Digital tube monitor

operating manual

Suitable model: digital tube monitor

Preface

Thank you for using the latest digital tube monitor (hereinafter referred to as the monitor).

To enable you to operate this monitor skillfully as soon as possible, we are equipped with detailed instructions for use. Please read carefully when you first install and use this instrument.

Due to the need to improve the performance and reliability of components and instruments, we sometimes make changes to the instruments (including hardware and software). At that time, we will try to modify or increase the information, but we may still be inconsistent in some descriptions. Please understand. If there are any mistakes or omissions in this instruction, you are welcome to correct them.

statement

The contents and version number contained in this manual may be updated without prior notice due to changes in software or technical specifications.

Version number of this manual: 1.0

Responsibility of manufacturer

The manufacturer shall be held responsible for questions relating to the safety, reliability and performance of the instrument only if:

- Assembly, expansion, readjustment, improvement or maintenance are carried out by manufacturer approved personnel；
- Electrical safety at installation sites conforms to national standards；
- The use of instruments shall be carried out according to the operating requirements.

目录

Chapter 1 Main structure composition

Digital monitor consists of mainframe, non-invasive blood pressure cuff, pulse oxygen saturation temperature sensor.

Chapter 2 Scope of application

It is suitable for monitoring and measuring vital signs such as pulse rate, noninvasive blood pressure (systolic blood pressure, diastolic blood pressure, mean blood pressure) and oxygen saturation in adults and children.

Chapter 3 Contraindications, precautions

3.1 Contraindication

This instrument does not belong to the treatment equipment.This product has no contraindication.

3.2 Precautions

⚠ Warning：

- The monitor is used for clinical patient monitoring and allows only doctors and nurses to use the monitor.
- Do not open the enclosure of the instrument to avoid possible danger of electric shock. Any maintenance and upgrading of the monitor must be carried out by the service personnel trained and authorized by the company.
- Do not use this instrument in places where flammable substances such as narcotics are in place to prevent explosion.

- Electrosurgical equipment causing electromagnetic interference or grid overload will damage or affect the operation of the monitor.
- Before using, the user should check that the instrument and its accessories work properly and safely.
- To prevent delay treatment , make adequate alarm settings for each patient . At the same time , an alarm sound can be made when the alarm is guaranteed .
- The equipotential body should be formed with the interconnecting equipment of the monitor (the potential equalization wire is effectively connected with the wire).
- This equipment is not suitable for the use of electrosurgical equipment.
- Packaging must be handled in accordance with current waste control codes and placed out of reach of children.
- It is suggested that the equipment should be checked every other year, and the verification should be submitted to a qualified third party organization for verification in accordance with the verification regulations prescribed by the state organs.

 Warning：

- When the products and accessories described in this manual are about to expire, they must be processed in accordance with the relevant product processing specifications. If you want further information, please contact our company or agency.
- When there is doubt about the perfection and arrangement of the external grounding of the monitor, the internal battery must be used to operate it.

Chapter 4 Summary

4.1 Brief introduction of Monitor

Digital monitor is a novel structure, small size, AC and DC dual equipment, with built-in batteries, easy to transfer patients.It can monitor and measure the pulse rate, noninvasive blood pressure (systolic blood pressure, diastolic blood pressure, mean pressure), blood oxygen saturation and other vital signs for adults and children.

Working environment:

Temperature: working temperature 5 ～ 40 (°C)

Transport and storage temperature -20 ～ 55 (°C)

Humidity: working humidity ≤ 85 %

Transportation and storage of humidity ≤ 93 %

Service voltage：DC12V@2A

⚠Warning：

Do not use this monitor outside the temperature and humidity range specified by the manufacturer.

⚠Warning：

This monitor is limited to one patient at the same time

The digital monitor has rich function and can be used for clinical monitoring of adults and children. Users can also choose different configuration of measurement parameters according to different needs.

Multi-parameter monitor feature-rich, suitable for adults, children's clinical care. Users can also according to different needs, choose different measurement parameters configuration.

The monitor can monitor SPO2, NIBP and other parameters. It integrates the functions of the parameter measurement module with the display to form a compact and lightweight monitor. Its built-in battery provides patient movement with ease and clearly displays the waveform and all monitoring parameters on its high-resolution display interface.

The monitor's power switch "⏻" is located on the monitor front panel. AC indicator "AC" is located on the right side of the power switch, when the instrument AC power, the light green,

charging light "POWER" is located above the AC indicator light "AC" light, when the monitor uses the internal rechargeable battery, the light green. Alarm ALARM is located in the upper right of the machine, when an alarm occurs, this light flashes. The sensor jacks are located on the right side of the instrument front panel while the other jacks and outlets are located on the left panel.The monitor has a friendly user interface, through the front panel keys and encoders to complete all operations, details, see the function button section.

Definitions Abbreviations:：

Name	Definitions Abbreviations:
NIBP	Noninvasive blood pressure
SPO2	Oxygen saturation
PR	Pulse rate

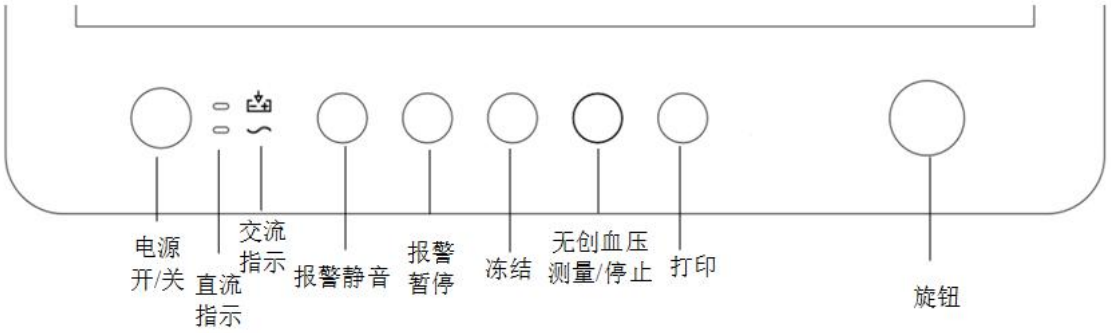
4.2 Appearance and structure of monitor

4.3 Various operations

Logo	Logo Description

	Type BF application section
	Warning! Please check the monitor's random files (this manual)!
	Alternating current(AC)
	network port
NIBP	Non-invasive Blood Pressure
SPO2	Pulse Oxygen Saturation

4.4 Function keystroke area and encoder



The encoder moves the cursor to select the option on the menu or the soft button on the screen; and press the encoder to confirm the current option.

