various devices can be any combination of Ethernet (Wired), Wireless WiFi (WLAN), and Wireless WMTS.

TheBeneVision Monitoring System supports one or more Mindray compatible physiological monitors and will display, store, print, and transfer information received from the compatible monitors. The BeneVision Central Monitoring System supports bi-directional configuration of the compatible monitors. No data processing is done by the BeneVision Central Monitoring System for data received from compatible monitors.

The BeneVision Monitoring System includes several Telemetry monitoring subsystems all of which operate in the 608M WMTS frequency range within a defined coverage area. All of the supported telemetry systems transmit data to the CentralStation for processing, display, and alarm.

- The TMS-6016 transmitter is intended for use on Adult and Pediatric patients to monitor ECG and SpO2 physiological data. The CentralStation will support ECG, Heart Rate, SpO2, Pulse Rate, Arrhythmia analysis, QT monitoring, and ST Segment Analysis for the TMS-6016.

- The Panorama Telepack-608 transmitter is intended for use on Adult patients to monitor ECG and SpO2 physiological data. The CentralStation will support ECG, Heart Rate, SpO2, Pulse Rate, Arrhythmia analysis, QT monitoring, and ST Segment Analysis for the Panorama Telepack-608.

■ The TMS60 transmitter is intended for use on Adult and Pediatric patients to monitor ECG and SpO2 physiological data. The physiological data can be reviewed locally on the display of the transmitter. The CentralStation will support ECG, Heart Rate, SpO_2, Pulse Rate, Arrhythmia analysis, QT monitoring, and ST Segment Analysis for the TMS60.

The BeneVision Central Monitoring System is intended for use in a hospital or other clinical environment under the direct supervision of a licensed healthcare practitioner.

⚠ WARNING

- **The device is intended for use by qualified physicians or well-trained clinicians. Anyone unauthorized or untrained must not perform any operation on it.**
- **The physiological waveforms, parameters and alarms displayed on the screen of the CMS are for reference only and cannot be directly used as the basis for clinical treatment.**
- **If any value displayed on the CMS screen is abnormal or questionable, first determine the patient's vital signs by alternative means and then verify that the CMS, or corresponding monitor or telemetry transmitter is working correctly.**

2.2 Contraindications

None.

2.3 CMS Functions & Features

The CMS includes three modules: CentralStation, WorkStation and ViewStation. They vary in functions.

CentralStation

The CentralStation can display, print, store and review patient clinical data. The clinical data displayed at the CentralStation is derived from compatible physiological monitor(s) or the Telemetry Transmitter(s). The compatible monitors are connected to the CentralStation via the bedside device network.

The CentralStation:

- Is capable of connecting up to 32 monitors.

- Is capable of connecting up to 32 telemetry transmitters.

- Only supports Mindray monitoring devices.

- Provides patient data to multiple WorkStations and ViewStations.

- Supports individual bed (1-32 bed) frequency setup in each telemetry monitoring system.

- Supports multi-screen display mode.

- Is capable of displaying information from 16 monitors in the single-screen mode and 32 monitors in the multi-screen mode.

- Allows you to view a single patient.

- Supports networking between multiple CentralStations and remote CentralStations.

- 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 a 4-hour dynamic short trend for each online patient.

- Allows you to review up to 720 C.O. measurements 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.

- Allows you to review up to 720 12-lead analysis results for each online patient.

- Is capable of storing discharged patients' full disclosure waveforms, parameters, alarms, etc.; allows you to search and review the data of over 1000 patients.

- Provides a 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 ability to record, print and save data.

- Provides comprehensive help information, prompts and operational guidance.

- 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, touchscreen, 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 your local Mindray service representative or Mindray Customer Service Department.

- Supports receiving the data generated during interruption from networked monitors and combining the data.

- Supports the redundancy backup with two hard disks on the host computer.

- Supports paging.

WorkStation

WorkStation provides the capability to display and manage patient data (including digital data and waveform) with assigned monitoring devices. All the patient data comes from the CentralStation. Most significant configuration changes can be made on the WorkStation.

- Is capable of monitoring up to 32 patients.

- Supports remote view of the patient parameters, waveforms, and alarms from monitors or telemetries admitted by the CentralStations.

- Allows you to enter or change patient demographic information, change alarm limits and priorities, discharge patients etc., if authorized.

- Allows you to print patient reports.

ViewStation

The ViewStation provides the capability to display patient data (including digital data and waveform) with assigned monitoring devices. All the patient data comes from the CentralStation.

- Is capable of monitoring up to 32 patients.

- Supports remote view of the patient parameters, waveforms, and alarms from monitors or telemetries admitted by the CentralStations.

- Allows you to print patient reports.

NOTE

- **Do not exchange the USB dongles. The USB dongle is used to configure the optional system functions which may be different for different CMS systems.**

2.4 Components

The CMS equipment consists of system software, computer, hardware dongle, network devices (optional), recorder (optional), printer (optional) and UPS (optional).
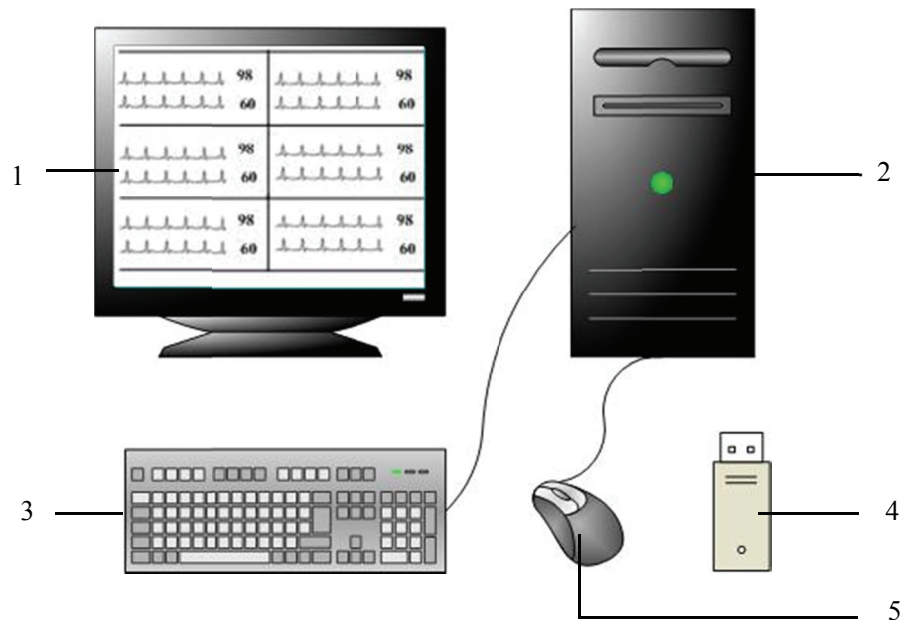
Figure 2-1 CentralStation

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

1. Display

2. Host computer (a tower computer or a 2U server)

3. Keyboard

4. USB dongle

5. Mouse

NOTE

- **The CentralStation, WorkStation or ViewStation can be equipped with up to four external displays.**

- **The WorkStation and ViewStation have the same components as CentralStation.**

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

2.5 Networking Mode

The typical networking diagram of the BeneVision monitoring system is shown below:
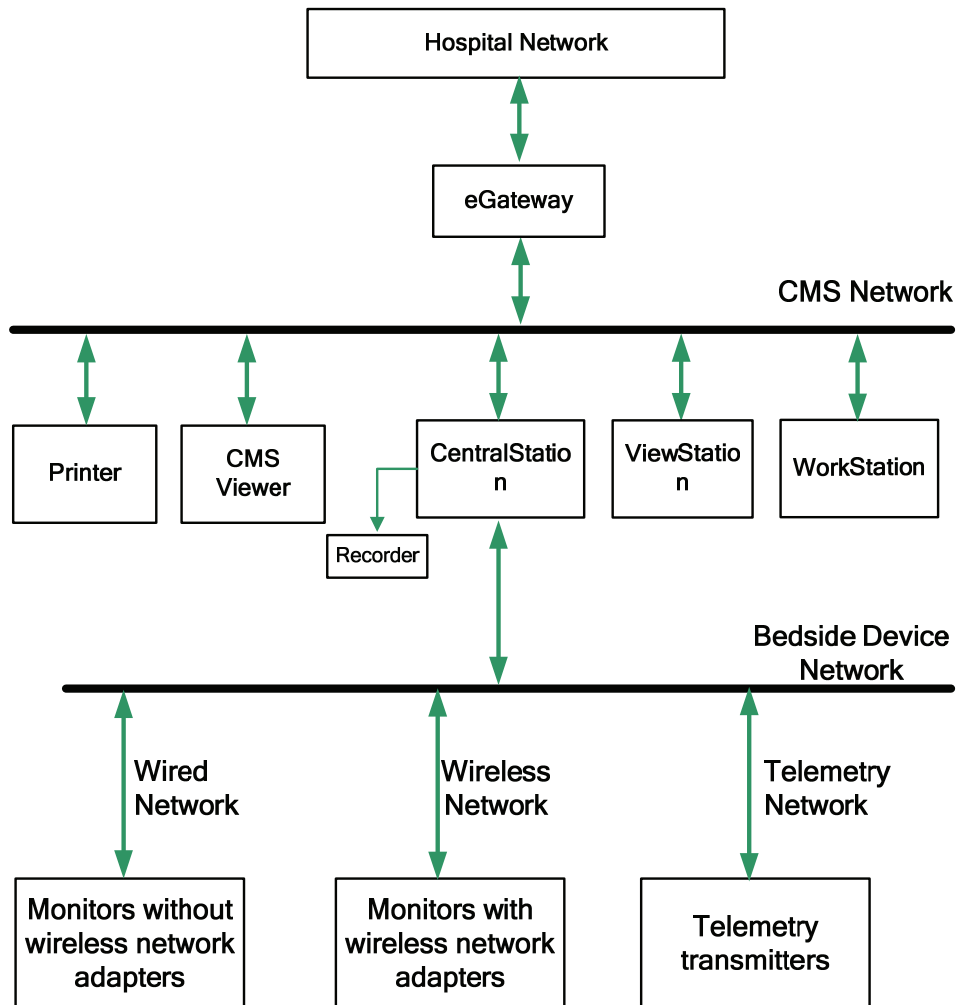
Figure 2-2 BeneVision Monitoring Network

■ CMS Network

The CMS network consists of CentralStation, WorkStation and ViewStation modules. The CentralStation is the module that monitors patients, collects and stores data, and performs alarm notification. The CentralStation transmits the patient data to the WorkStation and ViewStation.

■ Bedside Device Network

The Bedside device network connects the compatible bedside devices. There are three types of data communication mode to the CentralStation.

◆ Wired network

The CentralStation, exchange and monitors interconnect through a network cable.

◆ Wireless network

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

◆ Telemetry network

Through a network cable, the CentralStation is connected to the telemetry receiver, which via wireless RF connects multiple telemetry transmitters.

The CentralStation supports the networking between multiple CentralStations so that the information on one monitor within one CentralStation can be viewed by other networked CentralStations.

2.6 Controls

2.6.1 Mouse
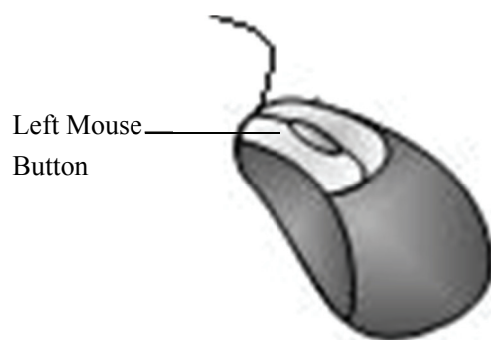
Left Mouse Button

The mouse is the primary means of user interaction with the CMS. There 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.

■ Scroll: position the mouse pointer on the scroll bar, and then scroll up or down the mouse wheel 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.

2.6.2 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.

2.6.3 Touchscreen

The touchscreen can be used to directly position, drag, select, or enter the text on the screen with a touch.

2.6.4 Controls

Scroll Bars

Left arrow   Scroll box   Right arrow   Up arrow

Scroll box

Down arrow

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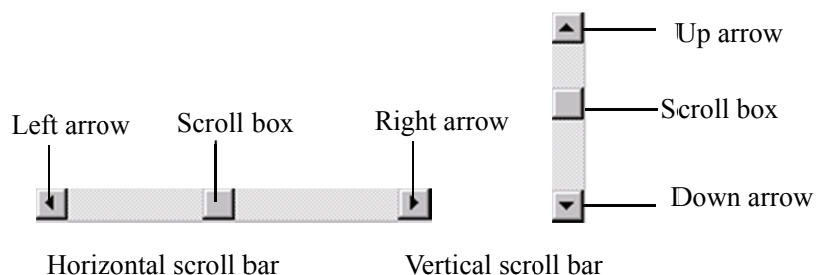
As shown in the figure above, there are two types of scroll bars: horizontal and vertical. The scroll bar can be used to position, browse and display your desired information.
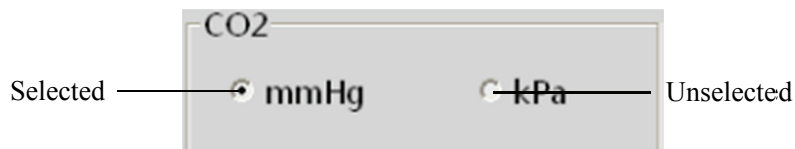
Text Box

The text box provides text entry fields, which are used to edit and display text. In a text entry field, you can use the mouse and keyboard to edit text, 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 is 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

Title —— Alarm Para
Scroll bar
A list of options {
HR
ECG LOST
PVCs
ST1
ST2
ST I
ST II
ST III
ST aVR
ST aVL
ST aVF
ST V1
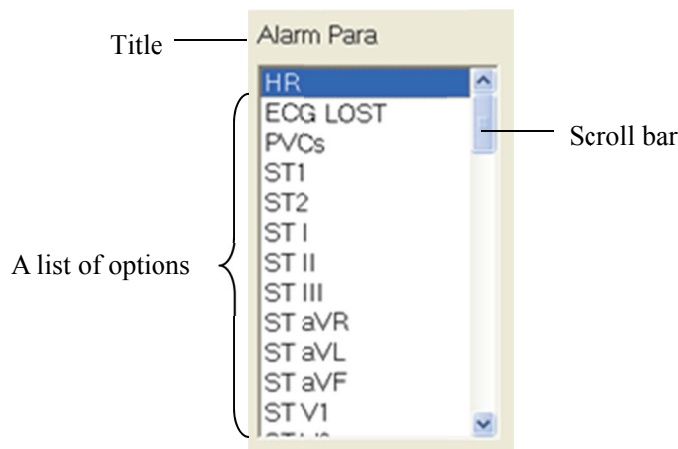
The list box contains a list of options from which the user can select one or more. If there are too many options to be displayed in the list box, you can use the scroll bar to display the hidden options.

Drop-down List Box

Drug A —— Down arrow
Drop-down list {
Drug A
Drug B
Drug C
Drug D
Drug E
AMINOPHYLLINE
DOBUTAMINE
DOPAMINE
EPINEPHRINE
HEPARIN
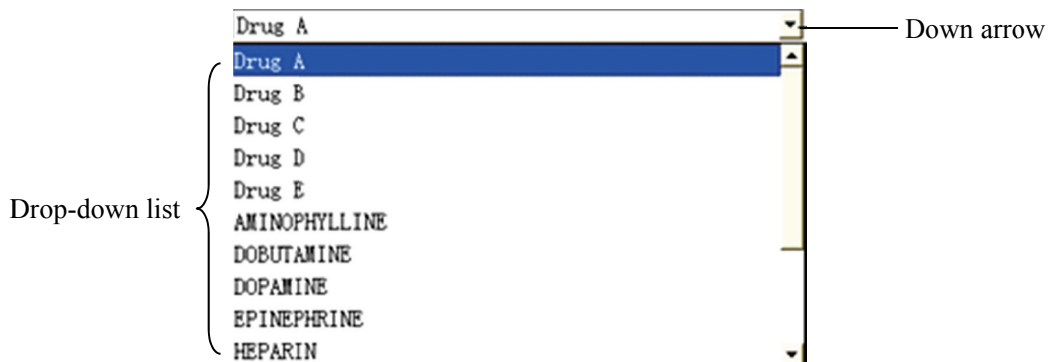
The drop-down list box has a down arrow button next to it, which can be used to open or close a list of options. You can make a selection from the drop-down list.

Tab Sheet

Tab

You can switch among the tab sheets by clicking the tab.

Touchscreen Controls

The following controls facilitate screen selection on the touchscreen.

: up arrow

: down arrow

: left arrow

: right arrow

FOR YOUR NOTES

3 Installation and Maintenance

3.1 Unpacking and Inspection

Before unpacking, examine the packing case carefully for signs of damage. If any damage is detected, contact the carrier or Mindray.

If the packing case is intact, open the package and remove the equipment and accessories carefully.

NOTE

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

⚠WARNING

- **When disposing of the packaging material, be sure to observe the applicable waste control regulations and keep it out of children's reach.**
- **Components of the CMS, such as the keyboard and mouse, may be contaminated by microorganisms 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 Mindray immediately.**

3.2 Installation

⚠️WARNING

- **The CMS should be installed by manufacturer designated personnel. The CMS software copyright is solely owned by Mindray. No organization or individual shall resort to altering, 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, and corrosive, flammable, 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 (5 cm) away from 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 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.**

3.3 Starting the System

To start your system:

1. Perform safety checks before starting your system. For details, refer to *3.5.1 General Inspection*.

2. Turn on the UPS, if applicable, and power on the system.

3. Press the power switches on the host to start the operating system and displays.

4. The system will perform a series of self-tests and displays corresponding information on the screen.

5. If the self-tests pass, the system will beep one time and enter the main screen immediately.

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

⚠CAUTION

- **To prevent damaging the system from a sudden power failure, it is recommended that your CMS is equipped with a UPS.**

- **If the computer host beeps during self-tests or startup, consult the manual provided with the computer for assistance or contact Mindray.**

3.4 Shutting Down the System

It is important to properly shut down the system to prevent inadvertent errors from occurring.

To shut down the system:

1. Click "System Setup" button.

2. Select "Shutdown" button from "General Setup" menu.

3. The system will check if any patients are being monitored:

    ◆ If no patients are being monitored, go to the next step.

    ◆ If patients are still being monitored, the message "$\times$ patients are being monitored. Are you sure you want to shut down?" will be displayed. You can either select "Yes" to begin the next step, or select "No" to close the message box and stop 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 password is required while shutting down the CMS, the CMS, the operating system and host will automatically shut off.

    ◆ If a password is required while shutting down the CMS, a dialog box will pop up. Enter the required password and select "OK". The CMS, the operating system, and host will automatically shut off.

5. Turn off the UPS if one is in use.

6. Disconnect the power cord of each device from the power outlet.

⚠CAUTION

- **All CMS equipment must utilize the hospital emergency power system. Failure to do so will result in loss of monitoring during extended periods of power failure. Hospitals without an emergency power system should use a UPS to provide power to the CMS. The UPS must not be turned off when the CMS is working. 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 the system may not work properly when it restarts.**

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 centrally monitored. If the system has been running continually for six months, restart the system.**

- **When the CMS is restarting, patient data will not be stored. To prevent any data loss, only restart your system when there are no patients being centrally monitored.**

3.5.1 General Inspection

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

Follow these guidelines:

- Inspect the equipment and its accessories for mechanical damage.

- Make sure the environment and power supply meet the specific requirements.

- Inspect all power cords and signal lines for fraying or other damages, and ensure that they are properly connected and insulated.

- Ensure the sound system functions normally.

- Ensure each function of the system is in good condition.

In case of any damage or abnormity, do not use the CMS. Contact the hospital biomedical engineers or Mindray 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 you are in an area that is heavily polluted or dusty, 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. The following are examples of cleaning solutions:

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

Follow these guidelines to avoid damaging the equipment:

⚠ CAUTION

- **Failure to follow these guidelines 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 to run into the casing, switches, connectors, or any ventilation openings in the equipment.
- NEVER use abrasive materials, or erosive, acetone –based cleaning agents.

⚠WARNING

- **Disinfection or sterilization may cause damage to the equipment.Therefore, when preparing to disinfect or sterilize the equipment, consult your hospital's Infection Control Officer or Epidemiologist.**

- **The indicated cleaning solutions should only be used for general cleaning. Mindray cannot assume any responsibility if these cleaning agents are used for infection control.**

FOR YOUR NOTES

4 Display

4.1 Overview

The CMS can support single-screen or multi- screen display modes.

4.2 Single-Screen Mode

4.2.1 Main Screen

In single-screen mode, up to 16 patients can be viewed simultaneously. Figure 4-1 below shows the main screen in the single-screen mode.
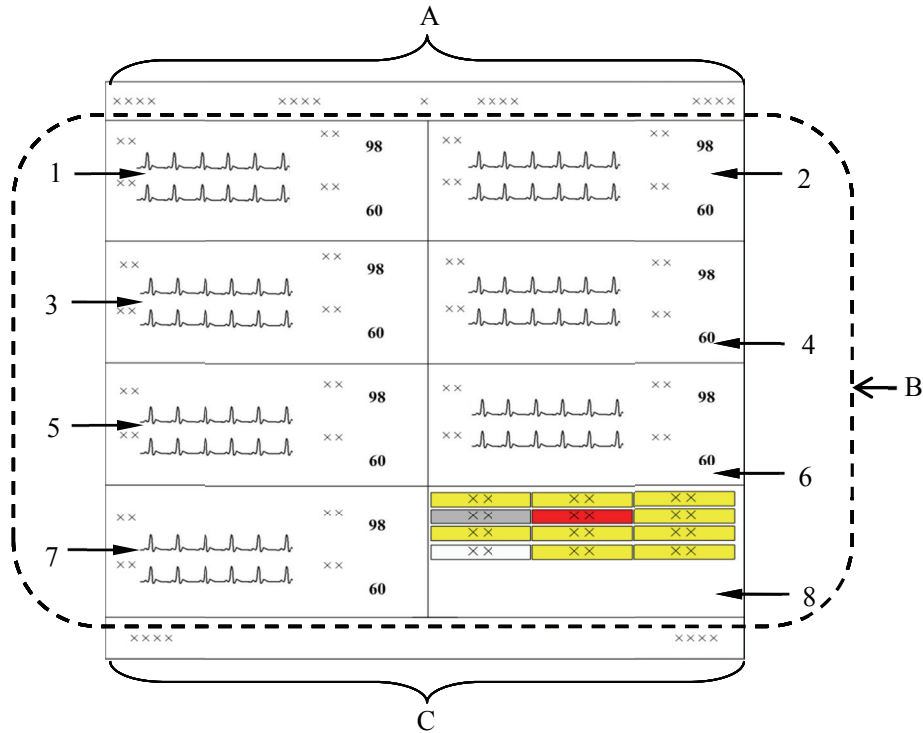
Figure 4-1 Main Screen in Single Screen Mode

A.   System information area

B.   Patient window area

Tiles 1-7 are spot patient windows, and Tile 8 is non-spot patient window.

C.   System button and icon area

NOTE

- **In single-screen mode, a maximum of 16 patients can be viewed simultaneously. If there are more than 16 but less than 32 patients being monitored on the CentralStation, we recommend you to use multi- screen mode.**

System Information Area

In this area, the following information is displayed:

Hospital information: Displays the hospital and area where the CMS is located.

System alarm area: Displays the system prompts or alarms. If more than one message occurs, they will scroll. Please refer to Appendix B for all the system alarms.

Current time: Displays the current time.

Patient Window Area

For details, refer to *6.3 Patient Window*.

System Button and Icon Area

System buttons include:

Button	Description
System Setup	Click to enter the "System Setup" window.
Discharged Pat.	Click to enter the "Discharged Patients" window. This button is only available on the CentralStation.
Remote CMS	Click to enter the "Remote CMS" window. This button is only available on the CentralStation.
Main Screen /ViewBed:	Click to close the auxiliary screen and return to the main screen./ Click to enter the auxiliary screen.
Paging	Click to enter the "Paging" window which is password protected. This button is only available on the CentralStation.
Device Assignment	Click to enter the "Device Assignment" window. This button is only available on the WorkStation and ViewStation.

