Multi-parameter Pet Monitor
User Manual

VM12,VS12,VE12,VE15

Directory

Statement of responsibility

Gives no warranty in relation to the mistakes, mis-installation and mis-operation. The company undertakes no liability to accidental failure or inevitable damage.

The Company considers that it should be responsible for the reliability, safety and performance of the instrument only if the assembly operation, expansion, readjustment, performance improvement and maintenance are carried out by the Company's approved personnel or institutions; the relevant electrical equipment conforms to the relevant national standards; and the operating instrument is carried out in accordance with the guidance of this Manual.

The contents of this manual may be changed without notice.

Handbook Version Number: V1.01

Revision date: November 2019

⚠Warning⚠

For the safe and continuous use of this equipment, the listed instructions must be followed. The instructions listed in this manual can not replace the medical steps already in place.

- **Do not rely only on audible alarm systems to monitor animals. When monitoring animals, if the volume is too low or completely turned off, it may lead to animal danger. Remember that the most reliable method of animal monitoring is to combine the correct use of monitoring equipment with close monitoring of animals.**
- **For pets with pacemakers and electrical stimulators tested! The heart rate meter may count pacemaker pulses during cardiac arrest or arrhythmia. Do not rely entirely on the heart rate meter alarm, should closely monitor animals with pacemakers. See this manual for the ability of equipment to suppress pacemaker pulses and electrical stimulation.**
- **Monitor is used for clinical animal monitoring, only professionals are allowed to use this monitor.**
- **Do not open the monitor housing to avoid the danger of electric shock. If necessary, ask our personnel to repair.**
- **The device may interfere with the ultrasonic imaging system, as shown by the interference signal on the ultrasonic display screen. The farther the distance between the two devices, the better.**
- **When the equipment may be connected to the GB4824 public power grid, it shall ensure that the safety requirements of the medical and electrical systems specified in the IEC/EN 60601-1-1 or GB9706.15 are met, and if necessary, the external equipment shall be supplied by an isolation transformer. Any medical**

equipment connected to the equipment shall comply with IEC/EN 60601-1 or GB 9706.1 safety requirements. Any non-medical equipment connected to the equipment shall comply with the corresponding product safety standards. If in doubt, please consult the manufacturer or local distributor.

- **For scrapped batteries, they should be recycled according to local laws.**

It is dangerous to expose electrical contacts or connectors to saline or other liquids and conductive glue. Electrical contacts and connections such as cable connectors, power supplies, rack connectors, etc. must be kept clean and dry. If they are contaminated with liquid, they must be thoroughly dried. For further decontamination, please contact us.

⚠Warning⚠

This is not a therapeutic device.

If each hospital or medical institution responsible for the use of this instrument fails to achieve a satisfactory maintenance plan, it will cause abnormal instrument failure and may endanger physical health.

⚠Be careful⚠

- **Please keep the environment clean. Avoid vibration. Keep this equipment away from corrosive drugs, dust, high temperature and humidity.**
- **Do not immerse the sensor in the liquid. When wiping the sensor, please do not pour the liquid directly on the sensor.**
- **Do not sterilize the monitor, recorder or any accessories.**
- **When equipment and accessories are about to exceed their service life, they must be handled in accordance with relevant local regulations or hospital regulations.**
- **Disposable devices can only be used once. These devices can not be used again because of the possibility of performance degradation or pollution.**
- **When the battery is about to exceed its service life, remove the battery from the monitor immediately.**
- **Do not splash liquid on the equipment. The operating temperature range of the equipment must be guaranteed to be transported and stored in the 5 C~40 C, temperature range must be guaranteed at -20 C~55**
- **To ensure animal safety, please use the attachment specified in this manual.**

Quality Assurance:

Free Service:

All equipment in accordance with the scope of our warranty service regulations can enjoy free service.

Fee range:

(1) Any equipment beyond the scope of the Company's warranty service regulations,

the Company will carry out charge services;

(2) Even during the warranty period, the product needs to be repaired for the following reasons: human damage; grid voltage beyond the specified range of equipment; irresistible natural disasters.

The Company is hereby not liable for direct, indirect or final damage and delay caused (including but not limited to) by:

components are disassembled, stretched, retuned; replacement of accessories without our permission or maintenance of machines by non-corporate authorized personnel.

Return:

Return procedures:

Please follow the following steps:

1. obtain the right of return. Contact our customer service department to inform us of the product series number. If the series number is not clearly identifiable, the return is not acceptable. Please indicate the product model, series number, briefly describe the reasons for return.

2. freight: the instrument is shipped to our company for maintenance, and the user must bear the freight (including customs charges).

Overview

This manual introduces the monitor's performance, operation method and other safety information in detail. This is the best starting point for new users to start using monitors.

This manual is suitable for multi-parameter pet monitor. Different types of multi-parameter monitor display size, key position and shape will be different, its operation and attention will be basically the same.

The following symbols represent some important tips that users should note:

⚠⚠**Warning tips for potentially dangerous or unsafe operations, if not avoided, can lead to death, serious bodily injury or property loss.**

⚠⚠**Careful indication of potential hazards or unsafe operations, if not avoided, may result in minor physical injury, product failure, damage or property loss.**

⚠⚠**To emphasize important considerations, provide instructions or explanations for better use of this product**

	See Random Documents
	"Prohibited" marking: means prohibited content, i.e., not allowed to do when using a product.
	"Attention to Electric Shock" Mark
	Waste disposal mark
	Term of use ,× year × month
	Production date, i.e .× year × month
	BF application part with anti-defibrillation function
	CF application part with anti-defibrillation function
	Air inlet
	Air outlet
	Alarm closed
	AC

	Switchgear

This manual is read by people who are familiar with the various measurements carried out and have experience in the use of monitoring equipment.

Contraindications and warnings:

- **The equipment is limited to one animal at the same time**
- **If the equipment is not fixed, it may fall, resulting in injury or equipment damage. In order to prevent injury or equipment damage, install the equipment to a fixed position.**
- **Do not use this device in the presence of magnetic resonance imaging (MRI) equipment, otherwise the induced current will cause animal burns.**
- **This equipment shall not work in flammable anesthetic gas or other flammable gas to avoid explosion.**
- **This equipment can not be used in situations with electromagnetic radiation, such as places where mobile phones are used.**
- **In order to avoid injury, other people can not repair the equipment except qualified technicians.**
- **Do not replace the power cord of this equipment, do not connect the three-core power cord of this equipment to the two-core socket.**

Notes:

- **Before use, verify that the calibration is correct and ensure that the equipment works properly.**
- **Pay attention to the placement of power cord, conduit and all cables, avoid animals being wound or suffocated, cables entangled together, or subjected to electrical interference.**
- **The back of the equipment is strictly prohibited to block in order to emit heat.**
- **If the liquid is sprinkled into the housing of the equipment, please disconnect the power immediately and contact the maintenance personnel immediately.**
- **This specification introduces this product according to the most complete configuration, the product you purchase may not have some configuration or function.**
- **When carrying out animal monitoring, the continuous power supply of the monitor should be guaranteed. The unexpected power failure of the monitor will lead to the loss of animal data.**

⚠Warning⚠

This monitor should be used by professional medical staff or under the guidance of professional medical staff. Personnel using this monitor should be fully trained. No person without authorization, or without training, shall perform any operation. If customer needs, the company can give on-site training as appropriate.

Chapter I Product Overview

- **Please read through the content of the monitor summarization for an overall understanding of the animal monitor.**
- **Please refer to screen display introduction for instruction of information displayed on the screen.**
- **Please refer to the content involving key functions and basic operation of the equipment for command of operation method.**
- **Please refer to the content involving external interface for interface position.**
- **Please refer to the content involving internal chargeable battery for precautions for the monitor power supplied by battery.**

⚠Warning⚠

- **Multi-parameter monitor is used for clinical animal monitoring, only professionals are allowed to use this monitor.**
- **Do not open the enclosure of the instrument to avoid possible electrical hazard. Any maintenance and upgrade of the monitor must be carried out by our company's training and authorized service personnel.**
- **Do not use this instrument where flammable substances such as anesthetics are placed to prevent explosion.**
- **Before use, the user should check whether the instrument and its accessories can work properly and safely.**
- **To prevent delay in treatment, make adequate alarm settings for each animal. At the same time should ensure that the alarm can be issued when the alarm sound.**
- **Electromagnetic field will affect the performance of the equipment, so other equipment used near the equipment must meet the corresponding EMC requirements. Mobile phones, X rays, or MRI devices are possible sources of interference because they all emit high-intensity electromagnetic radiation.**
- **Do not touch animals, tables and instruments during defibrillation.**
- **The equipment connected with the monitor shall form an isopotential body (effectively connected to the protection).**
- **This monitor is suitable for the use of electrosurgical equipment. When sharing with electrosurgical equipment, the user should pay attention to ensure the safety of the monitored animals.**
- **Packages must be treated in accordance with the currently implemented waste control code and placed outside the reach of children.**

⚠Be careful⚠

- **When the products and accessories described in this manual are about to exceed the service life, they must be handled in accordance with relevant local regulations or hospital regulations. If you wish to have further information, please contact our company or its representative body.**
- **When there is doubt about the perfection and arrangement of the external grounding of the monitor, the internal battery must be used to operate.**

1.1 Monitor Overview

Multi-parameter monitor is a new structure, small size equipment, its built-in battery, for animal transport to provide convenience, can be powered by built-in battery or AC power supply. The waveform and all monitoring parameters can be clearly displayed on its high resolution display interface. Easy to carry.This multi-parameter monitor is referred to as monitor or instrument in this specification.

Expected use:

This monitor is suitable for monitoring ECG, heart rate, body temperature, respiration, non-invasive blood pressure, blood oxygen, pulse rate, carbon dioxide at the end of breath (optional), invasive blood pressure (optional) and other vital signs parameters. Can be used in pet clinics, research units and other occasions, dogs and cats can be monitored and measured vital signs.

Contraindications:

No

Monitor composition:

The monitor is composed of mainframe, display screen, carbon dioxide parameter module, battery, and components such as cardiac conductance wire, oxygen probe, blood pressure cuff, body temperature sensor, power cord, ground wire and so on.

The multi-parameter monitor has the following characteristics:

- ☆ **True color, wide view, high brightness, LCD display.**
- ☆ **Display interface operation is simple and convenient, intuitive and friendly.**
- ☆ **Built-in rechargeable high capacity battery for easy transfer of animals.**
- ☆ **Long time waveform and monitoring data record playback browsing function.**
- ☆ **Optional printing output function, support alarm trigger printing.**
- ☆ **Automatic acousto-optic double alarm.**
- ☆ **Anti defibrillation, anti-high frequency electric knife interference.**

Product classification

Safety classification of this equipment: type I equipment CF 、BF type

Waterproof grade IPX0, AP/APG, continuous operation equipment.

Supply voltage:

100~240 V ,50Hz

Working environment:

Temperature	5(℃)~40(℃)
Humidity	15%～ 80%
Atmospheric pressure	86.0 kPa ~106.0 kPa;
Altitude	-500~4,600 m (-1,600~15,000 ft)

Transport and storage conditions:

Temperature	-20(℃)~55(℃）
Humidity	15%~85%, non-condensation
Atmospheric pressure	50.0 kPa ~106.0 kPa;

⚠Attention⚠

- **Do not use this monitor outside the manufacturer's specified temperature and humidity range, otherwise the performance specifications claimed in Appendix II will not be met.**

Keystrokes and Interface Functions:

The power switch of a multi-parameter monitor ⏻,(as shown in figure 1-1 ①).

The AC power indicator "AC" as shown in figure 1-1 ②, the battery charge indicator "POWER" as shown in figure 1-1 ③,

When the instrument is connected to alternating current, both ② and ③ lights are on. If the battery power is full at this time, the ③ lights are not on.

When the instrument does not install the battery to turn on, the ② lights are always on and the ③ lights are flashing.

When the instrument does not use AC to use the internal battery, the ② and ③ lights are not on.

Monitor keys are shown in figure 1-1 ④.One on the lower side of the machine, one on the right side of the machine

Monitor twist (encoder) is shown in figure 1-1 ⑤.

The recorder is located below the right panel of the instrument or at the back of the machine (Fig .1-1⑥).

An alarm lamp is ALARM located directly above or above the right of the instrument. When an alarm occurs, the lamp flashes or lights up (Fig .1-1 ⑦).

The sensor Jack is located on the left panel of the instrument (figure1-1 ⑧).

The battery is located at the bottom of the instrument (figure1-1 ⑨)

The CO2 parameter module interface is located on the upper right side of the rear panel of the monitor (figure1-1⑩)

Other sockets and power sockets are located on the back panel.

The monitor has a friendly operating interface, through the front panel buttons and knobs to complete all operations, details, please See function key section.

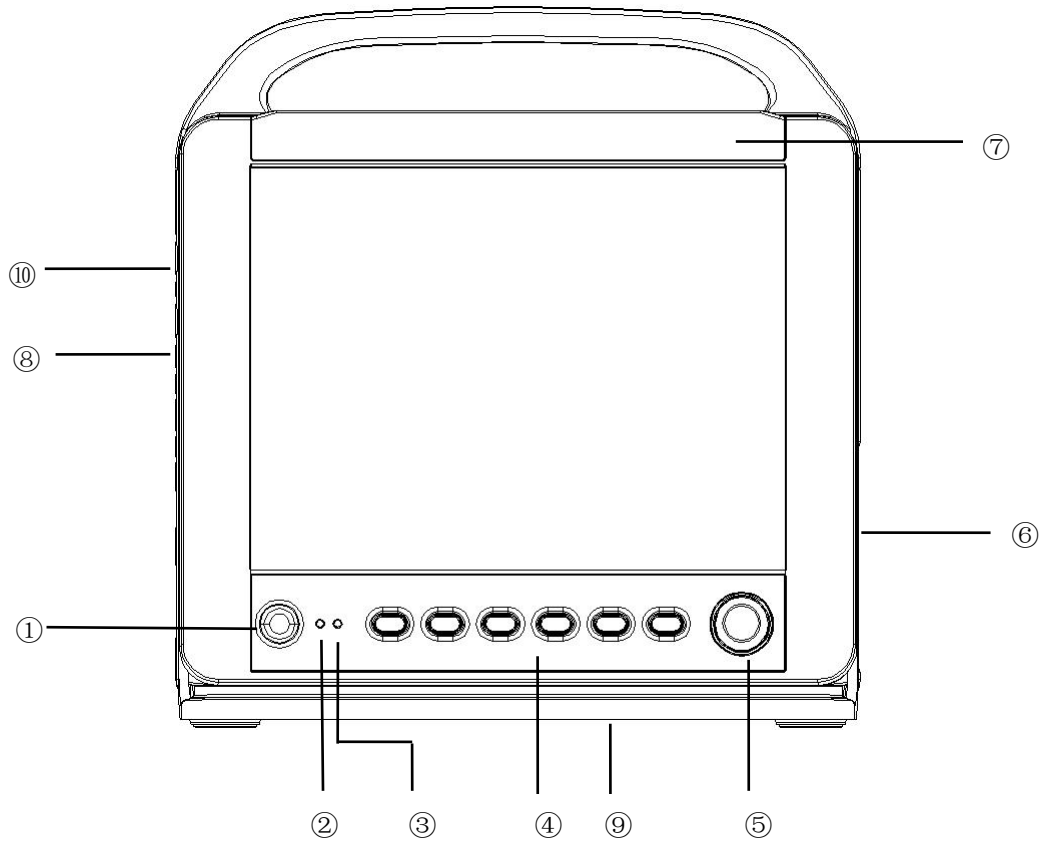


Figure 1-1 Multi-parameter Pet Monitor

①Power Switch	⑥ Recorder Position
②AC power indicator light	⑦ alarm light
③Battery Charge Indicator	⑧Sensor Jack
④Press Key	⑨Battery Position
⑤Twist (encoder)	⑩parameter module

Definition abbreviations:

Name	Definitions, abbreviations
ECG	**ECG**
RESP	**Breathe**
TEMP	**Temperature**
NIBP	**Non-invasive blood pressure**
SPO2	**Oxygen saturation**
HR	**Heart rate**
RR	**Respiratory rate**
PR	**Pulse rate**

1.2 Display Interface Introduction

The display screen of the monitor is a color LCD screen, which can simultaneously display the collected animal parameters, waveform parameters and alarm information provided by the monitor, bed, monitor status, clock and other prompt information.