4.5 Function keystroke area identification and operation instructions

Logo	Logo Description	Function keystroke operation instruction
	power light	When the monitor is connected to AC power through power supply, the indicator light is green. When the monitor has no alternating current and is powered by a built-in battery, the indicator lights are green.

	Switch	Press this button once, the monitor is turned on. Press the button again, the monitor turns off.
	NA	Not for this monitor.
	Alarm suspended	Suspend the alarm sound, and a 2-minute countdown.
	Alarm silence	Can turn off all sounds.
	Start(stop)measure blood pressure /rapid measurement	Press this button: start (or stop) the air pump, start (or end) no
	menu	Press this button to pop up the menu options.

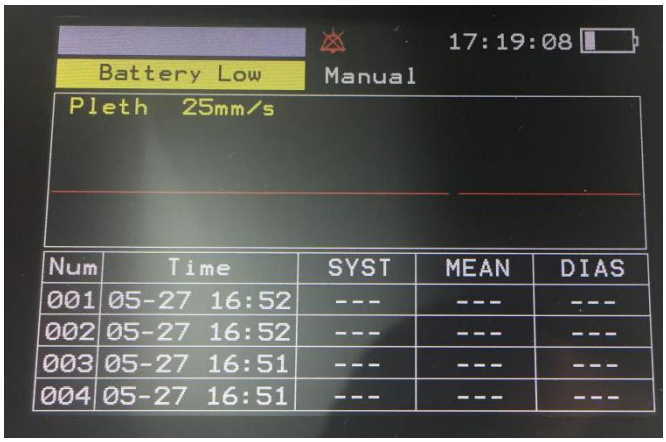
4.6 Display interface introduction

The display of this monitor is a combination of LCD screen and digital tube,It can display patient parameters, waveform parameters and alarm information provided by the monitor, monitor status, clock and other information at the same time.

The digital tube region is the parameter region of blood pressure and blood oxygen.

The LCD screen is divided into three regions

1. Information region
2. Blood pressure waveform region
3. Blood pressure list interface



4.6.1 Blood pressure list interface

The information area is at the top of the screen, showing the monitor and the patient's current state. The contents of the information area are as follows:

"10:31" means the current time.

Other cues in the information area appear and disappear accordingly with the monitored parameter status, such as:

1. Report the status of the monitor or sensor

For example, monitor alarm messages: Is the alarm pause time mark. When this button is pressed, " " indicates that all alarm sounds have been temporarily disabled until the " " button is pressed again or the alarm pause time is over and the system resumes sound. The alarm is paused for "120 seconds."

2. Mute alarm sign. Pressing the " " button appears when this symbol indicates that all alarm sounds have been artificially turned off. The voice prompt will not be restored until the operator presses the " " key again to release the mute state or a new alarm event occurs in the system.

4.6.2 Waveform / menu area introduction:

- The waveform area is shown as a blood oxygen waveform.

- The name of the waveform shows the upper left of the waveform. When the menu is popped out in the screen operation, the menu always occupies a fixed position in the middle of the waveform area, making a part of the waveform not visible for the time being. After the exit from the menu, the original picture is restored.

4.6.3 Introduction of parameter area：

The parameters displayed in the parameter area are:

Oxygen saturation SPO2

- Oxygen saturation SPO2 (unit:%)
- Pulse rate (unit: stroke / min)

Non-invasive blood pressure NIBP

- In order from left to right are systolic blood pressure, diastolic blood pressure, mea n pressure; (unit: mmHg mmHg or kPa)
- Recalls the storage of up to 204 patient blood pressure data, and even if the shutd own, as long as the default configuration is not made, the data will not be lost.

4.6.4 Alarm lights and alarm status

- Normal state, the warning light does not shine.
- When an alarm occurs, the alarm light flashes or lights constantly.
- The color of the light represents a certain alarm level. For details, see the chapter "A larm".For the details of alarm information and message, please refer to relevant param eters in relevant chapters.

4.7 Key function and basic operation

The operation on the monitor can be done with the keys and the encoder.

- SILENCE

Press this button, you can block all sounds (such as alarm sound, heartbeat sound, pulse sound, keyboard sound). And in the information area with "  " symbol display, press the

button again to restore all sounds and cancel the "  " symbol.

⚠Warning：

Whether or not the alarm can be recovered depends on whether the alarm is still present. However, press the mute button to permanently turn off the ECG lead off and SPO2 sensor off alarm.

- Alarm pause(PAUSE)

Press this button to suspend the alarm for up to 2 minutes.

- Blood pressure(NIBP)

Press this button to begin inflating the cuff for blood pressure measurement. During the measurement, press this key to abort the measurement and deflate.

- Rotary encoder (referred to as encoder)

The user can turn the encoder, select a menu item and modify the settings. Encoder can be rotated clockwise or counterclockwise, can also be pressed operation. Users can use the encoder to complete the main screen, the system menu, all the parameters in the menu operation.

4.7.1 Encoder to operate the screen method

The rectangular mark on the screen that moves as the encoder rotates is called the c ursor. Where the cursor can stay where you can operate. When the cursor is on a specific item, the user can open the relevant menu and set the relevant information.

The operation method is as follows:

- Move the cursor to the item to be operated.
- Press the encoder.
- The system will appear one of the following conditions:
  - ✧ Pop-up menu or measurement window on the screen, or the original menu i s replaced by a new menu.
  - ✧ The underlined cursor changes to an uncolored box, indicating that the conte nts of the box can change as the encoder rotates.

✧ Pressing the encoder to make the selection changes to an underlined box, which means that if this is selected, a certain function will be performed immediately.

