Taurus E®Multi-parameter Patient Monitor

Operator’s Manual

Northern Meditec Limited

Notice

Thanks for purchasing TAURUS® Multi-parameter Patient Monitor.

Before operating, please read this Manual carefully to ensure proper use.

Please keep this Manual properly for future reference.

Product Name:	Patient Monitor
Model:	**Taurus E®**
Structure and Components:	The monitor consists of master unit, display, ECG cable, SpO2 probe, blood pressure cuff, and temperature probe.
Scope of Application:	Monitors patient ECG, respiration (RESP), blood oxygen saturation (SpO2), pulse rate (PR), noninvasive blood pressure (NIBP), and temperature (TEMP) as well as displays, reviews and stores the monitoring information.

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Statement

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- Assembly, expansion, re-adjustment, improvement and repair should only be performed by qualified personnel approved by Northern;
- All the replaced parts and supported accessories and consumables relate to the maintenance shall be originally from Northern or others approved by Northern;
- The electrical equipment complies with relevant standards and the requirements of this Manual;
- The product is operated in accordance with this Manual.

Warranty and Maintenance Services

The warranty period is 2 years for this product and 1 year for the main accessories. The main accessories include: blood oxygen probe and extension cable, ECG cable, blood pressure cuff and catheter, temperature probe, power cord, stent, and ground wire. Consumables are disposable materials that should be replaced after each use or wearing parts that should be replaced periodically. The consumables are not covered by warranty.

The warranty period is counted from the "Installation Date" filled in the Warranty Card, which is the only certificate to check the period of warranty. To protect your rights, please urge your installation personnel to send the second copy of the Warranty Card to Northern within 30 days from the date of installation; if the Warranty Card for the product purchased is not sent to Northern on time, the warranty period will be calculated after 45 days from the "Delivery Date" marked on the packing box.

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- The product is used in accordance with the Operator's Manual.
- Product installation, repair and upgrade are carried out by personnel approved or authorized by Northern.
- The storage, operating and electrical environment meets product specifications.
- The S/N label or manufacturer logo of the product is clearly visible, and it is identified and confirmed that the product is manufactured by Northern.
- The damage is caused by non-human factors (human factors include accidentally dropping, sabotage, etc.).

The products that meet the warranty regulations can enjoy free service, and the products beyond the scope of the warranty will be charged for service. The freight (including customs fees) for transport of this product to Northern for maintenance is assumed by the user. For the maintenance due to any reason other than the abovementioned causes, Northern will charge for service, and the user needs to pay additional costs for maintenance and parts.

When the warranty expires, Northern will continue to provide charged maintenance services.

If you do not pay or delay the payment of maintenance fees, Northern will suspend the repair services until you pay up.

Preface

Notice

This Operator's Manual is the necessary instructions for the safe use of this product. This Manual introduces the use, properties, method of operation, safety information and intended use of the TAURUS E Multi-parameter Patient Monitor in details. Before using the product, please carefully read and understand the contents of this Manual, and abide by the method of operation stated in this Manual in order to ensure the safety of patients and operators.

This Operator's Manual is a major component of the product, and should always be placed near the product for easy reference.

Object of Application

This Operator's Manual is intended for professional clinical staff or personnel with experience in the use of monitoring equipment. The readers should have knowledge and work experience in medical procedures, practices and terminology of patient monitoring.

Illustration

All the illustrations in this Operator's Manual are for reference only. The menus, settings and parameters of the illustrations may be different from the monitor.

Convention

- [Character]: Used to represent the string in the software or characters on the interface.
- →: This symbol is used to indicate operation step.

Content

Chapter1 Safety

1.1 Safety Information

⚠ Danger

- **A warning that alerts you to a potential serious outcome, adverse event or safety hazard. Failure to observe a warning may result in serious injury or death to the user or patient.**

⚠ Warning

- **Alerts you to potential hazard or unsafe operation. Failure to avoid such hazard or operation may result in minor or moderate personal injury or damage to the product or other properties, and possibly in a remote risk of more serious injury.**

⚠ Caution

- **In order to safely use the device continuously, it is required to comply with the instructions listed. The instructions listed in this Manual are not substitute for the medical procedure being performed.**

Note

- **Emphasize important considerations, and provide a description or explanation in order to make better use of the product.**
- **In order to safely use the device continuously, it is required to comply with the instructions listed. The instructions listed in this Manual are not substitute for the medical procedure being performed.**

1.1.1 Danger

This product does not involve information of danger levels.

1.1.2 Warning

⚠ Warning

- **This monitor is used for clinical patient monitoring, and only trained and qualified doctors and nurses are allowed to use this monitor.**
- **Before operating, the user must check if the device, cables and accessories are functioning properly and safely.**
- **The alarm volume, upper and lower alarm limit should be set according to the actual situation of the patient. Do not just rely on audio alarm system while monitoring the patient, because too low alarm volume or complete shutdown may result in alarm failure and endanger the patient safety. Please pay close attention to the actual clinical situation of the patient.**
- **This device can only be connected to a grounded electrical outlet; if the power outlet is not connected to the ground wire, do not use the outlet; instead, supply power to the device with rechargeable batteries.**
- **Do not open the enclosure in order to avoid an electric shock. Any repair and upgrade of the monitor must be done by service personnel trained and authorized by Northern.**
- **When handling packaging materials, abide by local laws and regulations or hospital waste disposal regulations. Keep the packaging materials away from children.**
- **Do not use this instrument at a place with inflammables such as anesthetics to prevent explosion or fire.**
- **Please install the power lines and cables of accessories carefully to avoid patient entanglement or suffocation, cables tangled or electrical interference.**
- **The devices connected to the monitor should form an equipotential body (protective grounding effectively connected).**
- **When the monitor is used together with electrosurgical devices, the user (a doctor or a nurse) should ensure the safety of the patient and instrument.**
- **The physiological wave, physiological parameters and alarm information displayed on the monitor are only for the doctor's reference and should not be directly used as the basis for clinical treatment.**
- **This is not a therapeutic unit.**

- **For patients with pacemakers, the cardiotach ometer may count the pacemaker pulse in case of a cardiac arrest or arrhythmias. Never rely solely on the cardiotach ometer alarm. Closely monitor the patients with pacemakers. For the inhibition of the device on pacemakers, refer to this Operator's Manual.**

1.1.3 Caution

Caution

- **To avoid damage to the instrument and to ensure patient safety, please use the accessories specified in this Manual.**
- **Please install or carry the instrument properly to prevent damage due to falling, collision, strong vibration or other mechanical force.**
- **The electromagnetic fields may affect the performance of the instrument, so that using other devices in the vicinity of this instrument must comply with relevant EMC requirements. For example: mobile phone, X-ray or MRI equipment is likely to be a source of interference, since they will transmit high intensity electromagnetic radiation.**
- **Before powering on the device, make sure that the power used by the device complies with the supply voltage and frequency requirements on the equipment label or in the Operator's Manual.**
- **When the instrument and accessories are about to exceed the useful life, it must be treated in accordance with relevant local laws and regulations or the hospital's rules and regulations.**

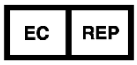
1.1.4 Note

Notes

- **Install the device at a place easy for observation, operation and maintenance.**
- **Keep this Manual near the instrument for easy reference.**
- **The instrument should be used only by one patient at the same time.**

1.2 Symbols

The symbols appearing on the instrument are as follows:

	Defibrillation-proof type CF applied part		EU representative
	Defibrillation-proof type BF applied part		USB interface
	Caution: Refer to accompanying documents (Operator's Manual)		Network Interfac
	Power on / off		Signal input and output interface
	AC power supply (AC)		Refer to the Operator's Manual
	Battery operating indicator		Equipotential terminal
	Alarm silence		Serial Number
	NIBP		Production date
	Wave freezing		Manufacturer info
	Print		Waste Electrical and Electronic Equipment Directive

Chapter2 Installation & Check

Note

- **To ensure normal working of the monitor, read this chapter before use, and install as required.**

⚠ Warning

- **All analog and digital devices connected to the monitor must be certified by IEC standards (e.g., IEC 60950 Data Processing Equipment Standard and IEC 60601-1 Medical Equipment Standard). Furthermore, all configurations shall comply with valid version of IEC 60601-1 standard. The personnel connecting additional devices to the input / output signal ports are responsible for the compliance with IEC 60601-1 standard. If there is any question, please contact Northern.**
- **If the patient cable interface and network interface are connected with multiple devices, the total electric leakage cannot exceed the allowable value.**
- **The copyright of the monitor software belongs to Northern. Without permission, any organization or individual shall not interpolate, copy or exchange by any means or form.**
- **When the monitor is combined with other devices, it must comply with IEC60601-1, and shouldn't be connected with multi-socket wire board or extension cord.**

2.1 Unpacking

Before unpacking, please check the box carefully. If any damage is found, please contact the carrier immediately. Unpack properly, take out the monitor and accessories carefully, and check the accessories according to the packing list. Check for any mechanical damage and if the items are complete. If there is any question, please contact our sales department or dealer.

Note

- **Please keep the packing box and material for use in future transporting or storage.**

2.2 Environmental Requirements

The storage, transport and use of the monitor must meet the following environmental requirements.

Working environment	Ambient temperature range	5℃~40℃
	Relative humidity range	≤80%
	Atmospheric pressure range	86kPa~106kPa
Supply voltage requirement	Supply voltage	a.c.100V~240V
	Power frequency	50Hz/60Hz
	Input power	40VA-60VA
	Fuse	FUSE T 1.6A
Transportation	Prevent severe shock, vibration, rain and snow splashing during transport.	
Storage	The packaged monitor should be stored in well-ventilated room with ambient temperature -20℃~+40℃, relative humidity lower than 80%, atmospheric pressure 50kPa~106kPa, and without corrosive gases.	

The operating environment of the monitor should avoid noise, vibration, dust, corrosive or flammable and explosive materials. In order to allow air flowing smoothly and achieve good heat dissipation, at least 2 inches (5cm) clearance should be kept around the device.

When the device is moved from one environment to another, the device may have condensation due to differences in temperature or humidity. In this case, wait until the condensation disappears before using the device.

⚠ Warning

- **Please ensure that the device operates under stipulated environment, or else technical specifications declared in this Manual may not be met, and it may result in damage to equipment and other unforeseen consequences.**

2.3 Connecting to AC Power

Connect to AC power in the following steps:

- Make sure that the AC power supply meets the following specifications: AC 100V ~ 240V, 50/60Hz.
- Use the power cord provided with the monitor. Plug the power cord into the power connector of the monitor, and plug the other end of the power cord into the mains (low voltage power supply network facilities) power outlet with protective earthing.

Note

- **Connect the power cord to the dedicated outlet in the hospital.**

2.4 Turning On

2.4.1 Checking the Monitor

- Before turning on, check whether there is mechanical damage to the monitor, and whether the external cables and accessories are connected correctly.
- Plug the power cord into the AC power outlet. If using battery power, make sure the battery is fully charged.
- Check all the functions required for patient monitoring to make sure that the monitor works properly.
-

⚠ Warning

- **If the monitor is damaged, or fails to work normally, do not use it for patient monitoring. Please contact the maintenance personnel or Northern immediately.**

2.4.2 Starting the Monitor

After checking the monitor, you'll be ready to start the monitor.

Press the power switch, the yellow and red warning lights flash once in turn, and the system enters the program reading interface; then the company's LOGO is shown; finally, the system makes a “tick” sound, the boot screen disappears, and the system enters the main interface.

If the yellow and red warning lights flash once in turn when the device is turned on and the

monitor makes a “tick” sound, the warning system of the monitor can work normally.

Notes

- **If any fatal error occurs during self-test, the system will alarm.**
- **Check all available monitoring functions to ensure that the monitor functions properly.**
- **If the monitor integrates a battery, charge the battery after each use to secure sufficient power.**

2.4.3 Connecting the Sensor

Connect the required sensor to the monitor and the monitoring position on the patient.

Note

- **For proper connections and related requirements for a variety of sensors, see Chapters 7-12.**

2.4.4 Starting Monitoring

Start monitoring in the following steps:

- Check if the patient cable and the sensor are connected properly.
- Check if the settings of the monitor are correct, such as: patient category [Patient Cat.]
- For the details of parameter measurement or monitoring, see the appropriate section.

2.5 Turning off

Please turn off the monitor in the following steps:

- Disconnect the cables and sensors connected to the patient.
- Press and hold the power switch for two seconds to pop up the 5sec countdown window, and the monitor turns off in five seconds.

⚠ Caution

- **If the monitor cannot be turned off properly or special cases occur, you can simply disconnect the power to force shutdown. However, forced shutdown may cause data loss, and is not recommended.**

Chapter3 Monitor Overview

3.1 Introduction

3.1.1 Scope of Application

This monitor is suitable for bedside monitoring of adults and pediatric. This monitor enables ECG, respiration (RESP), pulse rate (PR), blood oxygen saturation (SPO2), noninvasive blood pressure (NIBP), and temperature (TEMP) monitoring. It is equipped with a replaceable built-in battery to provide convenience for the patient movement in hospital.

3.1.2 Contraindications

None.

3.1.3 Composition and Structure

The monitor consists of master unit, display, ECG cable, SpO2 probe, blood oxygen cuff, temperature probe, and built-in lithium battery.

3.2 Master Unit

3.2.1 Front View

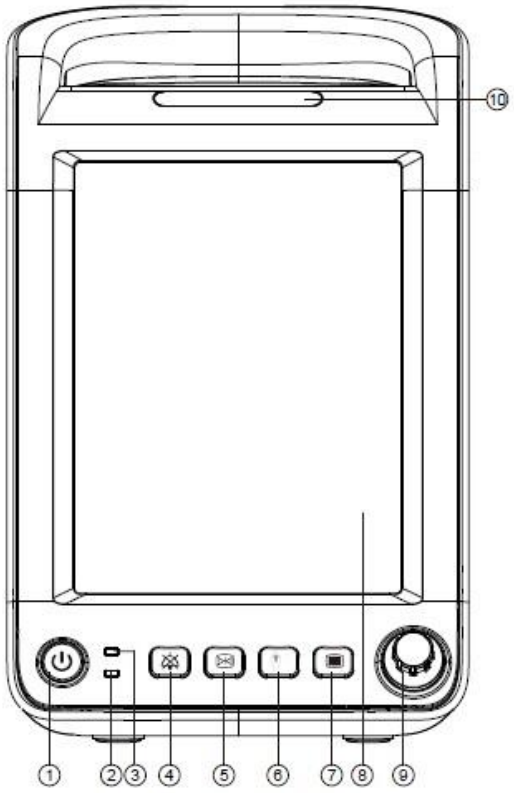


Fig. 2-1 Front View

1. Power on / off button (①)
   - Power on: When the monitor has been connected to AC power supply, press this key to turn on the monitor.
   - Power off: In power on state, press and hold this key for two seconds to turn off the monitor.
   - The key integrates indicator, which is lit when the monitor is turned on and off when the monitor is turned off.
2. Battery indicator (②)
   - On: The battery is being charged or has been fully charged.
   - Off: The battery has not been installed, or the battery has been installed but the AC power is not connected and the monitor is not turned on.
   - Flashing: The monitor is being powered by the battery.
3. Adaptor indicator (③)

- On: The monitor has been connected to AC adaptor
- Off: The monitor has not been connected to AC adaptor

4. Silence key (④) : Press this key to turn off/resume the alarm sound of the system.
5. Freeze key or print key (⑤) :
   - Presss this key to start/stop printing waveform or data.
   - Press this key to freeze / unfreeze the wave.
6. NIBP measurement start / stop key (⑥) : Press this key to start / stop the measurement of non-invasive blood pressure.
7. Admitting patient or menu (⑦)
   - Admitting a patient key: Press to pop-up quick admitting patient menu.
   - Menu: Press to pop-up "menu"
8. Display (⑧)
9. Shuttle (⑨)

   Shuttle can be used to perform the following operations:
   - Rotate: Rotate clockwise or counterclockwise to move the focus.
   - Press: Press the knob to perform an action, such as access to a menu or execute a command.
10. Alarm indicator (⑩)

    The alarm indicator indicates the levels of physiological alarms and technical alarms in different colors and flashing frequencies:
    - High: red, fast flashes
    - Medium: yellow, slow flashes
    - Low: yellow, lit without flashing.