The main screen is divided into four areas (Figure 1-2):

1、Information area ①

2、Waveform area ②

3、Parameter Area ③

Figure 1-2 Main Display Interface

Information area presentation (①):

The information area is located at the top of the screen, showing the current state of the monitor and animal. The content of the information area is as follows:

"Bed number" means the disease number of the animal under surveillance.

"Sex" means the male and female nature of the animal under guardianship.

"dog/cat" means the type of animal under guardianship.

"16:14:57" means the current time.

"2019-06-29" means the current date.

Other prompt information in the information area appears and disappears at the same time as the reported state, according to the content:

- Monitor prompt information, report monitor or sensor status, fixed after the "cat" area;
- Monitor alarm information (see "alarm" chapter for specific setting methods);

 It's an alarm stop sign. Press "ALARM" key to appear this sign, indicating that all alarms have been temporarily closed, until again press "ALARM" key, or alarm pause time end, the system will not resume alarm. Alarm pause time can choose "1 minute ","2 minutes "and "3 minutes" three kinds.

 It's alarm sound off sign. Press the SILENCE "key to appear this sign, indicating that all alarm sounds have been artificially turned off. until the operator presses the "SILENCE" key again to release the alarm sound off state, or the system appears a new alarm event, the alarm sound prompt is restored.

 It's an alarm closing sign. Indicates that the alarm prompt function has been artificially permanently turned off. Until the operator releases the alarm closing setting.

Attention

- **When the sign appears, the system will not be able to give an alarm prompt,so the operator should be particularly careful to use this function.**

- When the waveform on the screen is frozen, the corresponding prompt "freeze" window appears below the monitor screen.
- Animal parameter alarm information, fixed in the rightmost area.

Waveform/menu section description (②):

The waveform area displays the waveform.

Under the standard configuration, the system standard interface can display the ECG waveform, SpO2 volume tracing wave and breathing waveform in the waveform area.

The name of the waveform is displayed on the upper left of each waveform. ECG leads can be selected according to requirements. The gain of the channel and the filtering mode of ECG wave are also shown on each ECG wave. The left side of the ECG waveform has a scale bar of 1 millivolt. When the menu pops up in the screen operation, the menu always occupies a fixed position in the middle of the waveform area, making a part of the waveform temporarily invisible. After exiting from the menu, restore the original screen display.

The waveform is refreshed at a set rate, and the adjustment of each waveform refresh rate is shown in the settings of each parameter.

Description of parameter areas (③):

The parameter location is on the right side of the waveform area, and the waveform is basically placed accordingly. The parameters shown in the parameter area are:

ECG

Heart rate or pulse rate (unit: stroke/min)

ST1、ST2 of ST segment analysis of channels 1 and 2(units: mV)

SpO2

SpO2(units:%)

Pulse rate (units:beats/min)

NIBP

Systolic pressure, diastolic pressure, mean pressure, in order from left to right ;(units:mmHg or kPa)

RESP

Respiratory rate (units:beats/min)

TEMP

Temperature (in degrees Celsius ℃ or ℉ degrees Fahrenheit)

Alarm lamp and alarm status:

In normal condition, the alarm lamp is not on.

When an alarm occurs, the alarm lamp flashes or lights, the color of the lamp represents a certain alarm level, please refer to the "alarm" section.

Please refer to the relevant contents of the parameters in the relevant chapters.

Key area description (④)

You can rotate the knob selection option, twist to the left arrow symbol  , press twist, pop up as shown in the above menu.

For more details, see Chapter 3 menu operations

Sound off

Press this key to block all sounds (such as alarm, heartbeat, pulse, keyboard). And in the information area there is a symbol  display, press this key again to restore all sounds and cancel the symbol  .

Animal Information

Fill in bed number, sex, animal type and pacemaker according to animal condition. If you choose to update the animal, you empty the stored data.

Blood pressure measurements

Press this key to start inflating the cuff and measuring blood pressure. During the measurement process, pressing this key can abort the measurement and deflate.

Freeze

Press this key to enter the frozen state (the screen is temporarily still, this time can be better observed), then press this key, the system thawed (the screen back to the monitoring state).

Historical review

Press this key to view the records of a certain period of time.

Alarm settings

Press this key to set each alarm parameter. Alarm set password is "8008"

Settings menu

Press this key to appear in the system menu.

1.3 Key function and basic operation

The operation on the monitor can be done by keys and knobs. As shown in Figure 1-1:

- ⏻ (①)

Press this key for about 2 seconds to turn on or off the monitor

- **Sound off (SILENCE)**

Press this key to block all alarm sounds. And in the information area there is a symbol display, press this key again to restore all sounds and cancel the symbol.

Attention

If a new alarm occurs in the sound off state, the sound off is automatically lifted. See the alarm section for details.

Alarm suspended (PAUSE)

Press this key to suspend the alarm for up to 3 minutes (with "1 minute ","2 minutes "and "3 minutes" optional) and have the "" "symbol display in the information area.Press this button again to restore all alarms and cancel the "symbol.

Attention

- **Press the PAUSE key to turn off the alarm sound of ECG lead shedding and SpO2 sensor shedding.**

- **Freeze (FREEZE)**

Press this key to enter the frozen state (the screen is temporarily still, this time can be better observed), then press this key, the system thawed (the screen back to the monitoring state).

- **Blood pressure (NIBP)**

Press this key to start inflating the cuff and measuring blood pressure. During the measurement process, pressing this key can abort the measurement and deflate.

-  **Print (RECORD)**

When the monitor is equipped with a built-in recorder, press this key to start a real-time record printing.

-  **Main menu (MENU)**

Press this key to pop up the system menu, the user can set the system information in the system menu, and perform a review operation.

- **Rotating control button (knob)**

The user can turn the knob, select menu items and modify settings. The knob can be rotated clockwise or counterclockwise, or pressed. The user can use the knob to complete all operations on the main screen, in the system menu, in the parameter menu.

How to operate the screen with a knob:

The rectangular logo on the screen that moves with the knob is called the cursor. Where the cursor can stay can be operated.

When the cursor is in the waveform area, the user can modify the current setting. When the cursor is in the parameter area, the user can open the relevant parameter menu and set the relevant information of the parameter.

The operation is as follows:

- Move the cursor over the item to be operated on.
- Press the knob.
- One of the following four situations occurs in the system:
  - A pop-up menu or measurement window on the screen, or the original menu is replaced by a new menu.
  - The cursor with background color becomes a frame without background color, indicating that the content in the box can be changed with the rotation of the knob.
  - A mark "√" appears here to indicate the choice of this item.
  - Perform a function immediately.

1.4 Monitor external interface

In order to facilitate operation, different interfaces are located in different parts of the monitor. There is a sensor Jack on the left side of the monitor, as shown in figure 1-3:

Electrocardiogram (ECG): cardiac electrical wiring socket
Blood oxygen (SPO2): oxygen probe socket
Blood pressure (NIBP): cuff trachea socket
Body temperature (TEMP-1,TEMP-2): body temperature probe socket, two sockets optional

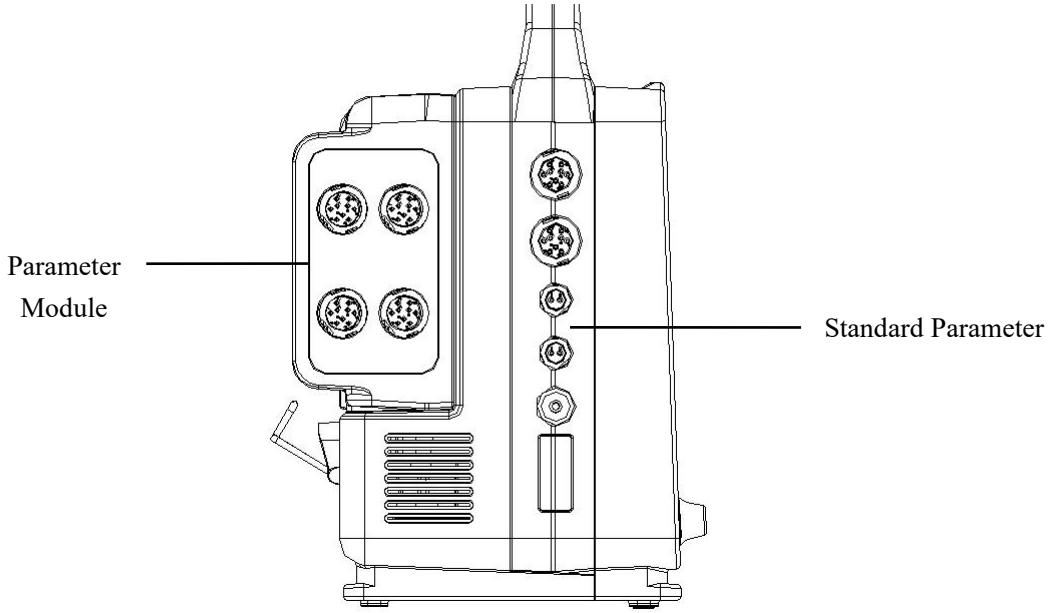


Figure 1-3 Sensor Jack

Other symbols are described in the chapter on animal safety.
The rear panel has the following jacks, as shown in Figure 1-4:

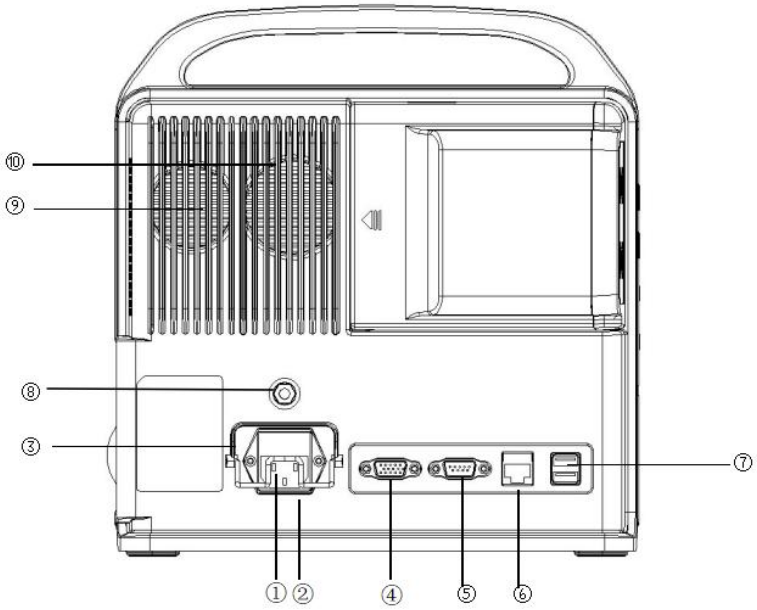


Figure 1-4 Back panel

① Power outlet: power input
② seat: for the installation of safety pipes (φ5X20/2A)
③ power retainer
④ CRT
⑤ RS232
⑥ Network ports
⑦ USB port
⑧ equipotential: equipotential interface
⑨ Built-in speaker (supports heartbeat synchronous sound and alarm sound)
⑩ Built-in fans

⚠Warning⚠

All analog and digital devices connected to this monitor must be products certified by specified IEC standards such as IEC 60950 data processing equipment standards and IEC 60601-1 medical equipment standards. And all configurations should follow the contents of the valid version of the IEC 60601-1-1 system standard. Be responsible for the staffing medical system connecting additional devices to input / output signal ports and be responsible for compliance with IEC 60601-1-1 standards.If in doubt, please contact the supplier.

1.5 Built-in rechargeable battery

The portable multi-parameter monitor is equipped with a built-in rechargeable battery. In the case of sudden power failure, the system will automatically use the battery monitor to supply power without causing interruption of the monitoring work.
Size :11.1 v/2000mAh or 4000 mAh
Installation method: use screwdriver to open the battery baffle at the bottom of the housing and insert the battery into the battery slot.(The monitor has been installed with battery when out of the factory ,and the user do not need to install it again after receiving it.) Figure 1-6.

Figure 1-6 Battery

Maintenance and testing:

battery performance may decline with time. When checking battery performance, please refer to the following steps:

1.First of all, please make sure that the monitor is on AC for more than four hours.

2.Disconnect AC power and stop all monitoring and measurement.

3.Use the battery to power the monitor until the monitor is off.

4.The length of battery power supply reflects the performance of the battery

The battery should be tested every three months,

If the power supply is cut off for more than 30 s, the monitor works normally when the battery is completely new and sufficient.

⚠Warning⚠

If the battery supply time is significantly lower than the time claimed in the specification, or the battery can not power the equipment, consider replacing the battery.

Recovery:

if the battery is obviously damaged, or when the battery energy is exhausted, it should be replaced and properly recovered. When dealing with waste batteries, should follow the corresponding regulations, can not be discarded at will.

Chapter Ⅱ Installation of monitor

2.1 Open and check

Carefully remove the monitor and accessories from the packing box and keep the packaging materials for later transportation or storage. Please click the packing list to clear the attachment.

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

When installed, leave at least 2 inches (5 cm) space around the monitor to ensure air circulation. Monitor should be used in a reasonable environment to avoid vibration, dust, corrosive or explosive gases, extreme temperature and humidity and so on.

If you have any questions, please contact our sales department or agent immediately.

2.2 Electrical connection

Connect AC power cord step:

■ Determine that AC power supply meets the following specifications :100~220 V ,50Hz

■ Use the power cord with the monitor. Plug the power cord into the power interface of the monitor and put the other end of the power cord

Insert a grounded three-core power outlet.

⚠Attention⚠

- ■ **Connect the power cord to the special socket of the hospital.**

  If necessary, connect the equipotential ground wire. See the section on equipotential grounding in the chapter on animal safety
- ■ **When there is a battery configuration, the instrument must be charged after transportation or storage. So do not connect AC power and direct boot, may be due to insufficient battery power, so that the instrument can not work properly. Turn on the AC power supply, whether or not the monitor can charge the battery..**

2.3 Power on and off

Boot: press and hold the power switch 2 seconds after loosening, the instrument starts, about 30 seconds later, the system self-check successfully into the monitoring home screen, this time the user can operate.

⚠Warning ⚠

If there are signs of damage to the monitor function or an error prompt, do not use this monitor to monitor animals and contact the biomedical engineer of the hospital or the maintenance engineer of the company.

⚠Attention⚠

- ■ **If a fatal error is found during self-examination, the system will alarm.**
- ■ **Check all monitoring functions that can be used to ensure that the monitor function is normal.**
- ■ **If a battery is configured, the battery must be charged after each battery is used to ensure adequate storage.**
- ■ **Shut down for 1 minute before turning on again.**

Shutdown: press and hold the power on for 2 seconds and release the machine.

2.4 Sensor connection

Connect the required sensor to the monitor and animal monitoring site.

⚠Attention ⚠

- **For correct connection methods and requirements for various sensors, see the relevant sections.**

2.5 Check the recorder

If the installed monitor has a recorder, check that the recorder on the right side of the monitor has paper.

Chapter Ⅲ System menu

■ **Monitor Setup**
■ **monitor maintenance**
■ **Monitor Information**
■ **Default configuration**
■ **Exit Demonstration**

The configuration of this monitor is flexible, the monitoring content, waveform scanning speed and so on can be configured by the user according to the need. Press the "MENU" key" on the front panel to pop up the menu shown in figure 3-1 and do the following:

Figure 3-1 System menu

3.1 Animal information management

⚠Attention⚠

- **Clear current animal data refer to the "clear animal record data" section of this chapter.**

Select Animal Information Management in the hotkey and pop up the menu in figure 3-2.

Figure 3-2 Animal Information Management

Bed 1-200 optional

Sex Animal Sex

Animal type (dog、cat)

Some models can rotate knob selection options, twist to the left arrow symbol, press twist, pop up such as the above menu. Among them, choose 《Animal Information》.

⚠Attention⚠

- **Before using the monitor, be sure to select the animal type correctly, and then select the corresponding accessories to monitor the animal. Remember not to measure cats in dog mode to avoid physical damage to cats.**

With pacemaker Whether animals carry pacemakers. When animals carry pacemakers, choose to open them. （If any, it will show a row of dots in the ECG waveform area.)

Update animals Receive the new animal and delete the monitoring data of the last animal.

In this menu, the user can also select the "change Animal item" to enter the "confirm update Animal" dialog box to determine whether to clear the data. As shown in Figure 3-3:

Figure 3-3 Confirm Update Animal Data

Select Yes, delete all information about the currently monitored animal, and exit the menu.