System icons include:

No.	Icon Name	Icon	Description
1	Alarm List		Shows the alarms of all monitored patients within the specified time range.
2	USB state		Indicates that the system is connected to a USB storage device. This icon will not appear when only the USB dongle is connected.
3	Printer state		Indicates that the printer can be used. Select it to access "Print Control" tab.
			Indicates a printer error.
			Indicates that no printer is connected.
4	Recorder state		Indicates that the recorder can be used. Select it to access "Record Control" tab.
			Indicates that the recorder is undergoing a self-test.
			Indicates a recorder error.
			Indicates that no recorder is connected.
5	Device Connection List		Shows the connection status of admitted devices by the CentralStation. This icon is only available on the CentralStation.
6	Network status		Indicates that the network is connected.
			Indicates that the network is disconnected.
7	Storage system status		Indicates that the storage system is in a normal state and the data is protected from a disk failure.
			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
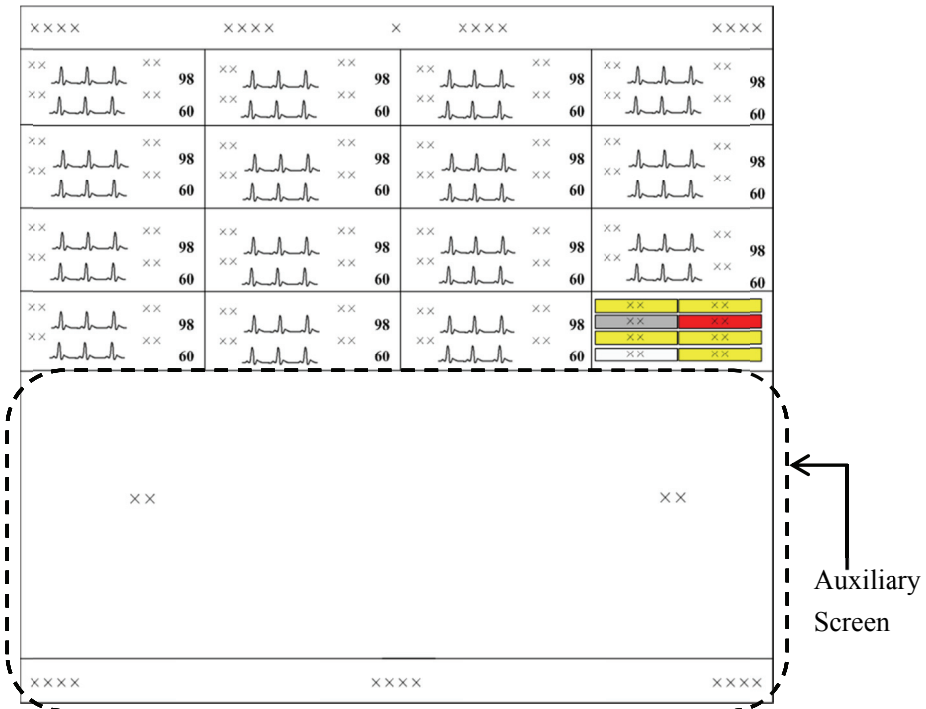
Figure 4-2 Auxiliary Screen in Single-Screen Mode

In single-screen mode, you can enter the auxiliary screen by clicking a patient window. As shown in Figure 4-2, the auxiliary screen will occupy the lower part of the screen. The system will automatically adjust the size and number of patient windows in this mode.

NOTE

● **For more information about the tab sheet, refer to *2.6.4 Controls*.**

4.3 Multiple Screen Mode

When CentralStation, WorkStation or ViewStation is configured with more than one display, you can set the number of the displays which are to be used for main screen.

■ If there are two displays, one or two displays can be set for main screen.

■ If there are three displays, two or three displays can be set for main screen.

■ If there are four displays, three or four displays can be set for main screen.

Refer to *12.2.2 Display Setup-Number of Main Screen* for setting the main screen number.

Take two displays as an example.

■ Both displays are set for main screen.

As shown in Figure 4-3, both displays default to the main screen. The system buttons and icons are located on the right display's screen.

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

In two main screens mode, a maximum of 32 beds can be viewed at one time.
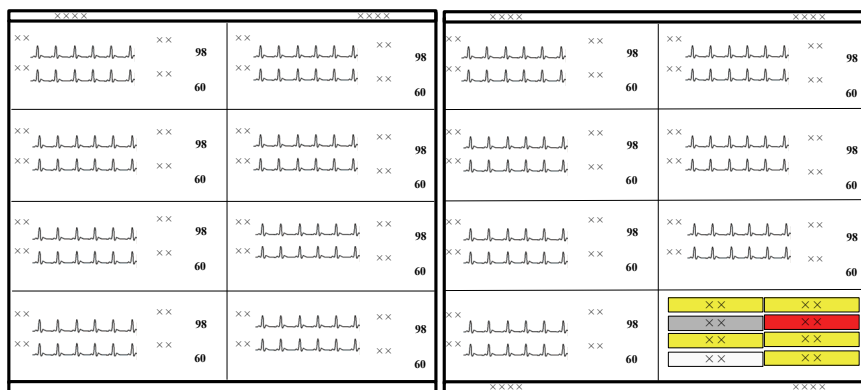
Figure 4-3 Two Main Screens (Default)

■ One display is set for main screen.

As shown in Figure 4-4, the left display always shows the main screen and right display always shows the auxiliary screen. In this mode, up to 16 beds can be viewed at one time.
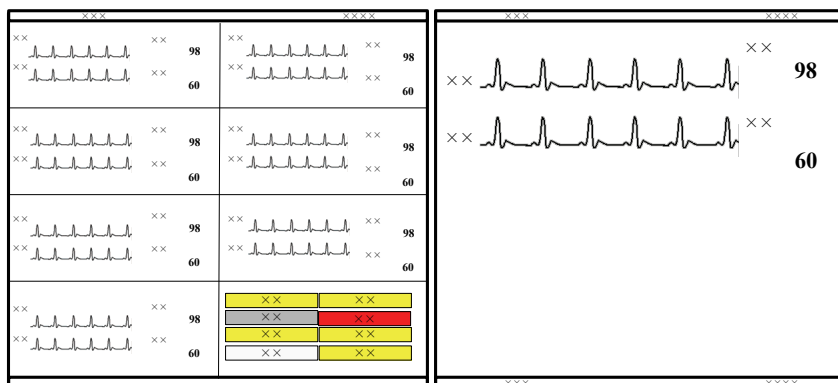
Figure 4-4 One Main Screen

4.4 Assigning a Device on WorkStation and ViewStation

Select the desired device on the BeneVision Monitoring Network to be displayed on the WorkStation and ViewStation. If the patient is connected, the patient data then displays on the WorkStation and ViewStation.

To assign a device to a WorkStation or a ViewStation, follow this procedure.

1. Select "Device Assignment" button in the system button area. A password may be required. Refer to *12.2.2 Display Setup* for enabling or disabling the password protection.

2. On the left side of the pop-up screen, select a desired CentralStation from the "CentralStation Name" drop-down list. The admitted devices on that CentralStation will be displayed.

3. Select one device.

4. On the right side of the screen, select a display tab. For example, "Display#1".

5. Select one tile on that display tab sheet.

6. Left click the mouse, and select "Assign". The device will appear in the display tab sheet.

7. If you want to cancel an assigned device, select the device in the display tab sheet, left click the mouse, and then select "Unassign".

5 Patient Management

The CentralStation, WorkStation and ViewStation have different patient management capabilities.

The CentralStation enables you to manage patients by:

- Obtaining patient information
- Synchronizing patient information
- Modifying patient information
- Discharging patients
- Switching patient windows
- Changing to idle sector
- Transferring patients
- Finding a patient

The WorkStation enables you to manage patients by:

- Viewing patient information
- Modifying patient information
- Discharging patients
- Switching patient windows

Some functions need to be enabled in "System Setup" menu. Refer to *12.2.8.7 Remote Control Settings (CentralStation and WorkStation Only)* for enabling these functions.

The ViewStation enables you to manage patients by:

- Viewing patient information
- Switching patient windows

5.1 Monitoring a Patient

Once the patient is monitored on the CentralStation, the CentralStation can display the patient's physiological parameters, waveforms and alarm messages and store the corresponding patient data.

5.1.1 Using a Monitor

To monitor a patient, a monitor can be admitted or select.

Admitting a Monitor on CentralStation

To admit a monitor on the CentralStation:

1. Select "System Setup" button.

2. Select "Admin Setup" button.

3. Select "Monitor List" Tab.

4. In the monitor list, find and select the monitor used by the patient.

5. Select "Admit" button.

After the monitor in the "Monitor List" is admitted by the CentralStation, the monitor is assigned to a patient window according to the sequence of left to right and top to bottom. Then the patient window is bound with the monitor. When the monitor is online again, the patient data from this monitor will be displayed in the same patient window. For details on patient window, refer to *6.3 Patient Window*.

Selecting a CMS on a Monitor

You can select and connect a desired CMS on the monitor for central monitoring. For how to connect a CMS, refer to the corresponding monitor's operator's manual.

NOTE

- **Select a CMS on a monitor for central monitoring only when the monitor supports this function.**

5.1.2 Using a Telemetry

The telemetry patient can be monitored on the CentralStation after the telemetry is admitted by the CentralStation, and then the patient may need to be admitted. Whether or not the patient needs to be admitted depends on what telemetry system is used.

TMS-6016

For the patient connected to a TMS-6016 transmitter, you can only admit the patient at the CentralStation.

1. Admit the transmitter in the "Monitor List" tab.

2. Click a spot patient window with "Idle Sector" to display a pop-up menu.

3. Click "Admit Telemetry Patient", and then select the desired transmitter name (such as TEL XXXX) to admit the patient.

TMS60

For the patient connected to a TMS60 transmitter, follow this procedure to admit the patient.

1. Turn on the TMS60 to start monitoring the patient.

2. Check whether the transmitter name displays in the "Monitor List" tab or not.

    ◆   If the transmitter name displays in the "Monitor List" tab, click the "Admit" button.

    ◆   If the transmitter does not display in "Monitor List" tab, follow the steps below:

        a. Click a spot patient window with "Idle Sector" to display a pop-up menu.
        b. Click "Admit Telemetry Patient", and then select the desired transmitter name to admit the patient.

Telepack-608

For the patient connected to a Telepack-608 transmitter, you can admit the transmitter from the "Monitor List" tab, and then turn on the transmitter to start monitoring the patient.

After telemetry is admitted by the CentralStation, the telemetry can be bound with a patient window, or not. Refer to *12.2.6 Telemetry (CentralStation Only)* for setting monitoring mode. If telemetry is not bound with the patient window, the patient information from the telemetry will be displayed in an idle patient window, if one is available. The patient window is assigned according to the sequence of top to bottom and left to right.

NOTE

- When there is no monitoring device online, an alarm message "No bed is online. Please check network connection." will be shown.

- If the admitted device's number exceeds the maximum number of patients allowed to a CentralStation, the message "The maximum number of beds connected is reached" will be displayed. At this time, the CentralStation cannot admit another device. If you need to admit a device, perform the "Cancel" operation first. For details, refer to *12.2.5 Monitor List*.

- On the LAN, the patient on the bedside monitor can be admitted to any CentralStation, but can only be admitted to one CentralStation.

5.1.3 Auto Waveform Storage

By default, the CentralStation will store five waveforms with the descending priority of ECG 1, ECG 2, ECG 7, Pleth and Plethb each time a patient is connected.

If waveforms in channel ECG 1, ECG 2, ECG 7, Pleth and Plethb are unavailable, waveforms will not be automatically saved. To change the waveforms to be saved, refer to *9.1.3 Waveform Review* for detail.

NOTE

- If you change ECG lead type through the bedside monitor after the waveforms have been automatically saved on the CentralStation, the waveforms stored in channel ECG 1, ECG 2 and ECG 7 may also change.

- When a patient is discharged, the waveform storage configurations are saved and the same waveform configuration is used the next time a patient is connected. If you discharge a patient and set the bed as an idle sector, the waveform storage settings are cleared, and the waveform configurations are restored to the system defaults.

5.2 Obtaining Patient Information

Patient information from a Hospital Information System (HIS) system can be obtained through the eGateway and will display on the current CentralStation/WorkStation.

There are two ways to obtain patient information:

■ Admit/Discharge/Transfer (ADT) Query:

a. Click the "Obtain Patient Information" button and the "ADT System Patient Information" menu is displayed.

b. Input a query condition for Patient ID, last name, first name or unit, and then click the "Query" button. The queried patient information is displayed.

c. Select a patient from the patient information list. Click the "Import the Patient to CMS" button. The corresponding patient information in the CentralStation/WorkStation will be updated.

d. Click the "Exit" button to exit the "ADT System Patient Information" menu.

NOTE

● **The "Obtain Patient Information" button is only available in the "Patient Mgmt." tab sheet when the "ADT Query" function is enabled in the "Communication Setting" menu. For "ADT Query" settings, refer to** *12.3 Communication Settings***.**

■ Patient Information Quick Query:

Enter patient keywords in the "Patient Mgmt." tab sheet, and click the "Save" button. The patient keywords may be patient name, ID, etc., which are defined on the eGateway. The CentralStation/WorkStation will automatically search for the patient. If the patient is found, the patient information will automatically be updated to the CentralStation/WorkStation.

NOTE

● **For the definition of patient keywords, refer to** *eGateway Integration Manager Installation Guide (P/N 046-002447-00)* **if configured with eGateway.**

5.3 Synchronizing Patient Information

When the CentralStation is associated with a HIS system, the CentralStation will automatically synchronize and update the patient information with the 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 operator's manual.

■ Modify patient information through the CentralStation/WorkStation.

For bedside monitors, when the network is properly connected, either party (the monitor, or the CentralStation/WorkStation) will inform the other party (the CentralStation/WorkStation, or the monitor) to make modifications accordingly, so that the patient information is kept consistent between the monitor and the CentralStation/WorkStation.

NOTE

● **If you have changed patient category through the CentralStation, patient category on the monitor will be changed accordingly.**

● **If Passport 2, Passport V, Spectrum, Spectrum OR, or V12/21 monitors are connected to the CentralStation, some patient information cannot be modified on the CentralStation.**

For telemetry, when the TMS-6016 or Telepack-608 is connected, the patient information can only be modified from the CentralStation/WorkStation, when TMS60 is connected, all patient information, except patient category and paced status, can be modified from the CentralStation/WorkStation.

To modify patient information:

1. Open the "Patient Mgmt." tab sheet.

   To open the "Patient Mgmt." tab sheet, you can click the spot patient window or the block in non-spot patient window, and then select the "Patient Mgmt." tab.

2. In this tab sheet, you can modify patient information, such as name, gender and height etc.

3. After modification, select "Save" to preserve the changes. Then a prompt message may appear.

◆ If unit, bed number, patient ID, last name, first name, patient category, or pacer switch information on the CentralStation conflicts with that on the bedside monitor, a dialog box will display for you to confirm which information is correct.

◆ If "Nurse Call" and/or "Event" in the telemetry system are set to "Off", a message box will be displayed. Select "OK" to preserve the changes or "Cancel" to delete the changes.

5.4.1 Inconsistent Patient Information between Monitor and CentralStation

If patient information is modified when the monitor is disconnected from the CentralStation, and then the monitor is re-connected to the CentralStation, inconsistent patient information may occur between the CentralStation and monitor. If this happens, a low priority technical alarm appears in the technical alarm area, and a prompt message simultaneously appears in the "Patient Mgmt." tab sheet. In this case, you need to confirm whether to use the patient information in the CentralStation or monitor.

5.5 Discharging a Patient

Discharging a patient stops monitoring a patient and allows you to monitor a new patient.

There are two ways to discharge a patient on the monitor:

■ Discharge a patient through the monitor. In this case, the patient will also be discharged by the CentralStation/WorkStation and all the patient's data will be saved by the CentralStation. Refer to the monitor's operator's manual for details about how to discharge a patient on a monitor.

■ Discharge a patient through the CentralStation/WorkStation. In this case, the patient will also be discharged by the monitor.

If you discharge a patient through the monitor, refer to the monitor's operator's manual.

For telemetry patient monitoring, the patient discharge method depends on what transmitter is connected:

■ For TMS-6016 and Telepack-608, it can only be performed through the CentralStation/WorkStation.

■ For TMS60, the patient can be discharged at the CentralStation/WorkStation or at the TMS60. For details about how to discharge a patient on TMS60, refer to the TMS60 Operator's Manual.

If you discharge a patient through the CentralStation/WorkStation, 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 dialog box, select either "Discharge patient and save data" or "Discharge Without Saving Data". If "Discharge patient and save data" is selected, the system will automatically save all monitored data for this patient. If "Discharge Without Saving Data" is selected, the system will delete all data about this patient after being discharged.

3. Optional- Some monitor models have a Standby option also. The message "The monitor enters the Standby mode after the patient is discharged." will be displayed if your monitor has this option. Select or deselect this option:

   ◆ If this option is selected, the monitor will directly enter Standby mode after a patient is discharged. The option is selected by default.

   ◆ If this option is not selected, the monitor will automatically admit a new patient after the previous patient is discharged.

4. Click the "OK" button.

- 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 the "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 message "The patient data storage space is nearly full. Please delete some discharged patients." appears in the system information area, please backup the database and then delete the data of some discharged patients. Otherwise, the system will automatically delete the earliest patient's data in the database when the discharged patient storage space is full.**

NOTE

- **When a patient is discharged, the waveform storage configurations are saved and used again the next time a new patient is being monitored on the same bed.**

- **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. Refer to *6.3.2 Spot Patient Windows* for the definition of idle sector.**

5.6 Switching Patient Windows

To exchange patient windows on the CMS, click the drop-down menu in the patient window and select "Move Zone to", then select desired bed number.

5.7 Changing to Idle Sector

If a patient window displays as "No patient admitted or patient transferred", click the drop-down menu and select "Change to idle sector", and then confirm the action in the pop-up window. The patient window will be released as an idle sector. An idle sector indicates that the patient window is not bound with a specific device. Once a sector is idle, it is available for a new device..

NOTE

- **Whether the "No patient admitted or patient transferred" patient window can be set to an idle sector is dependent on the setting in "Display Setup" in the "Admin Setup" menu. Refer to *12.2.2 Multibed Display*.**

- **When you select the option "Change to Idle Sector", the settings for this patient window restore to the defaults.**

5.8 Transferring a Patient

During monitoring, a patient may be transferred from one bed (source bed) to another (destination bed). Transferring a patient ensures that the patient will continue to be monitored. Once transferred, the patient will be monitored at the new destination bed.

5.8.1 Transferring a Patient on CentralStation

The CentralStation provides a patient transfer function.

NOTE

- **If the patient in the destination bed has not been discharged, selecting "Discharge Destination Bed Patient with Data Saved" and then transferring a patient will automatically discharge the patient. In this case, make sure the patient in the destination bed is ready to be discharged before you transfer a patient to it.**

To transfer a patient:

1. Enter the "Patient Mgmt." tab sheet.

2. Click the "Transfer" button. The system will open the "Transfer" dialog box.

3. Select the desired "Destination CMS" and "Destination Bed".

4. Select "Combine with Destination Bed Patient Data" or "Discharge Destination Bed Patient with Data Saved". These two options will be unavailable if a patient has not been admitted to the destination bed.

    ◆ Combine with Destination Bed Patient Data.

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

    ◆ Discharge Destination Bed Patient with Data Saved.

    The system will discharge the destination bed patient, saving its data before transferring the source bed patient data to the destination bed.

5. Click on the "Continue" button.

6. Select "OK" in the pop-up dialog to transfer the patient to the destination bed. When transferring patients between different CentralStations, you need to accept the source CentralStation's transfer request at the destination CentralStation.

NOTE

- **Selecting "Combining with Destination Bed Patient Data" to transfer a patient may cause patient data loss if the system time at the source and destination CentralStation are unsynchronized.**

- **Ensure that the same patient is monitored by both the source and destination beds when the "Combining with Destination Bed Patient Data" option is selected. Otherwise, select the "Discharge Destination Bed Patient with Data Saved" option.**

- **When a patient is transferred from one bed to another, the CentralStation will interrupt bedside monitoring temporarily.**

- **When a patient is transferred within one CentralStation, all of the monitored data will be transferred along; if the patient transfer is among different CentralStations, the full-disclosure waveforms and trend data from the last 72 hours, and other historic data are transferred along.**

- **If there is a version difference between two CentralStations, patient transfer may not be enabled.**

- **Patients connected to an Accutorr 7 bedside monitor cannot be transferred.**

5.8.2 Transferring a Patient on Monitor

When a patient is transferred between bedside monitors by a transport device, the bedside monitors will inform the CentralStation of the transference. The CentralStation will automatically operate as follows:

■ Transfer the patient to the destination bed.

■ Combine the patient data at source bed and data during transference with the data at destination bed.

5.9 Finding a Patient

If current patient was ever monitored on the same CentralStation and was discharged, the patient's historic data can be found and combined to the current review data.

To find and re-admit a discharged patient, follow this procedure.

1. Select the patient's window.

2. In the "Patient Mgmt." tab sheet of the patient, select "Find Patient" button.

3. In the pop-up screen, enter last name, first name or patient ID, and then click "Search". The search results are listed below.

4. Select a desired patient in the list, and then select "Ok". A prompt message "Are you sure you want to re-admit the discharged patient and combine the historic data to the current?"

5. Select "Ok".

FOR YOUR NOTES

6 Multibed Screen

6.1 Overview

The multibed screen of the CMS display as follows:
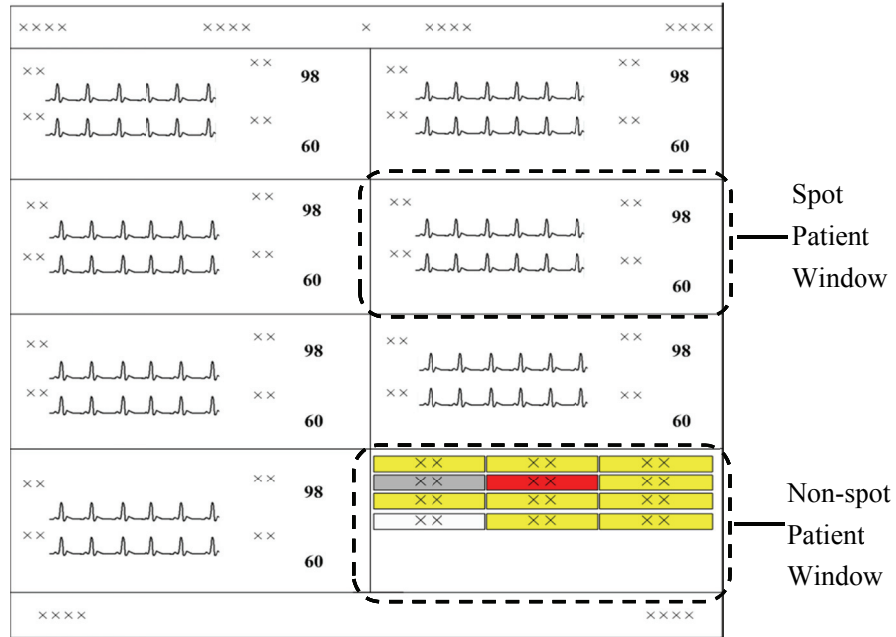
Figure 6-1 Multibed Screen

Each screen of the CMS can display up to 16 patient windows.

On the CentralStation, if the number of devices connected to the CentralStation is no more than the number of patient windows, all of the patient windows are used for spot observation, and the window is called spot patient window, and the patient is called spot patient. If not, the last patient window will be used for non-spot observation, and the window is called non-spot patient window, and the patients are called non-spot patients.