4.8 Monitor external interface

In order to facilitate the operation, different interfaces are located in different parts of the monitor.On the left side of the monitor is the sensor's socket, as shown in Figure below.

SpO_2：Blood oxygen probe socket

NIBP：Cuff with tracheal socket

4.9 Built-in rechargeable battery

Digital tube monitor come with a built-in rechargeable battery. When connected to A C power, the battery will automatically charge until it is full. When the device network p ower is off, the monitor will seamlessly switch to battery power, to maintain the normal o peration of the device. In the case of fully charged, the monitor can be maintained for ab out 240 minutes, depending on the size of the model and the temperature of the working environment.

When operating on battery power, the monitor alerts you when the battery is low. When t he battery is exhausted, the monitor triggers an advanced alarm, a continuous "beep ..." so und, and a message saying "Battery voltage is too low". At this point should be plugged in AC power, instant battery charging, about 2-3 hours of charge capacity can reach about

90% of battery capacity. If you still use the battery-powered, then the battery consumption indicator can indicate changes in battery capacity, power alarm alarm for the remaining grid to start the alarm, the remaining 5% of the red, empty for one minute off countdown.

 Warning：

Dispose of batteries according to local government departments, the relevant laws and regulations to deal with, or pay with the environmental protection department for recycling.

 Warning：

The state of charge of the battery does not reduce the performance of the device.

 Warning：

If you will not be using the machine for an extended period of time, remove the battery.

 Warning：

When defibrillators are used in patients, defibrillator discharges act on the device, the device should take special precautions.

Chapter 5 Installation of the monitor

5.1 Get out of the box and check

Carefully remove the monitor and accessories from the box and save the packaging materials for later shipping or storage. Please click on the packing list to count the accessories.

- Check for any mechanical damage.
- Inspect all exposed wires and insert some accessories.

When installing, leave a minimum of 2 inches (5 cm) around the monitor to allow ai r circulation. The environment in which the monitor is used should be reasonably safe fro m vibration, dust, corrosive or explosive gases, extreme temperatures and humidity, and m ore.If you have any questions, please contact our sales department or agent immediately.

5.2 Electrical connection

- Connect the output of the monitor's power adapter to the monitor and plug the power plug into a grounded 3-wire power outlet.

⚠Warning：

- Connect the power adapter to the hospital socket.
- When there is a battery, the battery must be charged after the instrument has been transported or stored. So do not connect the AC power and boot directly, may be because of lack of battery power, so that the instrument does not work. Turn on the AC power to charge the battery, regardless of whether the monitor is turned on or not.

5.3 Power on

About 1 minute after the power switch is turned on, the system self-test successfully enters the main monitor screen and the user can operate it.

Do not use this monitor if you notice signs of damage to the monitor's function or if an error message appears Person, and please contact the hospital's biomedical engineers o

r the company's maintenance engineers.

 Warning：

In the self-test process if a fatal error, the system will alarm.

 Warning：

Check all the monitoring functions that can be used to ensure that the monitor functions properly.

 Warning：

If equipped with a battery, then the battery must be charged after each use to ensure that there is sufficient power reserve.

5.4 Sensor connection

Connect the required sensors to the monitor and the patient's monitoring area.

 Warning：

For correct connection methods and requirements for various sensors, please refer to the relevant sections.

Chapter 6 System menu

- NIBP Setting
- SPO2 Setting
- Misc Setting

The monitor's flexible configuration, guardianship content, waveform scanning speed can be configured by the user as needed.

6.1 NIBP Setting

- Unit（pressure unit ）: mmHg / kPa Optional mmHg or kPa。
- Alarm En（alarm switch ）： YES/ON,Select "open" to alarm when the pressure alarm and storage, select "off" do not alarm.
- NIBP Alarm limit

6.2 SPO2 Setting

- Alarm En （SPO2 alarm switch）:YES/NO， If yes is selected, it will alarm when SPO_2 (oxygen saturation) alarm, and "no" will not alarm.
- SPO2 High / SPO2 Low（SPO2 alarm limit）： according to the set high limit and low limit, when SPO2 exceeds the high limit or below the low limit, the alarm is carried out.
- Style（Waveform type）:Line/Fill optional “Line”or“Fill”。
- PR High / PR Low（Pulse alarm limit）：According to the set high limit and low limit, when PR exceeds the high limit or below the low limit, alarm is carried out.

6.3 System time setting

In "Misc Setting" select the system time settings, time settings from year, month, day, time, minutes and then accurate to seconds to set, the upper right corner of the main interface display time and minutes, such as: 18: 10.

⚠Warning：

System time settings should be selected at boot time (if the user needs to do so), otherwise incorrect time information may be provided when reviewing content with time prompts.

Chapter 7 Patient safety

Environment：

Follow the instructions below to ensure the absolute safety of the electrical installation. The environment used by the monitoring system should be reasonably safe from vibration, dust, corrosive or explosive gases, extreme temperatures, humidity and more. When installed in the cabinet, there should be enough space in front for easy operation. With the cabinet door open, there should be enough space behind for easy maintenance. Should ensure that the cabinet air circulation.

Guardianship system in the ambient temperature of 5 ℃ ~ 40 ℃ below the work to meet the technical indicators. Ambient temperatures outside this range may affect the accuracy of the instrument and cause damage to components and wiring. Allow at least 2 inches (5 cm) of room around the instrument to allow air circulation.

7.1 Power Requirements

Please refer to the product specifications chapter.

7.2 Monitor ground

To protect patients and medical personnel, the monitor's housing must be grounded. If you do not have a three-wire outlet, consult a hospital's electrician.

⚠ Warning：

Do not connect the instrument's three-wire cable to the second plug.

Connect the ground wire to the equipotential ground terminal of the instrument. If it is not clear from the specifications of the instrument whether a particular combination of instruments is dangerous, for example because of the risk of leakage current build-up, the user should consult the relevant manufacturer or other specialist in order to ensure that all of them Necessary security will not be damaged by the proposed combination.

7.3 Interpretation of the symbols used on the monitor

 Warning, see random information (this manual)

 Description of the application components are BF type.

 Boot, shut down.