Select No, continue to save animal information, and exit the menu.

⚠Attention⚠

- **If yes, all information about the currently monitored animal is deleted.**

3.2 Default configuration

A user can set the current system configuration to the user's default configuration in the system menu, where the system automatically saves the settings, ECG leads, gains and filters of all current parameter menus to the corresponding user's default configuration content according to the animal type, and pops up the dialog box shown in figure 3-4:

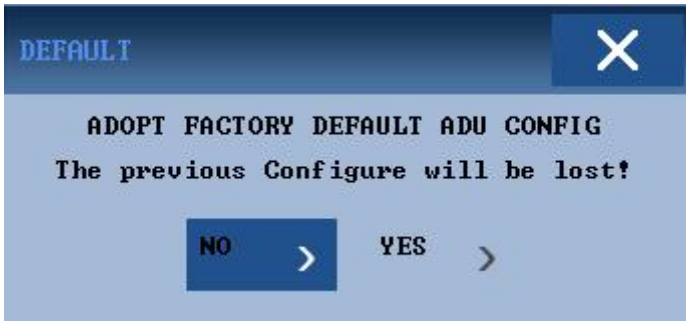


Figure 3-4 Default Configuration Menu

Select Yes to save all configurations of the current animal type as the user's default configuration.

Select No and abandon the current operation, and the system remains the same as the original configuration.

⚠Attention ⚠

- **After selecting any item in the default configuration menu, the confirm default configuration dialog box pops up. The user can choose Yes to determine the selection, or No to abandon the selection.**

⚠Warning⚠

- **All configuration in the system will be replaced by default configuration.**

3.3 Review function

Select the History Review option in the hotkey and the menu appears in Figure 3-5:

Figure 3-5 Review function menu

A menu like Figure 3-6 appears when you select the NIBP Measurement Review option in Review:

3.3.1 NIBP review

The monitor can display the most recent 400 NIBP measurements in the NIBP review.

Select the NIBP Measurement Review item in the Review function, and the last 3 NIBP measurements and measurement times are shown in the window.

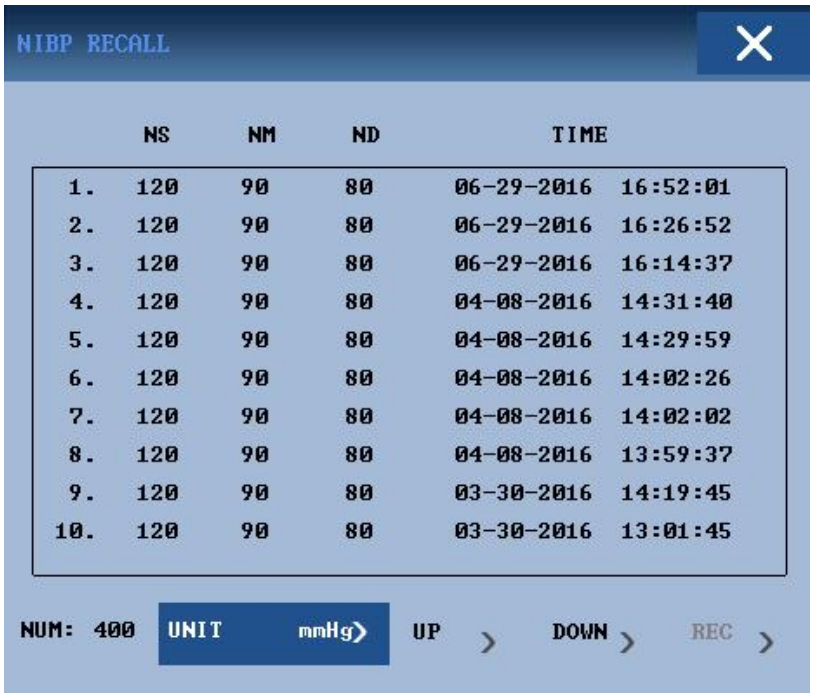


Figure 3-6 NIBP Measurement Review

The data are arranged in chronological order from near to far. Each screen can display 10 measurements, and select back and forth to view later or earlier data. Up to 400 measurements can be displayed. When the number of measurements exceeds 400, the most recent 400 times are displayed.

3.3.2 Alarm Review

Select the alarm event Review item in Review function and the menu appears in figure 3-7.

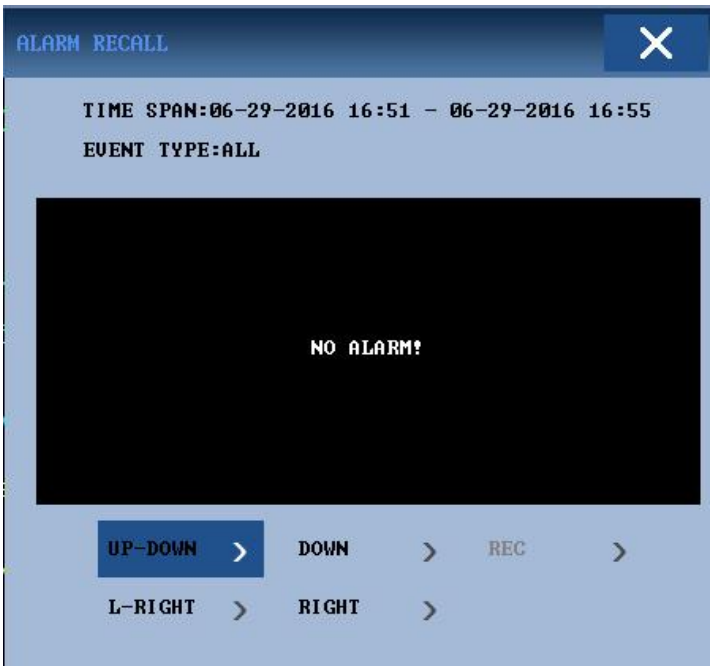


Figure 3-7 Alarm Event Review

"Alarm Event Review" records the alarm information at a certain time. Users can click on the "front and back page" to view.

3.3.3 Trend chart review

■ The trend chart for the last 1 hour can be displayed at the resolution of one data per second or every 5 seconds;

■ Latest 96-hour trend charts can be displayed at the resolution of one data per 1 minute, every 5 minutes or every 10 minutes.

Select the trend chart review item in Review function and pop up the following window:

Figure 3-8 Trend Chart Menu

The ordinate represents the measured value, the transverse coordinate represents the

measurement time, and the "🡻"is the trend chart cursor. The measured value of the position indicated is shown below the trend chart, and the corresponding time is shown above the trend chart. Except for NIBP values, other trends are shown as continuous curves. On the NIBP trend chart ," NS "represents systolic blood pressure" and "ND" represents diastolic blood pressure "NM" represents mean pressure.

Select trend plot display with different parameter:

Select the parameter selection option with the cursor, modify its display, and press the rotation button when desired parameters appear,

The trend chart of this parameter appears in the window.

Select 1 hour or 96 hour trend plot:

Select the Resolution option with the cursor. If you want to observe the trend for 1 hour, choose 1 second or 5 seconds, if you wish looking at the trend of 96 hours, you can choose 1 minute ,5 minutes or 10 minutes.

Obeserve earlier or later trend curve:

If there is a "🡺"indication on the right of the window, press the "left and right" button and rotate the button clockwise to see more later trend curve; if there is a "🡸"indication on the left of the window, press the "left and right" button and rotate counterclockwise rotate the button and observe the earlier trend curve.

Change in display ratio

The "amplitude modulation" button can change the proportion of the ordinate and the proportion of the trend curve. Data greater than the value of the maximum coordinate is represented by the maximum value.

Obtain trend data at some point in the current trend chart

Select "Move the cursor" and turn the knob to the left or right. The cursor will move with it and the moment it refers to will change,the parameter values at this time are shown below the abscissa. If there is a "🡺 "indication on the right side of the window, when the cursor moves to this position, the trend chart automatically turns over to show a later trend curve: if there is a "🡸"on the left side of the window, when the cursor moves to this position, the trend chart automatically turns over to show an earlier trend curve.

Examples:

NIBP trend chart for the last 1 hour:

■ In the hotkey press "history review" item, pop up "review function ", then select" trend chart review ";

■ Select Parameters: In Parameter Selection, turn the knob until "NIBP " appears in the box

■ Select "1 second "or "5 seconds" in the "resolution ";

■ Select "left and right shift ", turn the knob, and observe the change of trend chart time and trend curve;

■ Stop in the time period that needs careful observation, if the ordinate ratio is not appropriate, for example, some trend values exceed the maximum value of the current ordinate, select "amplitude modulation" to adjust;

■ If want to know the measurement value at a certain time, select "move the cursor ", move the cursor there, the time is displayed above, the measurement value is displayed below the curve;

■ Press "exit button" to exit trend chart observation.

3.3.4 trend table

Trend table data for the last 96 hours can be displayed at the following resolution :1 minute ,5 minutes ,10 minutes, 30 minutes ,60 minutes. Select "trend table review" in the hot key and pop up the following trend table:

Figure 3-9 Trend Table Settings menu

The time corresponding to the trend data for each group is shown in the leftmost column, with dates in parentheses. The list under the event is the marked event corresponds to the time of the marked event. The parameters in the trend table can be divided into six groups:

HR PVC
STI ST2
$SP0_2$ PR
NIBP S /M /D
RR
TI T2TD

NIBP trend data display has its particularity. In addition to the measurement values, the time to carry out this NIBP measurement is also shown under the "measuring point ". If there are more than one measurement value in this time period, only one set can be displayed, and a "*" is displayed at" MORE " meaning that there are two or more measurements.

Select a trend table with different resolutions:

Select the middle resolution with the cursor, change its options with the rotation button, and change the time interval of the trend data.

Observe earlier or later trend curve:

If the upper side of the window is indicated, you can select "turn the page back and forth" and rotate the button clockwise to observe the later trend data; if the lower side of the window is indicated, you can select the same item. Rotate the button counterclockwise to observe earlier trend data.

Observe trend data for different parameters

Select left and right to select one of the 6 groups of parameters. The right side of the

rightmost parameter is marked to indicate" >"that the page can be turned to the right, and the left side of the leftmost parameter is marked to indicate "<" that the page can be turned to the left.

Examples of operations

Observed NIBP trend tables:

■ Press "History Review" in the hotkey, pop up the "Review function" menu, select the menu "Trend Table Review ";

■ Selection parameters: select "left and right shift ", turn the knob until NIBP data appears in the window;

■ Selection resolution: select the first item on the left and select the desired data interval;

■ Select "turn the page back and forth ", turn the knob, and observe the NIBP trend data at different times;

■ Press exit button to exit trend table observation.

3.4 Monitor information

In the system menu, you can select Monitor Information to view the monitor information, as shown in figure 3-10.

Figure 3-10 Machine Version

3.5 Monitor setup

Select the Monitor Settings option in the System menu and the menu appears as shown in Figure 3-11:

Figure 3-11 Monitor setup

In the Monitor Settings menu, the user can set up the following items:

3.5.1 Interface selection

In the Monitor Settings menu, select the work Interface selection item to see that the current option is the standard interface. You can also choose other interfaces to meet the needs of different departments.

3.5.2 Alarm limit display

In the "monitor setting" menu, select "alarm limit display" item, can select "off" and "open" two states, when "open ", in the parameter data display area, will display the alarm upper and lower limit value. Conversely, when the "off" state is selected, the upper and lower limits of the alarm are not displayed.

3.5.3 Alarm record time

In the Monitor Settings menu, select alarm recording time, turn the knob to set the alarm to record the output time. The options are 8 seconds ,16 seconds and 32 seconds.

3.5.4 Alarm pause time

In the Monitor Settings menu, select alarm pause time and turn the knob to set the alarm time for short termination. The system will not perform any alarm processing during this time period. Select alarm hang time have "1 minute ","2 minutes ","3 minutes ".

3.5.5 Alarm volume

In the Monitor Settings menu, select alarm volume and turn the knob to set the alarm volume. The options are low, medium and high.

The sound pressure range of auditory alarm signal is 45 dB (A weight) to 85 dB (A weight).

3.5.6 Keyboard volume

In the Monitor Settings menu, select keyboard volume and turn the knob to set the keyboard volume. Optional items are "low "," medium" and "high ".

⚠Attention⚠

- **The various states in the "alarm volume" are still valid for the next boot, and the operator should carefully check the function before use to avoid the delay of animal treatment due to the silent or too small alarm sound.**

3.5.7 QRS volume

QRS volume in the ECG settings or SpO2 settings menu select "volume settings ". Optional have "close "," low "," middle "," high" four levels. "0" turns the volume off. The QRS volume will emit a short "Dong-" sound according to the rhythm of the ECG or SpO2 parameters.

3.5.8 System Time Settings

In Monitor Settings, select the system time Settings item and pop up the menu shown in figure 3-12:

Figure 3-12 System Time Settings

⚠Attention⚠

- **System time settings should be selected on boot (if the user needs to set), otherwise in reviewing the content with time prompt information, etc., will probably provide incorrect time information!**

3.5.9 record output settings

Select the Record Output Settings item in Monitor Settings and pop up the menu shown in

Figure 3-13:

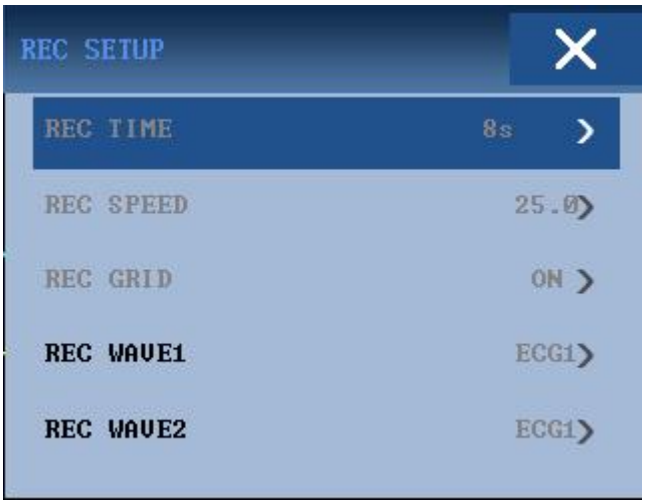


Figure 3-13 Record Settings

You can modify the print content of the record waveform 1 and waveform 2. Supports the selection ECG1,ECG2,SPO2,RESP printing four waveforms.

3.5.10 Event settings

Select the Event Settings option in Monitor Settings and pop up the menu shown in Figure 3-14

Figure 3-14 Event Settings

Users can customize four events, namely event A、 B、 C and D,, and click on the corresponding event in this menu. For the clicked event, the "@" mark appears in the box of the event, which can be cancelled by clicking again. The significance of event markers is to define various conditions related to animals and affecting parameter monitoring, such as taking, injecting drugs and various treatments, and to display the time on the trend table / chart to assist in the analysis of animal parameters at the time of the event.

3.6 Monitor maintenance

Select the Monitor maintenance item in the system menu and pop up the enter maintenance password dialog box, as shown in figure 3-15.

Users can enter user password, user password is 8118, in the user maintenance menu for user maintenance. Users can not perform manufacturer maintenance function, this is only open to the company's designated maintenance personnel.

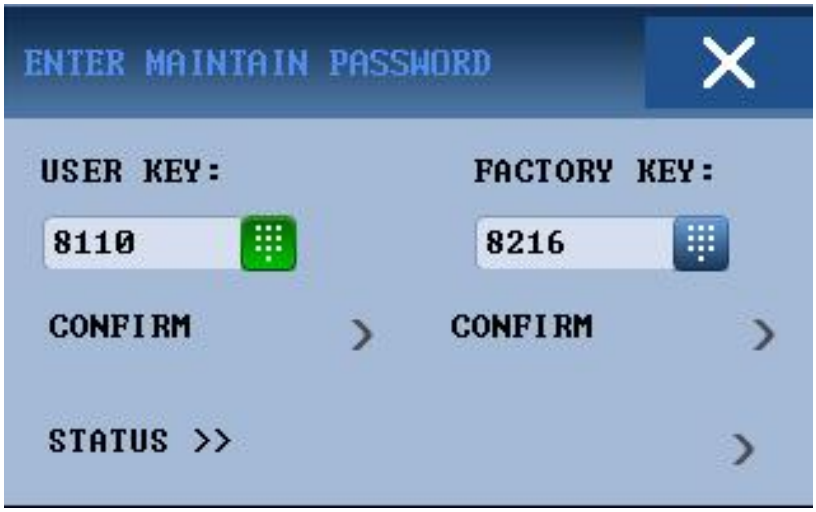


Figure 3-15 Input Maintenance Password

3.7 Demo Function

In the system menu, select the demo function item and pop up the enter demo password dialog box. After entering the correct password, the system enters the demo waveform state. Demonstration Waveform is an analog demonstration waveform set up by the manufacturer only to show machine performance and help users to train. In practical clinical use, the function of demonstration waveform is disabled, because it may make the operator mistake the animal waveform and parameters monitored, affect animal monitoring and delay the diagnosis and treatment of the disease.The password is 8008, please use it carefully. As shown in figure 3-16.