In single-screen mode, you can view 16 spot patients at one time; in multi-screen mode, you can view 32 spot patients 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 Screen Layout

The setting for the main screen layout directly configures 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 CentralStation 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. Refer to** *6.3 Patient Window* **for additional information regarding spot and non-spot patient windows.**

6.3 Patient Window

6.3.1 Non-Spot Patient Window

The non-spot patient window shows information including bed number, patient status and monitor status. For the devices displayed in this window, different background colors represent different statuses. In the following figure, "XX" represents a bed number.
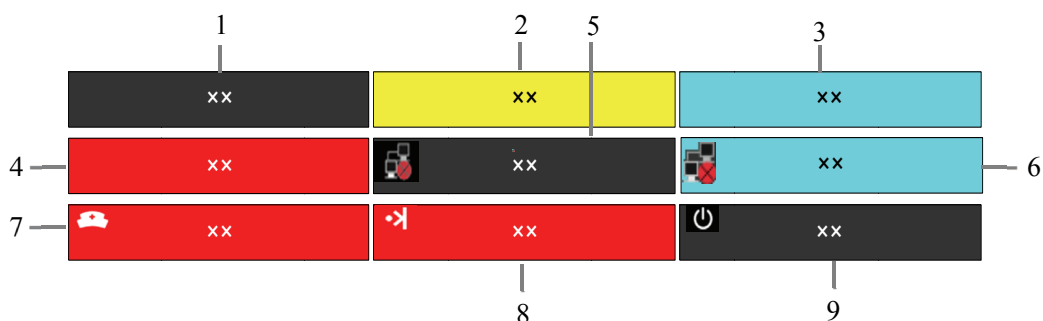
Figure 6-2 Non-Spot Patient Window

The following table shows the available status messages and what they indicate.

Item	Non-spot patient device status	Indication
1	Device is connected and no alarm is present.	Background is black.
2	Device is connected and a medium priority alarm(s) is present.	Background is flashing yellow.
3	Device is connected and a low priority alarm(s) is present.	Background is flashing cyan.
4	Device is connected and a high priority alarm is present.	Background is flashing red.
5	Disconnected	▨ is displayed. Background is black.

Item	Non-spot patient device status	Indication
6	Disconnection alarm occurs.	is displayed. Background is flashing cyan.
7	Nurse call occurred.	is displayed. Background is flashing red.
8	Event occurred.	is displayed. Background is flashing red.
9	Standby	is displayed. Background is black.

⚠CAUTION

- **Since a non-spot patient window presents neither waveform nor parameter to the clinician, it should not be used for monitoring patients.**

NOTE

- **The user can adjust the display layout at any time to convert a non-spot patient window to a spot patient window where they will be able to view the patient's real-time data.**

6.3.2 Spot Patient Windows

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

- "No patient admitted or patient transferred" indicates that no patient is admitted to the monitor or patient was transferred to another monitor.

- "Offline" indicates that this patient window has a patient admitted but its corresponding monitor may be turned off or disconnected from the CentralStation.

- The patient window is in monitoring status: Indicates that the patient window has an assigned monitor, a monitored patient, and is communicating with the CentralStation.

- "Standby" indicates that the monitor or telemetry transmitter has entered the Standby mode.

- "Idle sector" indicates that the patient window is available for bonding with a device.

6.3.3 Patient Window in Monitoring Status

When a patient window is in the monitoring status, it displays real-time patient data transmitted from the monitor, including a maximum of 4 waveforms and 5 parameters. 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 as shown in Figure 6-3.
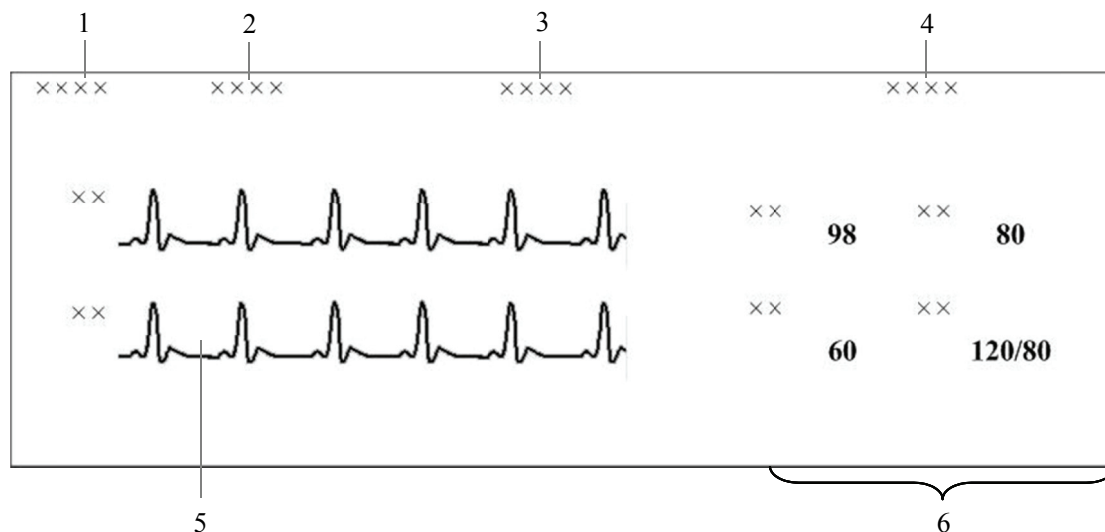
1. Bed mark & drop-down menu button   2. Alarm icon area   3. Technical alarm area
4. Physiological alarm area   5. Waveform area   6. Parameter area

Figure 6-3 Patient Window in Monitoring Status

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

6.3.3.1 Bed Mark

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

On the WorkStation and ViewStation, when placing the cursor at the bed number, the source CentralStation name will display.

6.3.3.2 Drop-down Menu Button

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

- Alarm Reset: You can select it to silence the existing alarms on the bedside device and on the CentralStation. Please refer to **8.6 Resetting Alarms**.

- Alarm Paused: In the normal status mode, you can select it to pause all alarms for the current patient for a configurable time period. The default alarm pause time at the monitor and telemetry is 2 minutes. During the alarm pause, you can select it to reactivate the paused alarms.

- Standby:

  - If a telemetry transmitter is connected and is in the normal status mode, you can select "Standby" to stop displaying, analyzing, storing or recording the current patient's physiological waveforms and data, and to disable all alarms and sounds. The device ID, battery icon and signal icon remain on the screen. If a telemetry transmitter is in Standby mode, you can select "Standby" to exit Standby mode.

  - If a bedside monitor is connected and in Standby mode, selecting "Standby" removes the bedside monitor from the Standby mode.

- Freeze/Unfreeze: In the normal status mode, you can select "Freeze" to stop the dynamic waveforms with freeze time and time scales displayed in the waveform area. In the frozen status, clicking "Unfreeze" 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" dialog 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: Open the "ST Select" menu of the telemetry system, and select the desired ST to be displayed in the patient window.

- Start/Stop NIBP Measurement: Used to start or stop an NIBP measurement.

■ Move zone to: Select to move the current patient window to another patient window.

On the WorkStation, you can refer to *12.2.8.7 Remote Control Settings (CentralStation and WorkStation Only)* for enabling the functions.

6.3.3.3 Alarm Icon Area

The alarm icon area displays:

■ No icon: Indicates that the monitor system sound is normal.

■ : Indicates that the monitor alarm is paused.

■ : Indicates that the monitor alarm is turned off.

■ : Indicates that the monitor alarm sound is switched off.

■ : Indicates that the monitor alarm system is reset.

■ Indicates the received signal strength of each telemetry device channel. This symbol is only available for telemetry devices. For additional information, refer to *6.3.3.8 Telemetry Signs*.

6.3.3.4 Technical Alarm Area

The technical alarm area displays:

■ The technical alarms and messages coming from monitor or CentralStation.

This area displays the highest technical alarm message. If multiple highest priority messages exist, they will scroll. The alarms in descending priority are exclusive high priority alarms, high priority alarms, medium priority alarms, low priority alarms.

Click this area to open the alarm message list which includes all the alarm messages of different priorities.

6.3.3.5 Physiological Alarm Area

The physiological alarm area displays:

■ Physiological alarms coming from bedside or telemetry.

■ A message indicating the alarm or physiological state. For example, "Alarm Pause", "CPB Mode".

■ For telemetry, the battery icon [battery icon] and transmitter name.

This area displays the highest physiological alarm message. If multiple highest priority messages exist, they will scroll. The alarms in descending priority are exclusive high priority alarms, high priority alarms, medium priority alarms, low priority alarms.

Click this area to open the alarm message list which includes all the alarm messages of different priorities.

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.**

6.3.3.6 Waveform Area

■ Displays waveforms transmitted from the monitor.

■ Displays 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. This is applicable when connecting Passport 12M/17M, Passport 8/12, and T1 monitor.

■ 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 a pacer pulse is detected. Click the ⬛ icon, the "Patient Mgmt." sheet will pop up. The "Paced" configuration can be configured here. This icon is also available in the patient's ViewBed screen.

- For all telemetries, displays the Nurse Call icon ⬛.

- Only for telemetry TMS-6016, displays the Event icon ⬛.

6.3.3.7 Parameter Area

This area displays parameter values transmitted from the monitor.

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

6.3.3.8 Telemetry Signs

The telemetry signs include the telemetry icons and transmitter names. The following table lists all telemetry signs.

Sign name	Sign	Description
Nurse Call	⬛	This icon is applied for all telemetries. ■ After the Nurse Call button is pressed on the transmitter, the Nurse Call icon will continuously flash and a corresponding prompt tone will sound. The prompt tone will automatically terminate after two beeps. ■ If you click this icon, it 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	⬛	This event icon is applied for the TMS-6016 telemetry. ■ After the Event button is pressed on the transmitter, the Event icon will continuously flash and a beep will sound. ■ If you click this icon, it 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".

Sign name	Sign	Description
Battery	🔋	This Battery icon is applied for all telemetries. The icon indicates the remaining battery charge available in the transmitter. While the battery charge is depleting, the color of the icon will change accordingly: ■ White: indicates the battery is in normal condition. ■ Yellow: indicates the battery is low. ■ Red: indicates the battery is nearly depleted
Signal	📶	This Signal icon is applied for all telemetries. The icon indicates the received signal strength for a corresponding channel. With the received signal strength changing, the number of the signal bars and the color of the icon will change accordingly. ■ White: indicates the received signal strength is normal. ■ Yellow: indicates the received signal strength is weak. ■ Red: indicates no signal is received.
Transmitter Name	TEL XXXX	The transmitter name represents different meaning when connecting TMS-6016, TMS60, or Telepack-608 transmitter. ■ For the TMS-6016 transmitter, the transmitter name shows as: TEL plus the last four characters of the serial number on the rear of the transmitter. For example, when the serial number is XXXX2583, the transmitter name shows as "TEL 2583". ■ For the TMS60 transmitter, the transmitter name is the same as the device name set in the "Maintenance" menu at the transmitter. ■ For the Telepack-608 transmitter, the transmitter name is the same as the transmitter ID attached on the rear of the transmitter.

6.4 Display Setup

Clicking "Display Setup" in the patient window drop-down menu will enter a tab sheet, where you can configure the "Multibed Waveform Setup" and "Multibed Numeric Setup" for the current patient window.

6.4.1 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 selecting the checkbox before the waveform name, you can select or deselect this waveform. Only the selected waveforms can be displayed in the current patient window.

■ By selecting the waveform speed beside the waveform name, 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.

■ 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.

NOTE

- **When a patient is discharged, the multibed settings in "Waveform Selection and Order" are saved. The waveforms will be displayed using the same default configurations when a new patient is monitored.**
- **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.**

6.4.2 Multibed Numeric Setup

The default numeric group cannot be modified or deleted. To change the displayed parameters and their order in the current patient window, you will need to add a new group. To add a new group:

1. Click on the "New Group" button, and "New Group 1" will appear under "Default Group".

2. Select "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 "New Group 1". The current patient will show parameters according to the setup of "New Group 1".

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

NOTE

- **When a patient is discharged, the numeric group selection is saved. The numeric group will be displayed using the same default configurations when a new patient is monitored.**
- **If you discharge a patient and set the bed to an idle sector, the selection of the numeric group is cleared, and the numeric group 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, 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, clicking on the block of a non-spot patient, or selecting another bed number in the bed drop-down list of the single bed window.

NOTE

● **In the single-screen mode, the CMS uses the lower half screen to accommodate the "ViewBed" screen.**
● **In the multi-screen mode, the CMS uses the secondary display screen to accommodate the "ViewBed" screen.**

7.2 ViewBed Screen

1. Patient information area   2. Alarm icon area   3. Technical alarm area
4. Physiological alarm area   5. Function drop-down list   6. View drop-down list
7. Waveform area   8. Parameter area
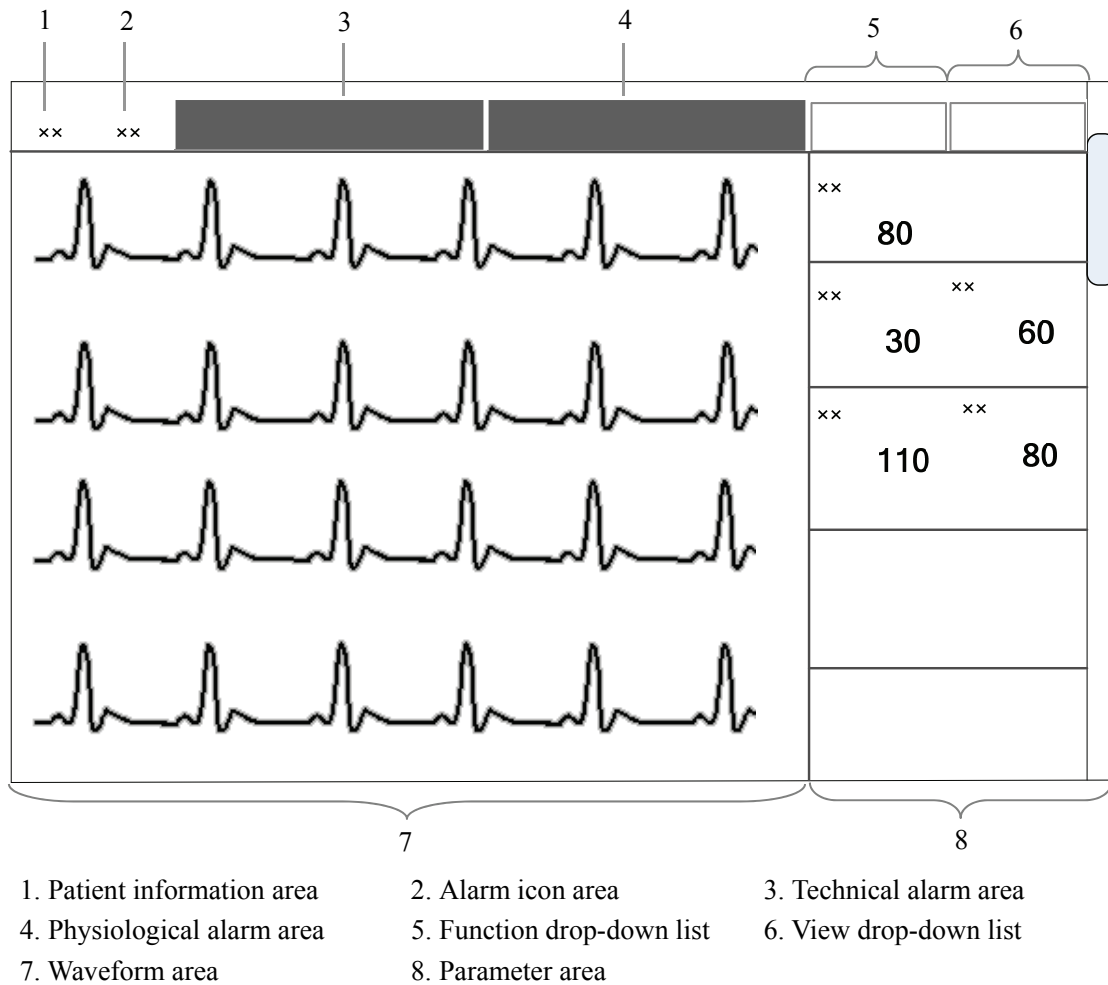
Figure 7-1 ViewBed Screen (Bedside Monitor)

1. Patient category   2. Telemetry icon area   3. Technical alarm area
4. Physiological alarm area   5. Function drop-down menu   6. View drop-down menu
7. Waveform area   8. Parameter area

Figure 7-2 ViewBed Screen (Telemetry)

In the patient information area, patient bed number, name, gender and type are displayed. For description of the physiological alarm area, alarm icon area, technical alarm area and telemetry icons, refer to *6.3.3 Patient Window in Monitoring Status*.

7.2.1 Function Drop-down Menu

The following table lists all function options for the monitoring devices.

Options	Description
Alarm Reset	Used to silence the on-going alarms.
Enter/Exit Alarm Paused State	Used to enter or exit alarm paused status. The pause time is subject to the monitor settings.
Enter/Exit Standby Mode	Used to enter or exit the STANDBY mode. This option is available only when connecting the telemetry.
Start/Stop NIBP measurement	Used to start/stop NIBP measurement.
Freeze/Unfreeze	Used to freeze and unfreeze waveforms.
Parameter Order	Used to open the "Parameter Order" dialog box where you can set the display order of modules.
Record	Used to open the "Record" dialog box.
Print	Used to open the "Print Setup" dialog box.
Alarm Setup	Used to enter the "Alarm Setup" tab sheet.

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

7.2.2 View Drop-down Menu

The following table lists all View options for the monitoring devices.

Options	Description
Show/Hide Alarm Limits	Used to show/hide alarm high/low limits.
Show/Hide Dynamic Trends	Used to show/hide dynamic short trends.
Show/Hide Multi-lead ECG	Used to show/hide multi-lead ECG.
Show/Hide NIBP Table	Used to show/hide NIBP groups.
Show/Hide BIS Expand View	Used to show/hide BIS Expand View.
Show/Hide Device Integration Expand View	Used to show/hide Device Integration Expand View.

7.2.3 Waveform Area

This area displays parameter waveforms transmitted from the monitoring device. In the single-screen mode, this area can only accommodate partial parameter waveforms due to space confines of the screen. However, you can drag the vertical scroll bar to view more.

For all telemetries, displays for paced on or for paced off above the first waveform.

7.2.4 Parameter Area

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

NOTE

- **The waveforms and parameters are consistent between the CMS and the monitoring devices.**
- **If you change the display order of waveforms and parameters on the monitoring device, the display order of waveforms and parameters on the CMS will not change automatically and vice versa.**
- **In case a module of the monitoring device is turned off or a parameter is no longer being monitored, the corresponding waveforms and parameters displayed at the CMS will no longer display.**

7.3 Parameter Setup

Click a parameter window, and the border of this window will appear highlighted. Clicking again will open the "Parameter Setup" window.

The Parameter Setup window includes several tabs. Each tab contains the available options of a parameter. The current tab sheet depends on the parameter window you have selected. For example, if you click the ECG parameter window, the Parameter Setup window will open, with the "ECG" tab sheet at the front.

■   Alarm Setup: Select "Alarm Setup" button to access the "Alarm Setup" window, and set alarm limit, record on alarm, print on alarm, and paging on alarm for all parameters. Refer to *8.4 Alarm Setup* for details.

■   Default: Click this button to restore CMS-related settings to factory default.

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

NOTE

● **When you change the alarm limits of the monitor via the CentralStation/WorkStation, 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.**

● **When the remote control on the alarm setup is enabled, the alarm properties which support bidirectional controls are shown in blue text. The alarm properties not supporting bidirectional controls are shown in grey text.**

● **For telemetry devices, Arrhythmia Analysis in the ECG tab of the "Parameter Setup" window is not configurable.**

7.4 Basic Operations

7.4.1 Alarm Setup

On the CentralStation or WorkStation, selecting "Alarm Setup" from the "Function" drop-down menu will enter the "Alarm Setup" tab sheet, where you can set parameter alarms, arrhythmia alarms, arrhythmia alarm threshold and alarm-related settings. For details, refer to *8.4 Alarm Setup*.

7.4.2 Resetting Alarms on Monitors

On the CentralStation or WorkStation, selecting "Alarm Reset" from the "Function" drop-down menu can silence the alarm sound on the monitoring device. The on-going alarms are also reset on the corresponding patient window on the CMS. Please refer to *8.6 Resetting Alarms*.

7.4.3 Pausing Alarms

On the CentralStation or WorkStation, selecting "Enter Alarm Paused State" from the "Function" drop-down menu will pause all current patient alarms for a period of time, which is subject to the monitor settings. The alarm pause time for the telemetry is fixed to two (2) minutes. The corresponding patient window on the CMS will enter alarm paused status. After the alarm pause time ends, the system will automatically release the alarm pause. You can also release the alarm pause by selecting the "Exit Alarm Paused State" from the "Function" drop-down menu.

7.4.4 Controlling a Telemetry to Enter/Exit Standby

On the CentralStation or WorkStation, selecting "Enter Standby Mode" or "Exit Standby Mode" from the "Function" drop-down menu will have the current telemetry enter or exit the Standby mode.

■ For the TMS-6016 and Telepack-608, the CentralStation notifies the telemetry to enter or exit the Standby mode.

■ For the TMS60, the CentralStation cannot notify the transmitter to enter or exit the Standby mode. The transmitter can implement the function by iteself. Refer to the *TMS60 Operator's Manual* for details.

7.4.5 Controlling a Bedside Monitor to Exit Standby

On the CentralStation or WorkStation, if a bedside monitor is in Standby mode, click any place in the ViewBed window. A dialog box of prompt information will pop up. Select "Yes" in the dialog box and the monitor will exit the Standby mode and resume normal monitoring.

NOTE

● **The CentralStation or WorkStation can control the bedside monitor by exiting Standby mode only when the monitor supports this function.**

7.4.6 NIBP Measurement

On the CentralStation or WorkStation, once "Start NIBP Measurement" from the "Function" drop-down menu is clicked, the corresponding bedside monitor will start an NIBP measurement. During the measuring process, you can select "Stop NIBP Measurement" to stop the measurement. This option changes accordingly when the bedside monitor starts or stops an NIBP measurement.

⚠WARNING

- **Before starting an NIBP measurement by a bedside monitor at the CentralStation or WorkStation side, be sure that patient type set on the bedside monitor is correct and NIBP cuff applied is proper.**
- **The remote NIBP meansurement is not supported when connecting the Passport 2, Passport V, Spectrum, Spectrum OR or V 12/21 monitors.**

7.4.7 Freeze/Unfreeze Waveforms

Selecting the "Freeze" option from the Function drop-down menu will freeze all dynamic waveforms in the waveform area.

In this area, freeze time is displayed at the top of the waveform area 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 shown in *Figure 7-1*.

In the frozen status, selecting the "Unfreeze" option will restore the dynamic waveforms.

7.4.8 Parameter Order

Selecting "Parameter Order" from the "Function" drop-down menu will open a dialog box, where you can configure the waveform and parameter display order.

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

NOTE

- **When a patient is discharged, the parameter order configuration is saved. The parameters will be displayed using the same default configurations when a new patient is admitted.**
- **If you discharge a patient and set the bed to an idle sector, the parameter order configuration is cleared, and the waveform configuration restores to the system defaults.**

7.4.9 Record

Selecting "Record" from the "Function" drop-down menu will open the "Record" dialog box, where you can select up to two waveforms. If the recorder is unusable or no recorder is connected, this option 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.

7.4.10 Print

Printing in Real-time

Select "Print" from the "Function" drop-down menu, and the "Print Setup" dialog box will pop up. In this dialog box, you can select the waveforms to be printed. If the printer is unusable or no printer is connected, this option will be disabled. Please refer to *11.2.4 Printing Control* about the general printing options settings.

Printing 12-Lead ECG

When performing 12-lead ECG monitoring and 12-lead ECG analysis using a bedside monitor, you can select "Show Multi-Lead ECG" from the "View" drop-down menu to display the 12-lead ECG waveforms. Select "Print" from "Function" drop-down menu, the "Print Setup" dialog box will pop up. In this dialog box, you can set the waveform layout as 12×1, 6×2+1 or 3×4+1. If the printer is unusable or no printer is connected, this option will be disabled.

Printing Multi-Lead ECG

When a patient is being monitored at the bedside using 5-lead ECG, select "Show Multi-Lead ECG" from the "View" drop-down menu to display the multi-lead ECG waveforms. Select "Print" from the "Function" drop-down menu to print the ECG waveforms. If the printer is unusable or no printer is connected, this option will be disabled.