 Equipotential grounding end.

Chapter 8 Alarm

- This chapter introduces the general information about the alarm and the measures to be taken when the alarm occurs.
- You can get alarm and prompt information about each parameter in the section about the setting of each parameter.

8.1 Summary

An alarm is a reminder to the user of a patient being monitored when a change in vital signs that is sufficient to attract the attention of the user or a malfunction of the machine itself prevents the monitoring of the patient from proceeding smoothly.

8.2 Alarm attribute

8.2.1 Alarm type

There are two types of alarms: If this alarm is due to a change in the patient's vital signs, that is, the patient's physiological parameters exceed a specified range or the patient experiences a physiological abnormality that can not be measured by a single physiological parameter, ; If this alarm originates from the machine itself, it is called a technical alarm because of an alarm that occurs when the patient care can not be accurately performed due to a technical obstacle in the use of the monitor or a malfunction of the machine itself.

Examples of Physiological and Technical Alarms

Patient or machine condition	Alarm category
Patient heart rate was measured as 114BPM, exceeding the user-defined heart rate alarm range.	Physiological alarm
Found in patients with ventricular fibrillation	Physiological alarm

SPO2 measurement module has failed	Technical alarm

8.2.1.1 Physiological alarm classification

Physiological alarm is the patient's physiological parameters over a specific range, the occurrence of physiological abnormalities. Including the ECG signal is too weak, the pulse was not found, RESP heartbeat interference, RESP respiratory asphyxia.

8.2.1.2 Alarm level

Each alarm, whether it is a technical alarm or a physiological alarm, has a level-specific characteristic. The higher the level, the more alert the alarm system will be when the alarm occurs. All technical alarm level users can not change. Some physiological alarm level can be set by the user, while others are not allowed to change after being specified by the system.

8.3 Alarm prompt form

When an alarm occurs, acousto-optic and text prompts will be made.

8.3.1 Acousto-optic characteristics

Different levels of alarm sound characteristics and lighting characteristics

Alarm level	Alarm sound characteristics	Alarm light characteristics
high	Mode is "beep - beep - beep ------ beep - beep, beep - beep - beep ------ beep - beep", every 11 seconds a vocal (interval count is from the beginning of this vocal Until the next vocal start)	Alarm light flashes red, blinking fast
in	The mode is "beep - beep - beep", uttering every 25 seconds (the interval count is from t	Alarm light flashes in yellow, blinking slowly

	he beginning of this utterance to the beginnin g of the next utterance)	
low	The mode is "beep-" and sounds every 25 se conds (the interval count is from the beginni ng of this utterance to the beginning of the next utterance)	Always bright yellow

8.4 Alarm state

8.4.1 Summary

For each alarm, there are two states: the trigger state and the clear state. Each mome nt can only be in one state.

Trigger Status: Status when the alarm is present.

Clear Status: The alarm does not exist.

All possible alarms at the start of the job are cleared, and when the alarm condition is met in the subsequent time, the alarm goes into the triggered state and any inherent de lay of any alarm status is determined to be within 10 s.

At each moment, the entire alarm system can only be in one state:

- For the entire alarm system (ie for all alarms), the following states exist: Normal state: refers to the alarm in the trigger state can make all prompts (including so und, light and text) state.
- Alarm pause status: the alarm is in the trigger status, but the status of the acous to-optical character is not temporarily displayed.
- Alarm mute status: refers to the alarm in the trigger state, the light, text prompts but no voice prompts.
- Alarm sound off state: refers to the alarm volume is 0 state.

8.4.2 Alarm mute status

The silent state of the alarm means that any audible alert on the monitor (including alarms, keys,

pulses, etc.) is turned off.

8.4.3 Alarm pause state

- When the alarm is paused, do the following：
- All alarm and light warning is forbidden.
- Ban all physiological alerts.
- Show how many seconds to stop the alarm in the physiological alarm description area, a total of 120 seconds.
- For an alarm that clears sound and light, change the alarm prompt to prompt information.
- Clear the alert for an alarm that can be cleared completely.

8.4.4 Status Switching

- Press "  " key to enter the alarm and alarm mute state, and then press "  " key to resume normal state.
- During the silent state, if there is a new technical alarm, the alarm will be paused and the normal state will be entered.

8.5 Alarm Settings

8.5.1 Automatic alarm shutdown

Alarm off refers to the failure of the alarm function. At this point, even if the alarm con ditions are met, the system does not do any alarm, alarm printing, alarm storage is not ca rried out.

When a new measurement module is added or the measurement module just started worki ng, all the alarms related to the module will be automatically shut down within 30 second s after the module starts to work. The other alarms will not be affected.

8.5.3 lead off when switched on

At power on, if the open parameter module is not connected to the lead, it will always have a text message in the message area.

8.6 Parameter alarm

 Warning：Do not set alarm limits that exceed the limit value, which can cause the alarm system to fail.

In each parameter menu can set its own alarm parameters, and the user can set the a larm limit and alarm status,When the parameters can be set independently of the alarm sw itch.

For setting alarm parameters, when the value of one or several parameters exceeds th e alarm limit, the monitor will automatically alarm and enter Line the following processin g:

1) A prompt appears on the screen, the form as described in the alarm mode;

2)Alarm light flashes；

8.7 Measures to be taken when an alarm occurs

Warning：

When an alarm occurs, you should first check the patient's condition.

Alarm information displayed in the system information area or system alarm information area, need to identify this alarm and take corresponding measures according to the alarm reason.

1) Check the patient's condition.

2) Identify which parameter is alarming or which alarm is occurring.

3) Identify the cause of the alarm.

4) If necessary, the alarm mute.

5) When the alarm condition is cleared, check whether the alarm is cleared.

In the parameter monitoring chapter can find the alarm information and tips on the parameters.

Sound pressure alarm signal range: 40dB-85dB (A).

After the power is interrupted, as long as the power supply is restored, the alarm sett ings remain unchanged.

The alarm can be closed individually to enter the inactive state.

Termination of alarm signal inactive status: enter the alarm setting interface, cancel th e shutdown.