Figure 3-16 Demo Function

Chapter Ⅳ Animal safety

The design of the portable monitor meets the requirements per relevant international standards of IEC60601-1，EN60601-2-27 and EN60601-2-30 constituted for medical electric equipments. This system is equipped with protection of ground disconnecting input anti-defibrillation and surgical electric knife. If adopting correct pole (refer to chapter of ECG and RESP) and mount it according to the guidance of the manufacturer, screen display may be resumed 10 seconds later after defibrillation.

⚠**Warning**⚠

- **Do not touch animals, beds or instruments during defibrillation.**

4.1 Environment

Follow the following instructions to ensure absolute safety of electrical installation. The environment used in the multi-parameter monitoring system should reasonably avoid vibration, dust, corrosive or explosive gases, extreme temperature, humidity and so on. When installed in the instrument cabinet, there should be enough space in front to facilitate operation. When the cabinet door is opened, there should be enough space behind it to facilitate maintenance. The circulation of air in the cabinet should be guaranteed.

The monitoring system can meet the technical specifications within 0℃~40℃ of ambient temperature. Ambient temperature beyond this range may affect instrument accuracy and cause damage to components and lines. At least 2 inches (5 cm) space should be set aside around the instrument to ensure air circulation.

4.2 Power requirements

This device can be connected to the public grid defined by the GB4824. Please refer to the product specification section.

4.3 Grounding of multi-parameter monitor

In order to protect animals and medical personnel, the housing of the multi-parameter monitor must be grounded, so the portable monitor is equipped with a detachable three-wire cable, which is inserted into a matching three-wire socket. Ground the instrument through the ground wire in the power line. If there is no three-wire socket, consult the electrical management staff of the hospital.

⚠**Warning**⚠

- **Do not connect the three-wire cable of this instrument to the two-wire plug.**

Connect the ground wire to the equipotential grounding terminal of the instrument. If it is not clear from the instrument specifications whether a particular instrument combination is dangerous, for example, due to the accumulation of leakage current, the user should consult the relevant manufacturer or other experts in this field to ensure that the necessary safety of all of the instruments is not damaged by the proposed combination.

4.4 Equipotential grounding

The first level protection of the instrument has been grounded by the power plug in the housing protection grounding (protection ground) system. For internal examination of the

heart or craniocerebral, the portable monitoring system must be connected separately to the equipotential grounding system. One end of the cylinder of the equipotential grounding wire (potential equalization wire) is connected to the equipotential grounding terminal on the back panel of the instrument (plus force), while the other end (fish clip) is connected to a joint of the equipotential system (protective grounding end of the medical room). If the protective grounding system is damaged, the equipotential grounding system can protect the grounding wire. Cardiac (or brain) examinations should only be carried out in medical houses equipped with protective grounding systems. Before each use, check that the instrument is in good working condition. The cables connecting animals and instruments must be free from electrolyte contamination.

⚠**Warning**⚠

- **If the protective grounding system is unstable, the monitor uses internal power supply.**

4.5 Condensation

During work, make sure the instrument is not condensed, which may form when the instrument is moved from one room to another. This is because the instrument is exposed to moist air and different temperatures.

⚠**Warning**⚠

- **If used in places with flammable anesthetics, there is a risk of explosion.**

Chapter Ⅴ Maintenance cleaning and maintenance

5.1 Overview

Please keep your equipment and its accessories free of dust. To prevent damage to equipment, be sure to comply with the following:

- Please dilute the cleaner and disinfectant according to the manufacturer's instructions, or use the lowest possible concentration.
- Equipment shall not be immersed in liquid
- Liquids shall not be dumped on equipment or accessories
- Do not allow liquids to enter the casing
- Wearable materials (e.g. wire velvet or silver polishing agent) and any strong solvents (e.g. acetone or cleaning agent containing acetone)

⚠Warning⚠

Before cleaning the equipment, the power supply must be turned off and the connection between the power cord and the socket must be disconnected.

5.2 Cleaning

The equipment should be cleaned and maintained regularly. It is recommended that the hospital should clean and maintain every 3 months. In areas with serious environmental pollution or large wind and sand pollution, the frequency of cleaning and maintenance should be increased. Please consult or understand the hospital regulations on cleaning equipment before cleaning.

The following is an alternative cleaner

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

Cleaning equipment

1. Power off and disconnect the power cord
2. Use soft cotton ball, adsorb proper amount of detergent, wipe the display screen.
3. Use soft cloth, adsorb proper amount of detergent, wipe the surface of the equipment.
4. Necessary, use dry cloth to wipe off excess cleaning agents.
5. Air the equipment in a cool, ventilated environment accessories of the equipment: ECG lead wire, blood pressure cuff, SpO2 sensor, temperature probe, power cord with soft cloth with clean water or with the cleaning agent except ethanol and isopropanol in the above cleaning agent. In addition to the temperature probe, it is recommended to clean every 3 months. The temperature probe is recommended for cleaning after each

use.

5.3 Disinfection and sterilization

- **Mainframe disinfection**

  Disinfection operations may cause some damage to the monitor. We recommend disinfection operations only if deemed necessary in your hospital maintenance procedures. Clean before disinfection.

  Recommended disinfectant :70%ethanol ,70%isopropanol ,2% glutaraldehyde solution.

  ⚠Be careful⚠

Do not use gas (EtO) or formaldehyde to sterilize the monitor to prevent damage to the monitor.

- **Annex Disinfection**
  - ECG lead line: the surface can be wiped with 70% ethanol with soft cloth, dry naturally or dry with clean, dry cloth.
  - SpO2 sensor: the appearance of the sensor can be wiped with medical alcohol cotton ball or soft cloth, and then dry with dry cloth.The sensor's luminous tube and receiver can also be cleaned and disinfected in the same way.The cable can be cleaned and disinfected with 3% hydrogen peroxide or 70% isopropanol. The active reagent is also effective. The joint can not be immersed in the above solution.
  - Temperature probe: the surface can be wiped with 70% ethanol with soft cloth, dry naturally or dry with clean and dry cloth.
  - Reusable blood pressure cuff: the cuff can be sterilized by conventional high pressure sterilization, gas or radiation disinfection in a hot air oven, or by immersion in a decontamination solution. But remember to remove the inner rubber bag when using this method. The cuff can not be dry-cleaned. Sleeve can be machine wash or hand wash, hand wash can prolong the service life. Before cleaning, remove the latex rubber bag. After washing, wait for the cuff to dry thoroughly, and then re-pack the rubber bag.

⚠Attention⚠

- **Disinfection operations may cause some damage to the accessories, we recommend that only in your hospital maintenance procedures when necessary, disinfection operation is carried out. Clean before disinfection.**

5.4 Inspection

5.4.1 Preventive inspection

Monitor should be fully checked before each use to ensure the normal operation.

Items inspected shall include:

- Check the equipment for any mechanical damage.
- Check all exposed wires, power cord, accessories. If the cable or conduit is characterized by damage or aging, a new cable or conduit should be replaced.
- Check all instrument functions that may be used to monitor animals and ensure that the instrument is in good working condition.

If any damage or abnormal phenomenon is found, please do not use this monitor, please

contact the medical engineer of the hospital or the maintenance staff of our company immediately.

5.4.2 Total Functional Examination

Comprehensive functional inspections, including safety checks, must be performed by qualified maintenance personnel every 6 months, and after each maintenance, to ensure the normal operation and operation of the monitor.

Items inspected shall include:

- The environment and power supply meet the requirements.
- No mechanical damage to equipment and accessories.
- Power cord no wear, good insulation.
- Alarm system function is normal.
- The recorder works normally and the recording paper meets the specified requirements. (means equipment equipped with a recorder)
- All kinds of monitoring functions are in good working condition

If any damage or abnormal phenomenon is found, please do not use this monitor, please contact the medical engineer of the hospital or the maintenance staff of our company immediately.

Chapter Ⅵ Alarm

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

6.1 Summary

The so-called alarm refers to the warning made by the monitor to the user when the vital signs of the animal under monitoring are changed enough to attract the attention of the user or the failure of the machine itself makes the monitoring of the animal not going smoothly.

6.2 Alarm attributes

6.2.1 alarm type

The alarm is divided into two categories: if the alarm originates from the change of animal vital signs, that is, the physiological parameters of the monitored animal exceed a specific range or the animal can not be measured by a single physiological parameter superbound, it is called physiological alarm.

6-1 Examples of physiological and technical alarms

Animal or machine conditions	Type of alarm generated
Animal heart rate is 114 BPM, beyond the user's set heart rate alarm range.	Physiological alarm
Detection of ventricular fibrillation in animals	Physiological alarm
ECG measurement module found ECG lead shedding	Technical alarm
Failure of SpO2 measurement module	Technical alarm

6.2.1.1 Physiological alarm classification

Physiological alarm can be divided into two situations, one is that the physiological parameters of the monitored animals exceed a specific range, the other is that the occurrence of physiological abnormalities in animals can not be measured by a single physiological parameter overrun.

The latter belongs to can temporarily shield the former alarm, have the following specific:

ECG signal is too weak;

Keywords arrest; ventricular fibrillation/ventricular tachycardia;

Pulse not detected;

RESP cardiac disturbance;

RESP respiratory asphyxia;

Others belong to the former case.

6.2.1.2 Alarm level

Each alarm, whether technical alarm or physiological alarm, has a level characteristic, the higher the level, when this alarm occurs, the system will prompt the alarm in a more alarming way. All technical alarm level users can not be changed. Some physiological alarm levels can be set by the user, others are not allowed to change after specified by the system.

6.2.1.3 Clear acousto-optic

Clearable acousto-optic, refers to some technical alarm, if the pause operation, then whether in the pause state, or return to the normal alarm state, has been changed to prompt information, as follows:

1. The ability to drive acousto-optic alarm is cleared, that is, no acousto-optic alarm.
2. The ability to drive text is cleared, that is, the color of the background color will

become the same as the title background color.

3. After returning to normal alarm state, when the alarm is triggered again, the alarm is prompted by normal alarm.

For this kind of technical alarm, it is mainly lead-off error in technical alarm, other error outside the alarm limit of NIBP parameter, and the normal use obstacle of recorder.

6.2.1.4 Complete clearance

Can be completely cleared: refers to press the "ALARM" key to suspend the state, will clear the alarm, that is, no more alarm warning; after the pause, the alarm will not be triggered, otherwise no alarm. It is mainly module communication error and module initialization error in technical alarm.

6.3 Warning Form

When alarm occurs, acousto-optic and text prompts will be carried out.

6.3.1 acoustooptic properties

6-2 Alarm sound and light characteristics at different levels

Alarm level	Alarm sound characteristics	Alarm Lighting Features
High	The mode is "beep beep beep beep beep -- beep beep beep beep beep"Sound every 10 seconds (interval count from this sound to the next sound)	The alarm light flashes in red and flashes fast
Middle East	The mode is "beep-beep-beep" and sounds every 25 seconds (the interval count starts from this sound to the next sound)	The alarm lights flicker with yellow lights, and the flashing frequency is slow
Low	The mode is "beep-" and sounds every 35 seconds (counting intervals from this sound to the next sound)	The alarm light is always on with the yellow light.

6.3.2 Text Features

Background: advanced alarm background color is red, intermediate alarm and low-level alarm background color is yellow.

String color: except NIBP technical alarm prompt area, regardless of alarm level, has been black.NIBP the string color displayed in the technical alarm prompt area is related to the alarm level, the advanced alarm display is red, the intermediate and low level alarm display is yellow.When the measurement parameters exceed the set alarm limit to induce physiological alarm, the parameter value of the trigger alarm flashes. The "*" symbol displayed in the information area of the monitor on the upper right of the screen indicates"***" that an alarm appears, and its color is red. If it is a technical alarm, there is no "*" symbol prompt in the information area of the monitor.

6.3.3 others

When multiple different levels of alarm are generated at the same time, the sound and light prompt is prompted according to the highest level in the current alarm.

6.4 Alarm status

6.4.1 overview

For each alarm, in two states: trigger state, and clear state. Each moment can only be in one state.

Trigger state: the state when an alarm exists.

Clear status: the state in which the alarm does not exist.

All possible alarms are cleared at the beginning of work. When the alarm condition is satisfied, the alarm enters the trigger state.

For the entire alarm system (i.e. for all alarms), there are the following states:

1. normal state: the state in which the alarm can make all hints (including sound, light and text) in the trigger state.

2. alarm pause state: refers to the alarm in the trigger state, but not for the time being acousto-optic text prompt state.

3. alarm sound off state: refers to the alarm in the trigger state, light, text prompt but not sound prompt state.

4. alarm sound off state: refers to the alarm volume of 0 state.

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

6.4.2 alarm sound off

The alarm sound off state means that any sound prompt (including alarm, key, pulse, etc.) of the monitor is turned off.

6.4.3 alarm sound off

Alarm sound off state refers to the alarm sound is turned off, other sounds will not be turned off.

6.4.4 Alarm Suspension

When the alarm is suspended, the following treatment:

All alarm sound and light cues are prohibited.

All physiological alarm text prompts are prohibited.

Show how many seconds the alarm pause is left in the physiological alarm description area.

For the alarm that can clear the acousto-optic, change the alarm prompt to prompt information.

For a fully cleared alarm, clear the alarm prompt.

6.4.5 state switch

Under normal conditions:

1. press "PAUSE" key to enter alarm pause state, press" SILENCE "or" sound off "key to enter alarm sound off state.

2. Click " PAUSE" to enter normal state in pause state.

3. if no button to pause time, into normal state.

4. the pause time, if there is a new technical alarm, will end the alarm pause state, into normal state.

5. the pause time, if there is a new physiological alarm, the system is still in the alarm pause state.

Alarm sound off:

1. if new technology or physiological alarm is generated, the current alarm sound will be closed and entered into normal state.

2. press "SILENCE" key to enter normal state.

If the monitor is switched to other alarm state or triggered a new physiological alarm or technical alarm when the alarm sound is closed, the alarm sound closing state is automatically cancelled within 4s.

In any state:

1. in the user settings, set the alarm sound switch to turn off, enter the alarm sound off state.

2. in the user settings, set the alarm sound switch to open, into the normal state.

6.5 Alarm mode

6.5.1 overview

There are two alarm modes: bolt lock mode and non-bolt lock mode.

Bolt lock: when the alarm condition does not exist, the system still carries on the characteristic of the alarm prompt is called the bolt lock mode, only after the alarm system is reset, can no longer prompt the alarm that does not exist.

Non-bolt lock: the characteristic of no longer warning after the alarm condition does not exist is called non-bolt lock mode.

6.5.2 Clearance of locks

The clearance of bolt lock mode is also called alarm reset. Users can use alarm pause function to reset the alarm of bolt lock. When the bolt lock alarm is cleared, the alarm that has occurred but because of the action of the bolt lock mode will be cleared if the alarm condition is no longer in existence.

When working in the non-lock alarm mode, the alarm pause key on the keyboard module has only the function of suspending alarm and no reset function.

6.6 Alarm settings

In the hotkey, select alarm Settings, and the user can set the alarm parameter values in the alarm Settings menu, as shown in figure 6-1.

Alarm set password 8008

Figure 6-1 Alarm Settings

Public Alarm Content Setting

- ST： is used to set the upper and lower limits of ST alarm.
- Heart rate: used to set the upper and lower limits of heart rate alarm.
- Shrinkage pressure: used to set the upper and lower limits of systolic pressure alarm.
- Average pressure: used to set the upper and lower limits of average pressure alarm.
- Diastolic pressure: used to set the upper and lower limits of diastolic pressure alarm.
- SPO2： is used to set the upper and lower limits of SPO2 alarm.
- PR： is used to set the upper and lower limits of PR alarm.
- RESP： is used to set the upper and lower limits of RESP alarm.