7.4.11 Show/Hide Alarm Limits

Selecting the "Show Alarm Limits" option from the "View" drop-down menu will show alarm high/low limits set for all physiological parameters. As shown in *Figure 7-3*, the alarm high/low limits are located to the right of the parameters value, with the alarm high limit above the alarm low limit. You can also hide the alarm limits by selecting "Hide Alarm Limits" option.
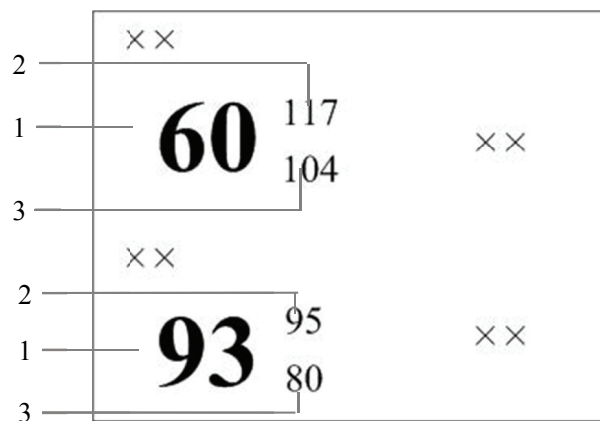
1 Measured parameter values   2 High alarm limits   3 Low alarm limits

Figure 7-3 Alarm High/Low Limits

7.4.12 Show/Hide Dynamic Trends

Select "Show Dynamic Trend" to show dynamic short trends for each physiological parameter. You can also hide the trend window by selecting "Hide Dynamic Trend" option.

For details on dynamic short trend, refer to *9.1.1 Dynamic Short Trend*.

7.4.13 Show/Hide Multi-Lead ECG

Select "Show Multi-Lead ECG" from the "View" drop-down menu to show multi-lead ECG waveform, or select "Hide Multi-Lead ECG" to hide the ECG waveform. The Multi-lead ECG screen is shown in Figure 7-4:
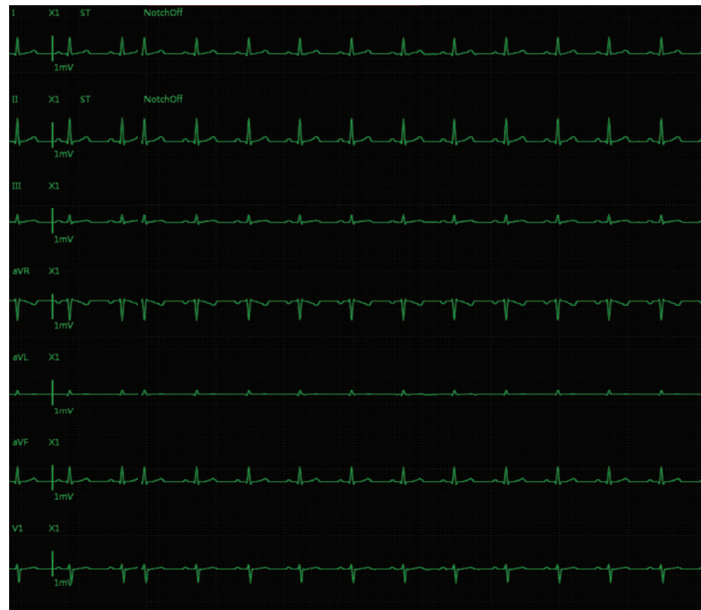
Figure 7-4 Multi-lead ECG

If there is no ECG waveform, or the monitor is set to 3-lead, the multi-lead ECG waveforms will not be displayed.

Select "Show Multi-Lead ECG"/ "Hide Multi-Lead ECG" to turn on or turn off 12-lead ECG waveform display when the bedside monitor enters full-screen 12-lead view, as shown in Figure 7-5 below.
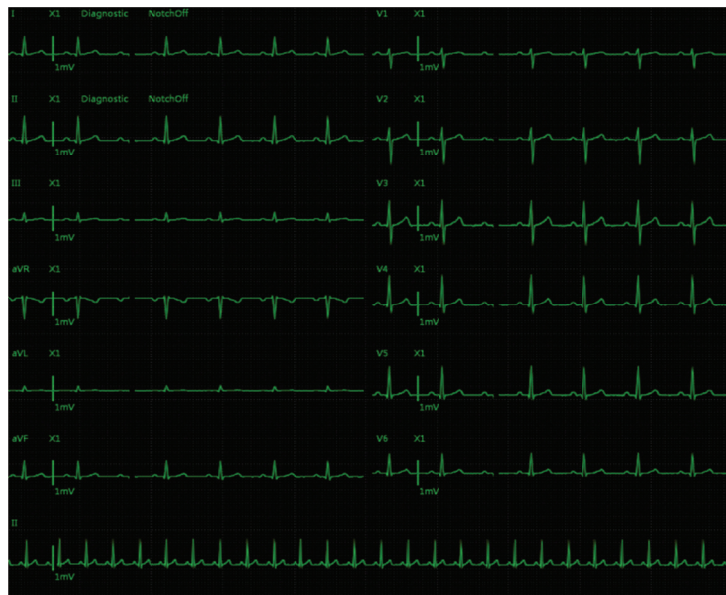
Figure 7-5 12-lead ECG (Standard)

7.4.14 Show/Hide NIBP List

Select "Show NIBP Table" from the "View" drop-down menu to show the NIBP list in the waveform area. Each measurement includes Measure Time, NIBP values and PR. You can also hide the NIBP list by selecting "Hide NIBP Table" option.

7.4.15 Show/Hide BIS Expand View

Select "Show BIS Expand View" from the "View" drop-down menu to show BIS Expand View, or select "Hide BIS Expand View" to hide BIS Expand View. This option is available in the menu when the bedside monitor supports the BIS function. 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 option is disabled.

7.4.16 Show/Hide Device Integration Expand View

Select "Show Device Integration Expand View" from the "View" drop-down menu to show Device Integration Expand View. This option is enabled only when the networked monitor supports connecting external devices, such as ventilators and anesthesia machines; otherwise, this option 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 the "Parameter Selection" button and the "Alarm Setup" button. You can use the "Parameter Selection" button to select the desired parameters for display if necessary. You can use the "Alarm Setup" button to change the priority of alarms issued by all the external devices. Options for Alarm Priority are Default, Low, and Message.

◆ Default: At the CMS, the alarm priority for external devices is the same as the one displayed on the patient monitor where external devices are connected.

◆ Low and Message: At the CMS, the alarm priority for external devices is Low or Message, regardless of the alarm priority displayed on the patient monitor.

■ Click the "Multi Devices" tab to access the tab sheet. In this sheet, you can view the parameters from all the external devices at the same time and change the alarm priority for all the external devices.Options for Alarm Priority are the same as that in individual device tabs.

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.
- The alarm priority in the Alarm Setup menu takes effect for alarms from all the external devices.

7.4.17 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 when using a 3-lead type;
- Displays ST segments of three leads when using 5-lead and 12-lead types.
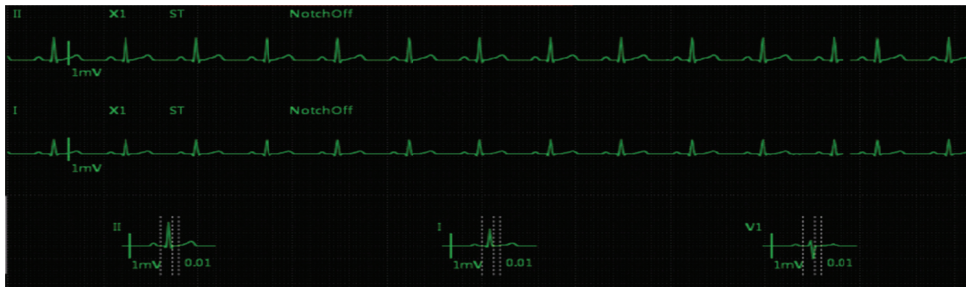
Figure 7-6 Display ST Segments of Three Leads

As shown in Figure 7-6 above, 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 the ISO point, J point and ST point. These three analysis points can be set in the CentralStation if necessary, or set on the bedside monitor. For details, refer to the operator's manual for the monitor.

Display ST-segments on the Multi-lead ECG Screen

If the 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 in Figure 7-7 below:
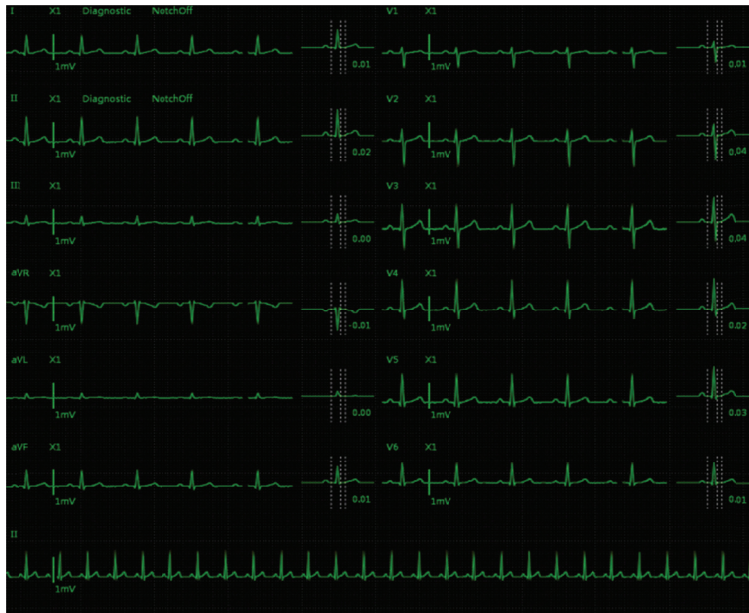
Figure 7-7 Display ST Segments on 12-lead ECG Screen

FOR YOUR NOTES

8 Alarm Control

8.1 Alarm Structure

Alarms, triggered by a vital sign that appears abnormal or by a monitor's technical problems, are sent to the CentralStation by the monitors and then indicated to the users by the CentralStation. Most of the alarms originally come from the monitors. The alarms coming from the CentralStation itself are displayed in the patient window's technical alarm area or system alarm area on the upper screen. Please refer to *Appendix B CMS 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 operator's 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 priority alarms: triple+double+triple+double beep

◆ Medium priority alarms: triple beep

◆ Low priority alarms: single beep

■ Mode 1:

◆ High priority alarms: high-pitched triple beep

◆ Medium priority alarms: double beep

◆ Low priority alarms: low-pitched single beep

■ Mode 2:

◆ High priority alarms: high-pitched triple beep

◆ Medium priority alarms: double beep

◆ Low priority 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.**

8.2.2 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. Those prompts are in a white font.

NOTE

- **Some physiological alarms, such as asystole, are exclusive. They have identical alarm tones with normal high level physiological alarms, but their alarm messages are displayed exclusively. That is to say, when an exclusive physiological alarm and a normal high level physiological alarm are triggered simultaneously, only alarm message of the exclusive physiological alarm is displayed.**

8.2.3 Background Color

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

- High priority alarms: red

- Medium priority alarms: yellow

- Low priority alarms: cyan

The alarm message background can be set to flash. To switch on the function, refer to *12.2.3 Alarm*.

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

8.2.4 Parameter Flashes

If a patient's physiological parameter 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 the "System Setup" button then "General Setup" tab, you can enter the "General Setup" tab sheet. The CMS provides up to 10 volume levels, increasing from 1 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 - Setting 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 high alarm volume level is greater than 10, the BeneVision Central Monitoring System will sound it in the volume of 10.**

8.4 Alarm Setup

In either the "Parameter Setup" or "Alarm Setup" window, you can define alarm switch, alarm high/low limits and alarm priority for each parameter.

⚠CAUTION

- **When you change the alarm limits of the monitor via the CentralStation/WorkStation, 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.**

NOTE

- **When you select the checkbox before "Alarm Setup" in the "Remote Control Settings" menu, the parameter alarm setting properties are controlled bidirectionally. For example, if the alarm limits have changed on the CentralStation/WorkStation, the alarm limits on the bedside device will change simultaneously. Refer to *12.2.8 Other* for the details of remote alarm setup.**

- **When the remote control on the alarm setup is enabled, the alarm properties which support bidirectional controls are shown in blue text. The alarm properties not supporting bidirectional controls are shown in grey text.**

- **You can only view the alarm settings on the ViewStation.**

8.4.1 Parameter Setup Window

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

Refer to *7.3 Parameter Setup* for details.

8.4.2 Alarm Setup Window

Selecting "Alarm Setup" from the "Function" drop-down menu in the "ViewBed" screen will enter the "Alarm Setup" tab sheet where you can set the monitored parameters' alarm properties, including parameter alarms, arrhythmia alarms, and arrhythmia alarm threshold settings.

8.4.2.1 Setting Parameter Alarm

In the "Parameter Alarm Settings" tab sheet, you can set the following alarm properties for all parameters:

■ Activation state: Select it to switch on/off the current parameter alarms. This is only available when DPM 3/4/5/6/7, Passport 12M/17M, Passport 8/12, Accutorr 7, and T1 are connected .

■ Alarm Priority: Select it to set the alarm priorities of the current parameter alarms to "High", "Med", "Low" or "Message". This is only available when DPM 3/4/5/6/7, Passport 12M/17M, Passport 8/12, Accutorr 7, and T1 are connected.

■ High limit: Select and enter the high limit. When Passport 2, Passport V, Spectrum, Spectrum OR or V12/21 monitors are connected, selecting "Off " in the pop-up keyboard to switch off the high limit alarm.

■ Low Limit: Select and enter the low limit. When the Passport 2, Passport V, Spectrum, Spectrum OR or V12/21 monitors are connected, select "Off" in the pop-up keyboard to switch off the low limit alarm.

■ Record On Alarm: Switch on/off the real-time alarm recording.

◆ On: A recording is performed when an alarm occurs.

◆ Off: No recording is performed when an alarm occurs.

■ Print On Alarm: Switch on/off the real-time alarm printing.

◆ On: A printing is performed when an alarm occurs.

◆ Off: No printing is performed when an alarm occurs.

■ Paging On Alarm: Switch on/off the alarm paging.

◆ On: The paging is sent to the pager when an alarm occurs.

◆ Off: No paging is sent to the pager when an alarm occurs.

8.4.2.2 Setting Arrhythmia Alarms

In the "Arrhythmia Alarms" tab sheet, the alarm for asystole, tachycardia and other kinds of arrhythmia can be set here. The following settings are only available when DPM 3/4/5/6/7, Passport 12M/17M, Passport 8/12, Accutorr 7, or T1 monitor is connected.

■ 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 Alarms On", "All Alarms Off" and "Lethals Only".

■ If the "Lethals Only" button is selected, only the lethal arrhythmia alarms are set to "ON" and other alarms are set to "OFF".

■ If the "All Alarms On" button is selected, all arrhythmia alarms are set to "ON".

■ If the "All Alarms Off" button is selected, all arrhythmia alarms are set to "OFF".

NOTE

- **If a bedside monitor is connected and the "Lethal Arrh Off" item in the monitor's "Admin Setup" menu is set to "Disable", the "All Alarms Off" button in the arrhythmia alarm settings of the central station is inactive.**

- **If a telemetry monitoring system is connected and the "Lethal Arrh Off" item in the "Telemetry" sheet under "Admin Setup" menu is set to "Disable", the "All Alarms Off" button in the "Arrhythmia Alarm" tab is inactive.**

■ Record On Alarm: Switch on/off the real-time arrhythmia alarm recording.

◆ On: A recording is performed when an alarm occurs.

◆ Off: No recording is performed when an alarm occurs.

■ Print On Alarm: Switch on/off the real-time arrhythmia alarm printing.

◆ On: A printing is performed when an alarm occurs.

◆ Off: No printing is performed when an alarm occurs.

■ Paging on Alarm: Switch on/off the arrhythmia alarm paging.

◆ On: The paging is sent to the pager when an alarm occurs.

◆ Off: No paging is sent to the pager when an alarm occurs.

8.4.2.3 Setting Arrhythmia Threshold

The threshold for PVCs high limit, tachycardia and others can be set in the "Arrh Threshold Setup" sheet.

Refer to the monitor or telemetry operator's manual for the arrhythmia alarms and their threshold.

8.5 Pausing Alarms

For monitors supporting bidirectional control of alarm pause, you can select "Enter Alarm Paused State" from the "Function" drop-down menu in the CentralStation/WorkStation ViewBed screen or "Alarm Paused" 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.

For the telemetry, you can select "Enter Alarm Paused State" or "Alarm Paused" to pause all alarms of current telemetry for 2 minutes.

After alarm pause time ends, the system will automatically release the alarm pause. You can also release the alarm pause by selecting "Exit Alarm Paused State" in the ViewBed screen or selecting "Alarm Paused" in the specific patient window again.

You can enable or disable the remote alarm control function on the CentralStation or WorkStation. When remote alarm control is disabled, "Enter Alarm Paused State" in the ViewBed screen and "Alarm Pause" in the specific patient window are not available. Refer to Section *12.2.8 Other* to see how to enable or disable the remote alarm control function.

8.6 Resetting Alarms

For telemetry or monitors supporting bidirectional control of alarm reset, you can reset the alarms through the following ways:

■ In the CentralStation/WorkStation ViewBed screens, select "Alarm Reset" from the "Function" drop-down menu.

■ In the Multibed screen, you can right click when the cursor is in the window where the patient needs the setting of Alarm Reset, or select the option "Alarm Reset" in its drop-down menu.

When "Alarm Reset" is selected, the alarm sounds will be silenced. If a new alarm occurs, the device will automatically sound.

As for the monitor's alarm behaviors after resetting alarm, please refer to the monitor's operator's manual. As for the telemetry's alarm behaviors after resetting alarm, please refer to the telemetry operator's manual.

You can enable or disable the remote alarm control function on the CentralStation or WorkStation. When remote alarm control is disabled, the "Alarm Reset" control is not available in the drop-down menu of the ViewBed and the Multibed screens. Refer to *12.2.8 Other* to see how to enable or disable the remote alarm control function.

9 Review

9.1 Online Review

Online review is used to review the dynamic short trends, C.O. measurements, waveforms, trends, events, 12 lead analysis and ST segment of a patient that is currently monitored by the CMS.

NOTE

- **When Passport 2, Spectrum, Spectrum OR, or V12/21 monitors are connected to the CentralStation, the following reviews are not available at the corresponding beds of the CMS.**
  - ◆ C.O. review
  - ◆ 12-lead review
  - ◆ ST review

9.1.1 Dynamic Short Trend

Selecting "Show Dynamic Trends" from the "View" drop-down menu in the ViewBed screen will show graphic short trends for the parameter. The colors and order are subject to their respective parameter modules.
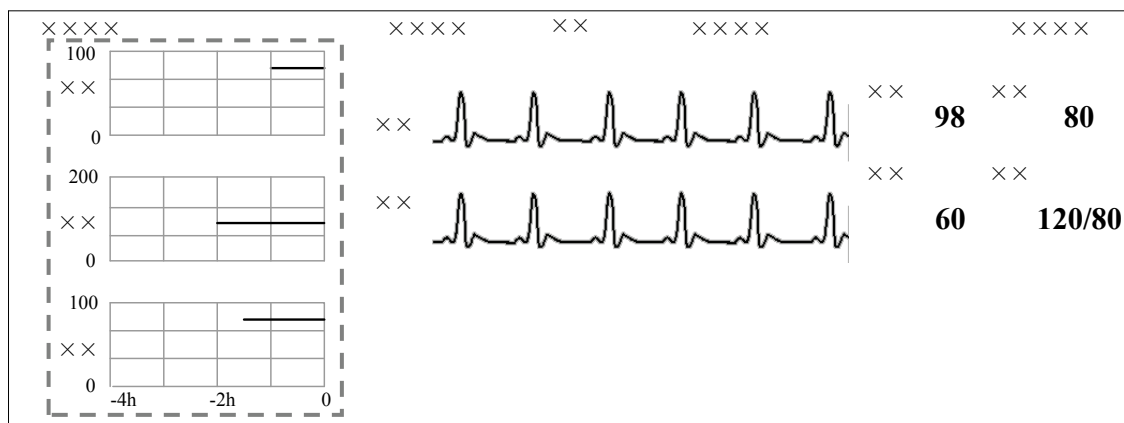
Figure 9-1 Dynamic Short Trend

The dynamic short trends will automatically update every minute, 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 with 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 parameters 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.

Trend changes can be observed in a graphic or tabular format. You can switch between the tabular and graphic format by simply clicking their respective buttons.

In the tabular format, parameters from integrated devices are indicated with "+" mark before the parameter name. In the graphic format, 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 a time interval as the resolution to display the tabular trends.

- When the resolution is set to "1 s", "5 s", "1 min", "5 min", "15 min", "30 min", "1 h" or "2 h", the tabular trends will display the measured parameter values for the selected time period.

- When the resolution is set to "NIBP" or "TEMP", up to 240 hours of 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 manually input data (such as glucose) can be displayed.

NOTE

- **The resolution "TEMP" and "Manually Saved" are available only when Accutorr 7 monitor is connected.**

In the graphic trends, you can set the desired resolution for reviewing graphic trends. Resolution options 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

By clicking a point in the graphic trends, you can place the cursor at that position and view the corresponding parameter values of the cursor time. In the tabular trends, the cursor time is the same as it is in graphic trends. Conversely, if you select a row in the tabular, the cursor in the graphic trends 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 move to the previous graphic page.
‹	Clicking this button will move the graph to the left by a time range of one resolution.
›	Clicking this button will move the graph to the right by a time range of one resolution.
»	Clicking this button will move to the next graphic page.

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

Selecting Trend Group

Click the "Trend Group" drop-down list to select the desired trend group to review. For details about setting trend groups, refer to *12.2.4 Trend Group*.

NOTE

- **Selecting different trend group views in the "Trend Review" screen shows different trend parameters.**

Refreshing Data

Trend data will not update automatically. Therefore, if you want to view current trend data, you have to manually refresh the screen. Clicking the "Refresh" button will open a dialog box, through which you can input a start time and then select "OK" to reload data. After refreshing, the select status and order of parameters remain unchanged.

9.1.3 Full Disclosure

The CentralStation stores 240 hours of waveform data for each patient.

9.1.3.1 Overview

In the "Full Disclosure" window, you can review compressed or full size waveforms as required.

9.1.3.2 Compressed Waveform View

Compressed Waveform Screen

Click the "Full Disclosure" tab to open the following window, through which you can review the patient's latest 240 hours of waveform data. 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.

1. Time scale   2. Compressed waveform area   3. Full size waveform area

4. Cursor time area   5. Cursor   6. Time bar
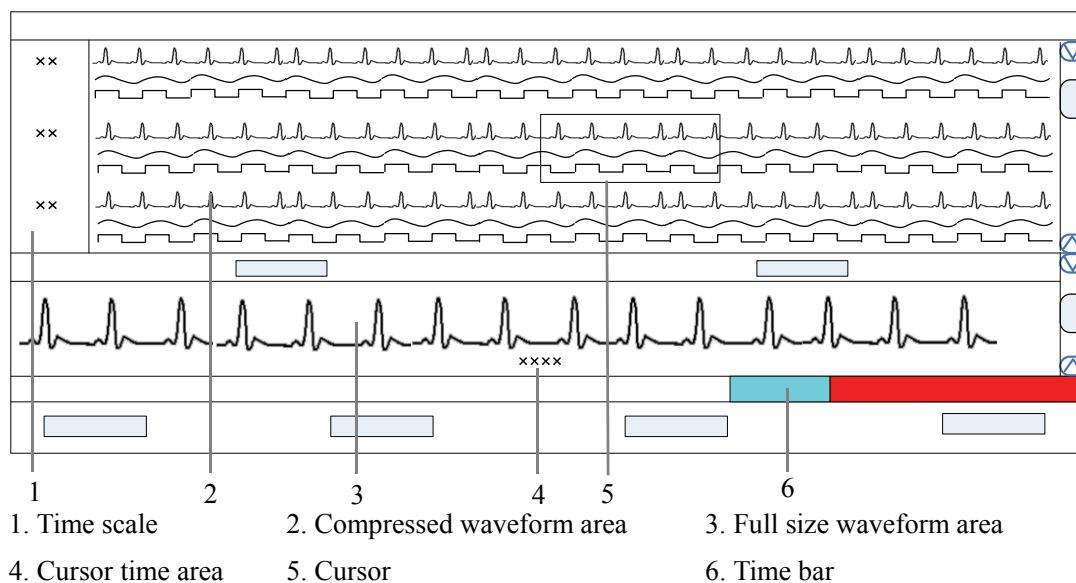
Figure 9-2 Compressed Waveform View

■ Time Scale

Displays the time to which the waveform group in the compressed waveform area corresponds.