3.2.2 Side View

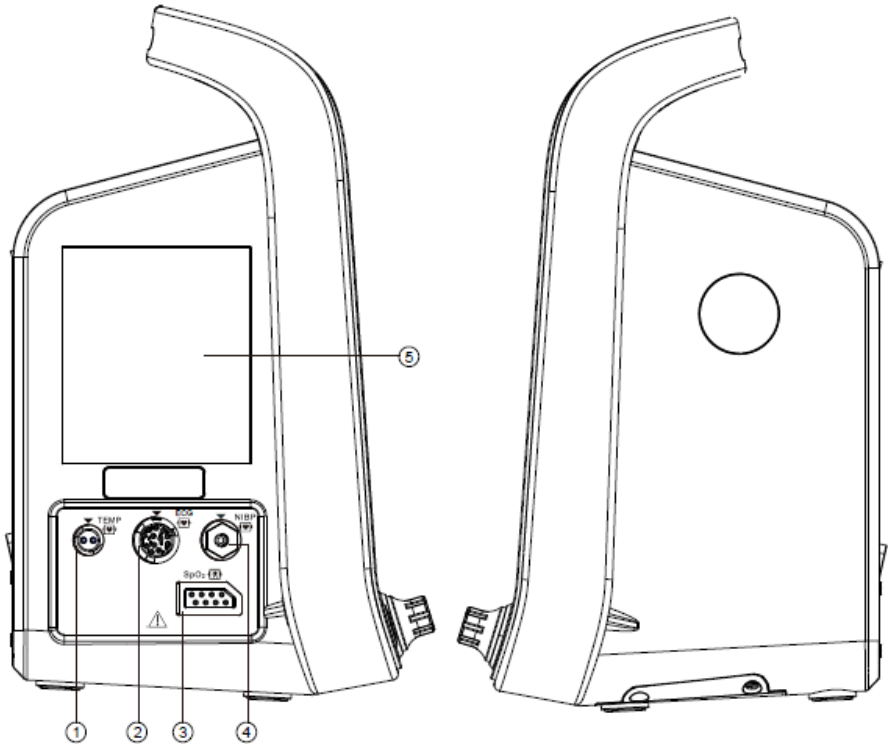


Fig. 2-2 Side View

1. Temp ——Temperature probe interface（①）
2. ECG —— ECG cable interface（②）
3. SpO2 or CO2 ——SpO2 cable interface（③）could conneted to Masimo SpO2,Northern SpO2,or Phasin CO2 module
4. NIBP —— NIBP cuff interface（④）
5. Printer or printer plate（⑤）: Could install a printer (optional).

3.2.3 Rear View

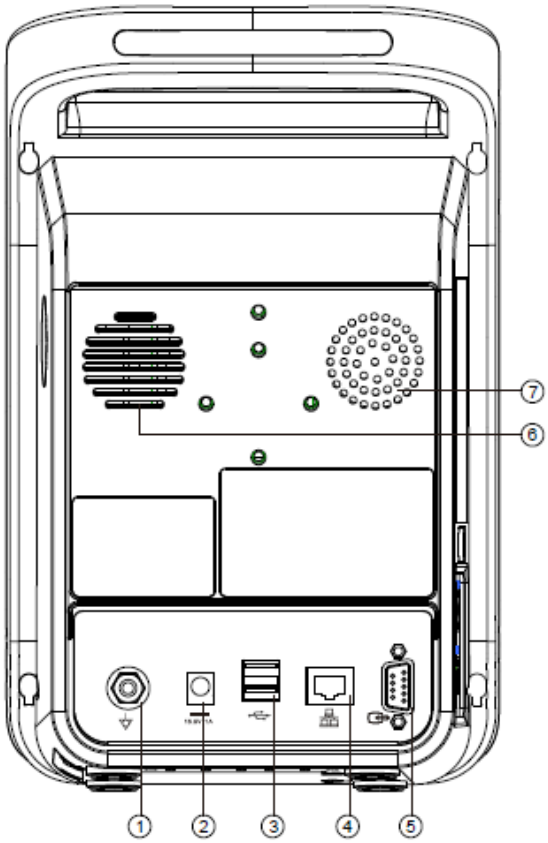


Fig. 2-3 Rear View (example)

1. Equipotential terminal: When other devices are used in conjunction with the monitor, you should connect the equipotential terminals of other devices and the monitor with wires to eliminate the ground potential difference between different devices and ensure safety.
2. AC adaptor socket: connect to AC adaptor: 16.8V, 1A, charge the battery of the monitor.
3. USB interfaces (2): Connect an external storage device to upgrade the monitor software.
4. Network interface
5. Signal input and output interface: standard DB9 interface, which can be connected to the PC to output data or connected with a compatible device.
6. Speaker holes
7. Spiracle

3.3 Screen Display

The monitor uses high-resolution color TFT LCD, which can clearly show the physiological parameters and waves and other information of patients and provide patient information, alarm information, clock, monitor status and other tips. The figure below is the standard interface (demo mode) of the monitor in the normal monitoring state.

The screen of the standard interface is divided into four areas: ①Info area, ②Parameter area and wave area, ③NIBP list ④Smart hotkey area.

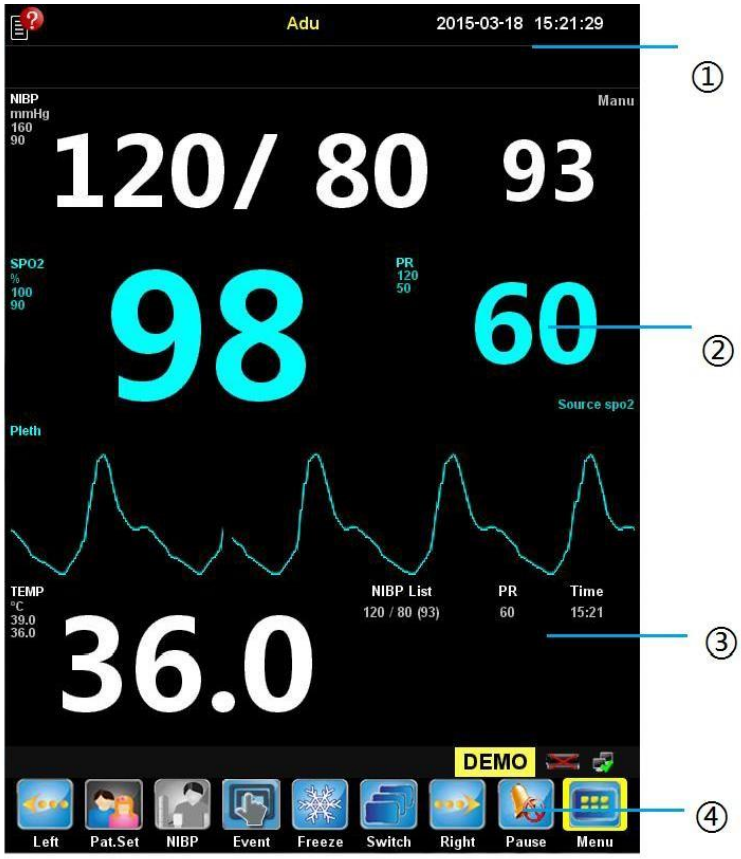


Fig. 2-4 Standard Interface (Demo Mode)

1. Introduction of info area (①)

   The info area includes patient information, alarm status icon, physiological alarms and technical alarms from left to right.

2. Parameter area and wave area (②)

   It consists of small parameter areas, which show the corresponding parameter measurement value and current upper and lower alarm limits of each parameter module. The parameters are shown in fixed positions, that is, from top to bottom and from left to right:

   - ECG parameter area

- NIBP parameter area
- SPO2 and PR parameter area
- TEMP parameter area
- RESP parameter area

3. NIBP list (③)

   Display the measurement result of NIBP.

4. Introduction of smart hotkey area (④)

   The smart hotkey area shows the hotkeys, which are mainly used for some common operations; see 3.4 for details.

3.4 Smart Hotkeys

Smart hotkeys are some graphics hotkeys displayed at the bottom of the main screen of the monitor, and enable you to use certain features conveniently.

The smart hotkeys at the bottom of the main screen are divided into fixed smart hotkeys and removable smart hotkeys.

There are five fixed smart hotkeys, of which the names or features are:

 [Pause]: Alarm pause

 [Left]: Slide left to show more smart hotkeys

 [Right]: Slide right to show more smart hotkeys

 [Main]: Return to the main interface

 [Menu]: Main menu

There are ten removable smart hotkeys:

 [Pat.Set]: Patient info setting key

 [NIBP]: NIBP measurement start / stop key

 [Event]: Manual event

[Print]: Print key

[Switch]: Interface switch key

[Freeze]: Freeze key

[Ala.Set]: Alarm setting key

[Silence]: Silence key

[Review]: Review key

[Vol.Set]: Volume setting key

Chapter4 Basic Operation

4.1 Basic Operation

4.1.1 Using the shuttle

Shuttle can be used to perform the following operations:

- Rotate: Rotate clockwise or counterclockwise to move the focus.
- Press: Press the shuttle to perform an action, such as access to a menu or execute a command.

Shuttle is the main control key. On the interface or the menu, the green highlighted box that moves with the knob turning is called the cursor. By turning the shuttle, you can position the cursor in order to perform the desired operation.

4.1.2 Using Keys

The monitor has three types of keys:

- Soft keys: The position that the cursor can stay on the interface, allowing quick access to certain menus or performing certain actions, including:
  - Parameter hotkey: Select a parameter area and enter the appropriate parameter setup menu.
  - Wave hotkey: Select a wave area and enter the appropriate parameter setup menu.
  - Smart hotkey: The shortcut keys that the user can operate quickly at bottom of the screen; see “Smart Shortcuts” for details.
- Hard keys: The physical keys on the monitor, such as the alarm silence key on the front panel.
- Popup keys: Menu keys relevant to the tasks that automatically appear in the monitor screen when needed. For example: the confirmation key popped up when you need to confirm the change.

4.1.3 Using the Touch Screen

You can directly click on the touch screen to quickly and easily accomplish some operations.

4.1.4 Using Soft Keyboard

Click on the edit box, and the system will display the soft keyboard on the screen; you can turn the shuttle or use the touch screen to select characters one by one, and input data. Use the Back key to delete a single character; use the Enter key to confirm that you have finished entering and close the soft keyboard.

4.1.5 Using Menu

Select the  [Menu] key on the monitor interface via the shuttle or directly the touch screen to open the [Main Menu] as shown below. Through the main menu, you can complete most of the operations and settings.

Fig. 3-1 [Main Menu]

The style of other menus is basically similar to the [Main Menu], and generally consists of the following components:

- Menu title: a summary of the current menu.
- Close menu: Close the current menu, exit the current menu or close the current menu and return to the previous menu.
- Main display area: display options, buttons or prompt messages. The symbol ">>" indicates that selecting this option can enter the corresponding submenu.
- Confirmation key area: Some menus contain a confirmation key area to confirm the

menu operations, including confirmation and cancel key.

4.2 User Setup

The common setup of the monitor is the general setup that defines how the monitor works, for example: alarm volume setting. They may affect the setup of multiple measurements or display interfaces.

4.2.1 Defining the Monitor

When install the monitor or change the usage occasion, the monitor should be defined as follows:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
  - Select [Device Name]: Enter device name through the soft keyboard on the screen.
  - Select [Department]: Enter the sector and department using the device through the soft keyboard on the screen.
  - Select [Bed No.]: Enter the bed number through the soft keyboard on the screen.

4.2.2 Language Setup

Set the monitor language in the following steps:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Language], and select the option as needed:
  - [English]: The interface language of the monitor is English.
  - [Spanish]: The interface language of the monitor is Spanish.

4.2.3 Date and Time

Set the monitor time in the following steps:

- Select  [Menu] Smart Hotkey→[Main Menu];
-
- Select [Time Setup >>] → enter [Time Setup] menu;
- Select [Date Format], and set the date format in accordance with custom
  - [YYYY-MM-DD]: Year - Month - Day.
  - [MM-DD-YYYY]: Month - Day - Year.
  - [DD-MM-YYYY]: Day - Month - Year.
- [Date]: Set the year, month, and day.
- [Time]: Set the hour, minute and second.

4.2.4 Volume Control

1. Alarm volume
   - Select  Vol.Set smart hotkey → [Volume Setup] menu;
   - Select [Alarm Vol]: Set [Y]. Y is X~9, X is the minimum volume, and Y value plus / minus 1 when turning the shuttle once.
2. Key-pressing volume
   - Select  Vol.Set smart hotkey → [Volume Setup] menu;
   - Select [Key Volume]: [N]. N value ranges from 0 to 9, plus / minus 1 when turning the shuttle once, select 0 to turn off the key-pressing tone, and select 9 to set to the maximum volume.
3. QRS volume

   Select  Vol.Set smart hotkey → [Volume Setup] menu;

   Select [QRS Volume]: [M]. M values ranges from 0 to 9, plus / minus 1 when turning the shuttle once, select 0 to turn off the key-pressing tone, and select 9 to set to the maximum volume.

4.2.5 Setting Parameter Unit

You can select a preferred unit through the following operations

- Select  [Menu] Smart Hotkey→[Main Menu];

- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Unit Setup >>] → [Unit Setup] menu;
  - Select [Height], and select the unit [cm] / [inch] as needed.
  - Select [Weight Unit], and select the unit [kg] / [lb] as needed.
  - Select [Press.Unit], and select the unit [mmHg] / [kPa] as needed.
  - Select [Temp Unit], and select the unit [℃] / [℉] as needed.

4.2.6 Network Setup

Press【Main Menu】→【UserMaintenance】→【Network Setup】to connect the monitor with CMS.

4-2Network Setup

1.Press【Net Type】to choose the network type.
2.Press【IP Add】to set the IP address of the monitor.
3. If the network type is wireless, type then network name in【SSID】and type the password in【Passwords】and press【OK】key. If the network type is wired, then ignore【SSID】and 【Passwords】

Chapter5 Patient Information Management

Connect the patient to the monitor, and the monitor will display and store the physiological data of the patient, so the patient can be monitored without admitting the patient. However, admitting the patient correctly is very important.

If the monitor has admitted the patient, it is recommended to operate the monitor to discharge the current patient before connecting to (not admitted) the next patient. Otherwise, the data of the previous patient will be stored in the data of the current patient.

Warning

- **Whether the patient is admitted or not, the system will give a default value to [Patient Cat.] and [Paced], and the user must confirm that the default value is appropriate for the patient being monitored.**
- **For patients with pacemakers, [Paced] must be set to [Yes]. Otherwise, the pacing pulse will be treated as normal QRS wave group, and the system is unable to detect the alarm status of [ECG Signal weak].**
- **For patients without a pacemaker, [Paced] must be set to [No]. Otherwise, the system is unable to detect the arrhythmias (including PVCs count) related to ventricular premature beats, and fails to perform ST segment analysis.**

5.1 Patient Setup Menu

You can manage the patients through the [Patient Setup] menu ; to enter the [Patient Setup] menu, operate as follows:

Select  [Menu] Smart Hotkey→ [Main Menu];

Select [Patient Setup >>] → [Patient Setup] menu, as shown in Fig. 4-1.

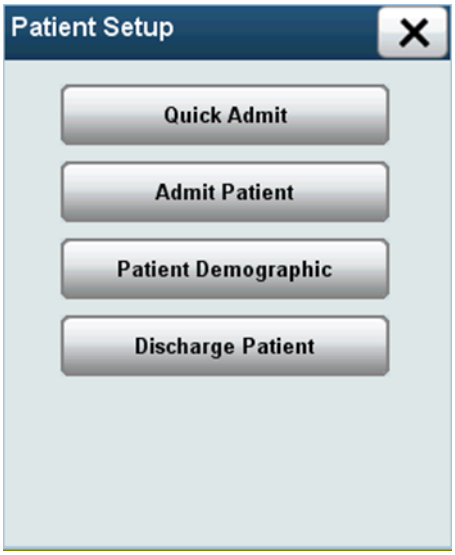


Fig. 5-1 Patient Info Setting

5.2 Admitting a Patient Quickly

Admit a patient quickly as follows:

In [Patient Setup] menu, select [Quick Admit] → [Warning] menu → [OK] → [Quick Admit] menu, which is shown below:

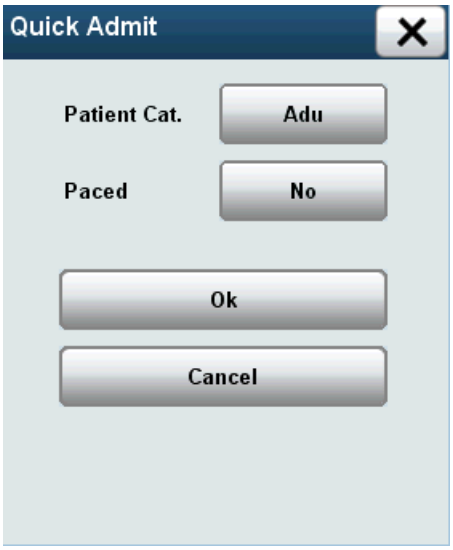


Fig. 4-2 Quick Admitting Menu

- Select [Patient Cat.], and set the patient category as needed:
  - [Adu]: Adults.
  - [Ped]: Pediatric.