■ T1： is used to set the upper and lower limits of T1 alarm.
■ T2： is used to set the upper and lower limits of T2 alarm.
■ TD： is used to set the upper and lower limits of TD alarm.

⚠Warning⚠

- **When a certain alarm occurs, the condition of the animal should be checked first. Setting the alarm limit to the limit may cause the alarm system to fail.**
- **Alarm settings before power loss does not exceed 30 s, will be automatically restored.**

6.6.1 Sound Switch Settings

See monitor settings in system settings, description of alarm sound switches.

6.6.2 Automatic Alarm Closed

Alarm shutdown refers to the failure of the whole alarm function. At this time, even if the alarm conditions are satisfied, the system does not make any alarm warning, no alarm printing, no alarm storage.

When a new measurement module is added or the measurement module has just begun to work, all alarms related to the module will also be automatically turned off within 30 seconds after the module begins to work, and other alarms will not be affected.

6.6.3 lead off when boot

When boot, if the open parameter module is not connected to the lead, then do the following:

1. for the ECG or SPO2 module, change the lead off alarm prompt to prompt information (that is, automatically clear the acousto-optic), and then prompt the user.
2. for other modules do not lead off alarm.

6.7 Parameter Alarm

The alarm parameters can **be value set independent**ly in each parameter menu, and the user can set the alarm limit and alarm state.

When a parameter alarm is turned off, the "prompt symboReferis displayed next to the parameter in the parameter display area. Independent settings

Alarm switch for each parameter.

When the value of one or more parameters exceeds the alarm limit, the monitor automatically alarm and enter the following:

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

2) if the alarm volume is set, the alarm sound is issued according to the set alarm level and alarm volume;

3) alarm lights flicker (if the machine has alarm lights);

6.8 Measures to be taken when alarm occurs

⚠Attention ⚠

- **When a certain alarm occurs, the condition of upthe animal** up **should be checked first.**

The alarm information is displayed in the system information area or the system alarm information area. It is necessary to identify the alarm and take it the sound and light are automatically cleared orrespondingremindres.

1) check animal condition.
2) identify which parameter is alarming or which alarm is happening.
3) identify the cause of the alarm.

4) If necessary, alarm sound off.

5) when the alarm condition is lifted, check whether the alarm is eliminated.

Alarm information and prompt information about parameters can be found in each parameter monitoring section.

Chapter Ⅶ Recorder (optional)

- **General information on the recorder**
- **Methods of configuring and recording**
- **Recording information**

7.1 General information on the recorder

A thermosensitive array recorder is used in this monitor. The print width of the waveform is 48 mm.

Recorder performance

- A recorder can run at a rate mm/25 seconds when outputting the waveform;
- Up to two waveforms can be recorded;
- English output;
- Real-time recording of time and waveforms
- The monitor automatically selects the waveform related to the alarm parameters when recording the alarm.

7.2 Type of record

This monitor produces the following band chart records:

- Real-time 8-second recording

Real-time recording

The 8-second real-time recorded waveform is set by the monitor (usually showing only the first two waveforms).

⚠**Attention**⚠

- **When the output operation is being performed, pressing the print key parameter output again will wait until the current output is over.**

7.3 Record output

Date

HR —— heart rate BED NO —— bed number

SPO2—— blood oxygen saturation PR SPO2—— pulse rate

NIBP —— systolic/diastolic pressure (mean pressure)

T1—— body temperature 1 T2—— body temperature 2

RR —— breathing

7.4 peration and status information

Requirements for paper recording

Thermal recording paper that meets the requirements must be used, otherwise it may result in the inability to record, a decline in recording quality or damage to the thermal head.

Normal operation

- When the recorder is running, the recording paper is sent out at a constant speed, so that the recorder can not be pulled out hard to avoid damage.
- The recorder can not be used without recording paper.

Recorder Paper Replacement Steps

- Open the recorder door;
- Put the new paper in the whole roll, and the printing surface of the paper faces the heat sensitive head;
- Pull the paper outward about a centimeter, pay attention to the paper pendulum, paper edge alignment;
- Close the recorder door.

⚠**Attention**⚠

- **Change paper action to light, can not collide with the heat-sensitive head. Do not keep the recorder door open unless you are changing paper or troubleshooting.**

Remove card paper

When the sound of the recorder or the output of the recording paper is abnormal, the door of the recorder should be opened to check whether the paper is stuck. If paper jam, please follow the following steps to clear:

- Open the recorder door;
- Rewind the paper and align the edges;
- Close the recorder door.

Chapter Ⅷ ECG and RESP

8.1 ECG monitoring instructions

8.1.1 Definition of ECG monitoring

ECG monitoring produces continuous waveforms of animal ECG activity to accurately assess the physiological state of the animal at that time. For this purpose

Ensure the normal connection of ECG cable so that the correct measurement value can be obtained.The monitor is in normal working condition

Three ECG waveforms are displayed at the same time.

■ use a five-lead device for monitoring, ECG can obtain three waveforms from two different leads.

■ monitoring showed parameters including heart rate (HR), st segment measurements, and arrhythmia (optional).

■ all the above parameters can be used as alarm parameters.

8.1.2 Attention to ECG monitoring

⚠Warning⚠

- **When animals need defibrillation, do not use non-defibrillation ECG cables.**
- **Do not touch animals, tables or instruments during defibrillation.**
- **Using the correct electrode and placing the electrode according to the manufacturer's instructions, the display screen can return to normal display within 20 seconds after defibrillation.**
- **ECG cables provided by our company must be used for ECG signal monitoring using portable monitors.**
- **When you connect electrodes or animal cables, you should ensure that there is absolutely no contact with any other conductive parts or with the ground. especially be sure that all ECG electrodes, including neutral electrodes, are attached to animals to prevent their contact with conductive components or ground..**
- **Using a non-resistance ECG cable, it can not be used for defibrillation on the monitor; on other monitors, if the monitor itself does not have defibrillation current limiting resistance, it can not be used for defibrillation.**
- **When selecting 5 lead settings ,5 disposable electrodes need to be pasted (electrode position is shown in figure 8-7); when selecting 3 lead settings ,3 disposable electrodes can be pasted (electrode position is shown in white, black and red in figure 8-7)**

⚠Attention⚠

- **Interference and ESU interference from ungrounded instruments near animals may cause waveform problems.**
- **if operated according to the conditions specified in the EN60601-1-2(radiation resistance is 3 v/m), the electric field intensity over 1 v/m may cause measurement errors at various frequencies. Therefore, it is recommended not to use devices with electrical radiation near electrocardiogram / respiratory measurements.**

8.2 Operation Method of ECG Monitoring

8.2.1 Ready

1) prepare the animal skin before placing the electrode.

● the skin is a bad conductor, the animal's skin preparation is ten to get good contact between the electrodes and the skin it's important.

●if necessary, shave the animal hair at the electrode placement.

● wash skin thoroughly with soap and water.(Do not use ethers and pure alcohol as this increases skin impedance).

●Dry skin to increase tissue capillary blood flow and remove skin debris and grease.

2) install a spring clip or button before the electrode is placed.

3) place electrodes on animals, such as electrodes without conductive paste, and apply conductive paste before placement.

4) connect the electrode lead to the animal cable.

5) Make sure the monitor is powered on.

⚠Warning⚠

- **Be careful to stick the discharge pole and make sure the contact is good.**
- **Check the ECG electrode patch daily for irritation of the skin. If there is any indication of allergy, change the electrode or change it every 24 hours**

Change position.

- **Check that the lead is normal before starting monitoring. After unplugging the ECG cable, the screen will display the error message of "sensor shedding" and trigger the sound alarm at the same time.**

⚠Attention⚠

- **To protect the environment, used electrodes must be recycled or properly treated**

8.2.2 Installation of ECG leads

Position of ECG monitoring electrode

The electrode placement of the five-lead device is shown in figure 8-7.

■RA white (right limb) electrode is placed near the armpit of the right forelimb.

■LA black (left limb) electrode is placed near the armpit of the left forelimb.

■RL green (right leg) electrode is placed near the armpit of the right hind limb.

■LL red (left leg) electrode is placed near the armpit of the left hind limb.

■V brown (chest) electrodes are placed on the chest wall in figure 8-7.

Or refer to Figure 8-7 or Figure 8-8

⚠Attention ⚠

- **Use 5 wire. silver-silver chloride (Ag-AgCl) ECG electrode only, and the product is effectively registered. use wiring that meets AAMI standards.**

⚠Attention ⚠

- **The following table lists the lead names in European and American standards. (R、**

L、N、F、C in European standards and RA、LA、RL、LL、V in American standards)

United States		Europe	
Lead Name	**Color**	**Lead Name**	**Color**
RA	**white**	**R**	**red**
LA	**black**	**L**	**yellow**
LL	**red**	**F**	**green**
RL	**green**	**N**	**black**
V	**brown**	**C**	**white**

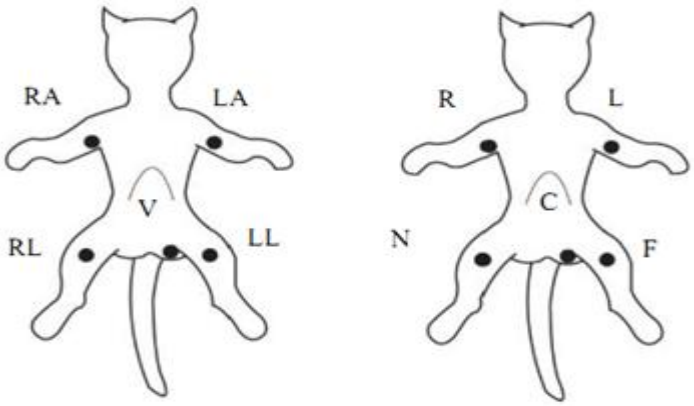


Figure 8-7 Location of 5 conductive electrodes

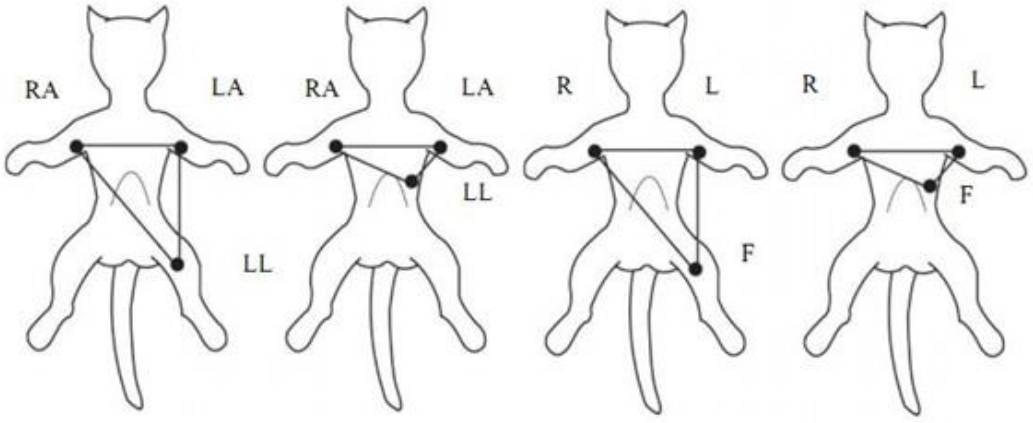


Figure 8-8 Location of 3 conductive electrodes

⚠Attention⚠

- To ensure animal safety, all leads must be connected to the animal.

⚠Warning⚠

- **When using the electro-surgical (ES) equipment, place the ECG electrode in**

the middle position between the ES floor and the electro-surgical knife to avoid burns. Cable of electrical surgical equipment can not be wound with ECG cable.

- **ECG placement of the lead depends on the type of operation performed. For example, for thoracotomy, electrodes can be placed on the side or back of the chest. sometimes the pseudo-difference may affect the ECG waveform in the operating room due to the use of surgical scalpel equipment. in order to help reduce the pseudo-difference, the electrode can be placed on the left and right limbs, close to the left and right sides of the abdomen, while the chest leads can be placed on the left side in the middle of the chest. avoid placing the electrode on the upper arm, otherwise the ECG wave will become very small.**
- **When using electrical surgery (ES) equipment, do not put the electrode on the grounding plate near the surgical equipment, otherwise there will be a lot of interference in the ECG signal.**

Features of a good signal (Figure 8-9):

- Tall and narrow without trace.
- R waves are tall and completely above or below the baseline.
- pacing signal is not greater than the height of the R wave.
- T wave is less than 1/3 height of R wave.
- P waves should be much smaller than T waves.

To obtain a calibrated ECG wave of 1 millivolt, ECG calibration should be carried out, where the screen prompts that "animals can not be monitored during calibration ".

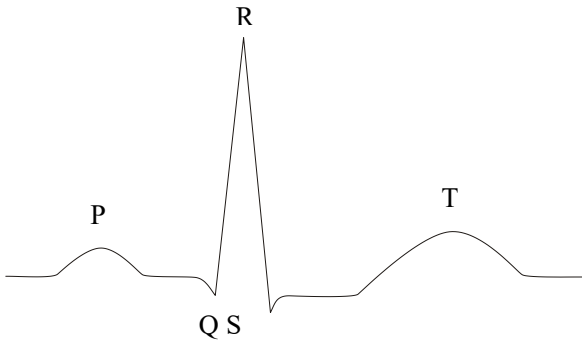


Figure 8-9 Standard ECG Wave

A five-lead ECG device

Users can arrange leads on channel 1 and channel 2 according to their own needs. Guide names on both channels are displayed on the left side of the corresponding waveform and can be changed ECG the menu. appropriate leads can be selected from the I 、II 、I Ⅱ、AVR 、AVL 、AVF 、V for channel 1 and channel 2, respectively. When the user selects the same lead, the monitor automatically adjusts to a different lead.

⚠Attention⚠

- **If the electrode is pasted correctly and the ECG waveform is inaccurate, replace the lead.**
- **Interference and ESU interference from ungrounded instruments near animals**

may cause waveform problems.

8.3 ECG menu

ECG Settings menu

Turn the knob, move the cursor on the main screen to the parameter area ECG hot key, then press the knob to pop up ECG set the menu

Single, as shown in figure 8-10:

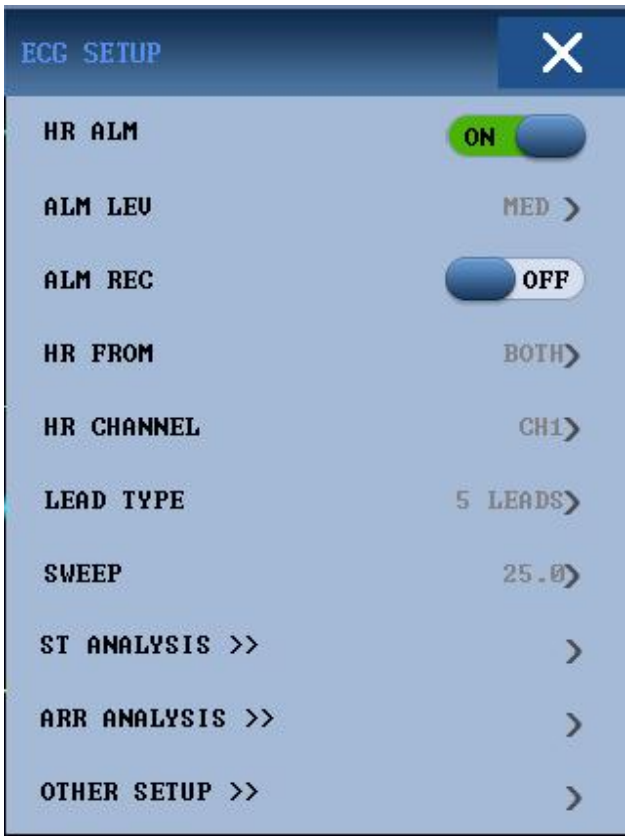


Figure 8-10 ECG Settings menu

■ECG Alarm Settings

● heart rate alarm: select "on" when the heart rate alarm alarm alarm warning and storage, select "off" do not alarm, and in the screen parameter area ECG next to the prompt "".

● alarm level: optional "high "," middle "," low" three values. "high" means the most serious alarm.

● alarm record: select "open" to record output when heart rate alarm occurs.

Alarm when the care rate exceeds the high limit or below the low limit.