Chapter 9 Oxygen saturation（SPO2）

9.1 SPO2 Oxygen saturation monitoring instructions

SPO2 Guardianship definition

The SPO2 plethysmographic parameter measures arterial oxygen saturation, which is the percentage of total oxyhemoglobin. For example, if the total 97% of the hemoglobin molecules in the arterial blood red blood cells are bound to oxygen, the blood has 97% SPO2 oxygen saturation and the monitor should read 97% of the SPO2 value. The SPO2 value shows the percentage of oxy-hemoglobin molecules that form oxy-hemoglobin. SPO2 plethysmography parameters also provide pulse rate signals and plethysmographic waves.。

SPO2 plethysmography parameter measurement principle

- Oxygen saturation was measured by pulse oximetry. This is a continuous, noninvasive method of determining the saturation of hemoglobin oxygenation. It measures how much of the light emitted from one side of the sensor's light source passes through a patient's tissue (such as a finger or an ear) and reaches the receiver on the other side. The wavelength that the sensor can measure usually red LED is 660nm, infrared LED is 940nm. The maximum LED output power is 4mW.

- The amount of light that passes through depends on many factors, most of which are constant. However, one of these factors, arterial blood flow, changes over time because it is pulsatile. By measuring the light absorbed during pulsations, it is possible to obtain arterial blood oxygen saturation. Detecting the pulsation itself gives a "plethysmographic" waveform and pulse rate signal.

- SPO2 in this manual refers to the functional oxygen saturation of the human body as measured by a noninvasive method.

- SPO2 in this manual refers to the non-invasive measurement of functional oxygen saturation in humans.

⚠ Warning：

If carboxyhemoglobin, methemoglobin or dye dilute chemicals exist, SPO2 values can be skewed.

Oxygen saturation / pulse monitoring

Warning：

If there is carboxyhemoglobin, methemoglobin or dye-diluting chemicals, Sp02 values will be biased

Warning：

Do not put the blood oxygen probe and blood pressure cuff blood pressure measurem ent on the same limb, because blood flow occlusion during blood pressure measurement Will affect the oxygen saturation reading.

Warning：

- Make sure nails cover the light.
- The probe line should be placed on the back of the hand.

Warning：

The Sp02 waveform is out of proportion with the pulse volume.

Warning：

If the sensor package or sensor has signs of damage, do not use this SPO 2 beholder, it should be returned to the manufacturer.

Warning：

Continuous, prolonged monitoring may increase the risk of unwanted changes in skin characteristics, such as abnormal sensitivity, redness, foaming or compressive necrosis.

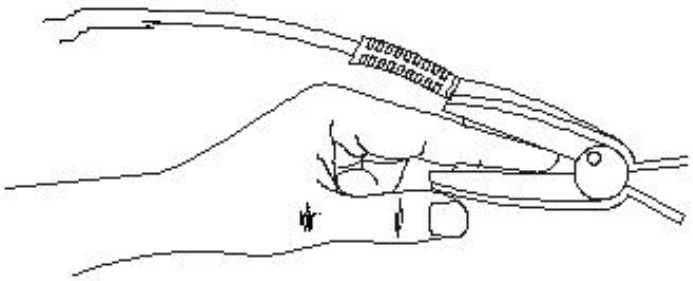
9.2 Operational method of oxygen saturation monitoring

Sp02 plethysmography measurement

1) Turn on the monitor;

2) the sensor attached to the patient's finger on the appropriate location;

3) Insert the connector on the end of the sensor cable into the hole Sp02.



Adult SpO_2 probe

Warning：

- If the test site and the probe can not be accurately positioned, may result in inaccurate readings of oxygen saturation, or even pulse wave can not be searched for blood oxygen monitoring, this time should be repositioned.
- Excessive movement of the measurement site may result in inaccurate measurements, in which case the patient should be quiet or change the measurement site to reduce the impact of excessive movement on the measurement.

Warning：

- During continuous monitoring for a long time, check the peripheral circulation and skin condition every 2 hours or so. If bad changes are found, the measured position should be changed in time.
- During long continuous monitoring, the position of the probe should be periodically checked to avoid the influence of the change of the position of the probe due to the movement and other factors on the measurement accuracy.

9.3 Limit of blood oxygen saturation monitoring

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

- High frequency electrical interference, such as interference generated by the host system itself or from electrical surgical instruments such as systems connected to the system.

■ Do not use the oximeter and the oximeter sensor during a magnetic resonance i maging scan (MRI). Induced currents can cause burns.

■Intravenous dye.

■Patients move too frequently.

■External light radiation.

■The sensor is improperly installed or in contact with the object.

■Sensor temperature (the best temperature should be 28 ℃ ~ 42 ℃ range).

■Place the sensor on a limb with a blood pressure cuff, an arterial catheter, or an e ndoluminal tube.

■Non-functional hemoglobin such as carboxyhemoglobin (COHb) and methemoglobin (MetHb) and other concentrations.

■Oxygen saturation is too low.

Poor circulation at the site of the test.

■Shock, anemia, hypothermia and the use of vasoconstrictor drugs may reduce arteria l blood flow to unmeasurable levels.

■Measurement also depends on oxyhemoglobin and hemoglobin hemoglobin on the a bsorption of special wavelengths of light. If any It absorbs substances of the same w avelength, which can lead to the measurement of false or low SP02 values. Such as: Carbonated hemoglobin, methemoglobin, methylene blue, rouge indigo.

■It is recommended to use the SpO2 sensor described in the attachment.

9.4 Oxygen saturation menu

SPO2 Setup menu

SPO2 Setup menu

Warning：

Setting the SPO2 alarm upper limit to 100% equals disconnecting the upper limit alarm. Hyperoxia levels can cause premature babies to crystallize Fibrous tissue disease. Therefore, the upper limit of oxygen saturation alarm must be carefully chosen according to accepted clinical practice.