■ Compressed Waveform Area

Displays compressed waveforms. If some waveform signals are not detected within a specific time period, square waves are displayed.

■ Full Size Waveform Area

Displays the full size of the corresponding compressed waveform where the cursor is located, 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 12 seconds of compressed waveforms. The waveform data contains 6 seconds before the cursor time and 6 seconds after the cursor time.

■ Time Bar

Same functions as in the full size view of full disclosure. Refer *to 0*
Full Size Waveform View.

Compressed Waveform Operation

In the compressed view window, you can:

■ Select waveforms to be saved

■ Select waveforms

■ Mark arrhythmia

■ View arrhythmia statistics

■ Refresh

■ Show/hide parameter

■ Zoom

■ ICP waveform scale

■ Print

■ Save as

For details about Print and Save as, refer to chapter *11 Record, Print and Save As*.

■ Selecting waveforms to be saved

Click the "Wave Save" button to select the desired waveforms to be saved for each patient:

1. Select a patient from "Patient Info" list.

2. Select the 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 CentralStation can save up to 240 hours of waveform data for each patient. If you do not select waveforms for a patient, no waveforms or parameter values can be reviewed from the "Full Disclosure" window.

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

■ Selecting waveforms

Click the "Wave Select" button to display the menu of waveforms. Select the checkbox beside the desired wave (at most four waves) and the compressed waveform area will display the selected waves.

To change the order of the waveform, click the waveform name, then select "Move First", "Move Up", "Move Down" or "Move Last".

Click the "Save as Default" button to save the current configuration as the user's default configuration; click "Load Configuration" to load the user's default configuration for the current patient.

NOTE

● **The new admitted patient is loaded with the default waveforms.**

■ Marking arrhythmia

The arrhythmia alarm waveforms can be marked with color in the compressed waveform area. From the "Arrh Mark" drop-down list, you can select the types of arrhythmia to be marked.

The marked waveforms start from the point 16 seconds before the arrhythmia alarm, and end when the alarm condition disappears.

To set desired color for each type of arrhythmia, refer to *12.2.1 Setting Color.*

NOTE

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

■ Viewing arrhythmia statistics

Click the "Arrh Statistics" button to view 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 chapter *11 Record, Print and Save As*.

■ Showing/hiding parameter

◆ Click the "Numeric Data" button to display the patient's parameter information in the full size waveform area.

◆ Click the "Hide Numerics" button to display the full size of the cursor-located compressed wave in the full size waveform area.

■ 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 gets, the more lines of compressed waveform display on the screen. In single-screen mode, up to 10 lines of waveforms can be displayed; in dual- or multi- screen mode, up to 32 lines of waveforms can be displayed.

■ ICP wavefrom scale

When ICP is displayed in the compressed waveform area, you can right click the mouse to adjust ICP waveform amplitude. Each time you right click the mouse,, 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 the change, the scale level displays above the ICP waveform.

9.1.3.3 Full Size Waveform View

Full Size Waveform Screen

Click the "Full Disclosure" tab. Click the "Full Size" button to open the following window, through which you can review the patient's latest 240 hours of waveform data.
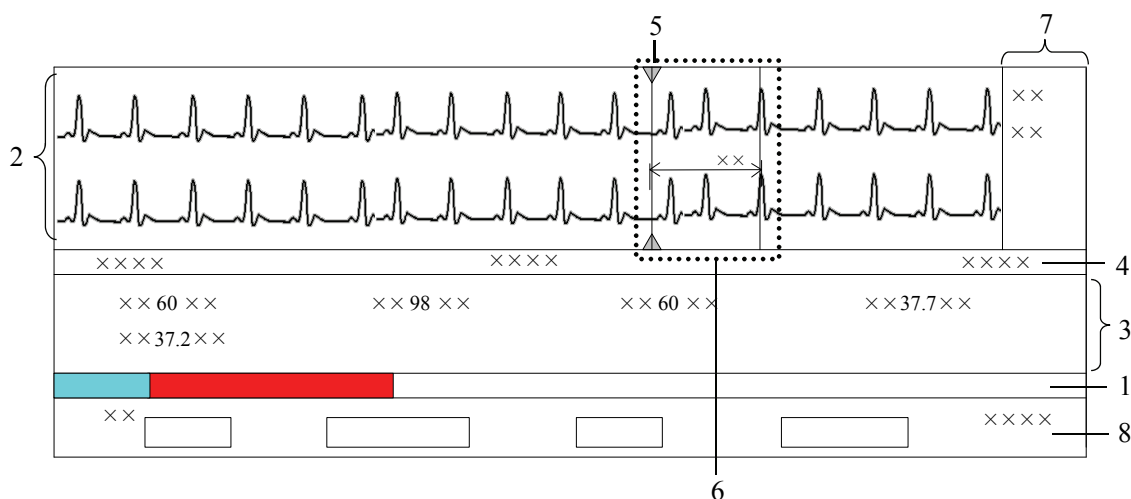
1. Time bar
2. Waveform area
3. Parameter area
4. Waveform time display area
5. Current cursor
6. Caliper
7. Caliper measurement area
8. Button area

Figure 9-3 Full Size Waveform View

■ Time Bar

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

◆ White: indicates that there are no waveforms or values.

◆ Grey: indicates that there are waveforms and all monitored parameters are within range and no alarms are occurring.

◆ Red: indicates that some parameters have high priority alarms but there are still waveforms.

◆ Yellow: indicates that some parameters have medium priority alarms but there are still waveforms.

◆ Cyan: indicates that some parameters have low priority alarms but there are still waveforms.

Within the time bar, there is a black line indicating the time 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 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.

◆ $|\langle$: Clicking it will move the black line to the leftmost, i.e. the review start time.

◆ $\langle\langle$: Clicking it will move the black line left, so that the waveforms in the waveform area move left at the length of one screen.

◆ $\langle$: Clicking it will move the black line left in short increments.

◆ $\rangle$: Clicking it will move the black line right in short increments.

◆ $\rangle\rangle$: Clicking it will move the black line right, so that the waveforms in the waveform area move right at the length of one screen.

◆ $\rangle|$: Clicking it will move the black line to the rightmost, i.e. the review end time.

■ Waveform Area

This area displays 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 down while dragging the cursor until your desired location is reached. During dragging, a caliper with two arms and a middle measurement line, marking the real time measurement, will appear on the waveforms. You can drag the cursor in vertical or horizontal direction:

■ In horizontal direction, the PR, QRS, RR, QTC, and QTC can be measured. The horizontal caliper is shown in Figure 9-4 Horizontal Caliper.

■ In vertical direction, the ST can be measured. The vertical caliper is shown in Figure 9-5 Vertical Caliper.

If a touchscreen is configured, select a place in the waveform by a harder fingertip touch on the screen, and then drag your finger on the screen surface without losing the contact until the desired location is reached. A caliper is then formd. If you need to adjust the caliper, slightly touch the left or right arm, then the touchscreen controls ◀ and ▶ will appear.
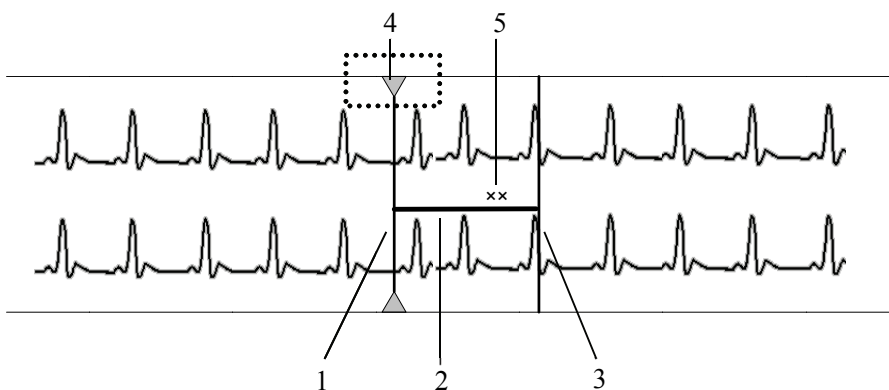
Figure 9-4 Horizontal Caliper
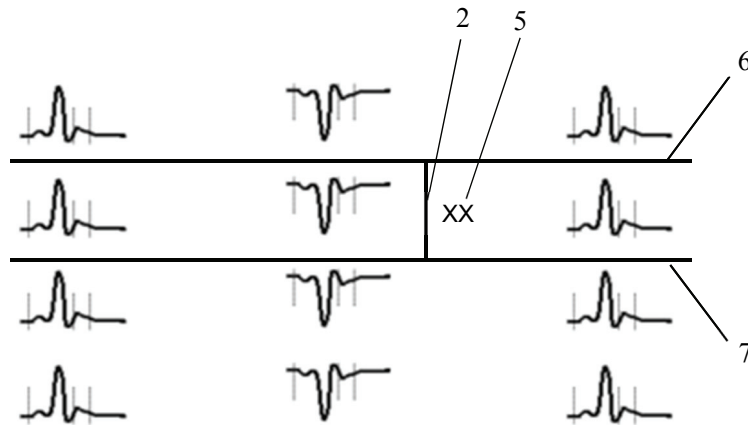
Figure 9-5 Vertical Caliper

1. Left arm   2. Measurement line   3. Right arm

4. Current cursor   5.Real-time measurement   6. Upper arm

7. Lower arm

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 the waveform area, right click the mouse, and select "PR", "QRS", "RR", "QT" or "ST" in the pop-up menu. The corresponding measurement will be shown above the first ECG waveform. In the caliper measurement area, the above-mentioned value can be acquired also. Refer to *0*
Full Size Waveform View for additional information on the caliper measurement area.

In the pop-up menu, select "Change Caliper" to switch between vertical caliper and horizontal caliper.

ECG Waveform Gain

You can set the ECG waveform gain in the waveform area in one of the following ways:

◆ 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 in one of the following ways:

◆ In the waveform area, right click the mouse and select either "Zoom in Sweep Speed" or "Zoom out Sweep Speed" to adjust the speed.

◆ In the button area, click "Sweep Speed" to set the waveform sweep speed. Refer to *0*

◆ *Full Size Waveform* View for additional information on selecting sweep speed.

■ Caliper Measurement Area

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

There are six measurement buttons and one "Clear" button. You can:

◆ Double click "PR", "QRS", "RR", "QT" and "ST" buttons to obtain their values. The QTC value is calculated after RR and QT value have been acquired.

◆ Clear all the values by clicking the "Clear" button.

■ Parameter Area

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

Parameter area shows all current parameter values.

◆ Parameters having high-level alarms are highlighted in red and "*******" is shown in front of the parameter values.

◆ Parameters having medium level alarms are highlighted in yellow and "******" is shown in front of the parameter values.

◆ Parameters having low level alarms are highlighted in cyan and "*****" is shown in front of the parameter values.

◆ Parameters that have a message are shown with black as the background color, but no indication of "*****" before parameter values.

◆ Parameters from integrated devices 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 *0*
Full Size Waveform View *- Full Size Waveform* Operation for additional information about button function.

Full Size Waveform Operation

In the full size waveform screen, you can:

■ Select waveforms to be saved

■ Select waveforms

■ Select sweep speed

■ Save event

■ Auto play

■ Record

■ Print

■ Save as

■ Export to Electronic Medical Record (EMR) system

For details about record, print and save as, refer to chapter *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 by 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 CentralStation can save up to 240 hours of waveform data for each patient. If you do not select waveforms for a patient, waveform and parameter values cannot be reviewed from the "Full Disclosure" 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 selecting its check box. You can also 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 that can be saved and input an event description. Select "OK" to save the currently displayed waveform strips. The saved event can be viewed in the "Event Review" screen.

■ Auto play

By clicking "Auto Play" and then selecting the ‹‹ , ‹ , › or ›› buttons, you can review waveforms in the auto mode.

■ Export to EMR

By clicking the "Export to EMR" button, you can export 20 seconds of waveform data after the start time of the current waveform to other systems.

NOTE

- **The Export to EMR function is available only when the eGateway is configured.**
- **The Export to EMR function is available when "Export Waveform Data" is enabled in "Admin Setup" – "Other" – "Communication Settings" – "Gateway Communication Settings".**

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.
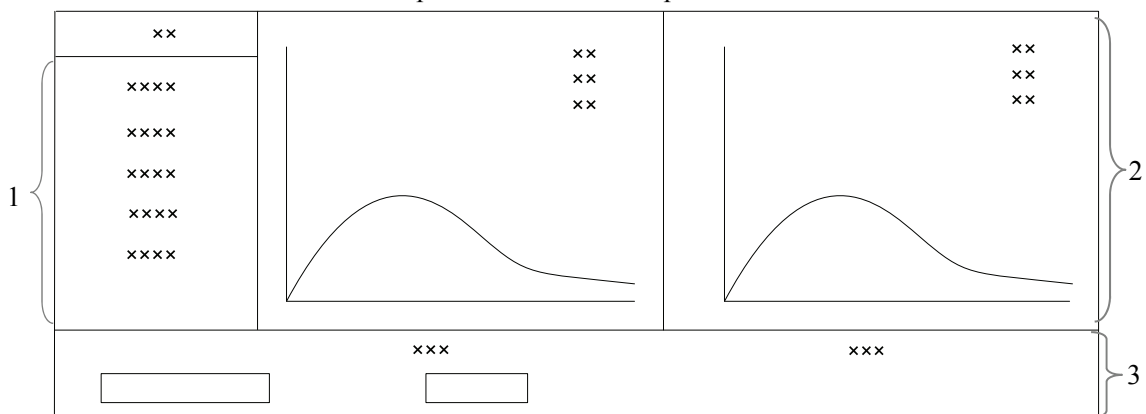
Figure 9-6 C.O. Review

1. Measurement list   2. Waveform area   3. Button area

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 the hemodynamic 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 measurements

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 six (6) C.O. review windows, displaying the C.O. curves and parameter values measured at six (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 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 9-7 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 integrated device parameters are indicated with a "+" before the parameter name, and the relevant text is shown in white. The CentralStation prompts if an alarm occurs for a specific parameter and indicates the alarm priority by using different background colors.

   ◆ Black: no alarm generated

   ◆ Red: high priority alarm generated

   ◆ Yellow: medium priority alarm generated

   ◆ Cyan: low priority alarm generated

3. Event waveform area: displays relevant parameters' waveforms within ±16 seconds around the event time. Please refer to *0*

Full Size Waveform View - *Full Size Waveform Screen* - *Waveform Area* for how to use calipers, 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 integrated device events, there are no corresponding waveforms in the event waveform area.**
- **If the alarm is paused, the events during the pausing period are not recorded.**

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
- Caliper measurement
- Print
- Record
- Save as

■ Export to EMR

For details about sweep speed and caliper measurement, refer to *0*
Full Size Waveform View.

For details about record, print and save as, refer to chapter *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", "SpO_2", "RESP", "NIBP", "IBP", "C.O.", "TEMP", "CO_2", "GAS", "ICG", "BIS", "RM", "CCO", "SvO_2", "$ScvO_2$", "Arrh", "ST Analysis", "Saved Event" ,"Event"(only for telemetry), "Anesthesia", "Ventilator", "Unknown Phys. Alarm", "Manual Event", and options for alarm priority include "All", "High", "Med", "Low" or "Message". By default, "All" for alarm type and "All" for alarm priority are selected.

Sorting the Event List

You can sort all events ascendingly or descendingly by clicking the heading of any column:

■ Time: Clicking it will sort all alarms ascendingly or descendingly by time.

■ Message: Clicking it will sort all alarms ascendingly or descendingly by parameter.

■ Description: Clicking it will sort all alarms ascendingly or descendingly by description.

■ Priority: Clicking it will sort 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 sorted in descending order 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 the **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 the **Ctrl** + **A** keys on the keyboard together and then all the events in the event list will be selected.

Locking and Unlocking Events (CentralStation Only)

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.

NOTE

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

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

Deleting Event (CentralStation Only)

1. On the CentralStation, 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.

Exporting to EMR

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

NOTE

- **The Export to EMR function is available only when the eGateway is configured.**
- **The Export to EMR function is available when "Export Waveform Data" is enabled in "Admin Setup" – "Other" – Communication Settings" – "Gateway Communication Settings".**

9.1.6 12-Lead Review

If the bedside monitor supports the 12-lead analysis function, you can click the "12-lead Review" tab to review the 12-lead analysis result obtained from the bedside monitor.

Refer to *0*
Full Size Waveform View *- Full Size Waveform Screen - Waveform Area* for how to use calipers, how to adjust ECG waveform gain, and how to adjust sweep speed in waveform area.

In the "12-lead Review" window, you can:

■ View 12 analysis waveforms

■ Delete

■ Sweep speed

■ Print

■ Record

■ Save as

■ Modify patient information

For details about sweep speed, refer to *0*
Full Size Waveform View *-Full Size Waveform Screen*.

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

NOTE

● **In the "12-lead Review" tab sheet, there is no caliper measurement area. "PR", "QRS", "RR" and "QT" cannot be measured.**

Viewing 12-Lead Analysis Waveforms

12-Lead analysis waveforms will be displayed on the right side by selecting an analysis result and clicking the "Waveforms" button. You can move the vertical scroll bar to view the waveforms. To view the analysis results, click the "List" button.

Deleting a Result

You can delete an analysis result by selecting it, and then clicking the "Delete" button. For details about record, print and save as, refer to chapter *11 Record, Print and Save As*.

Modifying Patient Information

If the Glasgow algorithm is used for 12-lead ECG analysis in the bedside monitor, you can modify the patient information by clicking the "Patient Info" button in "12-Lead Review" tab sheet.

The editable patient information includes patient ID, last/first name, technician and physician. The modified information will be updated in the 12-lead analysis report, strip, and saved file. The change of patient ID, first name or last name will also be updated in patient management.

9.1.7 ST Review

9.1.7.1 Overview

Click the "ST Review" tab to open the ST review window as shown in Figure 9-5. In this window, you can view real-time ST segments and review historical ST segments. You can also record and print out ST segments.
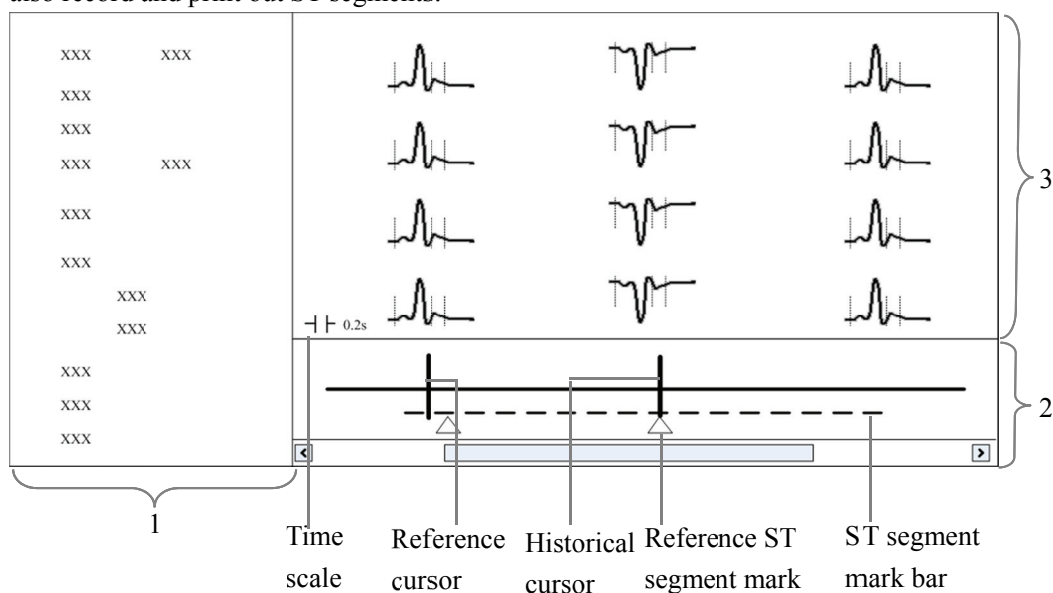
1. Setting control area   2. Trend parameter area   3. ST segment area

Figure 9-8 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.

⚠ WARNING

- **The ST algorithm has been tested for accuracy of the ST segment data. The significance of the ST segment changes need to be determined by a clinician.**

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 *Chapter 11 Record, Print and Save As.*

Viewing ST Segment

In the setting control area, you can select "Real-time" 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." button 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 CentralStation is capable of searching and reviewing the history data of over 1000 patients. By clicking the "Discharged Pat." button, you can enter the tab sheets as follows:

- All patients
- Patient Mgmt.
- Full Disclosure
- Trend Review
- Event Review
- 12-lead Review
- ST Review
- C.O. Review

NOTE

- **The patient management, full disclosure, trend review, event review, 12-lead review, ST review and C.O. review for discharged patients are essentially the same as those 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 from all CentralStations on the network. Brief information of discharged patients on the selected CentralStation is shown in the patient list, with one line for each discharged patient.

NOTE

- **The discharged patients on a CentralStation can be viewed only when the CentralStation is connected to the monitoring network. Please refer to *12.3 Communication Settings* for additional information.**

9.2.1.2 Operation

In the "All patients" tab sheet, you can:

- Sort discharged patients

- Search discharged patients

- Delete discharged patients

- Refresh

Sorting Discharged Patients

You can sort 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 sorted ascendingly by name.

Searching Discharged Patients

1. Click the ❭ button at the left of the "All patients" tab sheet, or select "Show Search" button, and the "All patients" tab sheet will show an area on the left for inputting search conditions.

2. Input search conditions, e.g. "Name" and "Patient ID". You can click "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 Patients

1. In the "Delete" 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, can you switch to other tab sheets for review.**

- **If a patient is allowed to be viewed by remote CMS during monitoring, the patient's physiological data can be viewed in the "Discharged Pat." window of other CentralStations after the patient is discharged.**

10 Calculation

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 chapter *11 Record, Print and Save As*.

Calculate

From the "Name" drop-down list below, you can select one of the choices listed 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

To make a calculation:

1. Confirm whether the patient type and weight entered are correct.

2. Select a drug to be calculated.

3. The system will automatically give a set of values. Do not use these calculations. Instead, input correct parameter values under the direction of a physician.

4. Select "Reference", "Dose Interval" 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. In addition, the reference, dose interval and dose type should be confirmed.**
- **We assume no responsibility for results arising from incorrect inputs and operations.**

Save Results

The CentralStation is capable of saving 75 calculations for each patient. To save calculations, you can click the "Save Results" button after the 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 save it into the Name drop-down list for later use.

All the saved calculations and their respective calculation times are displayed in the "Calculated Results List". From this list, you can select a specific calculation to view in the drug parameter area. At this time, all parameters in the drug parameter area are unchangeable but the reference, dose interval and dose type in the titration table can be changed by selecting the "New Calc." button. Click the "New Calc." button to input new parameter values and create a new calculation.

Delete

To delete unnecessary or incorrect calculations:

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 chapter *11 Record, Print and Save As*.

Calculate

To calculate a value:

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 results arising from incorrect inputs and operations.**

Save Results

The CentralStation is capable of saving 100 calculations for each patient. To save calculations, click the "Save Results" button after the 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 incorrect calculations:

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 chapter *11 Record, Print and Save As*.

Calculate

To calculate a value:

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 drop-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 results arising from incorrect inputs and operations.**

Save Results

The CentralStation is capable of saving 100 calculations for each patient. To save calculations, you can click the "Save Results" button after the 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 incorrect calculations:

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 chapter *11 Record, Print and Save As*.