⚠Attention⚠

- **The upper and lower limits of the alarm shall be set according to the clinical conditions of each animal.**
- **The upper limit of heart rate alarm is very important in monitoring. The ceiling should not be set too high, taking into account changes,Set the upper limit of heart rate alarm not 20 beats / min higher than animal heart rate.**

● sources of heart rate

Select heart rate source: can choose by ECG(heart wave), SOP2(blood oxygen volume recording wave) to detect heart rate; choose "automatic" by monitor according to signal quality to determine heart rate source; if choose "simultaneously ", monitor will show heart rate and pulse rate at the same time. prompt PULSE(pulse) and have pulse rate sound if provided by SPO2.

If the source of heart rate is SPO2, the alarm judgment of heart rate is not carried out, but the alarm judgment of pulse rate is carried out.

When the "simultaneous" option is selected, the measured value of the PR is displayed on the right side of the home screen SPO2; the HR and PR are alerted simultaneously. The heart beat sound is based on the HR, the HR has the data to carry on the sound prompt, if does not have the HR data to carry on the sound prompt to the PR.

● selection of computing channels

Channel 1 represents the calculation of heart rate using waveform data from the first ECG wave.

Channel 2 represents the calculation of heart rate using waveform data from the second ECG wave.

"Automatic" represents the channel through which the monitor automatically selects the heart rate.

● lead type: select 5 lead or 3 lead

● Waveform Speed

ECG waveform scanning speed of 12.5,25.0 and 50.0 mm /s three files can be selected.

●ST segment analysis

Choose this item to enter the ST Analysis menu.

● Analysis of arrhythmias:

● other settings

Choose this item to enter the ECG Settings menu, as shown in Figure 8-11:

Figure 8-11 ECG Settings menu

This submenu has the following features:

●ECG monitoring type: in the case of lead type 5 lead, select normal display to display two ECG waveforms in 5 lead. Choose "full-screen multi-lead display ", then display 6 ECG waveform, blood oxygen waveform and respiratory waveform a total of 8 waveforms in the screen waveform area.

● heartbeat volume: you can choose volume level off, low, medium, high.

● pacing analysis: when set to "open ", the detected pacing signal is marked above the ECG waveform-" ' " symbol "; when set to" close ", there is no pacing analysis.

● power frequency suppression: suppression of network interference.

● notch settings: remove AC interference ,"50 Hz" and "60 Hz" two options

●ECG calibration: select this ECG waveform will be automatically calibrated.

● default configuration: select this to enter the ECG default configuration dialog box. You can select the default configuration of the system.

⚠**Attention**⚠

- **When the animal has pacemaker monitoring, the "pacemaker "(PACE) switch should be turned on; when the animal does not have pacemaker monitoring, the" pacemaker "(PACE) switch should be turned off; when the "pacemaker" switch is turned on, The system will not perform some kinds of ARR analysis and ST analysis.**
- **For pacing animals, the function of pacing pulse analysis must be turned on. Otherwise, the pacemaker pulse may be counted as a normal QRS wave, so that the "ECG signal is too weak" alarm can not be detected.**
- **when the pacing analysis was opened, arrhythmias associated with ventricular premature beats (including PVCs counts) were not detected, and ST segment analysis was not performed.**

■ **Channel 1 and Channel 2 Waveform**

Alternative leads are I, II, III, aVR ,aVL ,aVF ,V.

■ **ECG gain**

the gain of each calculation channel can be selected. the gain has ×0.25×0.5,×1,×2 three, and a scale bar of 1 millivolt is given on the left side of each core wave shape.The height of a scale of 1 millivolt is proportional to the amplitude.

⚠**Attention**⚠

- **When the input signal is too large, the peak may be truncated. At this point, the user can manually change the gain file of the ECG waveform with reference to the actual waveform to avoid incomplete waveform display.**

■ **Filter Mode**

A cleaner or more accurate waveform can be obtained by filtering.Three filtering methods can be selected. An unfiltered ECG wave is displayed in the diagnostic mode; the monitoring mode will filter out the pseudo-difference that may lead to false alarm; the operation mode in the operating room can reduce the pseudo-difference and interference from the electrosurgical equipment.

⚠Warning⚠

- **The system can only provide unprocessed real signals when diagnosing. In the "monitoring" and "operation" filtering mode, the ECG waveform will be distorted to varying degrees. At this time, the system can only provide the basic condition of ECG, which will have a great impact on the analysis results of ST segment. ARR analysis results may also have partial effects in surgical mode. Therefore, it is recommended to use diagnostic mode for animal monitoring when interference is small.**

⚠Attention⚠

- **The detected pacing signal will be expressed as " ' "above the ECG waveform in the waveform area.**

8.4 ECG alarm information and prompt information

Alarm information

The possible alarm in ECG measurement can be divided into physiological alarm and technical alarm. At the same time, ECG measurement process may also produce various prompt information. When these alarms or prompts appear, the visual and auditory representations of the monitor can be referred to the description in the alarm function section. On the display screen, the physiological alarm and general warning information (general alarm) are displayed in the alarm area of the monitor, while the technical alarm and the prompt information which can not trigger the alarm are displayed in the information area of the monitor. description of alarm in this section does not involve arrhythmia and ST segment analysis section. When the alarm record switch in the relevant menu is turned on, the physiological alarm caused by the parameter exceeding the alarm limit may trigger the recorder to automatically output the alarm parameter value and the related measurement waveform.

The following classification list describes the various alarms that the measurement section may produce.

Physiological alarm:

Prompt information	Causes	Alarm level
ECG signals are too weak	Can not detect animal ECG signals	High
HR too high	HR measured value is higher than set alarm high limit	User optional
HR too low	HR measured values below set alarm low limits	User optional

Technical alarm:

Prompt information	Reasons	Alarm level	Countermeasures
ECG lead shedding	Electrocardiogram	Low	Make sure all

ECG LL lead shedding or ECG F lead shedding	electrodes fall off from animals or ECG cables fall off from monitors		electrodes, leads and cables are connected properly.
ECG LA lead shedding or ECG L lead shedding			
ECG RA lead shedding or ECG R lead shedding			
ECG module initialization error	ECG Measurement Module Fault	High	Stop using the measurement function provided by the ECG module and notify the biomedical engineer or our maintenance staff.
ECGmoduleinitialization error 1			
ECG module initialization error 2			
ECG module initialization error 3			
ECG module initialization error 4			
ECG module initialization error 5			
ECG module initialization error 6			
ECG module initialization error 7			
ECG module initialization error 8			
ECG module communication stopped	ECG measurement module failure or communication failure	High	Idem
ECG module communication error	Occasional communication failures	High	If the fault continues, the treatment method is the same as above.
HR alarm limit	Functional security failures	High	Stop using HR alarm function and notify biomedical engineer or maintenance staff.

ECG interference is too large	ECG measurement signal is greatly affected by interference	Low	Be sure to keep animals quiet and ensure reliable electrode connection and good grounding of AC power supply system.

Prompt information (including general alarm information):

Prompt information	Causes	Alarm level
HR measurement of super-boundary	HR measurement beyond measurement	High

8.5 Respiratory measurements

How is breathing measured?

The monitor measures respiration from the chest impedance of the two electrodes, and the impedance changes between the two electrodes (due to chest activity) produce a respiratory wave on the screen.

Setting of respiratory monitoring

Monitoring breathing does not require additional electrodes, but electrode placement is important. Some animals, due to their clinical conditions, lateral expansion of their thorax resulted in negative intrathoracic pressure. In this case, it is best to place the two respiratory electrodes in the right axillary midline and in the region with the largest movement during the left side of the chest to obtain the best respiratory wave.

⚠**Attention**⚠

- **Respiratory monitoring is not suitable for animals with large range of activities, as this may lead to false alarms.**

RESP monitoring checks:

1) prepare the animal skin before placing the electrode.

2) install a spring clip or button on the electrode and place the electrode on the animal as described below.Electrode placement for breathing measurements

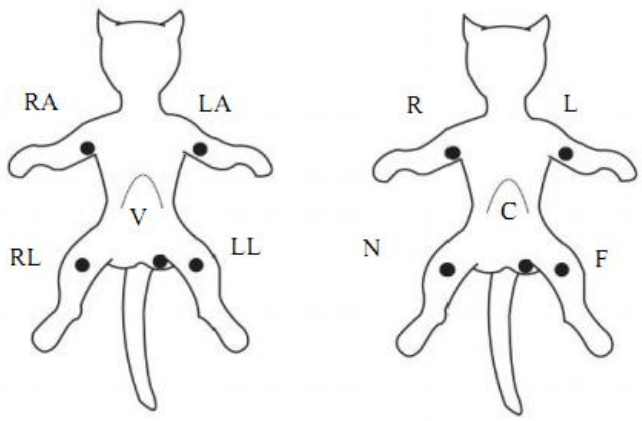
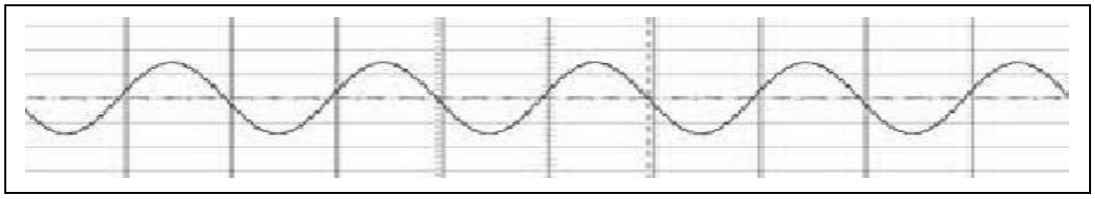


Figure 8-15 Placement of electrodes (five leads)

⚠**Attention**⚠

The white and red electrodes are placed diagonally to obtain the best breathing wave. The liver and ventricle should be avoided on the line of the respiratory electrode, which can avoid the pseudo-difference caused by cardiac coverage or pulsating blood flow, which is especially important for newborns.

Breathing detection-lead shedding detection and active noise suppression, acting on animal waveforms, frequency 65 KHz：



RESP Settings menu

Turn the knob, move the cursor to the RESP hot key in the parameter area in the main screen, and then press the knob to enter the RESP Settings menu, as shown in figure 8-17.

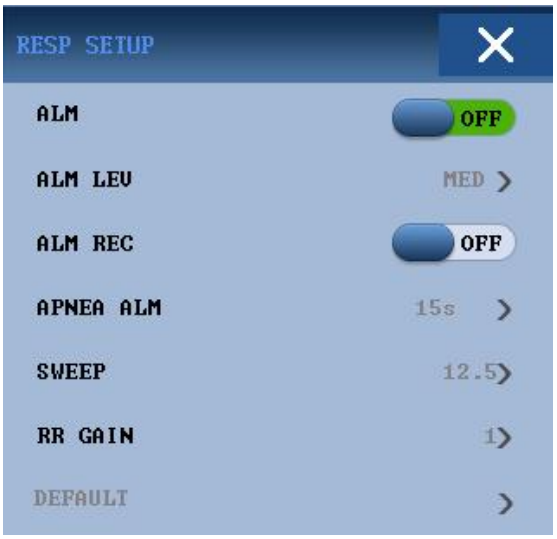


Figure 8-17 RESP Settings menu

RESP Alarm Settings

■ alarm switch: select "on" when breathing rate alarm alarm alarm alarm warning and storage, select "off" not alarm and prompt next to RESP screen parameter area "⚠".

■ alarm level: optional has "high "," medium "," low ". "high" means the most serious alarm.

■ alarm record: select "open" and output the recorder when the respiratory rate alarm occurs.

The respiratory rate alarm is based on the set high limit and low limit. When the respiratory rate exceeds the high limit or falls below the low limit, the alarm occurs.

Adjust the upper and lower limits of the RESP alarm as follows:

	Maximum ceiling	Minimum floor	Single adjustment
RR dog/cat	**150**	**6**	**1**

■asphyxiation alarm: set the time to judge animal asphyxiation, between 10s ~40s, add knob every time you turn/ minus 5 seconds.

■waveform speed: optional respiratory wave speed is 6.25 mm/s ,12.5mm/s ,25.0mm/s.

■breathing gain: the user can set the RESP waveform magnification display, the magnification option is 0.25,0.5,1，2,4。

■default configuration: select this to enter the RESP default configuration dialog box, and the user can select "manufacturer default settings" or "user default settings ". After selecting the exit dialog box, the system pops up a pair of boxes that require the user to determine the choice.

8.6 RESP Alarm and prompt information

When the alarm record switch in the relevant menu is turned on, the physiological alarm caused by the parameter exceeding the alarm limit will trigger the recorder to automatically output the alarm parameter value and the related measurement waveform.

A list of possible physiological alarms, technical alarms and tips for RESP measurements is given below:

Physiological alarm:

Prompt information	Causes	Alarm level
RR too high	RESP measured value is higher than set alarm high limit	User optional
RR low	RESP measured values below set alarm low limits	User optional
RESP breathing suffocation	Breathing is not measured at specific intervals	High

Technical alarm:

Prompt information	Reasons	Alarm level	Countermeasures
RESP alarm limit	Functional security failures	High	Stop using RESP alarm function and notify biomedical engineer or maintenance staff.

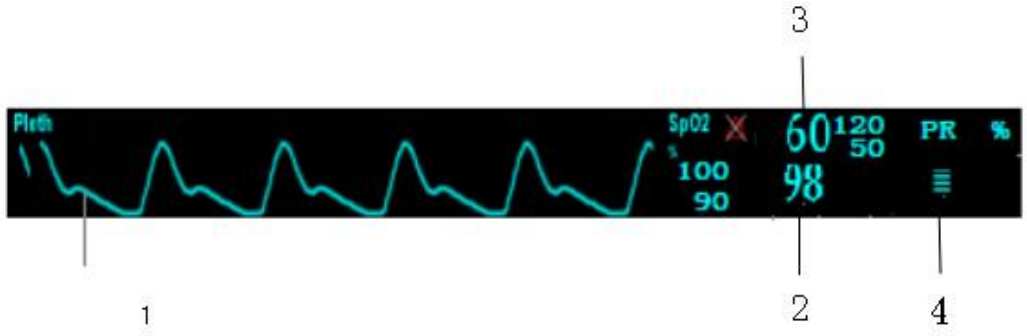
Prompt information (including general alarm information):

Prompt information	Causes	Alarm level
RR measurement of super-boundary	RR measurement beyond measurement	High

Chapter Ⅸ SPO2

9.1 SpO2 Monitoring Instruction

SpO2 measurements were performed using a continuous, noninvasive method of pulsating blood oxygen quantification. It measures the light emitted from the sensor luminous source at a specific wavelength. After being absorbed by oxygenated hemoglobin in animal tissue, it reaches the luminous flux at the end of the sensor photodetector to obtain oxygen saturation and pulse rate. The monitor has been calibrated to display functional oxygen saturation.



1.Volume Description (Pleth) Waveform

2. arterial oxygen saturation (SpO 2): oxygenated hemoglobin as a percentage of total hemoglobin.

3.Pulse rate (PR): Number of pulses per minute detected (obtained from volume tracing).

4. perfusion bar diagram: proportional to pulse intensity, reflecting the signal intensity of pulse rate signal, can also be used as signal quality index.

9.2 SpO2 principles for measuring volumetric parameters

- Blood oxygen saturation was determined by pulsating blood oxygen quantitative method. This is a continuous, noninvasive method for measuring hemoglobin oxygenation saturation. It measures how much light emitted from one side of the sensor light source passes through animal tissue (such as ears) to the receiver on the other side.
- The amount of light passing through depends on a variety of factors, most of which are constant. However, one of these factors, arterial blood flow, varies with time because it is pulsating. By measuring the light absorbed during pulsation, the oxygen saturation of arterial blood may be obtained. Detection of pulsation itself can give a "volume description" waveform and pulse rate signal.
- SpO2" values and volume tracing waveforms can be displayed on the home screen.
- SPO2 in this manual refers to the function of animal oxygen saturation measured by non-invasive method.
- The monitor uses digital filtering and signal correlation technology to process pulse waveform signal. This waveform is normalized to reduce noise before oxygen measurement. The noise generated by motion artifacts is smoothed to eliminate interference in saturation measurement. In the case of weak blood flow pulsation, the

noise generated by some limiting factors in electrical characteristics is greatly reduced.