5.3 Admitting a Patient

To admit a patient, operate as follows:

In the [Patient Setup] menu, select [Admit Patient] → [Warning] → [OK] → [Patient Info] menu, which is shown below:

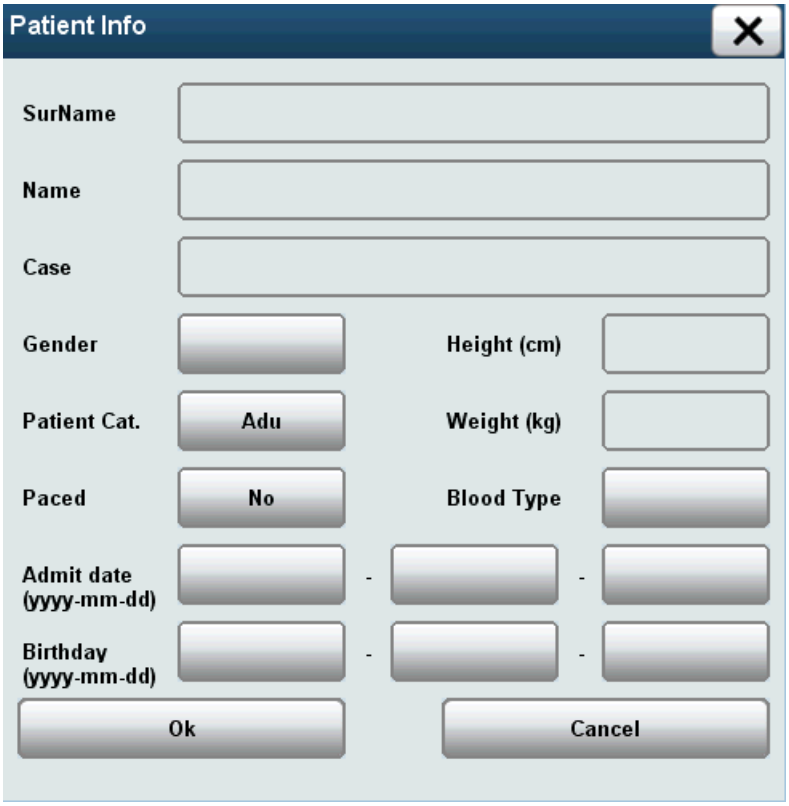


Fig. 43 Patient Info

a) Select [SurName], and enter patient's surname through the soft keyboard.

b) Select [Name], and enter patient name through the soft keyboard.

c) Select [Case], and enter the case number through the soft keyboard.

d) Select [Gender], and set the patient's gender according to the patient condition:

- [Male]: Males.
- [Female]: Females.
- [Others]: Others.

e) Select [Patient Cat.], and set the patient category as needed:

- [Adu]: Adults.
- [Ped]: Pediatric.

f) Select [Paced], and set whether the patient wears a pacemaker according to the patient condition:

- [Yes]: The patient wears a cardiac pacemaker.
- [No]: The patient does not wear a cardiac pacemaker.

g) Select [High (cm)], and set the patient's height via the pop-up keyboard on the screen.

h) Select [Weight (kg)], and set the patient's weight via the pop-up keyboard on the screen.

i) Select [Blood Type], and set the patient's blood type:

- [A]: Patient blood type is A.
- [B]: Patient blood type is B.
- [AB]: Patient blood type is AB.
- [O]: Patient blood type is O.
- [Others]: Other blood type of the patient.

j) Select [Admit date (yyyy-mm-dd)], and set the date of admitting the patient.

k) Select [Birthday (yyyy-mm-dd)], and set the birth date of the patient.

After setting, select [OK] to save the current setup; select [Cancel] and do not save the current setup.

5.4 Editing Patient Info

When the monitor has admitted a patient, but the patient information is incomplete, or needs to be changed:

Select the patient info area on the display to pop up [Patient Info] menu as shown in Fig. 4-3, and complement or change the patient info in the [Patient Info] menu; see 4.2 for specific operation.

5.5 Discharging a Patient

To discharge a patient, operate as follows:

In the [Patient Setup] menu, select [Discharge Patient] → [Warning] → [OK] to finish the operation of discharging a patient.

After the patient is discharged, all the information of the patient stored by the monitor will be cleared. Therefore, discharge the patient only when needed.

Chapter6 User Interface

The monitor has four working interfaces, which are “Normal Screen”, “Big Numerics”, “ECG 7-Lead Half-Screen” and “ECG 7-Lead Full-Screen”. The user can select the working interface according to needs, and get different screen information. Below describes the working interfaces.

6.1 Selecting User Interface

Select the user interface as follows:

- Select  [Switch] smart hotkey→[Screen Setup];
- Select [Screen Select], and select the user interface according to needs:
  - [Normal Screen]: Standard interface.
  - [Big Numerics]: Big font interface.
  - [ECG 7-Lead Half-Screen]: ECG 7-lead half-screen.
  - [ECG 7-Lead Full-Screen]: ECG 7-lead full screen.

6.2 Interface Introduction

6.2.1 Normal Screen

The normal screen is as shown in 6-1：

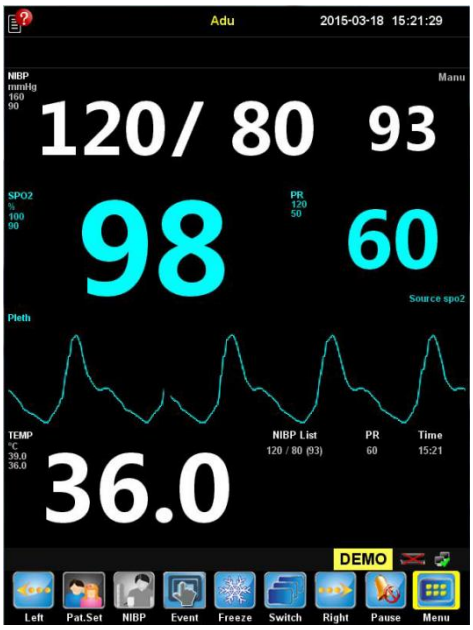


图 6-1 标准界面

The normal screen provides the parameter wave being monitored and the parameters displayed in the parameter area. This is the basic working interface of the monitor. The interface displays NIBP,SPO2,TEMP, one blood oxygen binding capacity scan wave.

Press【menu】->【Screen Setup】to setup the parameters shown in the display

6.2.2 Big Numerics

5 The Big Numerics screen is as shown in Fig. 6-2:

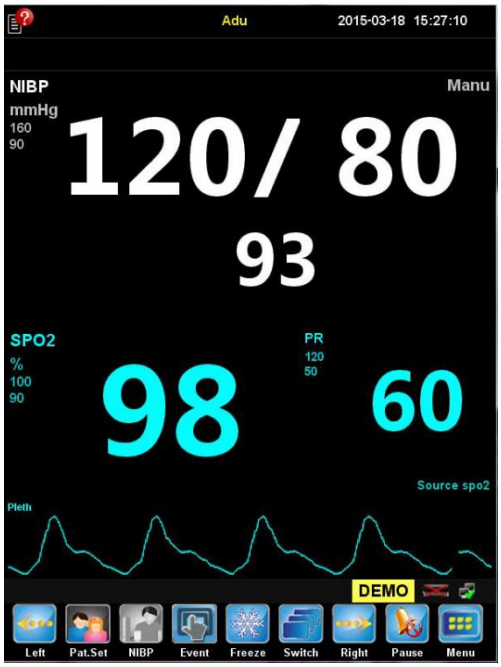


Fig. 6-2 Big Numerics Screen

Big Numerics screen allows observing NIBP+SPO2 parameters and one blood oxygen binding capacity scan wave.

6.2.3 ECG 7-Lead Half-Screen

ECG 7-Lead Half-Screen

6-3：

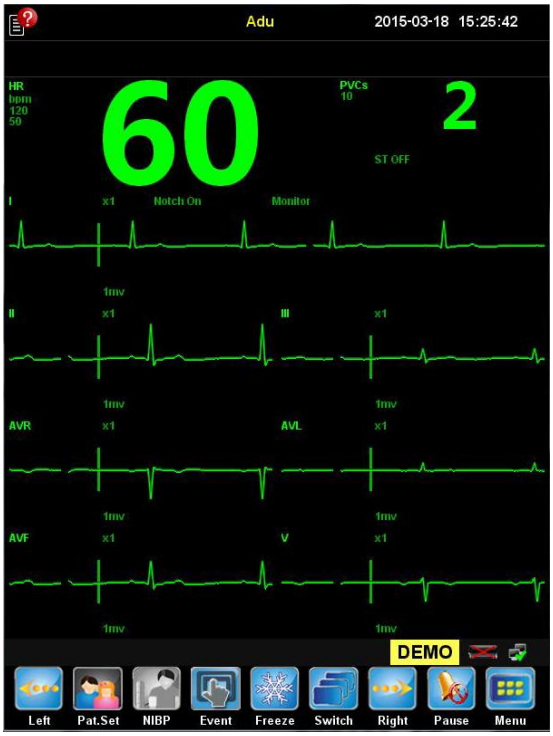


Fig.6-3 ECG 7-Lead Half-Screen

ECG 7-Lead Half-Screen allows observing all parameters, seven ECG waves (I, II, III, AVR, AVL, AVF, V)

Chapter7 Alarm

Alarm means that the monitor prompts the medical staff through sound and light when the patient being monitored has abnormal changes in vital signs or the monitor has a failure and is unable to monitor the patient successfully.

⚠ Warning

- **In any single region (e.g. ICU), it has potential dangers if the same or similar devices use different alarm setups.**

Note

- **After setting, the alarm and other parameters of the monitor won't be lost when the system power is cut off, unless modified manually; connect the power again (external and internal) and turn on the monitor, it will resume normal working, and the alarm and other parameters remain unchanged.**
-

7.1 Alarm Type

According to the nature of the alarm, the alarms of the monitor can be divided into physiological alarms, technical alarms and prompt messages.

- **Physiological alarms**

A physiological alarm is usually triggered when a physiological parameter of the patient exceeds the alarm limit or the patient has physiological abnormalities. The information of physiological alarm is displayed in the physiological alarm area on top of the screen.

- **Technical alarms**

Technical alarm is also known as a system error message, which is caused by improper operation or system failure resulting in system malfunction or monitoring result distorted. The information of technical alarm is displayed in the technical alarm area on top of the screen.

- **Prompt messages**

Strictly speaking, the prompt messages are not alarms. The monitor also will display some information associated with system status in addition to the physiological alarms and technical alarms, and generally such information do not involve the patient's vital signs. The prompt messages generally appear in the technical alarm area and parameters area.

7.2 Alarm Level

According to the severity of the alarm, the physiological alarms of the monitor can be divided into high level, medium level and low level.

- **High level alarms**

The patient is in critical condition that is life-threatening, and should be immediately rescued;

Or the monitor has a serious mechanical failure or malfunction, causing it unable to detect the patient's critical state and endangering the patient’s life.

- **Medium level alarms**

The patient's physiological signs are abnormal, and appropriate measures or treatment should be taken immediately;

Or although it won’t endanger the patient’s life, the mechanical failure or misoperation of the monitor will affect the normal monitoring of key physiological parameters.

- **Low level alarms**

The patient's physiological signs are abnormal, and appropriate measures or treatment may need to be taken;

Or certain monitoring function is invalid due to mechanical failure or misoperation, but it won’t endanger the patient’s life.

The levels of all technical alarms and some physiological alarms have been set in the monitor at the factory and cannot be modified by the user. The levels of some physiological alarms can be modified.

7.3 Alarm Mode

When an alarm occurs, the monitor uses the following audible or visual alarm to prompt the user:

- Light alarm
- Audible alarm
- Alarm info
- Parameter flashing

Of which, the light alarm, audible alarm, and alarm info distinguish the alarm levels in a different manner respectively.

7.3.1 Light Alarm

When an alarm occurs, the alarm indicator will flash in different colors and frequencies to prompt the alarm level.

- High level alarm: Red, fast flashes
- Medium level alarm: Yellow, slow flashes
- Low level alarm: Yellow, lit without flashing

7.3.2 Audible Alarm

An audible alarm is that the monitor prompts the alarm levels with different sound characteristics when an alarm occurs.

- High level alarm: Beep - beep - beep -- beep - beep ---- beep - beep - beep -- beep - beep
- Medium level alarm: Beep - beep - beep
- Low level alarm: Beep

7.3.3 Alarm Info

Alarm info refers to that the physiological or technical alarm area of the monitor will display the corresponding alarm information when an alarm occurs. The system will distinguish the alarm levels with different background colors:

- High level alarm: Red
- Medium level alarm: Yellow
- Low level alarm: Yellow

The following flags in front of physiological alarms are used to distinguish the alarm levels:

- High level alarm: ***
- Medium level alarm: **
- Low level alarm: *

7.3.4 Parameter Flashing

When a physiological parameter of the patient alarms, the parameter values in the parameter area will flash once per second, and the upper limit and lower limit of the parameter will also flash at the same frequency, indicating that the parameter exceeds the upper limit or lower limit.

7.4 Alarm States

In addition to the above alarm modes, you can also set the monitor to the following four alarm states as needed, and display different alarm icons on the screen:

-  Alarm silence
-  Alarm sound off
-  Alarm pause
-  Alarm off

7.4.1 Silence

Select  [Silence] smart hotkey, and you can temporarily turn off the alarm sound of currently occurring physiological alarms of the monitor, but the alarm information is still retained. For technical alarms, clear the alarm state, display alarm prompt information only and the monitor enters alarm silence state, and the alarm state icon area displays the  icon. When a new physiological alarm or technical alarm occurs, the alarm silence is automatically canceled.

7.4.2 Alarm sound off

The alarm sound can be turned off through the following operations:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Alarm Param >>] → [Ala.Para Setup] menu;

- Set [Min Alarm Vol] to [0];
- Select [Vol.Set] smart hotkey → [Volume Setup] menu;
- Set [Alarm Volume] to [0].

When the alarm sound is turned off, the alarm state area on the screen shows the icon.

If [Min Alarm Vol] is larger than 0, the system will cancel alarm sound off state.

7.4.3 Alarm Pause

Press the [Pause] smart hotkey to temporarily stop the alarm of the monitor in the following steps:

- Alarm state icon area will display the icon.
- The light alarm and audible alarm of the physiological alarms are suspended, and the alarm information is not displayed.
- The remaining time of alarm pause is displayed in the physiological alarm area.
- Alarm parameters and upper / lower limit stop flashing.
- The audible alarm and light alarm of technical alarms are suspended, but the alarm message is still displayed.

After the alarm pause is finished, the monitor will automatically cancel the alarm pause state. During the alarm pause, you can also press [Pause] smart hotkey to manually cancel the alarm pause.

You can set the alarm pause time as follows:

- Select [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Alarm Param >>] → [Ala.Para Setup] menu;
- Select [Alarm Pause Time], and set the alarm pause time as needed:
  - [1min] / [2min] / [3min] / [4min] / [5min] / [10min] / [15min]: Set the alarm pause time to 1 min, 2 min, 3 min, 4 min, 5 min, 10 min or 15 min. By default, the alarm pause time is 2 minutes.
  - [Permanent]: Set the alarm pause time to permanent.

7.4.4 Alarm off

As shown in 6.4.3, if the [Alarm Pause Time] is set to [Permanent], press the  [Pause] smart hotkey, and the monitor will turn off the alarm. In this case, except the alarm prompt characteristics maintained in alarm pause state:

- Alarm state icon area will display the  icon.
- The physiological alarm area displays [Alarm Pause].

You can press the  [Pause] smart hotkey again to manually cancel the alarm off.

If the monitor is in the alarm state of suspension or closure of senior technical alarm is triggered, the alarm and the alarm off pause are automatically canceled.

Warning

- **When the alarm volume is set to 0 or the alarm pause time is set to permanent, the monitor does not sound an alarm when an alarm occurs. Therefore, the operator should use this feature carefully.**

7.5 Alarm Setup

7.5.1 Setting the Alarm Sound

See 3.9.4 Volume Control for the method to set the alarm volume.

7.5.2 Setting the Alarm Delay Time

For over-limit alarm of continuous measurement parameter, you can set the alarm delay time. If the alarm condition disappears during the delay period, the monitor won't alarm. In [Ala.Param Setup] menu, select [Alarm Delay] time and [ST Alarm Delay] time.

The specific operation is as follows:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Alarm Param >>] → [Ala.Param Setup] menu;

- Select [Alarm Delay], and set the alarm delay time as needed:
  - [Off]: Turn off the alarm delay.
  - [1s] / [2s] / [3s] / [4s] / [5s] / [6s] / [7s] / [8s]: Alarm delay time is 1 sec, 2 sec, 3 sec, 4 sec, 5 sec, 6 sec, 7 sec or 8 sec. By default, the alarm delay time is 4 seconds.
- Select [ST Alarm Delay], and set the ST alarm delay time as needed
  - [Off]: ST alarm delay is off
  - [10s] / [20s] / [30s] / [45s] / [1min] / [2min] / [3min]: ST alarm delay time is 10 sec, 20 sec, 30 sec, 45 sec, 1 min, 2 min or 3 min. By default, the ST alarm delay time is 20 seconds.

The system sets physiological alarm delay time and also sets 1~2s delay time after technical alarm been triggered. Normally the delay time is limited to 5s.