Calculate

To calculate a value:

1. Input parameter values needed into the "Input Item" area.

2. Pressure unit can be changed by scrolling the drop-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 results arising from incorrect inputs and operations.**

Save Results

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

Delete

To delete unnecessary or incorrect calculations:

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 **Chapter 11 Record, Print and Save As**.

Calculate

To calculate a value:

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 results arising from incorrect inputs and operations.**

Save Results

The CentralStation is capable of saving 100 calculations for each patient. To save calculations, you can click the "Save Results" button after the 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 incorrect calculations:

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 Figure 11-1below, the CMS can be equipped with a thermal recorder, which, with a separate power supply, is connected to the host via the general interface.

The CMS supports the following recorders.

■ TR6B Recorder

■ TR6F Recorder

TR6B Recorder

Power indicator

Figure 11-1 Front Panel

Power switch

Equipotential grounding connector

Fuse

RS232 connector

Power inlet
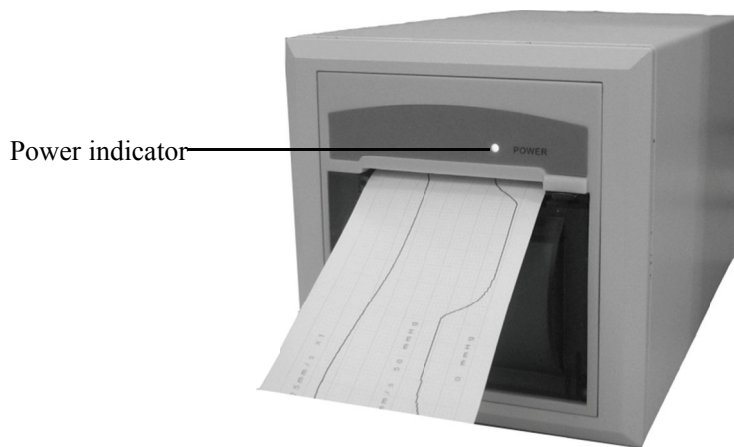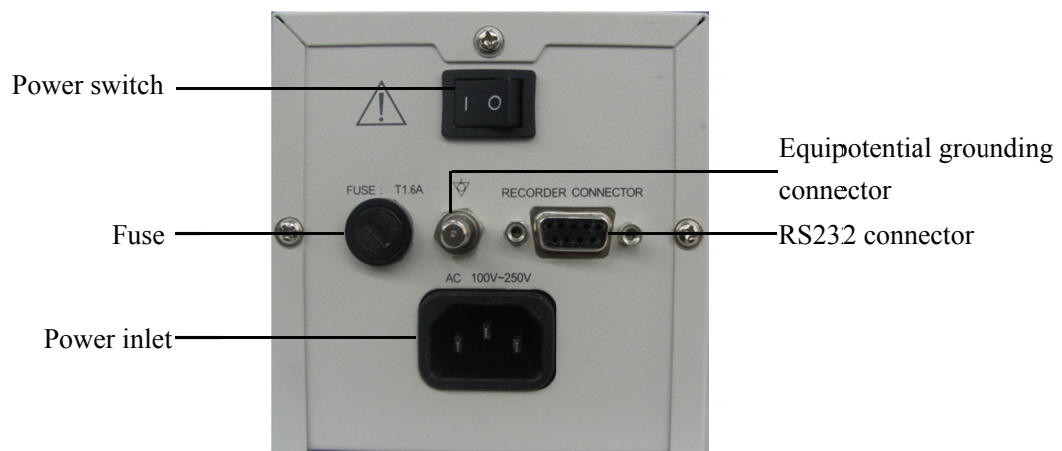
Figure 11-2 Back Panel

TR6F Recorder
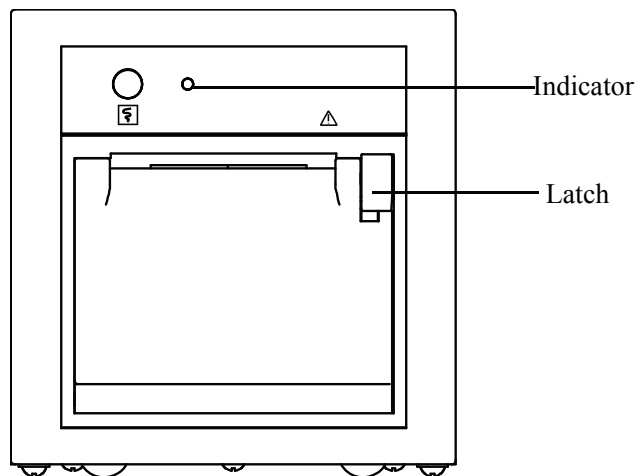
Figure 11-3 Front Panel

Indicator

Latch

Figure 11-4 Front Panel

Equipotential grounding connector

RS232 connector

Power Switch

Power inlet
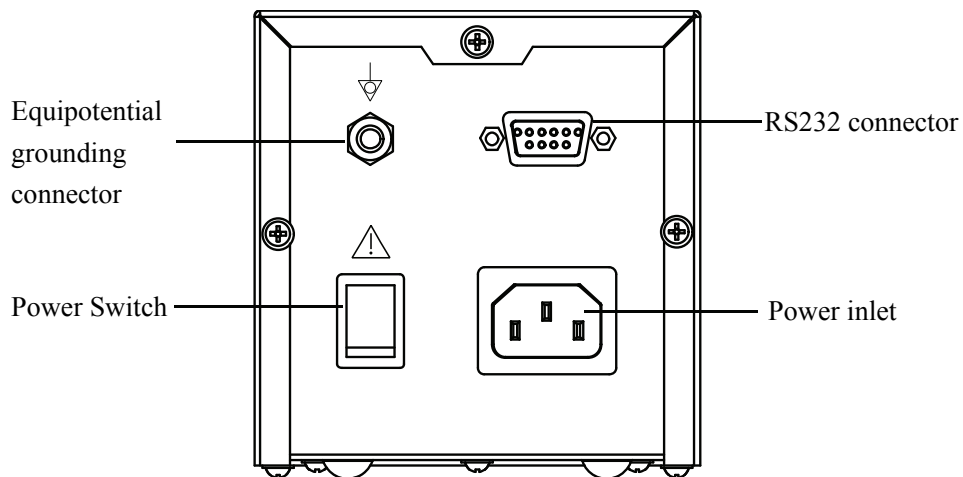
The indicator has three statuses:

- On: indicates that the recorder can print normally.

- Off: indicates that the recorder is switched off.

- Flashing: indicates that the reorder cannot print normally, e.g. the recorder runs out of paper.

The top left button of the recorder front panel has no function.

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 automatically initiates a recording when an alarm occurs. 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

- 12-Lead Review

- ST Review

- ICG Hemodynamic Parameters

- CCO Hemodynamic Parameters

- SvO_2/$ScvO_2$ Oxygenation Parameters

- 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 print with poor quality, may be unusable, or the recorder printer head may become 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 if you plan to replace the recorder paper or resolve an issue.**

TR6B Recorder Installation

To install recorder paper, follow this procedure.

1. Open the recorder door, and open the paper bail at the upper left corner of the recorder, shown in Figure 11-5.

2. Insert a new roll of recorder paper into the paper compartment, shown in Figure 11-4.

3. Insert the paper shown in Figure 11-5.

4. Pull the paper out and adjust it, shown in Figure 11-6.

5. Push down the paper bail, shown in Figure 11-7.

6. Close the recorder door, shown in Figure 11-8.
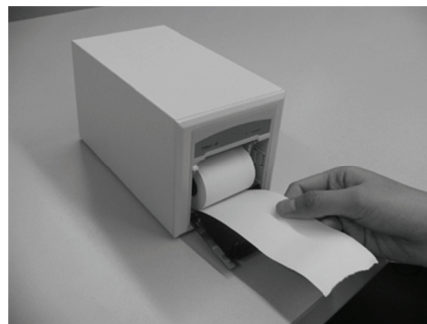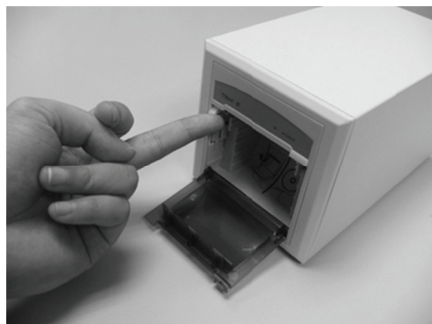
Figure 11-5 Installing Recorder Paper -1 Figure 11-6 Installing Recorder Paper -2
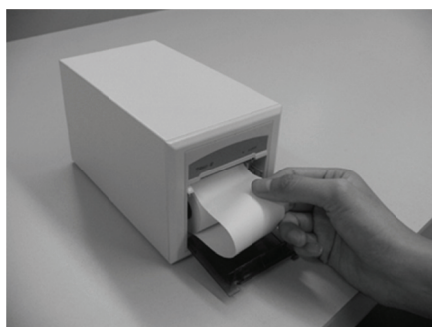
Figure 11-7 Installing Recorder Paper -3 Figure 11-8 Installing Recorder Paper -4
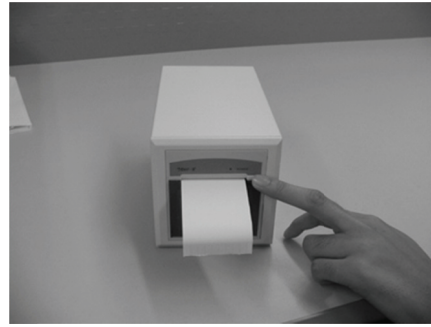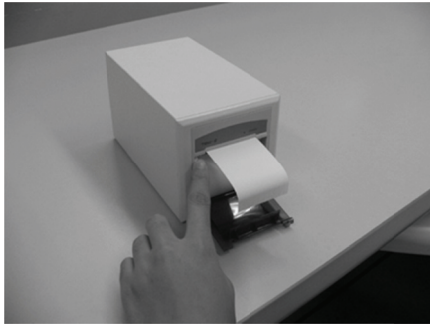
Figure 11-9 Installing Recorder Paper -5 Figure 11-10 Installing Recorder Paper -6

TR6F Recorder Installation

To install recorder paper, follow this procedure.

1. Use the latch at the upper right of the recorder door to pull the door open, shown in Figure 11-11.

2. Insert a new roll into the compartment with the inner paper side facing up, shown in Figure 11-12.

3. Close the door.

4. Verify that paper is loaded correctly and the paper end is feeding from the top.
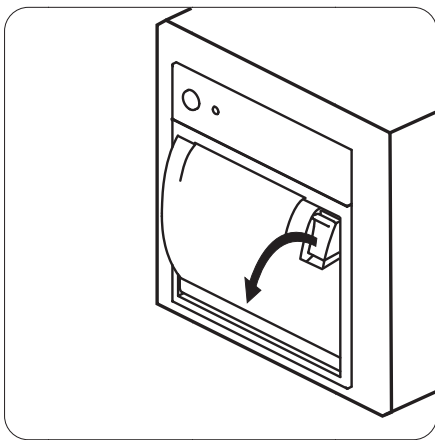
Figure 11-11 Installing Recorder Paper-1
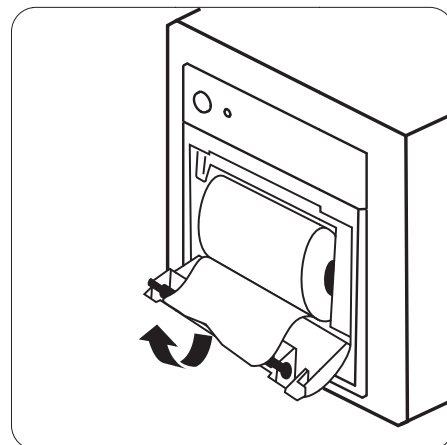
Figure 11-12 Installing Recorder Paper-2

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 *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 *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 *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 *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 *10.5 Renal Calculation*.

3. Click the "Record" button to print out the renal calculations.

Recording Full Size Waveforms

1. Enter the "Full Disclosure" tab sheet.

2. Click the "Full Size" button.

3. Click the "Record" button.

4. Select a maximum of two (2) waveforms from the pop-up dialog box.

5. Select "OK" to print out the selected waveforms.

Recording Events

1. Enter the "Event Review" tab sheet.

2. Select an event from the event list per *9.1.5 Event Review*.

3. Click the "Record" button.

4. From the pop-up dialog box, you can select a maximum of two (2) waveforms.

5. 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 12-Lead Analysis Results

1. Enter the "12-lead Review" tab sheet.

2. Click the "Record" button.

3. Select "Time Range" from the pop-up dialog box.

4. Click "OK" to print out the 12-lead analysis result list.

Recording 12-Lead Analysis Waveform

1. Enter the "12-lead Review" tab sheet.

2. Click the "Waveforms" button after selecting an analysis result.

3. Click the "Record" button to print out the analysis results and 12 analysis waveforms.

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 the 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 SvO$_2$/ScvO$_2$ Oxygenation Parameters

1. Enter the "ViewBed" tab sheet.

2. Select and then click SvO$_2$/ScvO$_2$ parameter area.

3. Select the "SvO$_2$" or "ScvO$_2$" tab sheet and click the "Oxygenation Parameters" button.

4. Click the "Record" button from the pop-up dialog box.

Recording Real-time Waveforms

1. Enter the "ViewBed" tab sheet.

2. Select "Record" from the "Function" drop-down menu.

3. Select a maximum of two (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. Select "Record" to print the displayed waveforms.

Recording Real-time Frozen Waveforms

1. Enter the "ViewBed" tab sheet.

2. Select "Freeze" from the "Function" drop-down menu.

3. Select "Record" from the "Function" drop-down menu.

4. Select a maximum of two (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 the "System Setup" button then selecting the "Recording Control" tab, 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 the recording.

NOTE

- **The system can store a maximum of 50 print tasks or requests.**
- **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 recordings cannot be paused.**
- **The automatically stopped recordings will record two lines of '*' at the end of reports; manually stopped or abnormally stopped recordings will record one line 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 M401n	Supports A4 or Letter sized paper.
HP LaserJet M602	
HP LaserJet M605n	
PDF Printer	Support to print electronic report. The PDF printing needs to be enabled in the "Factory Setup" menu.

You can purchase the printer directly from Mindray or buy the desired printer yourself. For details about how to use the printer, refer to the accompanying document provided with the printer.

11.2.2 Printing Contents

The following reports can be generated by the CMS:

- Patient Information
- Drug Calculations
- Hemodynamics Calculations
- Oxygenation Calculations
- Ventilation Calculations

- ■ Renal Calculations

- ■ Graphic or Tabular Trends

- ■ Full Size Waveforms

- ■ Waveform Segment Reports

- ■ Compressed Waveforms

- ■ Arrhythmia Statistics Results

- ■ Event List

- ■ Event

- ■ C.O. Measurements

- ■ 12-Lead Analysis Results

- ■ 12-Lead Analysis Waveforms

- ■ ST Segment Waveforms

- ■ Real-time Report

- ■ 12-Lead ECGs

- ■ Multi-lead ECGs

- ■ EEG Waveforms

- ■ ICG Hemodynamic Parameters

- ■ CCO Hemodynamic Parameters

- ■ $SvO_2/ScvO_2$ Oxygenation Parameters

- ■ Alarm Settings Report

- ■ Print on Alarm Report

- ■ QT report

- ■ Paging Assignment (CentralStation only)

11.2.3 Printing Operations

Printing Patient Information

1. Enter the "Patient Mgmt." tab sheet.

2. Make sure the patient information is correct. If not, correct it and click "Save" button.

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 *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 *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 *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 *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 *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 Trends

Manual printing:

1. Enter the "Trend Review" tab sheet.

2. Set the resolution or zoom per *9.1.2 Trend Review*.

3. Click the ▶ icon on the right side of the "Print" button in the tabular trends and select "Print Setup" to set up the printing options.

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, and select "Scheduled Report Setup" to set up the printing options.

3. Click "Close" button to exit the menu. The report will be printed at the start time you set in the printing control screen per *11.2.4 Printing Control*. If you want to print the report now, click "Print Now" button.

NOTE

- **The option "Scheduled Report Setup" is only available in the "Trend Review" tab sheet when the check box before "Scheduled Report" is selected in the "Printing Control" tab sheet.**

Printing Full Size Waveforms

1. Enter the "Full Disclosure" tab sheet. If compressed waveforms 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 Reports

1. Enter the "Full Disclosure" tab sheet. If full size waveforms are displayed, click the "Compressed" button in the lower right corner of the screen to change to the Compressed Waveform view.

2. Select the desired waveform groups by double-clicking to add them to the report. At most, six (6) waveform groups can be printed on each page. You can also deselect a waveform group by double clicking it again. The "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. Enter the "Full Disclosure" tab sheet. If full size waveforms 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 Arrh Statistics Results

1. Enter the "Full Disclosure" tab sheet. If full size waveforms are displayed, click the "Compressed" button in the lower right corner of the screen.

2. Click the "Arrh Statistics" button to enter the "Arrh Statistics" menu where you can view the statistics about the HR value and the number of each arrhythmia type that occurred during a specified time range.

3. Click the "Print" button.

Printing Event Lists

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 set up the printing options.

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 *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 12-Lead Analysis Results

1. Enter the "12-lead Review" tab sheet.

2. Click the ▶ icon on the right side of the "Print" button and select "Print Setup" to set the "Time Span".

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 12-Lead Analysis Waveforms

1. Enter the "12-lead Review" tab sheet.

2. Click the "Wave" button after an analysis result is selected.

3. Click the ▶ icon on the right side of the "Print" button and select "Print Setup" to set up the printing options.

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 ST Segment Waveforms

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 Multibed screen and select the desired patient window.

2. Click the drop-down menu button.

3. Click the "Print" to print the displayed waveforms.

Printing 12-Lead ECGs

1. Enter the "12-lead ECG analysis" tab sheet from the monitor.

2. Enter the "ViewBed" tab sheet from the CMS.

3. Select "Show Multi-lead ECG" from the "View" drop-down menu to display the 12-lead ECG waveforms.

4. Select "Print" from the "Function" drop-down menu.

5. In the pop-up dialog box, select "Print Layout".

6. Click the "OK" button.

Printing Multi-Lead ECGs

1. Enter the "ViewBed" tab sheet.

2. Select "Show Multi-lead ECG" from the "View" drop-down menu to display the multi-lead ECG waveforms.

3. Select "Print" from the "Function" drop-down menu.

Printing EEG Waveforms

1. Enter the "ViewBed" tab sheet.

2. Select "BIS Expand View" from the "View" drop-down menu.

3. Click the "Display" button and select "EEG" from the pop-up 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 SvO$_2$/ScvO$_2$ Oxygenation Parameters

1. Enter the "ViewBed" tab sheet.

2. Select and then click SvO$_2$/ScvO$_2$ parameter area.

3. Select the "SvO$_2$" or "ScvO$_2$" tab sheet and click the "Oxygenation Parameters" button.

4. Click the "Print" button from the pop-up dialog box.

Printing Alarm Settings Report

1. Enter "Alarm Setup" screen as per *8.4 Alarm Setup*.

2. Click "Print" button.

Printing on Alarm Report

If a parameter generates an alarm when its alarm switch and print switch are set to "ON", the CentralStation will initiate a real-time alarm printing.

Printing QT Report (Telemetry Only)

When the Telemetry is using Mindray algorithm, the QT report can be printed.

1. Enter the "ViewBed" tab sheet.

2. Select and then click "ECG" parameter area.

3. Click "QT View" button.

4. Click "Print" button.

Printing Paging Assignment

1. Enter the "Paging Assignment" tab as per *13.2 Accessing Paging*.

2. Select "Paging Assignment" tab.

3. Click "Print" button.

Remotely Printing Real-time ECG Waveforms from Bedside

NOTE

- **This function is only applicable when connecting Passport V and Spectrum bedside monitors.**

In the View screen of the bedside monitors, select the "Strip" button. The CentralStation will initiate a real-time waveform printing.

Remotely Printing Graphic or Tabular Trends from Bedside

NOTE

- **This function is only applicable when connecting Passport V and Spectrum bedside monitors.**

1. Enter the Trends screen on the bedside monitor.

2. Select "List Trends" or "Graphic Trends" on the bedside monitor.

3. Click "Print Trend" button. The CentralStation will initiate the printing.

Remotely Printing 12-Lead ECG Waveforms from Bedside

NOTE

● **This function is only applicable when connecting Passport V and Spectrum bedside monitors.**

1. Enter the 12-Lead screen on the bedside monitor.

2. Select "Strip" button on the bedside monitor.

3. Click "Print Trend". The CentralStation will initiate the printing.

11.2.4 Printing Control

By clicking the "System Setup" button and then selecting the "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 printing in the "Print Setup" area on the right side of the sheet.

■ Sweep Speed: select a sweep speed for the waveform from the options of 12.5mm/s, 25mm/s and 50mm/s.

■ 12-Lead Printout Sequence: set the printing mode in 12-lead ECG report.

◆ "Simultaneous": print simultaneous 12-lead ECG data.

◆ "Sequential": The 12-lead ECG data of a certain period is sequentially printed. The period is decided by the print layout setting. For example, when the print layout is set to 6×2+1, the l2 leads are allocated into two columns. The time span of each column is 5 seconds: the first column is 0-5s waveforms; the second column is 5s-10s waveforms. One row of rhythm waveform is located at the bottom.

■ Grid: Select if grid is printed.

You can set up 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 the periodic report print on or off .

- Start Time: set up the start time to print.

- Interval: set up the desired interval.

NOTE

- **If printing fails, restart the printer and press the "Restart Print Service" button to resume.**
- **When a network printer is selected, only printing tasks of the CMS are displayed. The printing tasks of other networks are not displayed.**
- **The option "Scheduled Report Setup" is available in the "Trend Review" tab sheet only when the check box before "Scheduled Report" is selected in the "Printing Control" tab sheet.**

11.3 Save As

The CMS can save the following items as HTML files:

- Graphic trends

- Tabular trends

- Full disclosure

- C.O. review

- Event list review

- Event review

- Drug calculations

- Hemodynamics calculations

- Oxygenation calculations

- Ventilation calculations

- Renal calculations

- 12-lead review

- DSA graph

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 saving, the "YYYY" will be 0001, which will automatically add one (1) every time data is saved.

The saved files can be browsed using 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!" message.

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:

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 trends are currently displayed on the screen, click the "Graphic" button.
3. Click the "Save As" button. A dialog box will be displayed.
4. Select a drive and click "OK". The graphic currently displayed on the screen will be saved to the selected storage disk.

Tabular Trends

1. Enter the "Trend Review" tab sheet.
2. If graphic trends are 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 the start time.**

5. Select a disk driver name and click "OK". The data in the tabular trends will be saved to the selected storage disk.

Full Size Waveform

1. Click the "Full Disclosure" 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 Full Disclosure*.

3. Click the "Save As" button. The "Save As" dialog box will be displayed.

4. Select a drive and click "OK". The waveforms currently displayed on the screen will be saved to the selected storage disk.

Compressed Waveform

1. Click the "Full Disclosure" tab sheet. If full size waveforms are displayed, click the "Compressed" button in the lower right corner of the screen.

2. For operation details, refer to *9.1.3 Full Disclosure*.

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 selected storage disk.

C.O. Review

1. Enter the "C.O. Review" tab sheet.

2. Select the C.O. measurements to be saved per *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 selected storage 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 selected storage 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 selected storage 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.

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.

12-Lead Analysis Results

1. Enter the "12-lead Review" tab sheet.

2. Click the "Save As" button. The "Save As" dialog box will be displayed.

3. Select a disk driver name and click "OK". The 12-lead analysis result list will be saved.

12-Lead Analysis Waveforms

1. Enter the "12-lead Review" tab sheet.

2. Click the "Wave" button after an analysis result is selected.

3. Click the "Save As" button. The "Save As" dialog box will be displayed.

4. Select a disk driver name and click "OK". The 12-lead analysis waveforms will be saved.

DSA Graph

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.

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"
- High level: "Factory Setup"

Certain authority is required if you want to modify some system configurations or execute certain operations. The user with lower authority cannot modify the configuration 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 10 volume levels. You can select one as required. For details, refer to *12.2.3 Alarm - Setting Minimum Alarm Volume* and *8.3 Alarm Volume*.