SPO2 Setting

- Alarm En （SPO2 alarm switch ）:YES/NO， Select "YES" when SPO_2 (oxygen saturation) alarm, select "no" will not alarm.
- SPO2 High / SPO2 Low（SPO2 Alarm limit）：According to the set high limit and low limit, when SPO 2 exceeds the high limit or below the low limit, alarm is carried out.
- Style（waveform type）:Line/Fill“Line”or“Fill”optional。
- PR High / PR Low（Pulse alarm limit）：According to the set high limit and low limit, when PR exceeds the high limit or below the low limit, alarm is carried out.

SPO2 and PR Alarm range:

Parameter	Maximum upper limit	Minimum lower limit	Single regulation quantity
SPO2	100	0	1

PR	250	0	1

Default alarm range for SPO_2 and PR in default settings:

Parameter		Maximum upper limit	Minimum lower limit
SPO2	Adult	100	90
PR	Adult	120	50

9.5 Oxygen saturation alarm message

9.5.1 SPO2 Warning message

SPO2 The physiological alarm, technical alarm and prompt information that may occur in the module measurement are listed in the table below.

Physiological alarm：

Prompt message	Reason	Alarm level
SPO2 is too high	The SPO2 measurement is above the set alarm high limit	User selectable
SPO2 is too low	The SPO2 measurement is below the set alarm low limit	User selectable
PR is too high	The RESP measurement is above the set alarm high limit	User selectable
PR is too low	The RESP measurement is below the set alarm low limit	User selectable

Technical alarm：

Prompt message	Cause	Alarm level	Remedial measure
SPO2 Sensor shedding	The SPO2 sensor was removed from the patient or monitor	Low	Make sure the sensor is placed on the patient's finger or other area, and that the monitor is properly connected to the cable.
SPO2 Module communication stop	SPO 2 module error or communication error	High	Stop using SPO 2 module and notify biomedical engineer or customer service department.
SPO2 Alarm error limitation	Functional safety failure	High	Stop using SPO 2 module and notify biomedical engineer or customer service department.
PR Alarm error limitation	Functional safety failure	High	Stop using SPO 2 module and notify biomedical engineer or customer service department.

Prompt information (including general warnings)：

Prompt message	Cause	Alarm level
SPO2 Measurement superbound	SPO2 measurement out of range	High
PR Measurement superbound	PR measurements out of range	High
Search pulse	The SPO2 module is searching for pulse	No alarm
Pulse not found	SPO2 module cannot detect SPO2 signal for a long time	High

Chapter 10 Non-invasive blood pressure （NIBP）

10.1 Noninvasive blood pressure monitoring instructions

- Noninvasive blood pressure（NIBP）measurement using oscillatory method；
- Measurement mode: manual, automatic and continuous measurement. Systolic, diastolic, and mean pressures are shown for each mode
  - "Manual" mode, only one measurement.
  - "Auto" mode, measurement is repeated. Interval can be set to 1/2/3/4/5/10/15 /30/60/90/120/180/240/480 minutes.
  - In "continuous" mode, the measurement is taken continuously in five minute s.

⚠ Warning：

- Non-invasive blood pressure measurements should not be performed in patients with sickle cell disease and in any patient with or expected to have skin damage.
- For patients with severe coagulation disorders, automatic blood pressure measurements should be determined according to clinical evaluation, because there is a risk of hematoma in the limb and cuff friction.

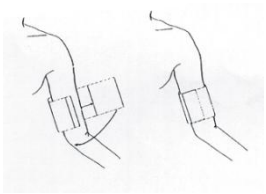
10.2 Noninvasive methods of blood pressure monitoring

10.2.1 Non - invasive blood pressure measurement

The inflatable tube connected to the blood pressure cuff and monitor should be free and untangled.

1. The inflation tube into the monitor blood pressure cuff interface, connect the instrument power.

2. Apply blood pressure cuffs to the patient's upper arm or thigh as shown as follows.



Cuff use

- Confirm that the cuff has completely deflated.
- Use an appropriately dimensioned cuff for the patient to ensure that the marker tissue is located just above the appropriate artery. Make sure the cuffWrapping limb is not too tight, or it may cause distal discoloration or even ischemia.

⚠Warning：

The width of the cuff should be 40% of the limb circumference, or 2/3 of the length of the upper arm. The length of the inflatable cuff should be sufficient to surround 50 to 80% of the limb. Unsuitable cuffs produce erroneous readings. If there is a problem with the cuff size, use a larger cuff to reduce the error.

3.Connect cuff to inflation tube. The limbs used for manometry should be placed at the same level as the patient's heart. If not To do so, we must use the following correction method to correct the measurement results:

- Check that the edge of the cuff falls within the range marked <->. If not, switch to a larger or smaller sleeve band.
- If the cuff band is above the heart level, the difference per centimeter should be added to the display value of 0.75mm HgG 0.10 KPA.
- If the cuff band is below the heart level, the difference per centimeter should be reduced by 0.75mm Hgn 0.10 KPA per cm.

4． Select the measurement mode in the NIBP menu, for details, see Action Tip below.

10.3 Operation prompt

1． Make an automatic measurement

◆ Enter the "NIBP Settings" menu, "Measure Type" select "Cycle", "Cycle Time" to select the interval time, the monitor will automatically measure the cycle measu rement according to the selected interval time. Automatic measurement interval (unit: minute). One, two, three, four, five, 10, 15, 30, 60, 90, 120, 180, 240, 48 0 minutes can be selected.

◆ To finish automatic measurement, select "Manual" in "Measure Type" to return to manual mode.

2．Make a manual measurement

◆ Enter the "NIBP Settings" menu, select "Manual" for "Measure Type" and press the "Blood Pressure" button on the front panel to start a manual measurement.

◆ Pressing the "Blood Pressure" key again will stop the manual measurement.

3．Continuous measurement

◆ Go to the NIBP Setting menu, select the Continue item, and start measuring continuously. "continuous" mode in which measurements are carried out continuously over a period of five minutes.

◆ During the measurement, press the blood pressure button, the measurement will stop, default back to "Manual" measurement mode.

⚠ Warning：

Continuous measurement mode of non-invasive pressure measurement time pull t oo long, then the cuff friction with the body may be accompanied by purpura, ische mia And nerve damage. In custody of patients, we must always check the distal limb color, warmth and sensitivity. Once the concept In case of any abnormality, place th e cuff in another place or immediately stop the blood pressure measurement.⚠ W arning：

If you have doubts about the accuracy of the readings, check the patient's vital signs before you can check the function of the monitor.