⚠Warning⚠

- **the pulse oximeter probe and probe extension cable specified in this instruction shall be used. before use, the user and/or operator need to verify the compatibility between the monitor, probe and cable. otherwise, it will be possible to cause the performance of the instrument to decline.**
- **If there is carboxyhemoglobin, methemoglobin or dye diluted chemicals, the SpO2 value will be deviated.**
- **The cable of the electrical surgical equipment can not be wound with the sensor cable.**
- **Do not place the sensor on a limb with an arterial or intravenous catheter.**
- **When blood pressure and oxygen are measured in the same limb in animals, weak perfusion caused by blood pressure measurement will lead to inaccurate blood oxygen measurement and trigger physiological alarm of blood oxygen.**
- **During long continuous monitoring, check the position of the oxygen probe attached every 2 hours or so, and move properly when the skin changes or every 4 hours. Some animals may require more frequent examinations, such as newborns, animals with perfusion disorders or skin sensitivity. because prolonged monitoring may increase unpredictable skin changes such as allergies, redness, blistering, or compressive necrosis.**
- **In the process of continuous monitoring for a long time, the position of the probe should be checked periodically to avoid the change of the position of the probe caused by moving and other factors, which will affect the accuracy of the measurement.**
- **Do not use this equipment in an environment above 40 degrees Celsius.**

⚠Attention⚠

■$Sp0_2$The value is always displayed in a fixed place.

■ pulse rate is shown only if:

1) set heart rate source to Sp02 on the ECG menu"or" full selection ".

2) set "heart rate source" to "automatic" in the ECG menu, and there is no ECG signal at this time.

■Sp02 waveform is not proportional to pulse volume.

⚠Warning⚠

- **The operator should check that the sensor cable is normal before starting monitoring. As a $Sp0_2$When the sensor cable or any wire of the extension line is disconnected or short circuit with other wires of the oxygen probe / extension line of the monitor, it will cause abnormal state and trigger sound alarm at the same time.**
- **Do not use this Sp02 if sensor packaging or sensor has signs of damage.The sensor should be returned to the manufacturer.**
- **This oxygen sensor is a light source class I LED,IPX0, do not decompose this**

sensor, do not look at the beam, otherwise, may cause harmful irradiation.

9.3 Operation Method of Oxygen Saturation Monitoring

$Sp0_2$ Volume Measurement

1) **turn on the monitor;**

2) clip the sensor in the proper position of the animal's ear; or clip the anesthetized animal's tongue near the root of the tongue (clip a medical sterile gauze between the probe and the tongue)

3) plug Sp0 connector at one end of sensor cable2Holes.

⚠Attention⚠

- **If the test site and probe can not be accurately located, it may lead to inaccurate blood oxygen saturation reading, or even unable to search for pulse wave and can not be monitored for blood oxygen, so it should be repositioned at this time.**
- **Excessive movement of measuring parts may cause inaccurate measurement, and animals should be quiet or replaced at this time to reduce the impact of excessive movement on measurement.**
- **If the probe falls off, the monitor will display in the form of prompt information "probe falls off ".**

⚠Declaration⚠

- **This instrument is not used to evaluate the accuracy of pulse oxygen probe and pulse oxygen monitor.**
- **The function tester can not be used to evaluate the accuracy of blood oxygen.**
- **The device has been calibrated and shows functional oxygen saturation.**

9.4 Measurement limits of oxygen saturation

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

■ high-frequency electrical disturbances, such as those generated by the host system itself or from sources such as external electrical connections to the system

The interference of scientific instruments.

■ don't use oximeter and oxygen sensor during magnetic resonance imaging scanning (MRI). Inductive current can

Can cause burns.

■ intravenously dye.

■ animals move too frequently.

■ external light radiation.

■ Improper installation of sensors or improper contact with objects.

■ sensor temperature (the optimum temperature should be in the range of 28℃~40℃).

■ place the sensor on a limb with a blood pressure cuff, ductus arteriosus, or intraluminal line.

■ the concentration of non-functional hemoglobin such as carboxyhemoglobin (COHb) and n-iron hemoglobin (MetHb), etc.

■ oxygen saturation is too low.

■ circulatory perfusion of the tested site was poor.

■ shock, anemia, hypothermia and the use of vasoconstrictor drugs may reduce arterial blood flow to an unmeasurable level.

■ measurements also depend on the absorption of oxygenated hemoglobin and reduced hemoglobin to special wavelength light. If any absorbs substances of the same wavelength and they cause false or low SP0 in measurements$_2$Value. For example:Carbide hemoglobin, iron hemoglobin, methylene blue, rouge indigo.

■ Suggested use of the SpO described in the annex$_2$Sensors.

9.5 Oxygen saturation menu

Sp0$_2$ Settings menu

rotate the rotation button to move the cursor in the display interface to the SP0 of the parameter area2Hotkeys, press the spin button access to SP02Settings menu, as shown in figure 9-5.

Figure 9-5 SP0$_2$Settings menu

⚠Warning⚠

- **Sp02 will be$_2$Alarm upper limit set to 100% equal to disconnect upper limit alarm. High oxygen levels cause premature infants to contract crystals**

Fibrosis. Therefore, the upper alarm limit of oxygen saturation must be carefully selected according to recognized clinical practice.

Sp0$_2$Alarm settings

- Alarm switch: select "on" to alarm and store when SpO2(oxygen saturation) alarm, select "off" not alarm, and prompt next to SpO2 screen parameter area "⚠".
- Alarm level: used to set the alarm level, the options are "high "," medium" and "low" three levels."high" means the most serious alarm.
- Alarm Record: Select Open at Sp0$_2$When the alarm occurs, the recorder outputs.
- Waveform speed: the user can set the speed of the waveform according to the need,

the options are "12.5" and "25".

- Pulse rate volume: users can set pulse volume as needed, optional "off" low "medium" and "high ".
- Calculation sensitivity: sensitivity is divided into three types: high, medium, low.
- the update period of blood oxygen measurement data is 1s, the sensitivity is set. The higher the sensitivity, the shorter the average time of calculation, and the faster the monitor can identify the change of animal state. The lower the sensitivity, the longer the average time of calculation. When the signal is disturbed, the monitor can eliminate the influence of the interference signal and make the measurement more stable.

$Sp0_2$ And PR alarm range:

Parameters	Maximum ceiling	Minimum floor	Sing leadjustment
$Sp0_2$	100	0	1
PR	254	0	1

SPO2 And PR default alarm range:

Parameters		Maximum ceiling	Minimum floor
$Sp0_2$	Dog	100	85
	Cat	100	85
PR	Dog	200	75
	Cat	200	75

- Waveform velocity

$Sp0_2$Volume tracing wave waveform scanning speed of 12.5 and 25.0 mm/s the second file can be selected.

- Pulse volume: You can select volume levels 0,1,2,3,4
- Calculation sensitivity: select the average time to calculate the SpO2 value. Choose "High "," Medium" or "Low" to indicate the SpO2 average in 4,8, or 16 seconds.
- Default configuration: select this to enter the SPO2 default configuration dialog box. You can select the default configuration of the system.

9.6 Alarm information on oxygen saturation

SpO_2 Alarm information

When the alarm record switch in the relevant menu is turned on, the physiological alarm caused by the parameter exceeding the alarm limit will trigger the recorder to automatically output the alarm parameter value and the related measurement waveform.

SpO2 physiological alarm, technical alarm and prompt information that may occur in the module measurement are listed in the following table.

Physiological alarm:

Prompt information	Reasons	Alarm level
SPO2 too high	SpO2 measured value is higher than the alarm upper limit.	User optional
SpO2 low	SpO2 the measured value is lower than the alarm limit.	User optional

PR too high	PR measured value is higher than the alarm upper limit.	User optional
PR low	PR measured below alarm limit	User optional

Technical alarm:

Prompt information	Reasons	Alarm level	Remedial measures
SPO2 sensor shedding	SpO2 sensors fall off from animals or monitors	Low	Make sure the sensor is placed in animal fingers or other parts, and the monitor is connected to the cable properly.
SPO2 module initialization error	SpO2 module error	High	Stop using SpO2 module measurement function and notify biomedical engineer or our customer service department.
SPO2 module initialization error 1			
SPO2 module initialization error 2			
SPO2 module initialization error 3			
SPO2 module initialization error 4			
SPO2 module initialization error 5			
SPO2 module initialization error 6			
SPO2 module initialization error 7			
SPO2 module initialization error 8			
SPO2 module communication stopped	SpO2 module error or communication error	High	Stop using SpO2 module measurement function and notify biomedical engineer or our customer service department.
SPO2 alarm limit	Functional security failures	High	Stop using SpO2 module measurement function and notify biomedical engineer or our customer service department.
PR alarm limit	Functional security failures	High	Stop using SpO2 module measurement function and notify biomedical engineer or our customer service department.

Prompt information (including general warnings):

Prompt information	Reasons	Alarm level
SPO2 measurement of super-boundary	SpO_2Measurement beyond range	High
PR measurement of super-boundary	PR measurement beyond range	High
Search for pulse	SpO_2The module is searching for a pulse	No alarm
No pulse	SpO_2Module can not detect SpO for long time$_2$Signal	High

Chapter Ⅹ Body temperature (TEMP)

10.1 Temperature monitoring instructions

Monitor can use temperature probe to measure body temperature data.

Temperature measurement setting

■ If you are using a disposable temperature probe, insert the temperature cable into the socket and connect the probe to the cable get up. For reusable temperature probes, you can insert them directly into the socket.

■ attach the temperature probe firmly to the animal (or insert the rectum).

⚠Warning⚠

- **The probe cable should be detected before starting monitoring. Pull the temperature probe cable from the jack, screen curtain will display error message "T1 sensor off" and make alarm sound. Other channels are similar.**
- **Carefully hold the temperature probe and cable, when not used, the probe and cable should be pulled into a loose ring. If the wires are too tight, will cause mechanical damage.**
- **Calibration of the temperature meter must be carried out every two years (or according to the time indicated by the hospital regulations).**

⚠Attention⚠

- **The disposable temperature probe can only be used once.In order to protect the environment, the disposable temperature probe should be recovered or properly treated.**
- **The temperature meter will automatically self-check every hour during the monitoring process. Self-test lasts 2 seconds and does not affect temperature monitoring the normal operation of the protector.**
- **The probe is correctly attached to the animal (or inserted into the rectum) for 10 minutes to obtain accurate readings.**

10.2 Measurement steps

Please refer to the following steps:

1、Select the appropriate body temperature probe according to the animal type and measurement requirements.

2、If a disposable probe is used, connect the probe to the extended cable.

3、Insert probe or extended cable into body temperature probe interface.

4、Attach the probe correctly to the animal.

5、Confirm that the alarm setting is applicable to the animal.

10.3 Temperature menu

The user can move the cursor to the parameter area TEMP hotkey in the home screen through the knob and press the knob to enter the TEMP settings menu, as shown in figure 10-1.

Figure 10-1 TEMP Settings menu

◆ alarm switch: select "on" when TEMP(body temperature) alarm warning and storage, select do not alarm "off" and prompt next to TEMP screen parameter area "".

◆ alarm level: used to set alarm level, optional have "high "," middle "," low ".

◆ alarm record: used to turn on / off record TEMP(body temperature) alarm function. When you choose Open, you can print output current TEMP alarm.The adjustment range of the upper and lower limits of the alarm is as follows:

Parameter	Max	Min	Single adjustment
T1,T2	50	0	0.1
TD	50	0	0.1

◆ temperature unit: select ℃ degrees Celsius or F degrees Fahrenheit.

■ Default configuration: select this to enter the TEMP default configuration dialog box. You can select the default configuration of the system.

10.4 Temperature alarm and prompt information

When the alarm record switch in the relevant menu is turned on, the physiological alarm caused by the parameter exceeding the alarm limit will trigger the recorder to automatically output the alarm parameter value and the related measurement waveform.

physiological alarm, technical alarm and prompt information that may occur in TEMP measurement are listed in the following table.

Physiological alarm:

Prompt information	Causes	Alarm level
T1, too high	Temperature measurement is higher than the set alarm limit	User optional
T1,too low	Temperature measurement below set	User optional

	alarm threshold	

Technical alarm:

Prompt information	Reasons	Alarm level	Countermeasures
TEMP sensor shedding	The temperature cable fell off the monitor	Low	Make sure the cable connection is reliable.
TEMP alarm limit	Functional security failures	High	Stop using TEMP alarm function and notify biomedical engineer or maintenance staff.

Prompt message:

Prompt information	Causes	Alarm level
TEMP measurement of super-boundary	Temperature measurement beyond measurement	High

Chapter XI Non-invasive blood pressure (NIBP)

11.1 Overview

11.1.1 Method of measurement, scope of application

An oscillatory method is used to measure non-invasive blood pressure (NIBP), which is suitable for dog or cat;

In order to understand how the oscillation method works, it can be compared with the auscultation method

- auscultation: doctors listen to blood pressure through stethoscope to obtain systolic and diastolic blood pressure. As long as the arterial pressure curve is normal, the average pressure can be calculated by systolic and diastolic blood pressure.
- Oscillation: the monitor can not listen to blood pressure, it measures the cuff pressure vibration amplitude. The change of blood pressure causes the vibration of cuff band, and the corresponding cuff pressure is average pressure when the amplitude is maximum. After measuring the average pressure, the systolic and diastolic blood pressure can be calculated.

Simply put, the auscultation method measures systolic and diastolic blood pressure and calculates the average pressure. The average pressure was measured by oscillation method, and the systolic pressure and diastolic pressure were calculated.

11.1.2 Security information

⚠**Warning**⚠

- **animal type must be confirmed before measurement. The use of wrong animal settings may endanger animal safety because higher dog blood pressure levels do not apply to cat blood pressure. When measuring on a cat, you must ensure that the corresponding mode settings have been selected (see Animal Information menu Settings).**
- **Do not measure NIBP. in animals with sickle cell disease that have occurred or are expected to cause skin damage**
- **For animals with severe thrombotic disease, automatic blood pressure measurements must be determined according to clinical conditions, as there is a risk of hematoma on the limbs tied to the cuff.**
- **Do not touch animals, tables or instruments during defibrillation.**
- **Do not install cuff bands on limbs with intravenous infusion or intubation, because during cuff inflation, tissue damage around the catheter may occur when the infusion is slowed or blocked.**
- **If you have doubts about the accuracy of the measurement, check the animal's vital signs by other methods, and then check that the monitor is in good condition.**
- **Blood pressure measured by this equipment is equivalent to the measured value of auscultation method, and its error meets the requirements of YY0667-2008 regulations.**
- **When using electro-surgical (ES) equipment, do not touch the blood**

pressure cuff ES connect the floor or electro-surgical knife to avoid burns. The cable of the electrosurgical equipment can not be wound with the blood pressure cuff.

⚠Attention⚠

- **Replacement of original parts with non-manufacturer components may result in measurement errors**

11.1.3 Restrictions on measurement

NIBP measurements can not be performed in animals with extreme heart rates (below 40 bpm or above 240 bpm) or connected to cardiopulmonary machines

The measurement time may be prolonged, the measurement may become inaccurate or make the measurement impossible.

■ difficult to detect regular arterial pressure pulsation

■ excess or continuous animal movement, such as shudder or spasm

■ arrhythmia

■ rapid changes in blood pressure

■ severe shock or hypothermia reduces blood flow to the periphery

■ on swollen limbs

11.1.4 Measuring patterns

There are three measurement modes: manual, automatic and continuous measurement.

- Manual: manual NIBP measurement when needed.
- Automatic: monitor according to the set time interval automatic, repeated NIBP measurement. The interval can be set to 1/2/3/4/5/10/15/30/60/90/120/180/240/480 minutes.
- Continuity: continuous measurement in 5 minutes.

11.2 Operation Method of Non-invasive Blood Pressure Monitoring

11.2.1 Measurement readiness

⚠Attention⚠

- **Before measuring, the cuff belt and its extension tube are combed first, from the cuff interface of the machine to the cuff end, there can be no entanglement, the trachea can not be squeezed, and the inflatable tube connecting the blood pressure cuff and the monitor should be smooth.**

1. if the monitor is off, turn on the monitoring instrument power.

2. Confirm animal type and change if not. For example, cat or dog, select cat mode (animal type is displayed in monitor information area, bed number right), if you need to change animal type, go to the system menu or < button at the bottom right of the screen to change "animal type"

3. connect the cuff and the inflatable tube to ensure the smooth flow of the inflatable tube without entanglement. Then connect the inflatable tube to the monitor blood pressure socket. According to the following method, the blood pressure cuff is bound to the animal's forelimb or hind limb, as shown in figure 11-1.It is recommended

to bind to the animal's forelimb.