7.5.3 Setting a Parameter Alarm

With SpO2 for example, select the SpO2 parameter area, select [Alarm Setup >>] in the popup [SpO2 Setup] menu to enter the SpO2 alarm setup interface.

1. Turn on / off alarm

- Select [Alarm Switch] and set the alarm switch as follows:
  - [On]: Turn on SpO2 alarm; when the parameter alarm occurs, the monitor will prompt according to the set alarm level.
  - [OFF]: Turn off SpO2 alarm;  icon is displayed in the parameter area, and the monitor won't prompt the parameter alarm.

2. Set the alarm level

- Select [Alarm Level], and set the alarm level as follows:
  - [Low]: Set the alarm level to low.
  - [Mid]: Set the alarm level to medium.
  - [High]: Set the alarm level to high.

3. Set the alarm limit

In any cases, the alarm system only allows setting the values within the effective range of the system, and the upper alarm limit must be higher than the lower alarm limit.

- Select [Spo2 Low Limit] and set the lower limit of SpO2 alarm.
- Select [Spo2 High Limit] and set the upper limit of SpO2 alarm.

4. Restore default alarm setup

- Select [Default], and restore the alarm setup to the factory default.

Note

- **When setting the upper and lower alarm limit, confirm the patient category to be adults or pediatric, and set its scope according to the clinical need. If the setting exceeds the alarm limit, the alarm system will fail easily.**
- **When the alarm limit is turned on, and the upper and lower alarm limits are manually set, the instrument will display the upper and lower alarm limits continuously, and the initial alarm preset value won't be provided additionally.**

7.6 Latch Alarm

Physiological alarms can be set to [Latching] or [No latching].

- [Latching]: Even if the cause of physiological alarm is cleared, the system will still be "latched", that is, continue to display the alarm information corresponding to physiological alarm, the alarm sound also continues, but the alarm mode has the following changes:
  - Parameters and upper or lower alarm limit are no longer flashing.
  - Display the time that the latest alarm was triggered after the alarm message in the physiological alarm area.
- [No latching]: After the causes of physiological alarm are cleared, the system will no longer prompt the physiological alarm.

The default alarm of the system is non-latching alarm; you can set the alarm as latching or non-latching in the following steps:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Alarm Param >>] → [Ala.Param Setup] menu;
- Select [Latching Alarms], and set the alarm as needed:
  - [Latching]: Latching alarm.

- [No latching]: Non-latching alarm.

7.7 Manual Event

In the patient monitoring process, some events may have an impact on the patient, resulting in changes of some monitoring waves or parameters. In order to assist in the analysis of these effects, you can manually record these events through the  [Event] smart hotkey, and then view it in the event review; refer to13.4 Event Review for detailed operation.

Chapter8 SpO2

8.1 Overview

Blood oxygen saturation (SpO2) is the percentage of oxyhemoglobin (HbO2) capacity bound by oxygen in the blood in the total hemoglobin (Hb) capacity that can be combined, that is, the concentration of oxygen in the blood.

The principle for monitoring the pulse SpO2 is to fix the probe fingerstall on the patient's finger, use the finger as a transparent container for hemoglobin, use 660nm wavelength red light and 880nm near-infrared light as the incident light, maximum output power is 300 mw, measure the light transmission intensity through the tissue bed, and calculate the concentration of hemoglobin and SpO2.

The passing lights depend on a variety of factors, most of which are constant. However, one of these factors, the arterial blood flow, changes with time, as it is pulsating. By measuring the light absorbed during pulsating, it is possible to obtain the arterial blood SpO2. Detection pulsation can give a "plethysmography" wave and pulse rate signal.

The main screen displays "SPO2" value and "plethysmography" wave.

This monitor applies to measure SPO2 of adults (>18 years), pediatric (30 Days to18 years). Contact SPO2 probe to Patient's finger to get "SPO2" value and "plethysmography" wave

SPO2 function of this monitor has been calibrated in factory.

8.2 Safety Information

⚠ Warning

- **Please use SpO2 sensor specified in this Manual, operate in accordance with the Manual, and observe all warnings and precautions.**
- **Before monitoring, check whether the sensor cable is normal. When SPO2 sensor cable is unplugged from the socket, the screen will display [SPO2Sensor OFF] error message, and trigger an audible and visual alarm simultaneously.**
- **If the sensor or sensor packaging has signs of damage, do not use this SPO2 sensor; return it to the manufacturer.**

- **If there is carboxyhemoglobin, methemoglobin or dye diluted chemical, the SPO2 value will have deviation.**
- **When the patient has a tendency to hypoxia, use the oximeter to analyze blood samples in order to fully grasp the patient's condition.**
- **Do not put the sensor on limbs with arterial duct or intravenous tube.**
- **Do not intertwine electrosurgical equipment cable with the sensor cable.**
- **Avoid using the monitor and sensors while using the NMR equipment, in order to avoid severe burns to the patient as a result of induced currents.**
- **During long time continuous monitoring of a patient, check the position of SpO2 sensor once every 2 hours, and move properly when the skin changes or every four hours. Some patients may require more frequent inspection, such as patients with perfusion disorders or sensitive skin, because persistent and prolonged monitoring may increase unpredictable skin changes, such as allergies, redness, blistering or pressure necrosis.**
- **Carefully select SpO2 alarm upper limit. High oxygen level will cause crystal-like fibrous tissue disease to premature children.**

Note

- **Do not put the oxygen probe and blood pressure cuff on the same limb, because blood flow occlusion during blood pressure measurement will affect the SpO2 readings.**

- **This monitor cannot be used to verify the accuracy of SPO2 Probe and SPO2 machine.**

8.3 Monitoring Steps

1. Select the appropriate SpO2 sensor according to the patient.
2. Turn on the monitor, and connect the SpO2 lead wire to the monitor.
3. Clean the measurement site, such as finger with nail polish.
4. Put the SpO2 sensor probe on the patient’s body.
5. Select the appropriate alarm settings.
6. Start monitoring.

Note

- **Turn on the monitor, plug in SPO2 probe and connect patient's finger, monitor displays SPO2 wave,【SPO2 Pulse Search】 displayed in the technical alarm area until the monitor measured SPO2 value and pulse rate. 【SPO2 Search Timeout】 displayed in the technical alarm area until the monitor measured pulse rate. Check the sensor mounting position, whether the sensor is damaged or sensor type. Reconnect the sensor or use new sensor.**

8.4 Display

SpO2 parameter area is shown in Fig. 8-1.

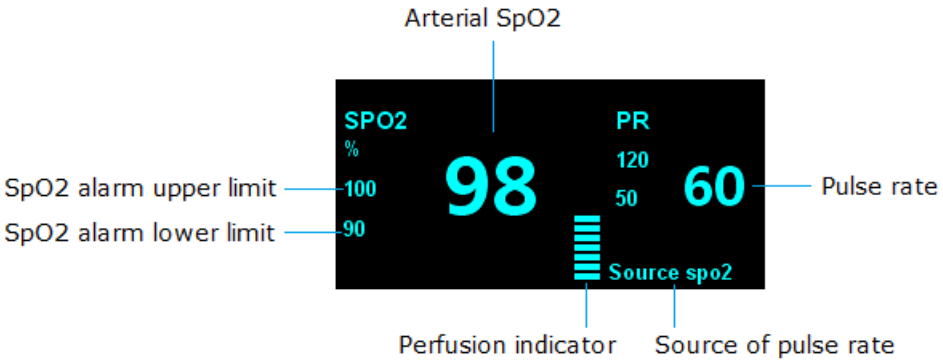


Fig. 8-1 SpO2 Parameter Area

SpO2 wave is shown in Fig. 10-2.

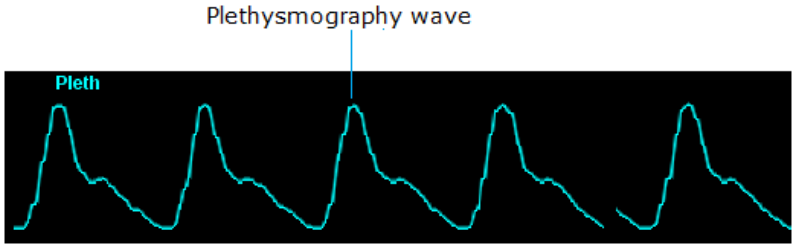


Fig. 8-2 SpO2 Wave

8.5 SpO2 Setup

Select SpO2 parameter area or Pleth wave area → [SpO2 Setup] menu, which is shown below. You can set SpO2 through [SpO2 Setup] menu.

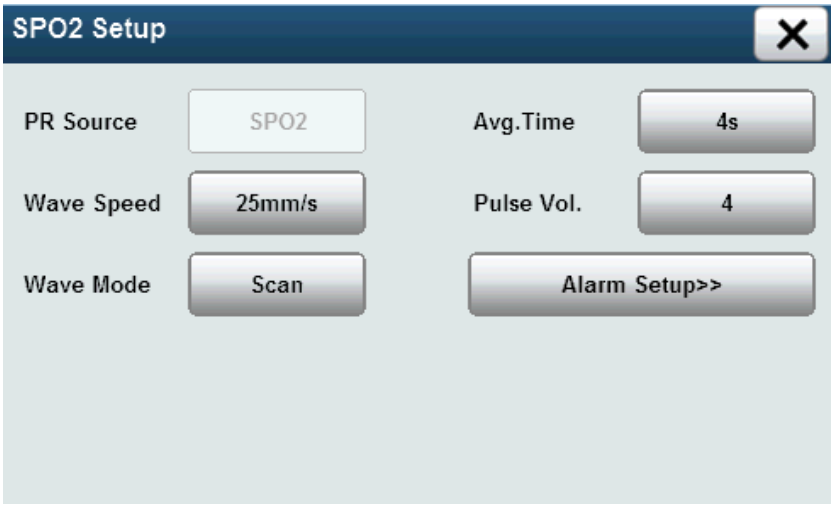


Fig. 8-3 [SpO2 Setup] Menu

8.5.1 Wave Speed

- Select [Wave Speed] and set wave speed to [12.5mm/s] or [25mm/s]; the faster speed, the smoother wave.

8.5.2 Wave Mode

- Select [Wave Mode], and set the wave drawing mode
  - [Scan]: Scan mode.
  - [Fill]: Fill mode.

8.5.3 Average Time

SpO2 values displayed on the monitor are the results averaged from the data collected over time. The shorter the average time, the faster the monitor responds when the patient's SpO2 value changes, but the measurement accuracy is lower. Conversely, the longer the average time, the slower the monitor responds when the patient's SpO2 value changes, but the measurement accuracy is higher. In monitoring critically ill patients, a smaller average time is conducive to timely analysis of the disease.

The setting method follows:

- Select [Avg.Time] to set the average time to [2s], [3s], [4s], [5s], [6s], [7s] or [8s].

8.6 Influencing Factors

During operation, the following factors can affect the accuracy of SpO2 measurement:

- High-frequency radio wave interference, such as interference generated by the host system or interference from electrosurgery instrument connected to the system.
- Intravenous dye.
- Too frequent movement of the patient.
- External light radiation.
- Sensor is improperly installed or improperly in contact with the patient.
- Sensor temperature (optimum temperature 28 ℃~42 ℃).
- The sensor is placed on limbs with blood pressure cuff, arterial duct or lumen tube.
- Concentration of non-functional hemoglobin such as carboxyhemoglobin (COHb) and methemoglobin (MetHb).
- SpO2 too low.
- Poor perfusion of test site.
- Shock, anemia, hypothermia, and the application of vasoconstrictor drugs may reduce the arterial blood flow to a level that can not be measured.
- The measurement also depends on the absorption of specific wavelengths of light by oxyhemoglobin and reduced hemoglobin. If there is any other substance that absorbs the same wavelength, the measurement may have false or low SPO2 values, such as: carbon hemoglobin, methemoglobin, methylene blue, and indigo carmine.
- SPO2 probe described in Annex is recommended.
- Operating environment limit: Operating temperature range: 0～45℃, Humidity range: 0~85% (non-condensing), Elevation range: -500m~5000m.

Chapter9 PR

9.1 Overview

The mechanical activity of the heart causes arterial pulsation, and PR (pulse rate) value can be obtained by measuring this pulsation. PR value can be obtained through SpO2 measurement.

9.2 Display

The color of PR parameter area is same as SpO2 parameter color of PR source, as shown in Fig. 9-1:

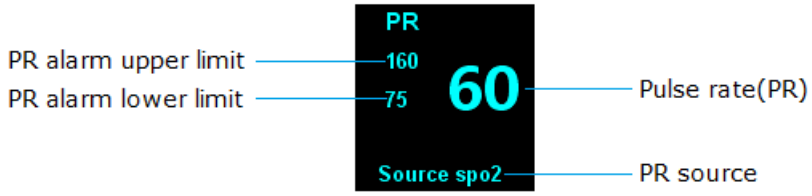


Fig. 9-1 PR Parameter Area

9.3 Pulse Vol.

Select SpO2 parameter area or Pleth wave area → [SpO2 Setup] menu;

Select [Pulse Vol.] to set [Pulse Vol.] to 0~9, and plus / minus 1 each time the shuttle is turned. Select 0 to turn off the key-pressing tone, and select 9 to set the maximum volume.

Note

- **HR sound has higher priority than PR sound; when HR makes a sound, PR won't; when HR sound is 0, PR can make a sound.**

9.4 Alarm Setup

Select PR parameter area → [SpO2 Setup] menu → [Alarm Setup >>] to enter the [Alarm Setup] interface, and set PR alarm switch, alarm level and upper/lower alarm limit. See 6.5

Alarm Setup for detailed setting method.

Chapter10 NIBP

10.1 Overview

2The monitor uses oscillometric method to measure noninvasive blood pressure (NIBP), and applies to adults, pediatric.

The oscillometric method for measuring blood pressure is to inflate a cuff with a certain amount of pressure until the arterial blood flow has been completely blocked. As pressure decreases, the arterial blood flow will be completely occluded, gradually opened, and completely opened. Then, the pulsation of the arterial vascular wall will generate a shock wave in the cuff. SBP, MBP, and DBP are obtained by measuring and analyzing cuff pressure oscillations when deflating.

- Produce first most clear signal - reflect SBP
- Oscillation amplitude reaches the peak - reflect MAP
- When the cuff pressure is suddenly lowered - reflect DBP

Measuring mode: manual, cycle, and continuous. Each mode shows systolic, mean and diastolic blood pressure.

- Manual mode

Using Manual mode start to measures by hand

- Automatic mode measures

Use manual mode to open automatic mode, then the measure will automatically turn to automatic mode after a certain time. During measurement. Any error will stop the current automatic measurement, but not affect next automatic measurement unless the time interval less than 30s. If the time interval less than 30s, should delay the next automatic measurement, keep the interval more than 30s.

The time interval can be chosen in automatic mode as follow: 1, 2, 3, 4, 5, 10, 15, 30, 60, 90, 120, 180, 240, 480 minutes

- Continuous mode

Choose continuous mode, 5 seconds after complete a measurement start the next

measurement, continue 5 minutes then stop. During measurement. Any error will stop the continuous measurement. If the first measurement time is over 4 minutes and 40 seconds but less than 5 minutes, the continuous mode will stop before 5 minutes, if the first measurement time is over 5 minutes, the continuous mode will stop after 5 minutes

10.2 Safety Information

⚠ Warning

- **Do not carry out non-invasive blood pressure measurement on patients with sickle cell disease and skin damage or any expected damage.**
- **For patients with severe coagulation disorder, determine if the automatic blood pressure measurement is carried out according to the clinical evaluation, since the friction of body and cuff may produce hematoma.**
- **When measuring on pediatric and neonate patient, ensure that the correct patient mode (see Patient Info menu setting) is selected in order to ensure that maximum cuff pressure does not exceed the measuring range of the patient (pediatric mode: 240mmHg, Neonate mode: 150mmHg). Using the wrong patient mode may endanger the safety of patients because higher adult blood pressure level does not apply to pediatric and neonate patients.**
- **Do not install a cuff on the limbs with intravenous infusion or duct, because it may lead to tissue damage around the duct when the cuff is inflated and makes the infusion slow down or be blocked.**
- **The inflatable tube connecting the blood pressure cuff and the monitor should be smooth without entanglement.**
- **For patients with severe thrombotic disorders, determine whether to carry out automatic blood pressure measurement according to the clinical situations, since the limb bundled with a cuff may produce hematoma.**
- **Do not measure blood pressure frequently, otherwise it will affect the distribution of blood flow, May endanger the safety of patients.**
- **Check the patient's physiological condition before measure blood pressure, in order to ensure that long time measure will not damage the circulation of patients**
- **Mastectomy patients，using NIBP cuff to measure blood pressure on the surgery side arm.**

10.3 Measurement Limits

According to the patient's condition, the oscillometric method has some limitations. This measurement is to look for the regular pulse waves generated by arterial pressure. If the patient's condition makes this detection method difficult, the measured value becomes unreliable, and pressure measurement time increases. The user should be aware that the following conditions may interfere with measurement method, making the pressure measurement unreliable or extend the time. In this case, the patient's condition does not allow measurement.