Draw Waveform Type

There are two options:

■ COLOR: Selecting this option allows you to see smoothed waveforms.

Figure 12-1 Color Drawing

■ MONO: Selecting this option allows you to see unprocessed waveforms.

Figure 12-2 Mono Drawing

Set Display Grid

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

Set Unit

Click the "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	℃, ℉	℃
ECG	ST	mV, mm	mV
Vascular Resistance	SVR/PVR	DS/cm^5, kPa-s/l	DS/cm^5
Oxygenation	Hb	g/dl, g/l, mmol/l	g/dl

Module	Parameter	Options	Defaults
IBP	IBP	mmHg, kPa, cmH2O	mmHg
GAS	CO_2	mmHg, kPa, %	mmHg
	O_2	mmHg, kPa, %	mmHg
Device Intergration	Pressure	cmH_2O, mbar, hpa	cmH_2O
	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 menu. For details, refer to *12.2 Admin Setup*.

Enter Factory Setup

By clicking the "Factory Setup" button and inputting the required password, you can enter the Factory Setup menu. As the "Factory Setup" is intended for use only by manufacturer-designated personnel, no details will be given 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 CMS screen, 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 arrhythmia mark as required.

Procedure

1. Enter the "Color" tab sheet and then select a parameter or Arrh mark whose color you want to change.

2. Click the color box corresponding to the parameter or Arrh 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 "Others" 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" drop-down menu.

3. Click the "Close" button.

NOTE

- **The screen size setting change will take effect after the CMS restarts.**

The CentralStation, WorkStation or ViewStation each can support connecting up to four (4) displays. 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 normal displaying, 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 a display error.

Number of Main Screen

Select a number for the item "Number of Main Screen" to change the displaying mode when the CentralStation, WorkStation or ViewStation is equipped with more than one display. The displays can be set without auxiliary screen, or with only one auxiliary screen.

The display number and configurable main screen number are shown in the following table.

Display Number	Options for Number of Main Screen
2	1, 2
3	2, 3
4	3, 4

Take the two displays as an example.

■ If "1" is selected, there is only one main screen which always displays the multibed screen. 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 the main screen. If you want to view a single bed, the single bed window will be shown in one display; if not, the two screens will both show multibed screen.

Display Layout

If a CentralStation, a WorkStation or a ViewStation is equipped with four displays, select the option of "1×4" or "2×2" for "Display Layout" to change the cursor moving mode.

■ When the four displays are arranged in a line, select "1×4". You can move the cursor from current display to its neighboring diplays, as shown in Figure 12-3.
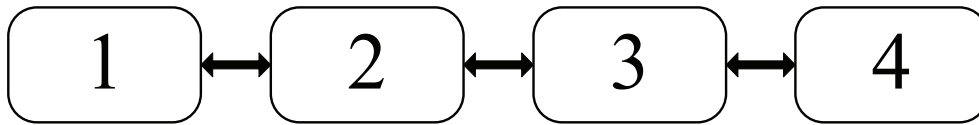
Figure 12-3 Cursor Moving Mode: 1×4

■ When two displays are stacked on the other two displays, select "2×2". You can move the cursor from current display to its neighboring displays, as shown in Figure 12-4.
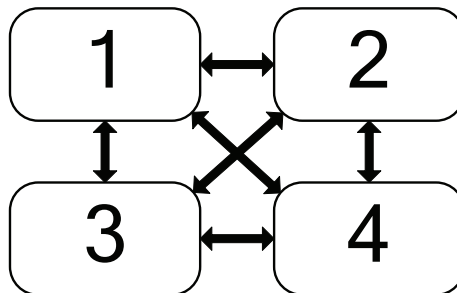
Figure 12-4 Cursor Moving Mode: 2×2

NOTE

- **The display setting changes will take effect 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. By default, the "Patient Name" is selected on the CentralStation and WorkStation, and is deselected on the ViewStation.

- In "Name Displaying Hotkey", you can set the hotkey which can be used to display the name in the first waveform area of the patient window on the multibed screen. The default hotkey is F9. If the check box before "Patient Name" is not selected, the patient's name displays when you press the hotkey, and the name does not display after 30 seconds or when you press the hotkey again.

- In "Change to Idle Sector" (only available on CentralStation), you can configure the switch of setting to an idle sector in multibed screen:

    ◆ If "Enable" is selected, the drop-down list of a "No patient admitted or patient transferred" patient window on multibed screen will display the option "Change to Idle Sector";

    ◆ If "Disable" is selected, the drop-down list of a "No patient admitted or patient transferred" patient window 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 the multibed view window based on your actual needs. The range for the number of rows is 2 to 8, and for the number of columns is 1 to 3. The product of the number of rows and the number 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 columns are selected, you can preview the new layout set on the right side of the screen.

After the number of rows and columns are selected, the settings of the multibed view window layout take effect.

ECG Lead Sequence

You can choose an option from "Standard" and "Cabrera" for "ECG Lead" to set waveform sequence for multi-lead ECG:

■ 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

The default multi-lead ECG sequence is "Standard".

After the ECG lead sequence is set, the waveform sequence will be updated in the following:

■ The display in 12-lead review

■ The realtime display in multi-lead ECG screen

■ 12-lead analysis waveform report

■ 12-lead analysis waveform strip

■ The XML file of 12-lead analysis waveform

■ 12-lead ECG report

■ Multi-lead ECG report

Soft Keyboard

The soft keyboard is to support the CMS configured with touchscreen. The soft keyboard can be set to "On" or "Off".

■ "On" is selected.

◆ A soft keyboard displays when a field that requires an input is selected.

◆ The touchscreen controls are enabled.

■ "Off" is selected.

◆ No soft keyboard displays when a field that requires an input is selected.

◆ The touchscreen controls are disabled.

Touchscreen Calibration

Select this button, and perform the procedures according to the screen prompts to calibrate the touchscreen.

Device Assignment Passport (WorkStation and ViewStation Only)

Accessing the Device Assignment screen on the WorkStation and ViewStation can be password protected.

Select the check box before "Device Assignment Password Protection", a password dialog box will display after selecting the "Device Assignment" system button. You are required to enter the correct password to access the Device Assignment screen. Otherwise, no such password dialog box displays.

Auxiliary Window Setup

Auxiliary window setup allows you to set the tab sheets on the single bed window. The six functional items of patient management, ViewBed, full disclosure, trend review, event review and display setup are fixed to be selected while ST review, 12-lead 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.

Setting Minimum Alarm Volume

The minimum alarm volume level can be set from 1 to 10.

Setting Alarm Audio Mode

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

Setting 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

Setting Simulated Alarm Light

You can switch on/off the simulated alarm light in the Multibed and ViewBed screens. By default, the simulated alarm light is switched on.

- If "On" is selected, the alarm message background will flash.
- If "Off" is selected, the alarm message background will not flash.

Selecting Stored Waveforms (CentralStation Only)

In the "Alarm" tab sheet, you can select the relevant waves stored when alarms occur within 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 three (3) waveforms and record two (2) waveforms for one parameter when an alarm occurs.**
- **Your selections are only effective for later alarms. For already existing 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 a system default trend groups list, a custom trend groups list, and the list of corresponding trend group member parameters. The system provides the following default trend groups: "All", "Standard", "ECG", "GAS", "Hemodynamic", "RM", "BIS", "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 a 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 a 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 (CentralStation Only)

Clicking the "Monitor List" will enter a tab sheet, which lists all the connected monitors in the LAN including the monitors admitted by this CentralStation.

The monitor list does not include the manually connected monitors and CMS protocol monitors. Refer to the monitor's operator's manual for connecting to a CentralStation.

The displayed items are:

■ Monitor name

■ Unit

■ Bed no.

■ IP address

■ Connected status

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 CentralStation.

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 CentralStation's admission of all the monitors.

Admit All Current Unit's Monitors

You can admit all current unit's monitors to this CentralStation 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 Telemetry (CentralStation Only)

If your CentralStation is connected with the telemetry, select the "Telemetry" tab. You can set the following items in an opened tab sheet.

12.2.6.1 Alarm Setup

You can set the following alarm items for telemetry transmitters at the CentralStation.

Alarm Delay

If the alarm-triggered condition disappears within the delay time, the CentralStation does not give the alarm.

You can set telemetry alarm delay time (6 s by default) and ST alarm delay time (30 s by default). After the desired time is set to the alarm delay, the associated physiological alarms include: HR too high, HR too low, SpO_2 too high, SpO_2 too low, PR too high, PR too low, QTc too high, $\triangle$ QTc too high, and SpO_2 Desat.

NOTE

- **The telemetry alarm system delay times are not greater than 10 seconds except for the ST alarm. The least delay time for ST alarm is 30 seconds.**
- **The alarm delay time for the following technical alarms is factory default 5 seconds:**
  - ◆ SpO_2 Sensor Off
  - ◆ SpO_2 Too Much Light
  - ◆ SpO_2 Low Signal
  - ◆ SpO_2 Interference

Alarm Latched

Alarm latching denotes that the audio and visual indicators, associated with an alarm condition, do not automatically stop after resolving the alarm condition. After resolving the condition, it must be acknowledged or the audio and visual indicators continue. The alarm triggered time displays after the alarm messages.

To set "Alarm Latched", you can select one of four options listed below:

- ■ "Off": no alarm will be latched.
- ■ "High Only": the alarms in the high level will be latched.
- ■ "Hi&Med": the alarms in the high and medium levels will be latched.
- ■ "All": all alarms will be latched.

To clear the latched alarm, you can select "Alarm Reset" or "Enter Alarm Paused State" from the "Function" drop-down menu.

Alarm Priority

You can set the "Alm Lev of ECG Lead Off", "Alm Lev of SpO_2 Sensor Off" and "Alm Lev of No RF signal" to "High", "Med" or "Low". The default settings for the three options are as follows:

- ■ "Alm Lev of ECG Lead Off": Low.
- ■ "Alm Lev of SpO2 Sensor Off": Low.
- ■ "Alm Lev of No RF Signal": Med.

Alarm Reset

You can set the duration for the alarm reset. The setting options include: "1 min", "2 min", "3 min", and "Permanence". The default is "Permanence".

Lethal Arrh Off Settings for Arrhythmia Alarms

"Lethal Arrh OFF" can be set for the telemetry monitoring system.

■ If it is set to "Disable", all the lethal Arrhythmia alarms switches are set to "ON" and are unchangeable. The "All Alarms Off" button is inactive.

■ If it is set to "Enable", the switches of lethal Arrhythmia alarms are able to be set. The "All Alarms Off" button is active.

Monitoring Mode Setup

Monitoring mode setup establishes a corresponding connection between the telemetry transmitter and multibed patient sector. The CentralStation provides two monitoring modes:

■ Fixed Monitoring: to establish fixed corresponding connections between the telemetry transmitter and the multibed patient sector. Such corresponding connections are not changed when the patient is discharged. The patient sector displays bed number and serial number of the telemetry transmitter and the bed mark color is not changed. The patient sector displays "No patient admitted or patient transferred".

■ Flexible Monitoring: no fixed corresponding connections are established between the telemetry transmitter and multibed patient sector. The corresponding connections are relieved when the patient is discharged. The patient sector is idle and displays "Idle sector".

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.

Analysis Lead Setup

The CentralStation uses information from two leads to detect beats and to compute heart rate (HR). These two leads are referred to as the primary and secondary leads. For Mortara ECG algorithm, information from an additional lead (analysis lead) is used to classify the beats (normal, abnormal and so on). The user can select any of the available leads (depending on whether a 3 or 5 lead cable is used) as primary, secondary or classification leads.

The ECG lead waveforms displayed in the waveform area are defined as the displaying lead.

You can set whether or not the analysis leads are consistent with the displaying leads by making adjustments in the "Consistent with Displayed Lead" option. For details about different transmitter analysis lead configurations, refer to the telemetry monitoring system operator's manual for details.

Nurse Call and event

There are two options: "Nurse Call and event" and "Nurse Call Audio Mode".

- "Nurse Call and event": enable or disable the nurse call and/or event function for the telemetry transmitters.

  - ◆ "Disable": disables nurse call and event functions.
    For the TMS-6016 transmitter, there are no fields of "Nurse Call" and "Event" in the Patient Mgmt. screen.
    For the TMS60 or Panorama Telepack-608 transmitter, there are no fields of "Nurse Call" in the Patient Mgmt. screen.

  - ◆ "Enable": enables the nurse call and event functions.
    For the TMS-6016 transmitter, the Patient Mgmt. screen displays the "Nurse Call" and "Event" fields.
    For the TMS60 or Panorama Telepack-608 transmitter, the Patient Mgmt. Screen only displays the "Nurse Call" field.

  - ◆ "Event": enables the event function, and the Patient Mgmt. screen displays the "Event" field. This setting is only applied for the TMS-6016 transmitter.

  - ◆ "Nurse Call": enables the nurse call function, and the Patient Mgmt. screen displays the "Nurse Call" field.

- "Nurse Call Audio Mode": sets the nurse call audio mode as "MODE 1", "MODE 2", or "Standard". The default setting is "Standard".

Frequency Setup

You can set or change the IP address and frequency, and view the system information for the telemetry receivers.

For details about different transmitter frequency setup, refer to the corresponding telemetry monitoring system operator's manual for details.

12.2.6.2 Telepack 608

Program

You can program for the Telepack-608 transmitter, and assign a receiving channel for the un-programmed transmitter.

Device Info

Display the device information, such as Device ID, Bad Segment, Bad Packet, and so on for the Telepack-608 transmitter connected to the CentralStation.

12.2.7 Log

Clicking the "Log" tab will enter a tab sheet, which records the operating status of the CentralStation providing a convenient way for service personnel to track and maintain the system. Each log includes occurrence time, log level, and log description.

A total loss of power has no impact on the saved logs. The earlier-recorded logs may be cleared and new logs are added if the log capacity is reached.

Delete

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

Refresh

You can update the logs by clicking the "Refresh" button.

Export

To export the logs:

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 local hard disk, mobile hard disk or USB.
3. The default file name is "cmsXXXX". If it is the first time saving, the "XXXX" will be 0001, which will automatically add 1 every time a 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.

12.2.8 Other

Clicking the "Other" button will enter a tab sheet. The CentralStation, WorkStation and ViewStation include different functions.

12.2.8.1 Shutdown Requires Password

If this option is turned on, you need to input a password before shutting down the system.

12.2.8.2 Change Language

The CMS has multiple languages available, 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 view a list of available languages.

3. Select the desired language. It is recommended to select the ones registered at time of installation and supported by the operating system.

4. Click the "OK" button.

5. If the language you have selected is not supported by the operating system, a message will be displayed.

NOTE

- **If the language you selected is inconsistent with that of the operating system, unrecognizable characters may appear on the CMS. If this occurs, change the operating system language and region settings by following the operating system operator's manual.**

12.2.8.3 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 your change.

4. If the old password you have entered is incorrect or the new password is entered incorrectly, the system will give a prompt message. You can select "OK" to repeat the input procedure.

NOTE

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

12.2.8.4 Time Setup

⚠WARNING

- **Do not change the operating system time if the CMS software is installed.**

NOTE

- **After the CentralStation time is changed, the networked monitor system time will be synchronized to match the CentralStation system time.**
- **When a monitor is connected to the CentralStation, the monitor system time will be synchronized to match the CentralStation system time.**
- **The CentralStation will synchronize the time of the networked monitors at start of every hour.**

The CMS system time can be changed automatically or manually.

Automatically change time:

1. Click the "Time Setup" button, and the dialog box will be displayed.

2. Set "Time Synchronization" to "Master Server" or "NTP Server".

   ◆ "Master Server" :Set the time to synchronize with master server.

   ◆ "NTP Server": Set the time to synchronize with NTP server. Input master time server IP and second time server IP.

3. Click "OK".

Manually change time:

1. Click the "Change Time" button, and the dialog box will be displayed.

2. Set "Time Synchronization" to "Manual".

3. Adjust the "Set System Time" setting by selecting the date and time field and entering the number, or by clicking the drop-down arrow and selecting a date or time from the table.

4. Click "OK".

12.2.8.5 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 should be within 8 characters.**

12.2.8.6 Communication Settings

Refer to *12.3 Communication Settings* for details.

12.2.8.7 Remote Control Settings (CentralStation and WorkStation Only)

CentralStation

In Remote Control Settings menu on the CentralStation, you can make the following settings. By default, all are deselected.

■ Alarm Setup: select or deselect the checkbox before "Alarm Setup" to switch on or off remote alarm setup. If the checkbox is selected, you can remotely change the settings of activation state, alarm priority, alarm high/low limit, Arrh threshold, Apnea alarm time and Desat limit of the monitor. If the checkbox is not selected, you can not change those settings on the CentralStation.

■ Alarm Paused & Alarm Reset: Select the checkbox before "Alarm Paused & Alarm Reset" to switch on/off alarm paused or alarm reset function. If the checkbox is selected, you can remotely control the alarm pause or alarm reset of the bedside monitors on the CentralStation. The corresponding controls are available in the drop-down menu of the spot patient window and the "Function" drop-down menu of ViewBed screen are active. If the checkbox is not selected, you cannot use those functions.

■ 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 the spot patient window. If it is not selected, you cannot use this function. The corresponding control is unavailable in the drop-down menu of the 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 the spot patient window. If it is not selected, you cannot use this function. The corresponding control is unavailable in the drop-down menu of the spot patient window.

NOTE

- **When the CentralStation restarts, the "Alarm Setup", "Alarm Paused & Alarm Reset", "Privacy Mode" and "Night Mode" checkboxes remain the same as when the CentralStation was last turned off.**

WorkStation

In the Remote Control Settings menu on the WorkStation, you can select the check box before each function and then remotely control the corresponding functions of the bedside monitors. If the checkbox is not selected, you cannot use the function on the Work Station:

- Patient Mgmt
    - ◆ Patient Info
    - ◆ Discharge
    - ◆ Standby
- Alarm Paused & Alarm Reset
    - ◆ Alarm Paused
    - ◆ Alarm Reset
- NIBP Measurement
    - ◆ Start/Stop NIBP Measurement
    - ◆ Interval
    - ◆ Clock
- Night Mode & Privacy mode
    - ◆ Night Mode
    - ◆ Privacy Mode
- Parameter Alarm Settings
    - ◆ Activation State
    - ◆ Alarm Priority
    - ◆ Alarm Limit
    - ◆ Apnea Delay
    - ◆ Sat-Seconds
- Arrhythmia Alarms
    - ◆ Activation State
    - ◆ Alarm Priority
    - ◆ Arrh threshold
- Pacer Settings

◆ Pacer Rate

◆ Pacer Reject

■ Define ST point

■ ECG Learning

NOTE

- **When the WorkStation restarts, the "Alarm Setup", "Alarm Paused & Alarm Reset", "Privacy Mode" and "Night Mode" checkboxes remain the same as when the WorkStation was last turned off.**

12.2.8.8 Patient Location Setting (CentralStation and WorkStation Only)

The patient window and ViewBed screens can display the patient location when the bedside device is in Standby mode. The available locations include:

■ Unspecified

■ Cathlab

■ X-Ray

■ MRI

■ CI scan

■ Ultrasound

■ Hemodialysis

■ OR

■ Therapy

By default, the patient window and ViewBed screens display "Not Specified" when the device is in Standby mode.

In the Patient Location Setting screen, after selecting one location, you can:

■ Click the "Delete" button to delete this location.

■ Click the "Move Up" button to move the location up in the list.

■ Click the "Move Down" button to move the location down in the list.

■ Click "Modify" button to modify a location.

In the Patient Location Setting screen, you also can:

■ Click the "Default" button to restore the default patient location list.

■ Click the "Add" button to add a location in the list.

12.2.8.9 Auto Shrink Database (CentralStation Only)

Auto shrink database provides the ability to clear up the invalid data in the database and release storage space. The system requires database shrinking daily. The default time of auto database shrink is set to zero hour (00:00:00). You can set it to another desired time to suit your needs.

To set the auto shrink database:

1. Click the "Auto Shrink Database" button.

2. Input the preset time for auto database shrink.

3. Click "OK".

12.2.8.10 Paging Settings (CentralStation Only)

■ Paging Delay: Select it to set the paging delay time. The default setting is 10 seconds.

■ Paging Demographics: Select it to set the degmographic data type sent to the pager. The options include Bed No., Bed No. + Last Name, or Bed No. + Patient ID. The default setting is Bed No.

■ Paging switch: Select it to switch on/off the paging function. The default setting is On.

■ Paging Password Protection: Select it to switch on/off the password requirement to enter the paging window. The default is On.

12.3 Communication Settings

In the Communication Settings screen, you can set the current CentralStation's communication with bedside devices, monitoring network, other CentralStations or eGateway.

To access the Communication Settings menu, select the "Others" tab, and then the "Communication Settings" button.

NOTE

● **Settings in the "Communication Settings" menu should not be changed, except by trained Service Personnel.**

12.3.1 Network Setup

Central Monitoring Network Settings

To set up the communication between a CMS and the master server, you need set the following:

■ Master Server IP Address: Enter the IP address of a CentralStation which is used as the master server.

■ Local IP address: In the drop-down list, select current CMS' IP address which is for communication between the CentralStation and external systems, such as Gateway, WorkStation, ViewStation, emote CentralStations.

Bedside Monitoring Network Settings (CentralStation Only)

To set up the communication between a CentralStation with the bedside devices, and to set data sending mode, you need set the following:

■ IP Address: In the drop-down list, select the IP address of the CentralStation network adapter which is for internal communication between the CentralStation and beside monitors.

■ CMS Sending Broadcast Data: This function is used when you view telemetry data on the bedside monitor. For the bedside monitor which only supports broadcast mode, you must select the check box before "CMS Sending Broadcast Data" to use this function.

Multicast Setup

You can set up the multicast IP address and TTL value used for the following multicast communications:

■ Between CentralStation and the bedside device.

■ Betweeen CentralStations.

■ From CentralStation to WorkStation, ViewStation and CMS Viewer.

12.3.2 CentralStation Authorization (CentralStation Only)

Each CentralStation can be configured to specify the following access types of WorkStation, ViewStation and CMS Viewer:

■ Full Control: The WorkStation, ViewStation and CMS Viewer, based on their corresponding read-write functions, are given full controls on this CentralStation.

■ Read Only: The WorkStation, ViewStation and CMS Viewer can view this CentralStation.

■ Off : The WorkStation, ViewStation and CMS Viewer cannot access this CentralStation.

Access to the CentralStation can be password protected by selecting the check box before "Requires password to access this CentralStation".

- When you select it for the first time, a password setting dialog will display.

- When you select it at other times, a "Modify Password" button will display. Select this button to change the password.

12.3.3 Bed Authorization (CentralStation Only)

By selecting the checkbox before the monitor name, you can authorize the corresponding bed on the current CentralStation to be viewed by Gateway/eGateway, CMS Viewer, another CentralStation, WorkStation or ViewStation.

Refresh

You can update the list by clicking the "Refresh" button.

12.3.4 CentralStation Connection

There may be multiple CentralStations in the BeneVision monitoring network. These CentralStations are listed in the CentralStation Connection screen with their names, IP addresses, and connected statuses. If a CentralStation is connected, your current station (CentralStation, WorkStation or ViewStation) has authorized access to this CentralStation. Refer to *12.3.2 CentralStation Authorization (CentralStation Only)* for the access type.

To connect a CentralStation:

1. Select a CentralStation (except the current CentralStation) in the list.

2. Select "Connect" button. If access to the selected CentralStation requires a password, a password dialog box will display.

3. Enter the required password. If the CentralStation is connected, the "Connect Status" for the selected CentralStation displays as "Connected".

Refresh

You can update the list by clicking the "Refresh" button.

12.3.5 Gateway Communication Setting (CentralStation Only)

The CentralStation can be configured with Gateway or eGateway to communicate with other hospital systems.