⚠ Warning：

If liquid is splashed on equipment or accessories, especially if liquid is likely to enter the tubing or monitor, contact your hospital's service department.

Limits of measurement

Depending on the patient, there are some limitations with the oscillatometry method. This measurement is looking for regular pulse waves generated by arterial pressure. In the case of patient conditions that make this detection difficult, the measured values become unreliable and the time taken for pressure measurement to increase. The user should be aware that the following conditions can interfere with the measurement method, making the pressure measurement unreliable or the pressure measurement time lengthened. In this case, the condition of the patient will make the measurement impossible.

■ Patient moving

If the patient is moving, shaking or cramping, the measurement will be unreliable or even impossible as these conditions may interfere Arterial pressure pulsation detected, pressure measurement time will be extended.

■ Arhythmia

If the patient shows an irregular heartbeat caused by an arrhythmia, the measurement will be unreliable or even impossible and the manometry time will be extended.

■ Heart-lung machine .

If the patient is connected with an artificial heart-lung machine, it will not be able to measure.

■ Pressure variation

If, at some point, the arterial pressure pulsation is being analyzed to obtain a measurement, at which time the patient's blood pressure changes rapidly, the measurement will be unreliable or even impossible.

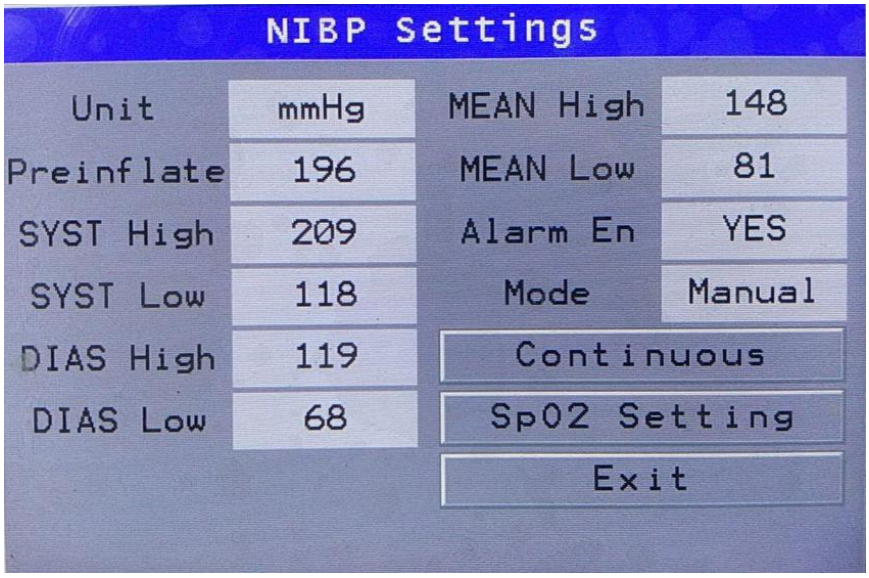
■ Severe shock

If the patient is in severe shock or hypothermia, manometry will be unreliable. Because the blood flow to the periphery of the reduction will lead Decreased arterial pulsation.

■ Extreme heart rate

Blood pressure measurements were not available at heart rates below 40 bpm (beats/ min) and above 240 bpm (beats / min).

12.3 Noninvasive Blood Pressure Menu



NIBP Setting menu

- Unit（Pressure unit ）: mmHg / kPa , mmHg or kPa optional。
- Alarm En（Alarm switch ）：YES/ON,Alarm switch: select "open" in the pressure alarm when the alarm prompts and storage, select "off" does not alarm
- NIBP Alarm limit

The pressure alarm is carried out according to the set high limit and low limit, when the pressure exceeds the high limit or below the low limit, the alarm is carried out. Systolic pressure, diastolic pressure and average pressure can be separately alarm processing.

Alarm upper and lower limits of the adjustment range is as follows:

adult

Systolic blood pressure 40 ~ 260 mmHg

Diastolic pressure 10 ~ 215 mmHg

The average pressure of 20 ~ 235 mmHg

- Pressure calibration: NIBP measurements shall be calibrated every two years (or in accordance with hospital maintenance regulations.

12.4 Blood pressure list data removal

In the Misc.Setting , select Delete History to clear the history measurement record.

12.5 NIBP Alarm Information and Prompt Information

Alarms triggered by parameters exceeding the alarm limit in the physiological alarm may trigger the recorder to automatically output parameters and associated measurement waveforms at the alarm occurrence, provided the alarm record switch in the relevant menu is turned on. Physiological alarms, technical alarms and prompts that may occur in NIBP measurements are listed in the following table:

Physiological alarm:

Prompt message	Cause	Alarm level
Nibp Syst Too High	The systolic pressure measurement of NIBP value is higher than the set alarm high limit.	User optional
Nibp Syst Too Low	The systolic pressure measurement of NIBP value is lower than the set alarm high limit.	User optional
Nibp Dias Too High	The measured value of NIBP diastolic pressure is higher than the set alarm high limit.	User optional
Nibp Dias Too Low	NIBP diastolic blood pressure measured below the set alarm limit	User optional
Nibp Mean Too High	The NIBP average pressure measurement value is higher than the set alarm high limit.	User optional
Nibp Mean Too Low	The NIBP average pressure measurement value is lower than the set alarm high limit.	User optional

Technical alarm 1 (displayed in the information area of the monitor)：

Prompt in	the reason	Alarm	Countermeasures

formation		level	
NS alarm limit error	Functional safety fault	high	Stop using the NIBP module alarm function and notify the biomedical engineer or our maintenance staff.
NM alarm limit error	Functional safety fault	high	Stop using the NIBP module alarm function and notify the biomedical engineer or our maintenance staff.
ND alarm limit error	Functional safety fault	high	Stop using the NIBP module alarm function and notify the biomedical engineer or our maintenance staff.