- Patient movement

If the patient is moving, shaking or cramping, the measurement will be unreliable or even impossible, as these may interfere with the detection of arterial pressure pulse, and extend the pressure measurement time.

- Arrhythmia

If the patient shows arrhythmia which results in irregular heartbeat, the measurement will be unreliable and even cannot be done, and the pressure measurement time will be extended.

- Use of an artificial heart-lung machine

If a patient is connected to an artificial heart-lung machine, the measurement will be impossible.

- Pressure changes

If the arterial pressure pulse is being analyzed to obtain a measured value at a certain time and the blood pressure of the patient changes rapidly, the measurement will be unreliable or impossible.

- Severe shock

If the patient is in severe shock or hypothermia, the pressure measurement will not be reliable, because the decrease of blood flow to the periphery would cause decrease in arterial pulsation.

- Limit heart rate

If the heart rate is below 40bpm (beats / min) or above 240bpm (beats / min), the blood

pressure measurement is impossible.

- Obese patients

A thick layer of fat around a limb blocks the arterial oscillation so that it cannot reach the cuff. The accuracy is lower than normal.

- Environmental Requirements

Measure blood pressure should meet the environment range as follow: ambient humidity 15%～80%, no condensing, ambient temperature 0～45℃, altitude -500m~5000m. NIBP performance and measurement accuracy will be affected beyond the range.

10.4 Measurement Procedure

10.4.1 Preparing for Measurement

a) Turn on the monitor, and check if it works properly;
b) Verify the patient mode, and make changes if improper;
c) Connect the blood pressure cuff extension tube to the monitor;
d) Select the cuff in accordance with the following method, make sure that the cuff is completely deflated, and then tie it to the upper arm or thigh of the patient.

- Determine the limb circumference of the patient.
- Select the appropriate cuff (marked with appropriate limb circumference). Cuff width should be 40 %(Neonate 50%) of the limb circumference or 2/3 of the upper arm length. The length of the inflated part of the cuff should be sufficient for 50%~80% around the limb.
- Place the cuff on the upper arm or thigh of the patient, and ensure that the marking φ is located just above the appropriate artery. Make sure that the cuff does not wrap too tight around the limb, or it may cause distal discoloration or even ischemia.

10.4.2 Patient posture requirements

1. Sit comfortable or lie down relax;
2. No crossing legs
3. Back and elbow should be supported;
4. The center of NIBP cuff and the right atrium are at in the same level.
5. Remind patients, no talking during measurement and try ro relax.

Note

- **If there is any question of measurement value, please repeat measurement then get average value, if the average value is not correct, please change to mechanical blood pressure measurement equipment.**
- **Please use neonate cuff to measure on neonate patient.**

10.4.3 Starting / Stopping Measurement

Use the  buttons on the monitor panel or  [NIBP] smart hotkey on the display to start / stop the blood pressure measurement.

10.4.4 Correcting Measurement Results

The position of limb blood pressure measurement should be in the same horizontal position of the patient's heart. Otherwise, correct the measurement results with the following correction method:

- If the cuff is above the heart level position, increase 0.75mmHg (0.10kPa) per centimeter of gap to the measured results.
- If the cuff is below the heart level position, subtract 0.75mmHg (0.10kPa) per centimeter of gap from the measured results.
- If the patient is obese or clothes are too thick, subtract 5mmHg ~ 10mmHg (0.65kPa ~ 1.3kPa) from the measured results.

10.5 NIBP Display

NIBP measurement has no waveform display, and only displays NIBP measurement results in the parameter area, as shown in Fig. 11-1. The figure below is for reference only. The graphics displayed on the monitor may be slightly different.

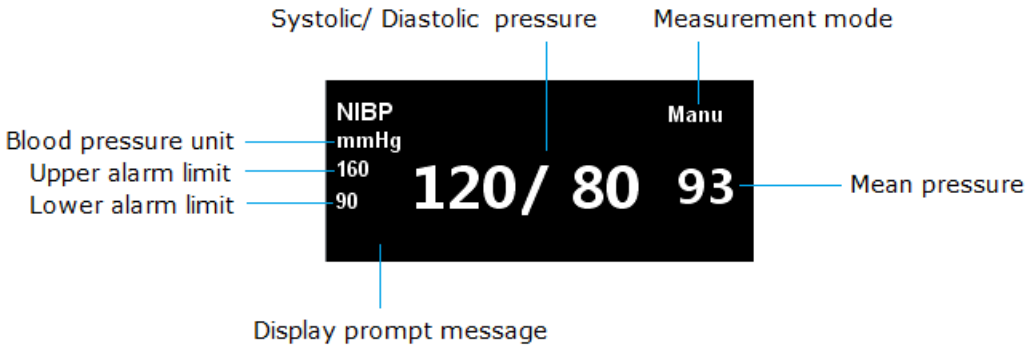


Fig. 11-1 NIBP Parameter Area

10.6 Inflation Pressure

If necessary, you can manually set the initial cuff inflation pressure as follows:

- Select the NIBP parameter area → [NIBP Setup] menu;
- Select [Pre-Infl Press], and set the appropriate cuff pressure value.

10.7 Resetting

Select NIBP parameter area → [NIBP Setup] menu → Select [Reset], and restore the inflation pressure of the blood pressure pump to currently configured initial settings. When the blood pressure pump is not working properly, but no warning is given, you can reset the blood pressure pump, and automatically restores the blood pressure pump.

10.8 Leakage Test

The purpose of leakage test is to detect if the sealing of the air passage is in good condition. If the leakage test passes, the NIBP parameter area displays [Leakage test Stopped]. If not passed, the NIBP parameter area displays [Cuff leak] message. NIBP leakage test shall be at least once every two years or when you think that the reading is not accurate.

Prepare the following materials before the test:

- Adult cuff: one
- Inflation tube: one
- Cylinder of appropriate size: one

Leakage test process

1. Connect the cuff to the NIBP pore of the monitor
2. Wrap the cuff on the cylinder of appropriate size.
3. Set the patient type to adults.
4. Select  [Menu] Smart Hotkey → [Main Menu];
5. Select [User Maintenance >>] → enter the password and confirm → [User Maintenance] menu;
6. Select [Module Maintenance >>] → [Module Maintenance] menu;
7. Select [NIBP >>] → [NIBP Maintenance] menu, and select [Leak Test] for leakage test.
8. After 20s, the system will automatically open the bleeder valve, and the leak test finishes.

9. If the NIBP parameter area displays [Leakage test Stopped], the system does not leak. If it displays [Cuff leak], it indicates that the air passage leaks. At this time, the operator should check if the entire connection is loose, and test for leak once again when the connection is correct. If there is error prompt still, please contact the manufacturer for repair.

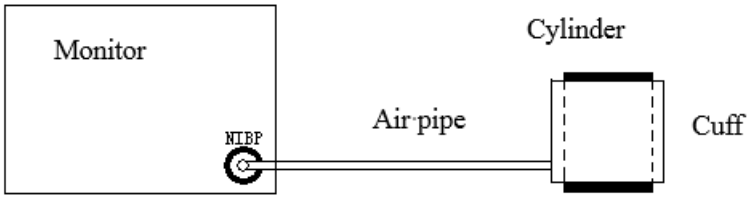


Fig. 11-2 NIBP Leakage Test Connection Diagram

10.9 Calibration

Users can not calibrate NIBP. If calibration is required, please contact your service representative. Cuff pressure sensor should be checked and calibrated at least once every two years by qualified professional service personnel.

10.10 Clean and disinfection

If necessary, NIBP cuff and NIBP extension tube can be cleaned and disinfected together without separated

10.10.1 Cleaning

1. Prepare enzyme cleaning agent, distilled water and 10% solvent, respectively in different spray bottle.

2. Sprinkle cleaning agent on NIBP cuff, connector and extension tube, keep 1 minutes for the dry stains.
3. Use a soft cloth to wipe smooth face. Use soft hair brush to brush visible stain and irregular surface

Note

- **Please be especially careful to clean the air ball and control valve of whole air system. Do not allow any liquid entering into reversing valve and saturated valve**
- **Don't use a soft cotton ball and fiber to clean this accessory, because they will stick on the cuff and extension tub**

10.10.2 Disinfection

1. Sprinkle bleach solution (Formula: the proportion of water and bleaching powder to 1:10) then keep 5 minutes
2. Wipe off excess bleach solution and elute with distilled water again
3. Natural dry cuff

10.11 Alarm Setup

In [NIBP Setup] menu, select [Alarm Setup >>] to enter [Alarm Setup] interface, and set NIBP alarm switch, alarm level, upper and lower alarm limit. See 6.5 Alarm Setup for detailed setting method.

Chapter11 Temp

11.1 Overview

This monitor has two temperature measurement channels; the temperature sensor will measure the body temperature, and calculate the difference between the body temperature data.

11.2 Safety Information

⚠ Warning

- **Before monitoring, check if the probe cable is normal. Unplug the temperature probe cable from the jack, the screen will display [TEMP1/TEMP2 Sensor Off] prompt and make an alarm sound.**
- **Calibrate the temperature measuring instrument at least once every two years (or according to hospital procedures). When calibration is required, please contact the manufacturer.**

11.3 Measurement Steps

Please refer to the following steps:

1. Turn on the monitor and check if it works normally.
2. Select the appropriate temperature probe according to the patient category and measurement needs.
3. Insert the probe lead wire into the temperature probe interface.
4. Attach the probe to the patient properly.
5. Make sure that the alarm settings apply to the patient.

11.4 Measuring Requirements

The normal measuring range of body temperature is 5~50° C, and the accuracy is consistent in this range.

The environmental temperature range for body temperature measuring is 0~55℃, the minimum measuring time is 1s, and the measuring interval is 1s.

Warning

- **Please measure the body temperature in the specified environmental temperature range, or else it may be dangerous.**

11.5 Temp Display

The monitor can display the body temperature of two channels (T1 and T2) and the alarm limits, difference between the two temperature (TD) and temperature units. Select Temp parameter area and open the [Temp Setup] menu.

Temp display area is shown below:

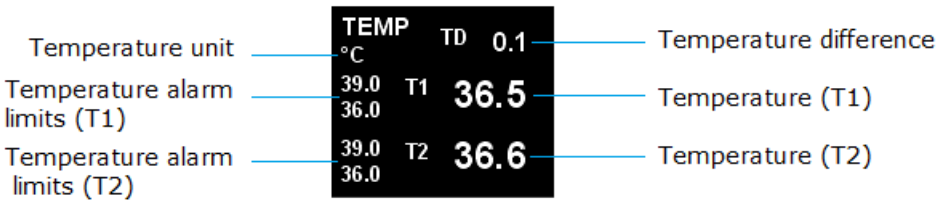


Fig. 12-1 TEMP Parameter Area

11.6 Selecting Resistance Type of Temp Probe

Select the appropriate [Temp Sensor] value according to the actual resistance of the temperature probe being used. The specific setting method follows:

- Select [Menu] smart hotkey → [Main Menu];
- Select [Factory Maintenance] → Enter and confirm the password → [Factory Maintenance] menu;
- In [Factory Maintenance] menu, set [Temp Sensor] to
  - [10K], probe resistance is 10kΩ ;
  - [2K], probe resistance is 2.25kΩ.

Warning

- **If the temperature value displayed by the monitor has significant difference from the body temperature under normal condition, please check if the probe resistance of the monitor matches the resistance set in the monitor system; if not, please replace a probe with appropriate resistance or adjust the monitor and select the appropriate resistance.**

11.7 Setting Temperature Unit

You can define your favorite temperature unit as follows:

- Select TEMP parameter area → [TEMP Setup] menu;
- In the [TEMP Setup] menu, set [Unit] to [℃] or [℉].

11.8 Alarm Setup

In [TEMP Setup] menu, select [Alarm Setup >>] to enter [Alarm Setup] interface, and set TEMP alarm switch, alarm level, upper and lower alarm limit. See 6.5 Alarm Setup for detailed setting method.

Chapter12 ECG

12.1 Overview

Electrocardiogram (ECG) is produced by the continuous electrical activity of the patient's heart, and displayed with waves and numerics on the monitor in order to accurately assess the physiological state of the patient at the time. The ECG cable should be connected properly, so as to obtain a correct measurement value and normal display. This monitor can simultaneously display 7 ECG waves.

Patient cable consists of two parts:

- Wires connected to the monitor
- ECG device connected to the patient

Connect to the monitor with five lead ECG cable, and ECG can display two different waves by adjusting the two leads. You can use the shuttle to change the lead name on the left of the ECG wave on the screen and select the lead to be monitored.

The parameters displayed in the parameter area of the monitor include heart rate (HR), ST segment measurements and arrhythmia counts per minute.

All these parameters can be used as alarm parameters.

Note

- **In the factory setup of this instrument, ECG waves display in the first two waves from the top in the wave area in the normal screen.**

12.2 Safety Information

⚠ Warning

- **To monitor ECG signal with this monitor, ECG cable and ECG electrodes specified in the Operator's Manual must be used.**
- **When you connect electrodes or patient cable, make sure that the patient is absolutely not connected with any other conductive parts or in contact with the ground. In particular, make sure that all the ECG electrodes, including the**

neutral electrodes, are attached to the patient and prevent them from contact with the conductive parts or ground.

- **Periodically check the skin that the electrode is placed at; if there is any sign of allergy, replace the electrode or change the placement position.**
- **Electrosurgery (ESU) device interference, defibrillator discharge:**
  - ✧ **When the patient needs defibrillation, do not use non-defibrillator type ECG cables.**
  - ✧ **During defibrillation, the operating personnel shall not touch the patient, tables and instrument.**
  - ✧ **During defibrillation, the ECG cable connected with the patient's body may be damaged. Check if the function is normal again before using these cables.**
  - ✧ **Recover within 10 seconds after defibrillation and will not lose any stored data. During electrosurgery (ESU) or defibrillation, the measurement accuracy may be temporarily reduced. This does not affect the safety of the patient or the instrument.**
  - ✧ **Do not expose this equipment to X-ray or strong magnetic fields (MRI).**

12.3 Monitoring Steps

12.3.1 Preparation

Before placing the electrode, prepare the patient's skin in the following steps:

- Skin preparation: Since the skin is a poor conductor, it is very important to treat the patient's skin for electrode placement appropriately to make good contact between the electrode and the skin. Select the flat position with less muscles for the electrode placement, and refer to the method below for treatment of the skin:
  - ◆ Remove the body hair at the position for electrode placement.
  - ◆ Gently rub the skin at the position for electrode placement to remove dead skin cells.
  - ◆ Wash the skin thoroughly with soap and water (do not use ether and pure alcohol, as this will increase the skin's impedance).
  - ◆ Dry the skin completely before placing the electrode.
- Install the spring clip or stud prior to the placement of the electrodes.

- Place the electrode on the patient.
- Connect the ECG cable and ECG interface.

Warning

- **Check if the lead is normal before monitoring. When the ECG cable is unplugged, the screen will display [ECG Lead Off] prompt, and trigger an audible and visual alarm.**

12.3.2 Selecting Lead

- Select the ECG parameter area or wave area → [ECGSetup] menu;
- Select [Other Setup >>] → [ECG Other Setup] menu;
- Select [Lead Type], and select the ECG lead as needed:
  - [3-Lead]: 3-lead; ECG wave options: I, II, III.
  - [5-Lead]: 5-lead; ECG wave options: I, II, III, AVR, AVL, AVF, V.

12.3.3 Lead Name and Corresponding Color

The lead names in European standard and U.S. standard (represented with R, L, N, F, C in European Standard, and represented with RA, LA, RL, LL, V in the U.S. standard) are shown in Table 7 -1.

Table 7-1: Lead Name in European Standard and American Standard

European Standard (IEC)		American Standard (AHA)	
Lead Name	Color	Lead Name	Color
R	Red	RA	White
L	Yellow	LA	Black
F	Green	LL	Red
N	Black	RL	Green
C	White	V	Brown

12.3.4 Installing Electrodes

- 3-lead

  The electrode placement position of 3-lead is shown in Fig. 7-1:

  - R electrode: placed below the clavicle, near the right shoulder.
  - L electrode: placed below the clavicle, near the left shoulder.
  - F electrode: placed on the left abdomen.