NOTE

- **Settings in the "Gateway Communication Setting" tab should not be changed, except by trained Service Personnel.**

Gateway

When the CMS is configured with Gateway, the Gateway communication setting menu provides seven tabs which are Networking Status, Network Setup, Authorization Setup, Results Service, ADT Service, Comm. View, and Log View. For more information about the functions, refer to *Mindray Patient Data Share Solution Guide*.

eGateway

You can configure the settings when the CentralStation communicates with the eGateway.

Transmit Data to eGateway

The options are "Enable" and "Disable".

- When "Enable"is selected, the CentralStation data can be sent to the eGateway.

- When "Disable" is selected, the CentralStation data cannot be sent to the eGateway. All items in "Gateway Communication Settings", "ADT Query Setup" and "Data Export Setup" are grey, and the CentralStation does not communicate with eGateway.

Gateway Communication Settings

You can set the CentralStation's communication mode with the eGateway:

- If "Multicast" is selected, the CentralStation communicates with eGateway in multicast mode.

- If "Unicast" is selected, the CentralStation communicates with the specified eGateway in unicast mode. "IP Address" will be the eGateway address, and the "Port" setting will be consistent with that set in eGateway.

ADT Query Setup

When "ADT Query" is set to "Enable", the "IP Address" and "Port" can be edited. "IP Address" will be the eGateway address, and the "Port" setting will be consistent with that set in eGateway.

NOTE

● **The "Obtain Patient Information" button is available on the patient management screen only when**〝**ADT Query**〞**is set to "Enable".**

Data Export Setup

■ Export Waveform Data: When configured to "Enable", the button "Export to EMR" will be displayed on the "Full Disclosure" (full size waveform view) and "Event Review" sheets. The waveform or event can then be exported to other systems. When configured to "Disable", the waveform or event cannot be exported to other systems.

■ Export 12-Lead ECG Report: When configured to "Enable", the CentralStation will receive the 12-lead ECG analysis result from the bedside monitor. The CentralStation will then automatically generate a 12-lead ECG report, and send the report to other systems. When configured to "Disable", the report will not be generated.

■ Input multicast IP address and port. "IP Address" will be the eGateway address, and the "Port " setting will be consistent with that set in eGateway.

The sampling characteristics of ECG waveforms are:

■ Sampling frequency: export in full disclosure and event review：80 Hz; export in 12 lead analysis review: 256 Hz

■ Sampling amplitude resolution: 19.5313 uV/LSB

■ Significant bits: 8 bits

FOR YOUR NOTES

13 Paging

13.1 Overview

The CentralStation has integrated a Paging interface using protocol TAP1.8. The Paging acquires patient physiological alarms data from the bedside or the telemetry, and relays it to the clinician-worn pager.

⚠WARNING

- **The CentralStation provides a paging interface to allow a third-party paging system to be connected. The third-party paging system may not provide visual or auditory alarm indicators, and a delay within the third-party paging system may occur. Therefore, do not rely on the third-party paging system only. Also pay close attention to the BeneVision Central Monitoring System or monitoring devices.**

NOTE

- **You can set which alarms of an individual patient are sent to the pager. Refer to *8.4.2 Alarm Setup Window*.**

13.2 Accessing Paging Window

To access the paging window:

1. Select the "Paging" button in the system button area. If a password is required, the "Enter Password" dialog box will pop up.

2. Enter the required password.

NOTE

- **Paging can be password protected. Refer to *12.2.8.10 Paging Settings* for enabling/disabling the password requirement.**

13.3 Basic Operations

13.3.1 Adding a Pager

To add a pager:

1.   Select the "Pager Assignment" tab.

2.   Select the "Add" button. The "Pager Details" dialog box will pop up.

3.   Select the "Pager Number" field, and enter the pager number.

4.   Select the "Pager Assignment" field, and enter the name of the person who will be responsible for the pager or some other identifying information.

5.   Select "Ok". The pager with number and assignment will display in the pager list.

NOTE

● **Pager numbers and assignments must be unique.**

13.3.2 Assigning an Existing Bed to a Pager

To assign an existing bed to a pager:

1.   Select the "Pager Assignment" tab.

2.   From the pager list, select a pager.

3.   From the bed list, select a bed, and then select the "Assign" button. The assigned bed will appear under the pager in the pager list.

NOTE

● **A bed can be assigned to more than one pager.**

13.3.3 Assigning a New Bed to a Pager

If a bed currently is not available in the bed list, you can add and assign the bed to a pager:

1.   Select the "Pager Assignment" tab.

2.   From the pager list, select a pager.

3.   Select the "Add and Assign" button. A dialog box will pop up.

4.   Enter the bed No.

5.   Select "Ok".

NOTE

● **A bed can be assigned to more than one pager.**

13.3.4 Removing a Bed Assignment

To remove an existing bed assignment from a pager:

1. Select the "Pager Assignment" tab.

2. From the pager list, select the assigned bed under a pager.

3. Select the "Unassign" button.

13.3.5 Editing a Pager

To edit an existing pager number or pager assignment:

1. Select the "Pager Assignment" tab.

2. From the pager list, select the pager to be edited.

3. Select the "Edit" button. The "Pager Details" dialog box will pop up.

4. Edit the pager information.

5. Select "Ok".

13.3.6 Removing a Pager

To remove a pager:

1. Select the "Pager Assignment" tab.

2. From the pager list, select the pager to be removed.

3. Select the "Delete" button. A prompt "Are you sure you want to delete this pager and all its assignments?" is displayed.

4. Select "Ok".

13.4 Resending a Failed Page

If an attempt to send a page was unsuccessful, the page will be added to the Failed Page tab sheet. The "Failed Page" screen contains a list of failed pages. The failed pages are shown chronologically in descending order.

To resend a failed page:

1. Select the "Failed Page" tab.

2. Select a failed page from the list box.

3. Select the "Resend" button. The failed page is resent and the row is removed from the list box if the page was successfully resent. If the page was not successfully resent, a new row will be added to the top of the Failed Page list with an updated date and time.

If the failed pages are not necessary, you can select the "Delete" button to delete an individual page, or select "Delete All" to delete all the pages on the tab sheet.

14 Remote CMS

14.1 Overview

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

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

⚠WARNING

- **In the Remote CMS window, no audio alarms are provided for the viewed CentralStation.**

NOTE

- **One CentralStation can be viewed by a maximum of 16 CMS Viewers or other CentralStations simultaneously.**

14.2 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.
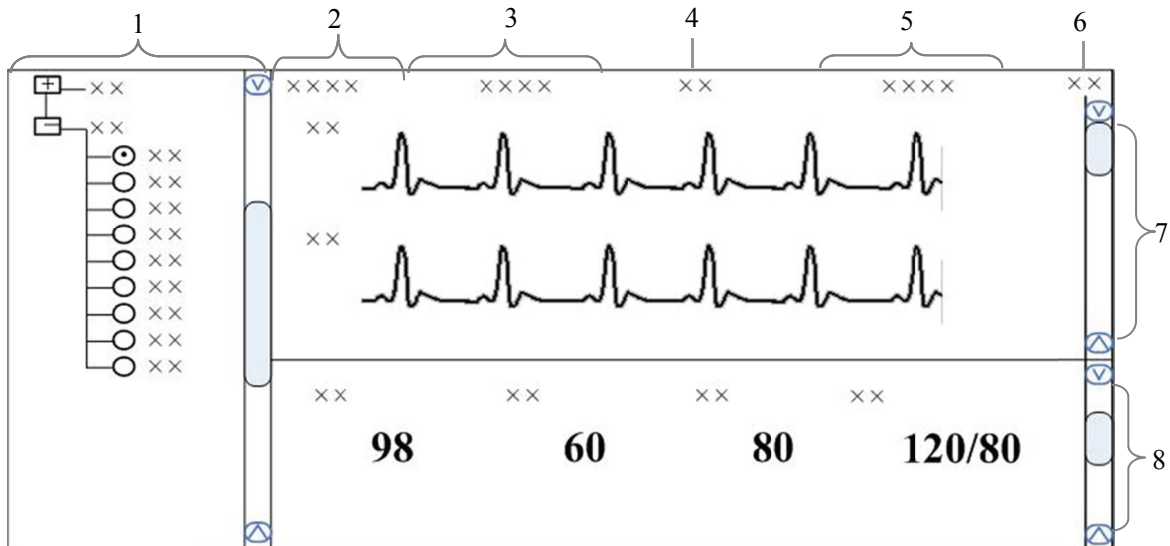
1. Beds list	2. Patient information area	3. Physiological alarm area
4. Alarm icon area	5. Technical alarm area	6. Button area
7. Waveform area	8. Parameter area	

Figure 14-1 Remote CMS Viewbed Screen

14.2.1 Beds List

The beds list displays the information about all CentralStations and networked bedside devices (target bed) in the same network segment of a LAN.

When the "Remote CMS" screen is accessed, the CentralStation will automatically list other CentralStations which can be operated remotely. Only when the CentralStations' IP addresses are added in the "CentralStation Connection" menu, will the names of the corresponding CentralStations be automatically displayed in the list.

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

You can select the target monitoring device 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 monitoring device.

- White: indicates no alarm on the target monitoring device.

- Red: indicates a high level alarm, nurse call or event on the target monitoring device.

- Yellow: indicates a medium level alarm on the target monitoring device.

- Cyan: indicates a low level alarm on the target monitoring device.

- Grey: indicates that the target monitoring device is in standby status.

- Light Grey: indicates that the target monitoring device is offline.

14.2.2 Physiological Alarm Area

This area displays physiological alarm messages and relevant text coming from the viewed target monitor. The display rule is the same as that in the physiological alarm area of the patient window. Please refer to *6.3.3.5 Physiological Alarm Area.*

Different background colors are used to indicate the alarm priorities.

- Red: indicates a high level alarm on the target monitoring device.

- Yellow: indicates a medium level alarm on the target monitoring device.

- Cyan: indicates a low level alarm on the target monitoring device.

14.2.3 Technical Alarm Area

This area displays technical alarm messages or prompt messages circularly coming from the viewed target monitoring device. The display rule is the same as that in the technical alarm of the patient window. Please refer to *6.3.3.4 Technical Alarm Area.*

14.2.4 Alarm Icon Area

This area displays icons for alarm pause , alarm off , and alarm reset . Please refer to *6.3.3.3Alarm Icon Area*.

NOTE

- **In the Remote CMS window, only the alarm messages coming from the target monitoring device will be displayed.**

14.2.5 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.

14.2.6 Waveform Area

This area displays the waveforms on the target monitoring device.

14.2.7 Parameter Area

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

14.3 Remote CMS Review

In the Remote CMS window, there is "Full Disclosure" tab, "Trend Review" tab, "Event Review" tab, "ST Review" tab, "12-lead Review" tab and "C.O. Review" tab. Select a tab to 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*.

14.4 Network Setup and Authorization

If your CentralStation needs to implement the Remote CMS function on another CentralStation, the following configurations are required:

■ In the "Communication Setting" menu of your CentralStation, connect the CentralStation to be viewed in the "CentralStation Connection" tab sheet. Refer to *12.3.4 CentralStation Connection* for details.

■ In the "Communication Setting" menu of another CentralStation, authorize itself and its beds viewed by the other CentralStation. Refer to *12.3.2 CentralStation Authorization (CentralStation Only)* for central authorization, and *12.3.3 Bed Authorization (CentralStation Only)* for bed authorization.

15 Database Backup and Recovery

15.1 Overview

The CentralStation provides database backup and recovery.

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

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

By operating the CentralStation

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 CentralStation 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 CentralStation.**

When the CentralStation fails to log into the database

The CentralStation will automatically log into the database when it starts. If it fails to log into the database, a message box will pop up. Click the "Restart" button to restart the CentralStation; 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.

15.2 Backup Database

15.2.1 Select Operation Type

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

15.2.2 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.

15.2.3 Backup Database

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

If the database backup times out or an abnormal condition occurs during the 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 a USB disk, the old one will not be deleted.

15.3 Recover Database

⚠CAUTION

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

NOTE

- **If the CentralStation cannot start normally due to a database error resulting an abnormal shutoff or improper operation, recover the database.**

15.3.1 Select Operation Type

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

15.3.2 Select Path

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

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

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

15.3.3 Recover Database

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

If the database recovery times out or an abnormal condition occurs during the database recovery, a message will be presented.

15.4 Rebuild Database

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

NOTE

- **All the data in the current database will be deleted during rebuilding of the database.**
- **All alarm settings previously saved will be lost and will have to be manually restored.**

15.5 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.

15.6 Exit Database Backup and Recovery

When you exit the "Database Backup and Recovery" program, the CentralStation will start automatically.

16 System Help

16.1 Overview

The CMS features a webpage-like on-line help to assist in obtaining a better understanding of the system. Click the "Help" menu to enter the help screen.

There are three icons on the 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, etc.

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 the 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 the monitoring functions of each parameter module, such as ECG, SpO_2, etc.

FOR YOUR NOTES

A Technical Specifications

A.1 Requirements

The computer of the CMS should be highly reliable and stable. The recommended configurations are as follows:

Components	Requirements
System	Meet the IEC60950 requirements defined for ITE equipment, and comply with CE low voltage directives (LVD) and EMC directives.
Host	**CentralStation:** 4 cores and 2.9 GHz minimum 4GB minimum memory 500 GB minimum hard disk, support data redundancy by dual hard disks 100M (minimum) self-adapting, Ethernet 802.3 Two or more USB ports One or more serial ports **WorkStation and ViewStation:** 2 cores and 2.0 GHz mininum 2GB minimum memory 280 GB minimum hard disk 100M (minimum) self-adapting, Ethernet 802.3 two 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$^®$ 7 Professional Embedded SP1 (32 bits)
Antivirus	Support Solidcore S3 Control
Graphic card	Support dual or multiple displays.
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 IEC 60601-1-8.

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 Accuracy: ±10%
Interface	RS232 interface
Width of the recorder paper	50 mm

A.3 Audio Signals

Alarm tone	600 Hz, ISO pattern
Self-test tone	650 Hz, a short beep
Alarm volume adjusting tone	650 Hz, a short beep
Event tone	A long tinkle
Nurse call tone	Three beeps

A.4 Wired Network

Network structure	Ethernet 802.3
Transmission rate	10/100 Mbps
Network interface	RJ45
Max alarm time delay	≤ 3s

A.5 Review

Dynamic short trend	4 hours
Trend review	240 hours
Full disclosure	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

Historic review	Over 1000 discharged patients' data
12-lead Review	720 12-lead analysis results, 12 analysis waveforms for each analysis result
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 media	mobile hard disk, flash drive
Contents	Graphic/table, full disclosure, C.O. measurements, event review, drug calculations, hemodynamics calculations, oxygenation calculations, ventilation calculations, renal calculations, 12-lead Review and DSA graph

A.8 Display

Sweep speed	6.25 mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s Accuracy: ±10%

A.9 Print

Print paper	A4 or Letter
Sweep speed	12.5 mm/s, 25 mm/s, 50 mm/s Accuracy: ±10%
Contents	Patient information, Graphic/table, full disclosure, waveform segment report, C.O. measurement, events, drug calculation, hemodynamic calculations, oxygenation calculations, ventilation calculations, renal calculations, 12-lead Review, ST waveforms, real-time report, 12-lead ECG report, multi-lead ECG report, Arrh statistics result, EEG report, ICG report, CCO report, $SvO_2/ScvO_2$ report, alarm settings report, real-time alarm report, QT report, paging assignment report.

A.10 Record

Contents	Patient information, full disclosure, C.O. measurement, events, drug calculation, hemodynamics calculations, oxygenation calculations, ventilation calculations, renal calculations, real-time waveform recoding, real-time alarm recording, 12-lead Review, ST review, ICG hemodynamic parameter, CCO hemodynamic parameter, $SvO_2/ScvO_2$ oxygenation parameters

A.11 Data Export

Data format	Standard xml file [1]	
Protocol	Windows CIFS [2]	
ECG waveform sampling characteristics	Frequency:	Export in full disclosure and event review: 80 Hz Export in 12 lead analysis review: 256 Hz
	Amplitude resolution:	19.5313 uV/LSB
	Significant bits:	8 bits

[1]: For more information, please contact Mindray.

[2]: The CIFS protocol is from Windows Operating System.

B CMS Alarms

The CMS technical alarms displayed in the system alarm area on the upper screen are shown in the table below.

Alarms	Level	Cause or solution
Printer is out of toner	Low	Install the toner.
Printer is offline	Low	Connection between printer and computer may have a 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 Not Available	Med	Restart the recorder.
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 CentralStation.
No bed is online. Please check network connection.	High	This alarm is only available on the CentralStation. Check whether the patient monitor is connected to the network.
Database service is abnormal. Please restart CMS or contact the service representative.	High	Database service has an error. Restart the CentralStation to restore database service or contact the service personnel.
The patient storage space is nearly full. Please delete some discharged patients.	Med	This alarm is only available on the CentralStation. The discharged patient storage space is nearly full. Please delete some discharged patients.
Communication lost	Low	Check the connection between WorkStation/ ViewStation and the CentralStation.
Pager communication lost	Low	Check the paging network.

The CentralStation alarms displayed in the patient window's technical alarm area are shown in the table below.

Alarms	Level	Cause and solution
Offline	Low	The bedside monitor is disconnected from the CentralStation network. Please check.

C Units, Symbols, Terms and Formulas

C.1 Units

BPM	beats per minute
℃	centigrade
cc	cubic centimeter
cm	centimeter
cmH_2O	centimeter of water
dB	decibel
℉	Fahrenheit
g	gram
GB	giga bytes
GTT	gutta
hr	hour
hPa	hectopascal
Hz	hertz
"	inch
k	kilo
kg	kilogram
kPa	kilopascal
l	liter
lb	pound
m	meter, minute
M	mega
MB	mega bytes
mbar	millibar
MHz	mega hertz
mcg	micrograms
mEq	milli-equivalents
mg	milligrams
min	minute
ml	milliliter
mm	millimeters
mmHg	millimeters of mercury
ms	millisecond
RPM	respiration 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	Anesthesia gas
ART	Arterial
ATMP	Atmospheric pressure
AP MAP	Mean artery pressure
AUX	Auxiliary
AVF	Left foot augmented lead
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 function index
CH	Channel
C.I.	Cardiac index
C.O.	Cardiac output
CCO	Continuous cardiac output
CO_2	Carbon dioxide

ABBREVIATION	DEFINITIONS
Compl	Compliance
CPI	Cardiac power index
CPO	Cardiac power output
CPU	Central processing unit
CRT	Cathode ray tube
Cr	Creatinine
Cstat	Static compliance
CVP	Central venous pressure
DES	Desflurane
D, DIA	Diastolic
dPmx	Left ventricular contractility
DO_2	Oxygen delivery
DO_2I	Oxygen delivery index
ECG	Electrocardiograph
EDV	End-diastolic volume
EE	Energy expenditure
EEC	European Economic Community
EMC	Electromagnetic compatibility
EMG	Electromyograph
EMR	Electronic Medical Record
ENF	Enflurane
Et	End-tidal
EtAA	End-tidal anesthetic agent
EtAA 2nd	2nd Exp. Agent
EtDes	End-tidal desoflurane
EtSev	End-tidal sevoflurane
EtEnf	End-tidal enflurane
EtIso	End-tidal isolurane
EtHal	End-tidal haloflurane
$EtCO_2$	End-tidal carbon dioxide
EtN_2O	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

ABBREVIATION	DEFINITIONS
FiAA 2nd	2nd Insp. Agent
$FiCO_2$	Fraction of inspired carbon oxygen
FiN_2O	Fraction of inspired nitrous oxide
FiO_2	Fraction of inspired oxygen
FiDes	Inspired desoflurane
FiSev	Inspired sevoflurane
FiEnf	Inspired enflurane
FiIso	Inspired isoflurane
FiHal	Inspired haloflurane
fmand	Mandatory breathing frequency
FRC	Fractional residual capacity
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	Hematocrit
HR	Heart Rate
IBP	Invasive brood 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
$\triangle$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 artrial pressure
LCD	Liquid crystal display

ABBREVIATION	DEFINITIONS
LVD	Low voltage directive
M, Mean	Mean pressure
Mac, MAC	Minimal alveolar concentration
%MinVol	Percentage of minute volume to be delivered
MV	Minute volume
MVe	Expiratory minute volume
MVLEAK	Leakage minute volume
N_2O	Nitrous oxide
N_2O cyl.	N_2O cylinder pressure
N_2O Flow	N_2O flow
N/A	Not applied
NIBP	Noninvasive blood pressure
NIF	Negative inspiratory force
O_2	Oxygen
ΔO_2	Difference between inspiratory and expiratory O_2
O_2CI	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
PaO2	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
PEEP	Positive end-expiratory pressure
PEEPi	Intrinsic positive end-expiratory pressure
PEEPtot	Total PEEP
PEF	Peak expiratory flow
Phigh	Upper pressure level
PIF	Peak inspiratory flow
Pinsp	Pressure control level of inspiration
PIP	Peak inspiratory pressure

ABBREVIATION	DEFINITIONS
PLETH	Plethysmogram
Plimit	Pressure limit level
Plow	Lower pressure level
Pmax	Maximum airway pressure
Pmean	Mean pressure
Posm	Plasma Osmolality
Ppeak	Peak pressure
Pplat	Plateau pressure
PPV	Pulse Pressure Variation
PR	Pulse rate
PTP	Pressure time product
PS/2	Personal System/2
Psupp	Pressure support level
P-Trigger	Inspiratory trigger level(pressure trigger)
PVC	Premature ventricular contraction
PVPI	Pulmonary vascular permeability index
Ramp	Ramp
RAP	Right atrial pressure
RAW	Airway resistance
RCexp	Expiratory time constant
RCinsp	Inspiratory time constant
Re	Expiratory resistance
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
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
TB	Temperature of blood

ABBREVIATION	DEFINITIONS
TCP/IP	Telecommunication Control Protocol/Internet Protocol
$tcpCO_2$	Transcutaneous carbon dioxide partial pressures
tcpO2	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
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	Urine 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_2I	Oxygen Consumption Index
VT	Tidal volume
VTapnea	Apnea tidal volume
VTe/TVe	Expiratory tidal volume
VTe spn	Spontaneous breathed minute volume
VTi/TVi	Inspiratory tidal volume
VTsigh	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 ×（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 ×（PA MAP － PAWP）/ C.O.
PVRI (DS m^2/cm^5)	Pulmonary Vascular Resistance	PVR × BSA
LCW (kg-m)	Left Cardiac Work	0.0136 × AP MAP × C.O.
LCWI (kg–m/m^2)	Left Cardiac Work Index	LCW / BSA
LVSW (g-m)	Left Ventricular Stroke Work	0.0136 × AP MAP× 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 ×（ATMP － 47）－ PaCO$_2$ ×（FiO$_2$ / 100 ＋ (1－ FiO$_2$ / 100) / RQ)
AaDO$_2$ (mmHg)	Alveolar-arterial Oxygen Difference	PAO2 － PaO$_2$
Pa/FiO$_2$ (mmHg)	Oxygenation Ratio	100 × PaO$_2$ / FiO$_2$
a/AO2 (%)	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 (%)	Physiological 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	Uosm / Posm
BUN/Cr	Blood Urea Nitrogen Creatinine Ratio	1000 × BUN / Cr
U/Cr	Urine-Serum Creatinine Ratio	Ucr / Cr

Oxygenation Calculations

Abbreviation and Unit	Description	Formula
VO2 calc (ml/min)	Calculated Oxygen Consumption	C(a-v)O$_2$× C.O.
C(a-v)O$_2$ (ml/L)	Arteriovenous Oxygen Content Difference	CaO$_2$ － CvO$_2$
O$_2$ER (%)	Oxygen Extraction Ratio	100×C(a-v)O$_2$/ CaO$_2$
DO$_2$ (ml/min)	Oxygen Transportation	C.O. × CaO$_2$
PAO$_2$ (mmHg)	Alveolar Oxygen Level	FiO$_2$ / 100 ×（ATMP － 47）－ PaCO$_2$ ×（FiO$_2$ / 100 ＋ (1－ FiO$_2$ / 100) / RQ)

AaDO₂ (mmHg)	Alveolar-arterial Oxygen Difference	$PAO_2 - PaO_2$
CcO₂ (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	$VO2 / (CaO_2 - CvO_2)$

FOR YOUR NOTES