Technical Alarms 2 (display area below NIBP pressure):

Prompt information	the reason	Alarm level	Countermeasures
NIBP self-test error	Sensing of NIBP measurement module or other hardware error	high	Stop using the NIBP measurement function and notify the biomedical engineer or our maintenance staff.
NIBP communication error	Communication with NIBP measurement module failed	high	If the problem persists, stop using the NIBP measurement function and notify the biomedical engineer or our maintenance personnel.
Cuffs are too loose or not connected	The cuff is not tied or cuffed	low	Tied up the cuffs.
Inflatable cuff i	Cuff, hose or fitting da	low	Inspect and replace the leaky parts, if

nflatable tube	maged		necessary, notify the biomedical engi neer or our service personnel.
Air pressure is wrong	No stable pressure valu es, such as hose tangles	low	Check hose is entangled, such as the failure continued, notify the biomedi cal engineer or the company maintena nce staff.
Signal is too w eak	The cuff is too loose o r the patient's pulse is t oo weak	low	Use other methods to measure blood pressure.
Pressure over ra nge	The measurement range exceeds the specified upper limit	low	Reset the NIBP measurement module. If the fault persists, stop using the NIBP measurement function and infor m the biomedical engineer or our ser vice personnel.
Arm movement	Affected by arm move ment, signal noise is to o large or irregular puls e rate	low	To ensure the patient was quiet, no e xercise.
Overvoltage prot ection	Pressure exceeds the sp ecified safety limit	low	Measure again and, if the problem pe rsists, stop using the NIBP measurem ent function and notify the biomedica l engineer or our service personnel.
Signal saturation	Great exercise	low	Do not exercise the patient。
NIBP system fa iled	Blood pressure pump sy stem operation failure	high	Stop using the NIBP measurement fu nction and notify the biomedical engi

			neer or our maintenance staff.
Cuff type wron g	Cuff type does not mat ch patient type	low	Use the right cuff.
Measurement ti meout	Measurement time exce eds 120 seconds (adult / child) or 90 seconds	high	Measure or use another manometric method again.
NIBP error rese t	Module reset is not nor mal	high	Use the reset function again.
Measurement err or	The system can not per form measurement analy sis or calculation while making measurements	high	Check the cuff to ensure that the pati ent does not move while in custody and measure again.

Message (displayed in the prompt area below the NIBP pressure value):

Prompt informa tion	Cause	Alarm level
Manual measur ement ...	Manual measurement of the process	No alarm
Continuous me asurement ...	Continuous measurement of the process	
Automatic mea surement ...	Automatic measurement process	
Measurement te rminated	Press the start key during measurement to stop the m easurement	
calibration…	During calibration	

Calibration ter minated	The calibration process is over	

Chapter 11 System Care and Cleaning

⚠ Warning： Before cleaning the monitor or sensor, always turn the power off and disconnect the AC power.。

11.1 Cleanliness of the monitor

- ✧ Cleaning The monitor can be used with the most commonly used hospital cleaning fl uids and non-aggressive detergents, but note that many of these cleaners must be dilu ted before use. Follow the instructions of the detergent manufacturer.
- ✧ Avoid using ethanol, amino or acetone based cleaners.
- ✧ The monitor's case and screen should be kept free of dust and contaminated. Use a s oft, lint-free cloth or a sponge soaked in detergent. When cleaning, be careful not to pour the liquid on the instrument, make sure the instrument can not enter any liquid inside. There are various types of cable sockets on the side panel of the monitor and special precautions should be taken when wiping to ensure that no water can enter.
- ✧ It is forbidden to use abrasives such as wire brushes or metal polishes, which will da mage the monitor panel and screen.
- ✧ Do not immerse the monitor in liquid. 40°C
- ✧ When the connector of the cable or accessory gets wet occasionally, rinse it with distilled water or deionized water and then dry it for at least 1 hour at 40°C to 80°C

11.2 Battery Maintenance and Care

Built-in rechargeable battery maintenance-free monitor to ensure that the AC power off the

monitor is still working, under normal circumstances without special maintenance and care.。

■ Lithium-ion battery

At least two full optimization cycles should be guaranteed when the battery is first used. A complete optimization cycle: uninterrupted charge, then discharge until the monitor shut down.Battery life should be optimized regularly during battery use. It is recommended that the battery be optimized for every two months of use or storage, or when the operating time of the battery is significantly reduced。

Optimization, please refer to the following steps:

- Disconnect the monitor from the patient and stop all monitoring and measurement.
- The battery needs to be optimized into the monitor battery slot;
- The monitor connected to AC power, the battery charge continuously for 6 hours or more;
- Disconnect the AC power and use the battery to power the monitor until the monitor is turned off.
- Re-connect the monitor to the AC power supply, charging the battery for more than 6 hours without interruption.
- Battery optimization is completed.

⚠Warning：Do not remove the battery, put it in the fire or short-circuit it. Battery burning, explosion or leakage can cause personal injury.

11.3 Accessories cleaning and disinfection

1. Carbon dioxide sensor

- Recommended disinfectants: 70% isopropanol solution, 70% alcohol solution.
- Methods of cleaning and disinfection can refer to ECG cable cleaning and disinfectio n methods.

⚠Warning:

- Do not sterilize the sensor in a high-pressure container. Do not immerse the sens or directly in the liquid.

- Do not pull or squeeze the sensor extension cable when using it.

✧ The sensor can not work at the temperature lower than 10 ℃ or higher than 35 ℃.。

2. Noninvasive blood pressure cuffs

✧ Please clean the product regularly.

✧ remove the cuff from the connector, remove the airbag from the skin;

✧ clean the medical soft gauze pad or other soft cleaning tools soaked in water or neut ral soapy water, the gauze after soaking squeezed excess water, wipe the balloon and catheter;

✧ Wash the cuff skin in a clean neutral soapy water;

✧ Wash the outer skin and air bags fully dry, the air bag into the cuff skin before re-p ut into use.

⚠Warning：

- Excessive, multiple cleaning of the airbag, may cause damage to the airbag, unless necessary, please do not clean the airbag.
- Air bags and skins shall not be dried at high temperature.
- For a higher disinfection grade, use a disposable cuff.