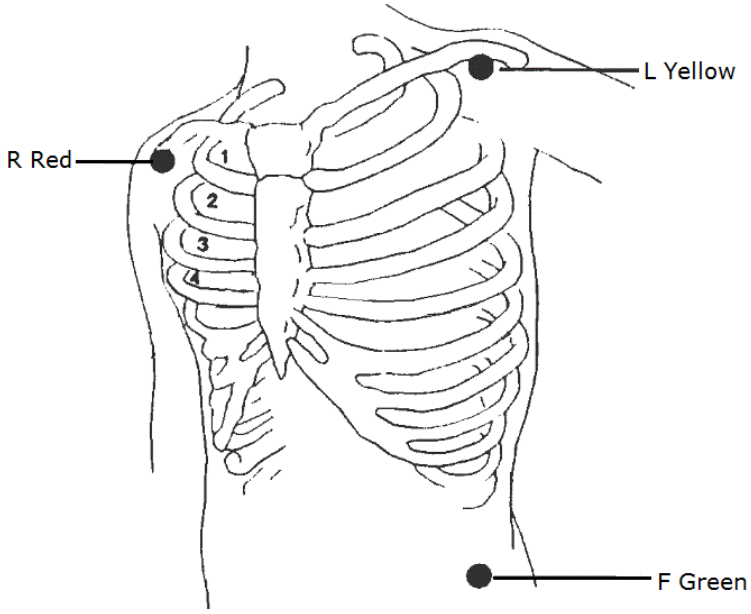


Fig. 7-1 3-lead Connection Method

- 5-lead

The electrode placement position of 5-lead is shown in Fig. 7-2:

  - R electrode: placed below the clavicle, near the right shoulder.
  - L electrode: placed below the clavicle, near the left shoulder.
  - n electrode: placed on the right abdomen.
  - F electrode: placed on the left abdomen.
  - C electrode: placed on the chest wall.

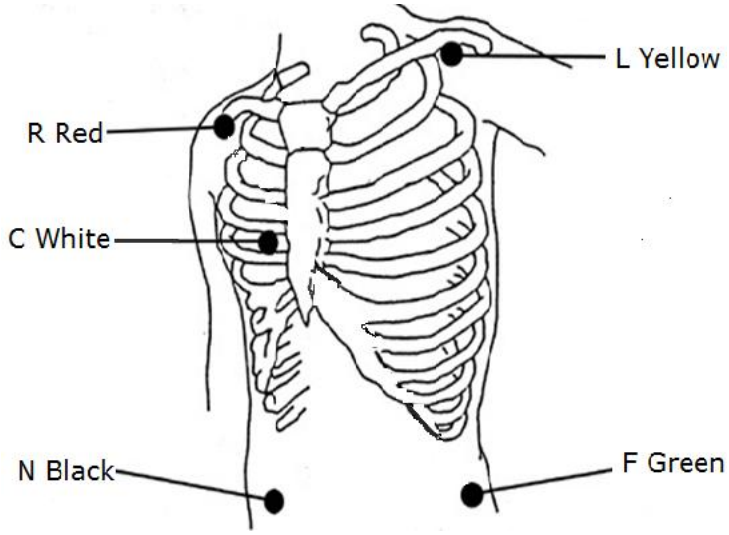


Fig. 7-2 European 5-lead Connection Method

Notes

- **To ensure patient safety, all leads must be connected to the patient.**
- **If the electrodes are attached correctly, but the ECG wave is not accurate, then replace the lead.**
- **Interference from ungrounded instrument near the patient and ESU interference may cause wave problems.**

12.3.5 Checking the Pacemaking Status

Before ECG monitoring, it is very important to set the pacemaking state of the patient properly. If the patient has a pacemaker, set [Paced] to [Yes], and the icon  displays in the patient information area. When the system detects a pacing signal, the " | "symbol will be marked in the top of the ECG wave.

You can change the pacing state in the following method:

- Select the patient information area to pop up the [Patient Info] menu;
- Select [Yes] / [No] for [Paced] as needed, indicating that the patient with or without pacemaker

12.4 ECG Display

■ ECG wave display

The monitor displays two ECG waves on the normal screen. Fig. 7-4 below is the monitoring interface of 5-lead, and is for reference purposes only. The graphics displayed on your monitor may be slightly different.

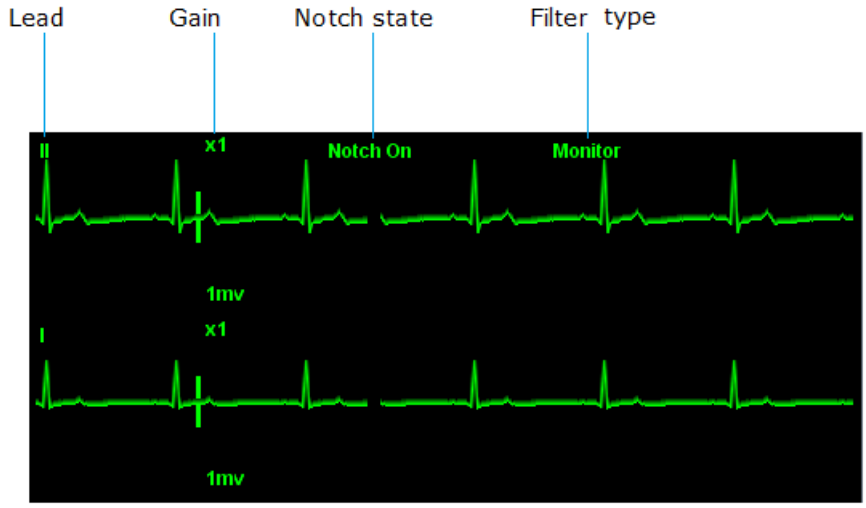


Fig. 7-4 ECG Wave on Normal Screen

In addition, when [Paced] is set to [Yes], and the patient wears a pacemaker, the " | "symbol will be marked in the top of the ECG wave.

■ ECG parameter display

The ECG parameter area of the monitor in the normal screen is shown in Fig. 7-5:

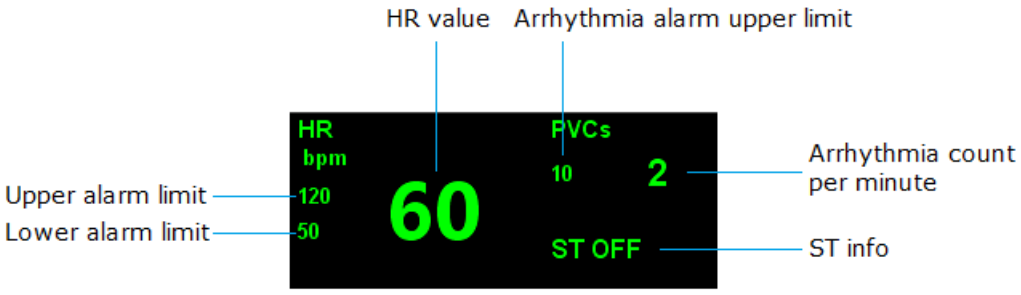


Fig. 7-5 ECG Parameter in Normal Screen

12.5 ECG Setup

Click the ECG parameter area or wave ECG area to pop up the [ECG Setup] menu, which is as shown below. You can set the ECG through the [ECG Setup] menu.

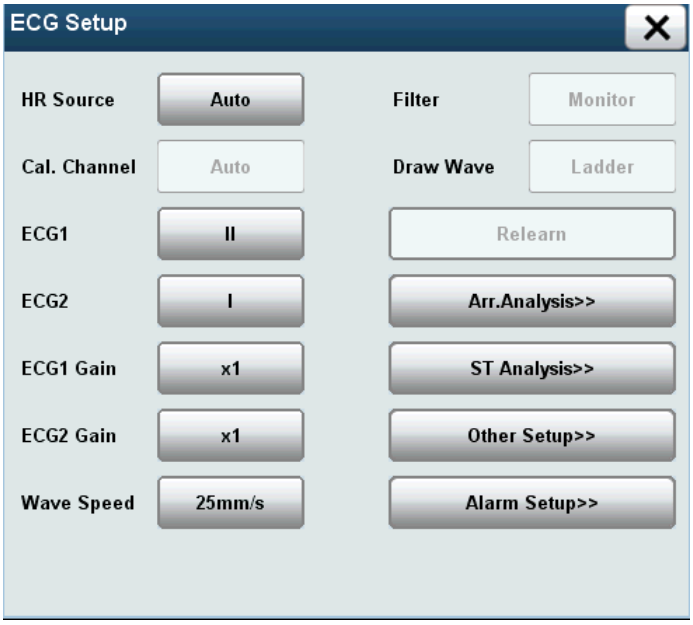


Fig. 7-6 [ECG Setup] Menu

- Select [HR Source], and set the heart rate source:
  - [Auto]: Automatically select HR source.
  - [ECG]: Select ECG monitoring as the HR source.
  - [SPO2]: Select SpO2 monitoring as the HR source.
- Select [Cal.Channel] and select heart rate calculation channel.

Select [ECG1] / [ECG2] to set the display wave channel. Select ECG1/ECG2, and set the names of upper ECG wave and lower ECG wave on the screen.

- ECG1/ECG2 should not be the source of the same wave.
- Select [ECG1 Gain] / [ECG2 Gain] and set the ECG wave gain. When the wave is shorter, increase the wave gain factor appropriately; when the wave is high or the peak cannot be displayed, reduce the wave gain appropriately.
- Select [Wave Speed], and set the wave speed.
- Select [Filter], and set the filter mode:
  - [Monitor]: Monitor mode
  - [Diagnostic]: Diagnostic mode
  - [Surgery]: Surgery mode

- [Strong]: Strong filter mode

- Select [Draw Wave], and set the wave drawing method as below:
  - [Smooth]: Smooth
  - [Ladder]: Ladder; default.
- Select [Relearn] to learn arrhythmia. In the following cases, you need to start arrhythmia self-learning:
  - In ECG monitoring process, when the patient's ECG module has larger changes, arrhythmia self-learning should be started once.
  - ECG module changes could cause wrong arrhythmia alarm, ST measurement lost, and inaccurate heart rate.

12.6 Alarm Setup

Select [Alarm Setup >>] → [Alarm Setup] interface to set ECG related alarms; see 6.5 Alarm Setup for the setting method.

Chapter13 Review

The monitor provides up to 120 hours trend data review of all monitoring parameters, 1000 groups of NIBP measurement data and 200 alarm events. The user can select trend chart or trend table to view trend change; or view the latest wave.

13.1 Reviewing Trend Chart

Select [Review] smart hotkey to enter [Review] menu, and select [Graphic] to enter the following window.

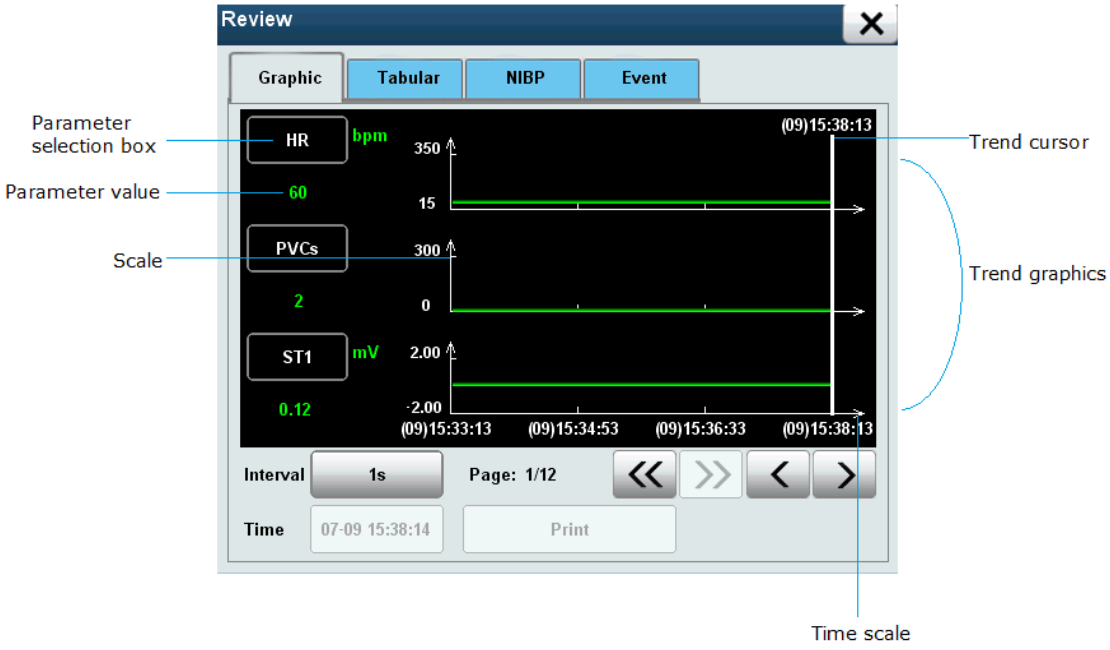


Fig. 13-1 Trend Chart

- In the trend chart, use the following method to select the parameter to be reviewed:
  - Select the parameter box, rotate the shuttle to select the parameters to be reviewed, click on the shuttle, and set the parameter box as the parameter to be reviewed.
- Select [Interval], and select the option as needed:
  - [1s]: observe the trend of the last hour at 1sec interval.
  - [5s]: observe the trend of the last eight hours at 5sec interval.
  - [1min]: observe the trend of the last 120 hour at 1min interval.
  - [5min]: observe the trend of the last 120 hour at 5min interval.
  - [10min]: observe the trend of the last 120 hour at 10min interval.

- [30min]: observe the trend of the last 120 hour at 30min interval.
- [60min]: observe the trend of the last 120 hour at 60min interval.

■ Browse the trend chart in the following method:

- Select and to move the trend cursor.
- Select and to turn pages to left or right and move the trend chart.
- The cursor top displays the current time corresponding to the current cursor position, and the left of the trend chart window displays the parameter values of the time, which will change automatically with the move of trend cursor.

13.2 Reviewing Trend Table

Select [Review] smart hotkey to enter [Review] menu, select [Tabular] and enter the following window.

Fig. 13-2 Trend Table

■ Select [Interval], and select the option as needed:

- [1s]: observe the data of the last hour at 1sec interval.
- [5s]: observe the data of the last eight hours at 5sec interval.
- [1min]: observe the data of the last 120 hour at 1min interval.
- [5min]: observe the data of the last 120 hour at 5min interval.
- [10min]: observe the data of the last 120 hour at 10min interval.
- [30min]: observe the data of the last 120 hour at 30min interval.

- [60min]: observe the data of the last 120 hour at 60min interval.

■ Browse the trend table in the following method:

- Select and to turn pages to left or right and move the trend table to observe the target parameters.
- Select and to move the trend table upward or downward progressively and observe more data.
- Select and to turn pages up or down and move the trend table to observe more data.

13.3 NIBP Measurement Review

Select [Review] smart hotkey to enter [Review] menu, and select [NIBP] to enter the following window

Fig. 13-3 Measurement of NIBP Review

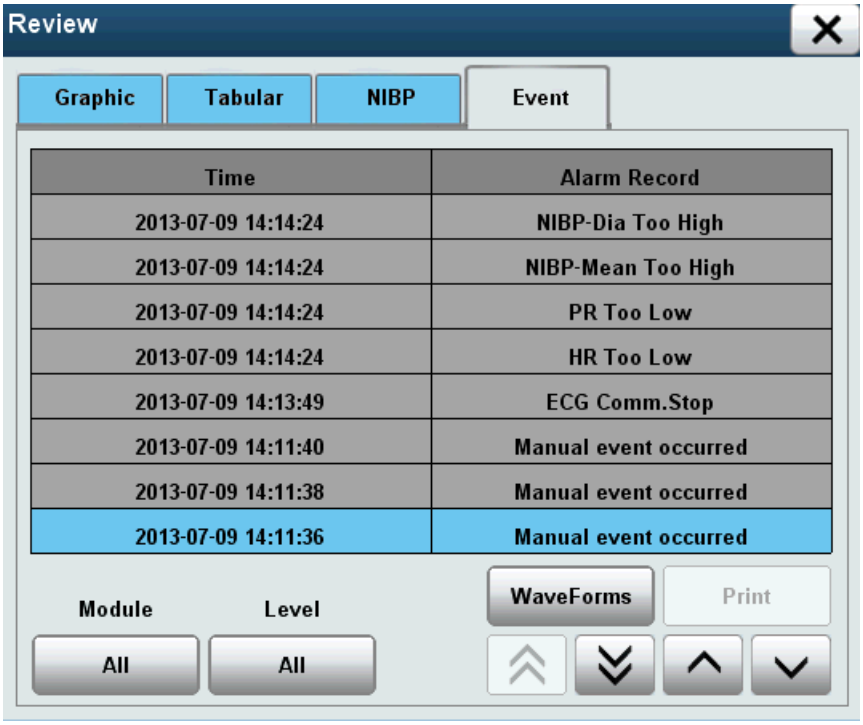
This window shows the measurement time of noninvasive blood pressure, systolic blood pressure [Sys], diastolic blood pressure [Dia], mean blood pressure [Mean] and pulse rate [PR]. The monitor can store 1000 sets of NIBP measurements in total.

■ NIBP viewing method is as follows:

- Select and to move the trend table upward or downward progressively and observe more data.
- Select and to turn pages up or down and move the trend table to observe more data.

13.4 Event Review

Select [Review] smart hotkey to enter [Review] menu, and select [Event] to enter the following window.



13.4 Event Review

This window shows the time of alarm events and corresponding alarm information, and the time of manual events and corresponding manual tag events. This monitor allows reviewing 200 events in total, including the physiological alarm events, technical alarm events and manual events.

- Select [Module], and select an option as needed:
  - [ECG]: View ECG-related alarm events.
  - [SPO2]: View SPO2 related alarm events.
  - [NIBP]: View NIBP related alarm events.

- [RESP]: View RESP related alarm events.
- [TEMP]: View TEMP related alarm events.
- [Manual]: View manual events.
- [All]: View all related events.

■ Select [Level], and select an option as needed:

- [High]: View high level alarm events.
- [Mid]: View middle level alarm events.
- [Low]: View low level alarm events and manual events.

■ Select [Wave Forms] to view the waveform and relevant parameters when alarm occurs, as shown in Fig. 13.5 below:

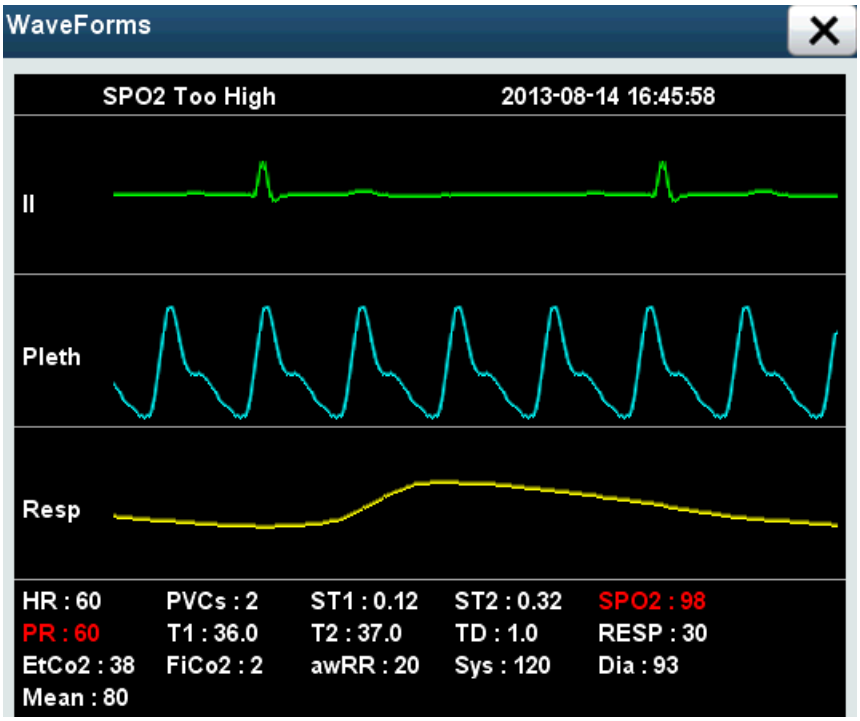


Fig. 13.5 Waveform Review

■ Event viewing method is as follows:

- Select and to move the trend table upward or downward progressively and observe more data.
- Select and to turn pages up or down and move the trend table to observe more data.

Chapter14 Caring and Cleaning

14.1 Overview

In the using process, please make sure that there is no dust on or near your device. To prevent damage, please use the diluted detergents and disinfectants specified in this Manual, and use the lowest possible concentration. For the damage or accident caused by using other materials or methods, Northern does not assume any responsibility.

14.2 Cleaning

The device should be cleaned regularly. In the heavily polluted environment, increase the frequency of cleaning. Before cleaning, please consult the hospital about device cleaning requirements.

Below are available cleaning agents:

- Diluted ammonia
- Diluted sodium hypochlorite (washing bleach)
- Diluted formaldehyde
- Hydrogen peroxide (3%)
- Ethanol (70%)
- Isopropanol (70%)

Before cleaning:

1. Turn off the monitor, disconnect the power cord and remove the battery.
2. Use a soft cotton ball to adsorb appropriate amount of cleaning agent and wipe the display screen.
3. Use a soft lint-free cloth to adsorb appropriate amount of cleaning agent and wipe the surface of the device.
4. If necessary, use a clean, dry, lint-free cloth to remove any excess detergent.
5. Dry the device naturally in a ventilated cool environment.

Warning

- **Before cleaning the monitor or sensor, turn off the power and disconnect the AC power.**
- **The monitor should be kept clean. It is recommended to regularly clean the enclosure surface and the display screen. Cleaning the enclosure with non-etching cleaners such as soap and water.**

⚠ Caution

- **To avoid damaging the monitor:**
  - ✧ **Do not use strong solvents such as acetone.**
  - ✧ **Most cleaners must be diluted before use. Dilute according to the manufacturer's instructions.**
  - ✧ **Do not use abrasive materials (such as steel wool).**
  - ✧ **Do not allow any liquid entering into the enclosure, and never immerse any part of the device into liquid.**
  - ✧ **Do not leave any cleaning solution on the surface of any part of the device.**

Notes

- **Wipe the monitor and sensor surface with medical alcohol, dry it naturally or with clean, dry, lint-free cloth.**
- **Northern is not liable for effectiveness of using these chemicals for infectious disease control. Please consult the infectious disease control officers or experts of the hospital for advice.**

14.3 Disinfection

In order to avoid damage to the product, we recommend that the product is disinfected only when it is deemed necessary by the hospital maintenance procedures. We also recommend that the instrument to be disinfected must first be cleaned.

⚠ Caution

- **To prevent damage to the monitor, do not disinfect the monitor with gas (EtO) or formaldehyde.**

14.4 Sterilization

In order to avoid long-term damage to the device, we recommend that the product is sterilized only when it is deemed necessary by the instrument maintenance program. We also recommend that the instrument to be sterilized must first be cleaned.

Sterilization materials recommended for the monitor: ethanol group, aldehyde group.

⚠ Caution

- **Dilute or use concentration as low as possible according to the manufacturer's instructions.**
- **Do not let liquid enter into the enclosure.**
- **Never immerse any part of the instrument.**
- **Do not pour liquid onto the instrument in the sterilization process.**
- **Do not leave any fungicide residues on the surface of the device; clean it immediately with a damp cloth.**

Chapter15 Maintenance

Warning

- **If the hospitals or institutions using this instrument can't implement a satisfactory maintenance schedule, it will result in device failure and may endanger human health.**

15.1 Checking

Check the following basic items before using the monitor:

- Check for any mechanical damage;
- Check all exposed wires, insertions and accessories;
- Check all instrument functions that may be used for patient monitoring and ensure that the instrument is in good working condition.

If the instrument function has any sign of damage, do not use this monitor for any patient monitoring. Please contact the hospital's professional maintenance personnel or our customer service personnel.

Every 6-12 months or after each repair, a comprehensive examination must be performed by trained and qualified technical service personnel, including functional safety checks; the specific inspection items are as follows:

- Environment and power meet the requirements.
- Device and accessories have no mechanical damage.
- The power supply has no wear, and the insulation is good.
- Specified accessories are used.
- Alarm system is functioning correctly.
- Battery performance meets the requirements.
- Monitoring functions are in good working condition.
- Ground impedance and leakage current meet the requirements.

If the instrument function has any sign of damage, do not use this monitor for any patient monitoring. Please contact the hospital's professional maintenance personnel or our customer service personnel.

All checks that require disassembling the instrument must be performed by qualified service personnel. Safety and maintenance checks may also be carried out by the Company's personnel.

15.2 Viewing Software Version Info

You can view the software version through the following steps:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [Monitor Information >>] → [Monitor Info] menu;
- [Monitor Info] menu displays the software version information of the monitor.

The software version of the monitor: V1.1.7

15.3 Maintenance Plan

The following tasks can only be done by qualified service personnel of Northern. When the following maintenance is needed, please contact your service representative. Before testing or maintenance, clean and disinfect the device.

Inspection / Maintenance Item	Frequency
Check the safety according to IEC 60601-1	At least once every two years, after replacing the power supply or the monitor falls down.
Check all monitoring or measuring functions not listed	At least once every two years, or when you suspect that the measured value is not accurate.
NIBP leakage test	At least once every two years, or follow hospital regulations
NIBP calibration	At least once every two years, or follow hospital regulations

15.4 ECG Calibration

In the process of using the monitor, the displayed ECG signals may be inaccurate due to hardware or software problems, mainly shown as waveform amplitude becoming larger or smaller. At this moment, you need to calibrate ECG.

Prepare the following instruments before testing:

- ECG simulator
- ECG cable
- Vernier caliper

The calibration method is as follows:

- Connect the ECG cable to the monitor.
- Connect the ECG electrodes to the ECG simulator.
- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Module Maintenance >>] → [Module Maintenance] menu;
- Select [ECG >>] → [ECG Maintenance] menu, and select [Calibration] to calibrate the ECG;
- Measure the wave amplitude with a caliper; in different filtering modes, X0.25 is 2.5 ± 5% (mm), X0.5 is 5.0 ±% 5 (mm), X1 is 10.0 ±% 5 (mm), and X2 is 20.0 ±% 5 (mm). Comparing the amplitude of the square wave with the ruler, the error range should be within 5%;
- When calibration is complete, select [Stop Calibration] to exit.

15.5 Touch Screen Calibration

You can follow the steps below to complete the calibration of the touch screen:

- Select  [Menu] Smart Hotkey→[Main Menu];
- Select [User Maintenance >>] →enter the password and confirm → [User Maintenance] menu;
- Select [Cal. Touchscreen] to enter the touch screen calibration interface.
- Click on the screen and the alignment mark appears in different positions.

- If the touch screen calibration is finished after clicking three times, select [Ok] to exit the calibration interface; if the touch screen isn't completely calibrated, select [Retry] for re-calibration.

Chapter16 Accessories

⚠ Warning

- **Use the accessories specified in the Operator's Manual; using other accessories may damage the monitor, or cannot reach the performance claimed in this Manual.**
- **The operating and storage environment of the monitor should meet the requirements of the accessories. Please refer to the manual of the accessories for these requirements.**
- **Disposable accessories can only be used once, because repeated use can cause performance degradation.**
- **If the packaging or accessories have any sign of damage, do not use such accessories.**

Standard accessories are as follows:

No.	Name	Specifications & characteristics	Standard quantity
1	5-lead ECG cable	Adult 5-lead all-in-one clip	1
2	Electrode slice	50mm×55mm, adult, disposable	1
3	Oxygen probe	Adult finger clip	1
4	Blood pressure cuff	Adult repetitive single-tube cuff	1
	Blood pressure gas nozzle	Metal	1
	Blood pressure extension tube	3M gray	1
5	10K-type temperature probe	Adult body surface	1
6	4800mAh lithium battery	Detachable three-cell lithium battery (11.1V 4800mAh)	1
7	Ground wire	V0020A	1
8	Power cord	3×0.75mm2 10A 250V L=2M	1

Appendix A Specifications

A.1 Safety Specifications

A. 1. 1 Product Category

In accordance with classification specified in the European Medical Device Directive 93/42/EEC, this monitor is IIb type equipment. The monitor is classified as follows in accordance with IEC 60601-1:

Category Name	Specification
93/42/EEC ohm Medical Devices Directive Category	IIb
Type of electric shock protection	Grade I, internal and external power supply equipment When you question the integrity of the external protective earthing or protective ground conductor parameter of the equipment, the device must be powered by the internal power supply (battery).
Electric shock protection grade	ECG/NIBP/SpO2/PR/TEMP/RESP: CF (defibrillation protection)
Explosion protection grade	Common equipment, no explosion protection
Liquid inlet protection grade	IPX1 (prevent water from entering when the water drips vertically)
Operating mode	Continuous
Movement	Portable

A. 1. 2 Power Specifications

Parameter	Specification
External AC power	
Input voltage	100-240V~
Input current	1.5A
Frequency	50/60Hz
Internal power supply: Lithium-ion battery	

Rated battery voltage	d.c. 14.8V
Battery capacity	2600mAh
Maximum supply time	About 2 hours
Charging time	About 3 hours in power on state
Minimum supply voltage	16.8V

A.2 Hardware Specifications

A. 2. 1 Physical Specifications

Dimensions	8 inch	175×275×175mm (L×W×T)
Weight		< 3kg under standard configuration

A. 2. 2 Display

Host Monitor	
Type	Color TFT LCD
Size	**Resolution**
8 inch	600×800 pixels

A. 2. 3 Host LED

Alarm indicator	1 (yellow / red)
AC power indicator	1 (green)
Battery status indicator	1 (green)

A. 2. 4 Audio Instruction

Speaker	Alarm sound (45 ~ 85dB), key-pressing sound QRS sound, PR sound. Alarm sounds meet IEC 60601-1-8 standard.

A. 2. 5 Recorder

Category	Thermal spot
Printing width	48mm

Resolution ratio	Flat direction in curve mode 32dot/mm Vertical direction 8dot/mm Flat direction in image mode 8dot/mm
Length of recorder paper	20m
Recording speed	12.5mm/s, 25mm/, 50mm/s
Recording wave	2 waves or 3waves

A. 2. 6Alarm Signal

Alarm delay	Off or 1s, 2s, 3s, 4s, 5s, 6s, 7s, 8s; depending on the configuration; the default is 4s.
Pause duration	1min, 2min, 3min, 4min, 5min, 10min, 15min or infinite; depending on the configuration; the default is 2min.

A.2.7Data Storage

Trend data	Long trend: 120h, minimum resolution: 1min
	Short trend: 1h, minimum resolution: 1s
Parameter alarm event	200 parameter alarm events
NIBP measurement results	1000 groups

A.3 Measurement Specifications

A.3.1 ECG/TEMP/RESP Specifications

ECG Specifications		
Standards compliant	EN 60601-2-27/IEC 60601-2-27, GB 9706.25, IEC60601-2-25	
Lead type	3-lead	I, II, III
	5-lead	I, II, III, aVR, aVL, aVF, V
Display sensitivity	2.5mm/mV (×0.25), 5mm/mV (×0.5), 10mm/mV (×1.0), 20mm/mV (×2.0)	
Wave sweep speed	6.25mm/s, 12.5 mm/s, 25 mm/s, 50 mm/s	
Bandwidth	Diagnostic mode	0.05Hz~100Hz
	Monitor mode	0.5Hz~40Hz
	Surgery mode	1Hz~20Hz
	Strong filter mode	5Hz~20Hz
CMRR	>100dB	
Notch	50/60Hz notch filter can be set to on or off	
Differential input impedance	>5MΩ	
Electrode polarization voltage range	±400mV	
Baseline recovery time	<3s after defibrillation (in monitor and surgery mode)	
Calibration signal	1mV (peak - peak), accuracy ±3%	

Pacing pulse		
Pulse identification	For PACE pulses that meet the criteria below, PAEC will be marked on the screen: Detection range: ±4mv ~ ±700mv Pulse width: 0.2ms ~ 2.0ms	
Average HR	Calculate from 15s data	
Interval of HR refreshing	Calculate once every second	
HR change response time	Time from 80bpm to 120bpm: ≤ 10sec Time from 80bpm to 40bpm: ≤ 10sec	
Tall T-wave suppression	For T-wave with 100ms QRS wave, 350ms QT period, 180ms duration and 1.2mV amplitude, the HR calculation won't be affected	
Alarm specifications	**Range (bpm)**	**Step (bpm)**
HR upper limit	Adult: 16~300	1
	Pediatric: 16~350	
HR lower limit	Adult: 15~299	
	Pediatric: 15~349	

HR		
Measuring range	3/5-lead monitoring	Adult: 15bpm~300bpm
		Pediatric: 15bpm~350bpm
Resolution	1bpm	
Heart rate measurement error	±1bpm or ±1%, whichever is greater	

TEMP		
Standards compliant	EN12470-4, ISO 80601-2-56	
Measurement method	Thermistor	
Measuring range	5~50 ℃ (41~122 ℉)	
Resolution	0.1 ℃	
Measurement accuracy	±0.1 ℃	
Number of channels	Two	
Alarm specifications	**Range**	**Step**
T1/T2 upper limit	0.1 ℃~50.0 ℃	0.1 ℃ 0.1 ℉
T1/T2 lower limit	0 ℃~49.9 ℃	
TD upper limit	0~50 ℃	

RESP	
Measurement method	Thoracic electrical bioimpedance method
Measuring lead	Lead I, II
Wave gain	×0.25, ×0.5, ×1, ×2
Respiratory impedance range	0.5-5Ω
Baseline impedance	500-4000Ω
Gain	10 grades
Scan speed	6.25mm/s, 12.5 mm/s, 25mm/s

A.3.2 NIBP Specifications

Standards compliant	EN 60601-2-30/IEC 60601-2-30, EN 1060-1, EN 1060-3, EN1060-4 EN/IEC 60601-1.
Measurement method	Automatic oscillometric method
Operating mode	Manual, automatic, continuous
Useful life	100, 000 times
Measurement interval	1/2/3/4/5/10/15/30/60/90/120/180/240/480min

in automatic mode			
Typical measurement time	20~40s		
Normal mode measuring range (mmHg)		Adult	Pediatric
	Systolic blood pressure	40-270	40-230
	Mean blood pressure	20-230	20-165
	Diastolic blood pressure	10-210	10-145
Measurement accuracy	Maximum average error: ±5mmHg Maximum standard deviation: 8mmHg		
Resolution	1mmHg		
Initial inflation pressure		Default	Pressure setting range
	Adult	150mmHg	80~240mmHg
	Pediatric	100mmHg	80~200mmHg
Overpressure protection point (software)	Adult: 300mmHg Pediatric: 240mmHg		
Overpressure protection point (hardware)	Adult: 320~330mmHg Pediatric: 265~275mmHg		
Pressure accuracy	±3mmHg		
Electrical characteristics			
Supply voltage	10V~14V DC		
Maximum power consumption	3.6w		
Quiescent current	50mA		
Maximum current during measurement	180mA		
Maximum current during inflation	300mA		

A.3.3 SpO2 Specifications

Standards compliant	ISO 80601-2-61
Display range	0%~100%
SpO2 display resolution	1%
SpO2 checking accuracy	2% (70%~100%); not define when lower than 70%

SpO2 alarm preset limits	Upper alarm limit	1%~100%
	Lower alarm limit	0%~99%
SpO2 alarm preset accuracy	±1%	
SpO2 alerting signal generates a delay	No delay	
SpO2 value refresh period	1s/time	
SpO2 value refresh delay	＜ 10s	
Average period	Low sensitivity	7～8s
	Intermediate sensitivity	4～6s
	Advanced sensitivity	2～3s
Alarm condition delay period	Low sensitivity	＜8s
	Intermediate sensitivity	＜6s
	Advanced sensitivity	＜3s
Alarm sign generates delay period	0s	
PR		
Measuring range	30~254bpm	
Resolution	1%	
Accuracy	±2% or ±2bpm	

Appendix B EMC

This product complies with EN 60601-1-2 Medical Electrical Equipment - Part 1-2: General requirements for safety - Collateral standard electromagnetic compatibility requirements and tests

Notes:

- **Using unqualified accessories, sensors and cables will increase the electromagnetic emission and reduce the electromagnetic immunity of the device.**
- **Do not put the device close to other devices or stack together. When necessary, observe the device closely to ensure that it runs normally in the environment.**
- **The device requires special EMC protection, and it is necessary to install and maintain it in the environment that meets the following EMC information.**
- **Even if other devices comply with CISPR emission requirements, they may also cause interference to this device.**
- **When the input signal amplitude is smaller than the minimum amplitude specified in the technical specifications, it may result in inaccurate measurements.**
- **Mobile communication devices or wireless network devices may have an impact on the device.**

<table>
<tr><td colspan="3">Electromagnetic Emission Guidelines and Declarations</td></tr>
<tr><td colspan="3">Taurus® Patient Monitor should be used in the specified electromagnetic environment. The user should ensure that the device is used in the following electromagnetic environment.</td></tr>
<tr><td>Emission test</td><td>Compliance</td><td>Electromagnetic environment - Guide</td></tr>
<tr><td>RF emission
CISPR11</td><td>Group 1</td><td>The device uses radio frequency energy only when the internal function is running, and thus its RF emission is very low, and won’t cause electromagnetic interference to nearby electronic equipment.</td></tr>
<tr><td>RF emission
CISPR11</td><td>ClassA</td><td rowspan="3">This device is suitable for the public low-voltage power supply network that isn’t connected to residence directly.</td></tr>
<tr><td>Harmonic emission
IEC 61000-3-2</td><td>ClassA</td></tr>
<tr><td>Voltage fluctuations and flicker IEC 61000-3-3</td><td>Conform</td></tr>
</table>

Guidance and Declaration - Electromagnetic Immunity			
Taurus® Patient Monitor is suitable for use in the electromagnetic environment specified below. The customer or the user of the device should assure that it is used in such an environment.			
Immunity	**test IEC60601 test level**	**Compliance level**	**Electromagnetic environment - guidance**
Electrostatic discharge (ESD) IEC 61000-4-2	±6 kV contact ±8 kV air	±6 kV contact ±8 kV air	Floors should be wood, concrete or ceramic tile. If floors are covered with synthetic material, the relative humidity should be at least 30%.
Electrical fast transient/burst IEC 61000-4-4	±2 kV for power supply lines ±1 kV I/O for input/output lines (>3 m)	±2 kV for power supply lines ±1 kV I/O for input/output lines (>3 m)	Mains power quality should be that of a typical commercial or hospital environment.
Surge IEC 61000-4-5	±1 kV differential mode ±2 kV common mode	±1 kV differential mode ±2 kV common mode	
Voltage dips, short interruptions and voltage variations on power supply input lines IEC 61000-4-11	<5 % UT (>95 % dip in UT) for 0.5 cycle 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip inUT) for 25 cycles <5 % UT (>95 % dip in UT) for 5 s	<5 % UT (>95 % dip in UT) for 0.5 cycle 40 % UT (60 % dip in UT) for 5 cycles 70 % UT (30 % dip in UT) for 25 cycles <5 % UT (>95 % dip in UT) for 5 s	Mains power quality should be that of a typical commercial or hospital environment. If the user of our product requires continued operation during power mains interruptions, it is recommended that our product be powered from an uninterruptible power supply or a battery.
Power frequency (50/60 HZ) magnetic field IEC 61000-4-8	3 A/m	3 A/m	Power frequency magnetic fields should be at levels characteristic of a typical location in a typical commercial or hospital environment.
Note: UT is the AC mains voltage prior to application of the test level.			

Guidance and Declaration - Electromagnetic Immunity

Taurus® Patient Monitor is suitable for use in the electromagnetic environment specified below. The customer or the user of the device should assure that it is used in such an environment.

Immunity test	**IEC 60601 Test level**	**Compliance level**
Conduced RF IEC61000-4-6	3 Vrms 150k to 80M Hz	3 Vrms
Radiated RF IEC61000-4-3	3V/m 80M to 2.5G Hz	3V/m

Electromagnetic environment - guidance

Portable and mobile RF communications equipment should be used no closer to any part of the device, including cables, than the recommended separation distance calculated from the equation applicable to the frequency of the transmitter.

Recommended Separation Distance:

$d-1.2\sqrt{p}$ ($d-3.5\sqrt{p}$)

$d-1.2\sqrt{p}$ (Resp: $d-3.5\sqrt{p}$) 80 to 800MHz

$d-1.2\sqrt{p}$ 800M to 2.5GHz

Where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer and d is the recommended separation distance in meters (m).

Field strengths from fixed RF transmitters, as determined by an electromagnetic site survey, a should be less than the compliance level in each frequency range b Interference may occur in the vicinity of equipment marked with the following symbol: 

Note 1: From 80 MHz to 800 MHz, the higher frequency range applies.

Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.

[a] Field strengths from fixed transmitters, such as base stations for radio (cellular/cordless) telephones and land mobile radios, amateur radio, AM and FM radio broadcast and TV broadcast cannot be predicted theoretically with accuracy. To assess the electromagnetic environment due to fixed RF transmitters, an electromagnetic site survey should be considered. If the measured field strength in the location in which the device is used exceeds the applicable RF compliance level above, the device should be observed to verify normal operation. If abnormal performance is observed, additional measures may be necessary, such as reorienting or relocating the device.

[b] Over the frequency ranges 150kHz to 80MHz, field strengths should be less than 3V/m.

Appendix B EMC

Recommended Separation Distances between Portable and Mobile RF Communications Equipment and The device			
The device is suitable for use in an electromagnetic environment in which radiated RF disturbance are controlled. The customer or the user of the device can help prevent electromagnetic interference by maintaining a minimum distance between portable and mobile RF communications equipment (transmitters) and the device as recommended below, according to the maximum output power of the communication equipment.			
Rated Maximum Output power of Transmitter Watts (W)	**Separation Distance Meters (m) Corresponding to Frequency of Transmitter**		
	150k to 80MHz $d=3.5\sqrt{p}$	80M to 800MHz $d=3.5\sqrt{p}$	800M to 2.5GHz $d=[\frac{7}{3}]\sqrt{p}$
0.01	0.35	0.35	0.23
0.1	1.11	1.11	0.74
1	3.5	3.5	2.34
10	11.07	11.07	7.38
100	35	35	23.24
For transmitters at a maximum output power not listed above, the separation distance can be estimated using the equation in the corresponding column, where P is the maximum output power rating of the transmitter in watts (W) according to the transmitter manufacturer. Note 1: From 80 MHz to 800 MHz, the separation distance for the higher frequency range applies. Note 2: These guidelines may not apply in all situations. Electromagnetic propagation is affected by absorption and reflection from structures, objects and people.			

Appendix C Alarm Information

This chapter lists some important physiological and technical alarm information, and some alarms are not necessarily listed.

Note that in this chapter: L column indicates the default alarm level: H indicates high level, M indicates middle level, L indicates low level, and "*" indicates level set by the user.

Corresponding countermeasures are listed for each alarm message. If you operate in accordance with the countermeasures but the problem persists, contact your service personnel.

C.1 Physiological Alarm Information

Source	Alarm message	L	Causes and countermeasures
ECG	HR Too High	M*	HR value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	HR Too Low		
	PVCS Too High	M*	PVCs value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	Asystole	H	The patient has arrhythmia. Check the patient's condition, electrodes, cables and lead wires.
	VF/VTA	H	
	R on T	M*	
	Frequent PVC	M*	
	Couplet PVC	M*	
	Single PVC	M*	
	PVC Bigeminy	M*	
	PVC Trigeminy	M*	
	Tachycardia	M*	
	Bradycardia	M*	

Source	Alarm message	L	Causes and countermeasures
	Miss Beat	M*	
	Pacemaker Not Capture	H	Pacemaker works abnormally; check the pacemaker.
	Pacemaker Not work	H	
	ECG Signal weak	H	The patient ECG signal is too weak, and the system can’t analyze. Check the patient's condition, electrodes, cables and leads.
	ST-I Too High	M*	ST value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	ST-I Too Low		
	ST-II Too High		
	ST-II Too Low		
	ST-III Too High		
	ST-III Too Low		
Resp	RR Too High	M*	Patient PR value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	RR Too Low		
	Apnea(RESP)	H	The patient's respiratory signal is too weak, and the system can’t analyze. Check the patient's condition, electrodes, cables and leads.
	RESP ARTIFACT	H*	Respiration heartbeat interference
Temp	T1 Too High	M*	T1/T2 value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	T1 Too Low		
	T2 Too High		
	T2 Too Low		
	TD Too High		TD value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
SpO2	SPO2 Too High	M*	SpO2 value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient
	SPO2 Too Low		

Source	Alarm message	L	Causes and countermeasures
			category and alarm limit settings are appropriate for the patient.
	PR Too High		SpO2 value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	PR Too Low		
NIBP	NIBP signal weak	M*	NIBP value is higher than the upper alarm limit or lower than the lower alarm limit. Check the patient's physiological condition, and check if the patient category and alarm limit settings are appropriate for the patient.
	NIBP-Sys Too High		
	NIBP-Sys Too Low		
	NIBP-Mean Too High		
	NIBP-Mean Too Low		
	NIBP-Dia Too High		

C.2 **Technical Alarm Information**

Source	Alarm message	**L**	Causes and countermeasures
System	Battery Low	H	Connect to AC power supply, and charge the battery, and power with the battery as needed after fully charged.
ECG	ECG Comm. Stop	H	ECG module failure, or communication failure between the module and the host; please restart the device.
	ECG Comm. Error	H	
	ECG Config Error	H	
	ECG Self check Error	H	
	ECG Lead Off	M*	The electrodes are not connected to the patient firmly or fall off, or lead wires and the main cable fall off. Check the connection of electrodes and lead wires.
	ECG YY OFF (YY is a lead name)	M*	
Temp	TEMP1 Sensor Off	L	The temperature sensor falls off from the patient. Check the sensor connection.
	TEMP2 Sensor Off	L	
SpO2	SPO2 Comm. Stop	H	SpO2 module failure, or communication failure between the module and the host; please restart the device.
	SPO2 Comm. Error	H	
	SPO2 No Sensor	L	SpO2 sensor falls off from the patient or monitor, malfunctions, or sensor other than specified in this Manual is used. Check the sensor mounting position, whether the sensor is damaged or sensor type. Reconnect the sensor or use new sensor.
	SPO2 Sensor Off	L	
	SPO2 Sensor Error	L	
	SPO2 Search Timeout	L	
	SPO2 Search Pulse	L	Sensor signal is poor or too weak. Check the patient's condition, and place the sensor in a suitable position. If the failure persists, replace the sensor.
	SPO2 Signal Unstable	L	
	SPO2 Failure	L	
	SPO2 Signal Weak	L	
NIBP	NIBP Comm. Stop	H	NIBP module failure, or communication failure between the module and the host; please restart the device.
	NIBP Comm. Error	L	
	NIBP Self check error	H	
	NIBP CFG Error	H	
	NIBP system error	H	If failure occurs during measurement, the system can’t analyze and calculate. Check the patient's
	Measurement timeout	L	

Source	Alarm message	**L**	Causes and countermeasures
			condition, check the connections or replace the cuff, and then re-test.
	Cuff type error	L	The used cuff does not match the set patient category. Verify the patient category and replace the cuff.
NIBP	Cuff loose or no cuff	L	NIBP cuff isn't placed or connected properly, or there is gas leak.
	Cuff leak	L	Check cuff and inflation tube.
	Air pressure error	L	Ambient atmospheric pressure is abnormal. Confirm that the environment complies with the monitor's specifications, and check whether there are special reasons affecting ambient pressure.
	NIBP over range	L	The measured blood pressure of the patient exceeds the measuring range.
	NIBP signal weak	L	Patient's pulse may be weak or cuff is too loose. Check the condition of the patient, and place the cuff in a suitable position. If the failure persists, replace the cuff.
	NIBP signal unstable	L	Excessive movement may result in too much motion artifact or interference in the signal during measurement.
	NIBP signal saturated	L	Motion signal amplitude is too large due to movement and other reasons.
	NIBP over pressure	L	Cuff overpressure, and gas blockage may occur; check the gas path, and then re-measure.
	Module reset failed	L	NIBP module reset error; check the gas path is blocked, and then restart the measurement.

Appendix D Default Parameter Configuration

This chapter lists the important factory default settings of different departments in monitor configuration mode. Users can not change the default configuration, but can modify the settings as required and save as user-defined configuration.

Module	Option			Module defaults	
				Adult	Pediatric
ECG	Alarm level			Mid	Mid
	Alarm record			Off	Off
	Lead type			5-lead	5-lead
	Calculation channel			Auto	Auto
	Power frequency suppression			On	On
	Alarm limits			50~120 on	75~160 on
	ST segment analysis	ST segment analysis		Off	Off
		Alarm level		Mid	Mid
		Alarm record		Off	Off
		Alarm limits		-0.2~0.2 on	-0.2~0.2 on
	Arrhythmia analysis	Alarm level		Mid	Mid
		Alarm record		Off	Off
		Alarm limits		0~10 on	0~10 on
		ARR alarm settings	Alarm switch	On	On
			Alarm level	Mid	Mid
			Alarm record	Off	Off
	Gain			x1	x1
	Wave velocity			25.0mm/s	25.0mm/s
	Filter mode			Monitor	Monitor
	Wave color			Green	Green
	Wave style			Color scale	Color scale
NIBP	Alarm level			Mid	Mid
	Alarm record			Off	Off
	Pressure unit			mmHg	mmHg
	Measurement mode			Adult	Child
	Interval			Manual	Manual
	Display color			White	White
	Pre-inflation value			150	100
	Systolic blood pressure limit			90~160 on	70~120 on

	Mean blood pressure limit	60~110 on	50~90 on
	Diastolic blood pressure limit	50~90 on	40~70 on
SPO2	Alarm level	Mid	Mid
	Alarm record	Off	Off
	Alarm limits	90~100 on	90~100 on
	Wave velocity	25.0	25.0
	Wave color	Cyan	Cyan
	Wave style	Line	Line
RESP	Alarm level	Mid	Mid
	Alarm record	Off	Off
	Apnea alarm	20 sec	20 sec
	Alarm limits	8~30 on	8~30 on
	Gain	x1	x1
	Wave velocity	12.5	12.5
	Wave color	Yellow	Yellow
	Wave style	Line	Line
PR	Alarm source	SPO2	SPO2
	Alarm level	Mid	Mid
	Alarm record	Off	Off
	Alarm limits	50~120 on	75~160 on
TEMP	Alarm level	Mid	Mid
	Alarm record	Off	Off
	Display color	White	White
	Temperature unit	℃	℃
	T1 alarm limits	36.0~39.0 on	36.0~39.0 on
	T2 alarm limits	36.0~39.0 on	36.0~39.0 on
	TD alarm limits	0.0~2.0 on	0.0~2.0 on