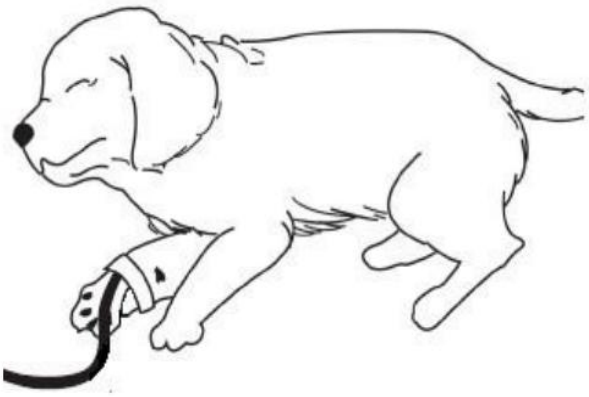


Figure 11-1 Sleeve Use

◆ confirm that the cuff is fully deflated.

◆ Give animals the appropriate size of the cuff to ensure that the mark Φ is just above the appropriate artery. Make sure the cuff wound is not too tight, otherwise it may cause distal discoloration or even ischemia.

⚠Attention⚠

The cuff width should be limb circumference (40%~50%), or two-thirds of forelimb length. An inflatable part of the cuff should be 50~80% long enough to surround the limb. Improper size cuff will produce wrong reading. The edge of the cuff should be within the range of the mark, otherwise the cuff should be replaced.

◆ check that the edge of the cuff falls within the range marked <->. If not, use a more suitable cuff.

11.2.2 Start-up/stop measurement

use the "NIBP" key "on the front panel to start the measurement. Press the "NIBP" key "at any time during the charging and deflating of the NIBP measurement will stop this measurement.

11.2.3 Revised measurement results

Limbs measuring blood pressure should be placed at the same level as the animal heart. Otherwise, the measurement results should be corrected by the following correction methods:

◆ if the cuff is above the heart level, the measurement results should be increased by 0.75 mmHg per cm (0.10 kPa).

◆ if the cuff is below the heart level position, the measurement results should be subtracted by 0.75 mmHg per cm gap (0.10 kPa).

11.2.4 Automatic measurement

1. Select the NIBP parameter area and open the NIBP Settings menu.
2. Set Interval Time to other options except Manual.
3. press the "NIBP" key" of the front panel to manually start the first measurement. after the measurement is finished, the monitor will automatically and repeatedly start the measurement according to the set interval time.

⚠Warning⚠

- **In automatic mode, if the time is too long, cuff friction with the limb may lead to purpura, ischemia and nerve injury. When monitoring animals, check the color, warmth and sensitivity of the distal limb. Once any abnormality is observed, the cuff should be placed in another position or blood pressure measurement should be stopped immediately.**

4. Perform a manual measurement

At the free time of automatic measurement, press the NIBP "key to start inserting a manual measurement.

5. Stop automatic measurement

open the NIBP settings menu, select the interval item and set the value to "manual ".

11.2.5 Continuous measurement

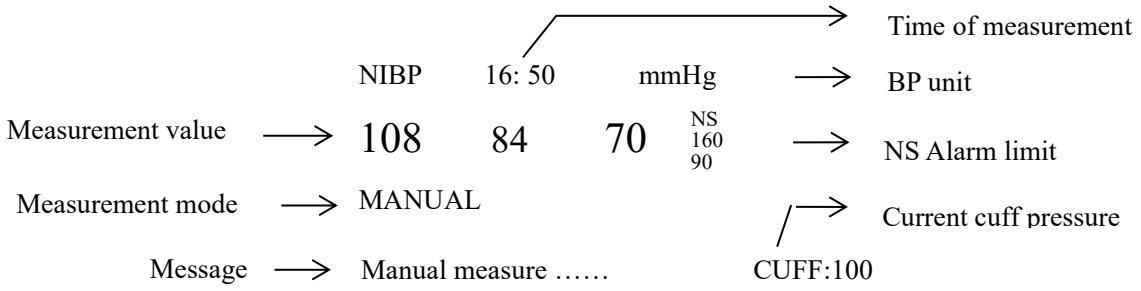
Enter the NIBP Settings menu, select the continuous Measurement item, and start continuous measurement. This process will last for 5 minutes.The cuff should be inflated to half of the specified maximum pressure during continuous measurement, that is, for cat and dog, the cuff pressure should be close to 20 kPa (150mmHg) and 10 kPa (75mmHg), respectively. Press the NIBP "button on the control panel to stop continuous measurement.

⚠Warning⚠

- **If the continuous measurement pattern is repeated, the friction between the cuff and the limb may lead to purpura, ischemia and nerve injury.**

11.2.6 Non-invasive blood pressure data

NIBP measurements and corresponding information are displayed on the screen as follows:



11.3 Non-invasive Blood Pressure Menu

Turn the knob, move the cursor to the NIBP hotkey in the parameter area on the screen, and press the knob to enter the NIBP Settings menu, as shown in figure 11-2.

■NIBP Alarm Settings

◆ alarm switch: select "on" in the pressure alarm alarm alarm alarm and storage, select "off" do not alarm, and in the screen parameter area NIBP next to the prompt⚠.

◆ alarm level: there are three options: high, medium and low. "high" means the most serious alarm.

◆ alarm record: select "on" to output the recorder when the pressure alarm occurs.

Figure 11-2 NIBP Settings menu

◆ pressure unit: optional mmHg or kPa.

◆ interval time: automatic measurement interval time (unit: minutes). At 1, 2,3, 4,5, 10, 15, 30, 60, 90, 120, 180, 240, Choose in 480 minutes. After selecting the interval, A hint appears in the NIBP prompt area ," press the blood pressure button ", At this point, press the NIBP "key to start the first automatic measurement of inflation. To end the automatic measurement, select Manual to return to manual mode during the measurement interval.

When the user presses the "MENU" key "on the front shell, enter the" default configuration "menu in the" system menu ". After confirming the default configuration, return to the NIBP menu hotkey of the main interface selection NIBP parameter area and enter "NIBP settings ". It can be seen that the initial value of the corresponding "precharge value" is the initial inflatable pressure value corresponding to the selected default configuration, as shown in the above table. Move the cursor to the "precharge value" option and press to see the range of precharge value selection for manual adjustment as shown in the above table.

⚠Attention⚠

- **The "pre-charge value" option helps the user to select the next cuff inflation pressure, but the pre-charge value for subsequent measurements will be**

based on the last systolic pressure measured in the same animal. Systematic memory of this value can shorten the measurement time of the same animal and increase the accuracy of the measurement.

- **Sleeve pressure should be inflated during each test, that is, for dog and cat, the cuff pressure should be close to 160 mmHg and 70 mmHg respectively**
- **When the user only sets the animal type in the Animal Information Settings and does not make any choices in the default configuration, the system will initially set the relevant module parameters according to Animal Type. And changes to the default type settings in the "default configuration" will simultaneously change the "animal type" in the "animal information settings ".**

■ reset

The measurement state of the blood pressure pump is reset.

Press this key to restore the inflatable value of the blood pressure pump to the initial setting.

This key is recommended when the blood pressure pump is not working properly but the monitor can not indicate the cause of the problem. Because this makes the blood pressure pump self-examination, thus automatically recover when the pump works abnormal due to accidental reasons.

■ Continuous Measurement

Start continuous measurement.

When this item is selected, the menu automatically disappears and is measured continuously immediately.

■ calibration

Manufacturers recommend the use of calibrated pressure gauges (or mercury sphygmomanometers) with accuracy higher than 1 mmHg. Select the Calibration item to start calibration and this item becomes stop Calibration. If the knob is pressed at this time, the system will stop calibration.

⚠Warning⚠

- **Calibration of NIBP measurements shall be carried out every two years (or in accordance with the maintenance regulations of your hospital). Its performance should be checked according to the following details.**

Calibration of pressure sensors:

A metal container of 500 ml +5% is used to replace the cuff. The calibrated standard pressure gauge with an error of less than 0.8 mmHg and the ball air pump and inflatable tube with a T interface are connected to the NIBP Jack on the module. Set the monitor to calibration mode, The pressure inside the metal vessel is then inflated to 0 by a spherical air pump 0, 50 and 200 mmHg. At this point, the difference between the standard pressure gauge and the pressure indicated by the monitor should be within 3 mmHg. Otherwise, Please contact our maintenance engineer.

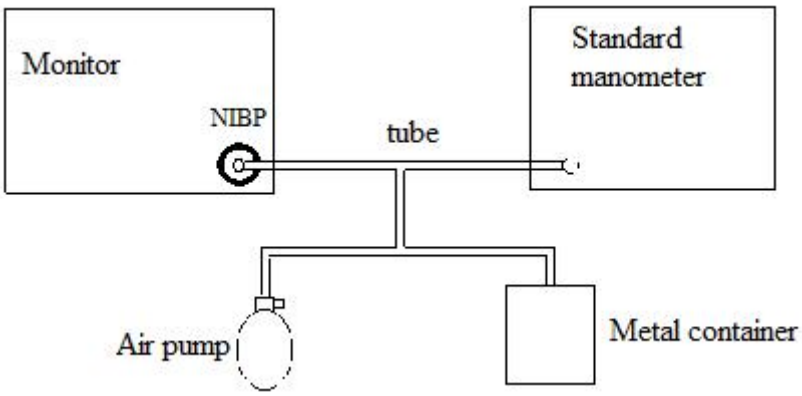


Figure 11-3 NIBP Calibration connection diagram

■ leak detection

Used to detect NIBP measure whether the pump leaks, when connected to the NIBP cuff, the key can be used to start the NIBP inflation process, so as to find out whether the airtight condition of the NIBP air path is good. If the leak test is passed, the system will not make any prompt; if not, there is a corresponding error prompt in the NIBP information area.

⚠Warning⚠

- **This leak detection is different from the EN 1060-1 standard and is for users to simply detect air leakage when NIBP is inflated. If the system shows NIBP leakage at the end of the test, please contact our maintenance engineer.**

Air leakage detection process:

1) Connect the cuff with the NIBP air hole of the monitor.
2) Wrap the cuff around the appropriate size cylinder.
3) Enter the NIBP Settings menu.
4) Turn the knob, move the cursor to the leak detection item, and press the knob. At this point in the screen under the NIBP parameters will be displayed "leak detection....."means the system begins to perform leak detection.
5) Automatic system inflation to pressure 180 mmHg .
6) After about 20 seconds, the system automatically opens the exhaust valve to mark the completion of the leak measurement.
7) If there is no prompt information in the NIBP parameter area, it indicates that there is no leakage in the system. If "pump leaks...", indicating that there may be a gas leakage fault. At this point, the operator should check whether the whole connection is loose, and when the connection is correct, carry out a leak detection again. If there is still a fault prompt, please contact the manufacturer for maintenance.

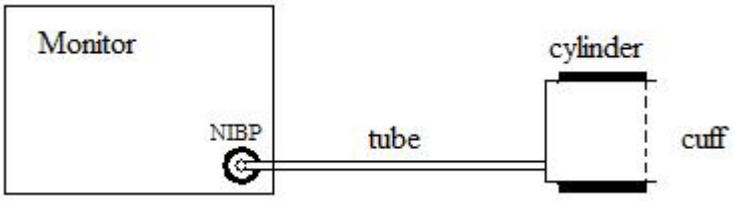


Figure 11-4 NIBP Air leakage detection connection diagram

■ **Default configuration: select this to enter the NIBP default configuration dialog box, you can select the system default configuration.**

11.4 NIBP Alarm and Prompt Information

In physiological alarm, the alarm caused by parameter exceeding alarm limit may trigger the parameters and related measurement waveforms of the automatic output alarm of the recorder, if the alarm record switch in the relevant menu is turned on.A list of possible physiological alarms, technical alarms and tips for NIBP measurements is given below:

11.5 Setting Alarm Properties

On the parameter setting menu, select the NIBP parameter area, open the NIBP Settings menu, and then set the alarm properties in the pop-up menu.

Physiological Alarm:

Prompt information	Causes	Alarm level
NS too high	NIBP systolic pressure measurement is higher than the set alarm high limit	User optional
NS too low	NIBP systolic blood pressure measured below set alarm low limit	User optional
ND too high	NIBP diastolic blood pressure measurement is higher than the set alarm high limit	User optional
ND too low	NIBP diastolic blood pressure measurement below the set alarm low limit	User optional
NM too high	NIBP average pressure gauge is higher than the set alarm height limit	User optional
NM too low	NIBP average pressure measurement value is lower than the set alarm low limit	User optional

Technical Alarm 1(Display in monitor information area):

Prompt information	Reasons	Alarm level	Countermeasures
NS alarm limit	Functional security failures	High	Stop using NIBP module alarm function and notify biomedical engineer or maintenance staff.
NM alarm limit	Functional security failures	High	Stop using NIBP module alarm function and notify biomedical engineer or maintenance staff.
ND alarm limit	Functional security failures	High	Stop using NIBP module alarm function and notify biomedical engineer or maintenance staff.

Technical Alarm 2(shown below the NIBP pressure value):

Prompt information	Reasons	Alarm level	Countermeasures

NIBP self-checkin g errors	Sensor or other hardware error NIBP measurement module	High	Stop using NIBP measurement function and notify biomedical engineer or maintenance staff of our company.
NIBP communicati ons	Communication failure with NIBP measurement module	High	If the failure persists, stop using the NIBP measurement function and notify the biomedical engineer or our maintenance staff.
Sleeve too loose or not attached	The cuff is not tied or cuffed	Low	Tie the cuff.
Air leakage in cuff inflatable tube	Damage to cuff, hose or joint	Low	Check and replace leak parts and notify biomedical engineer or maintenance staff if necessary.
Air pressure is wrong	Unstable pressure values, such as hose tangles	Low	Check that the hose is entangled, if the failure continues, notify the biomedical engineer or our maintenance staff.
The signal is too weak	Too loose cuff or too weak animal pulse	Low	Use other methods to measure blood pressure.
Pressure beyond range	Measurement beyond the prescribed limit	High	Reset the NIBP measurement module, if the failure continues, stop using the NIBP measurement function, notify the biomedical engineer or
Arm movement	Affected by arm motion, too loud signal noise or irregular pulse rate	Low	Ensure that the animals under test are quiet and have no movement.
Overpressur e protection	Pressure exceeding specified safety limit	High	Measure again, if the failure continues, stop using the NIBP measurement function, notify the biomedical engineer or our maintenance personnel.
Signal saturation	Large movement	Low	Don't make animals move.
Pump leakage	Leakage detected during leak test	Low	Check and replace leak parts and notify biomedical engineer or maintenance staff if necessary.
NIBP system failed	Operation failure of blood pressure pump system	High	Stop using NIBP measurement function and notify biomedical engineer or maintenance staff of our company.
Wrong cuff type	The cuff type does not match the animal type	Low	Choose the right cuff.
Measureme nt timeout	Measuring time over 120 seconds (dogs) or 90 seconds (cats)	High	Measure or use other pressure measurements again.

NIBP Error Reset	Module reset abnormal	High	Use reset function again.
Measurement error	When measuring, the system can not perform measurement analysis or calculation	High	Check the cuff to ensure that the animal does not move while monitoring and measure again.

Hint Information (shown below the NIBP pressure value):

Prompt information	Causes	Alarm level
Manual measurement..	During manual measurement	
Continuous measurement..	In the process of continuous measurement	
Automatic measurement..	In the process of automatic measurement	
Press Start button	After selecting the measurement interval in the menu	No alarm
Measurement termination	Press start key to stop measurement during measurement	
Calibration..	During calibration	
Calibration termination	The calibration process is over	
Air leak detection...	Air leak detection in progress	No alarm
Airleakage detection terminated	Air leak detection terminated	
Module reset...	NIBP module after loading reset process	
Manual reset...	NIBP reset (user triggered) process	
Reset failure	Reset action failed	

⚠Attention⚠

- **In order to protect the environment, disposable blood pressure cuff must be recycled or properly treated.**

Chapter XII Carbon dioxide (CO2)(optional)

12.1 Overview

This instrument can measure the CO2(carbon dioxide) pressure of animal gas path and obtain the carbon dioxide content at the end of tidal gas (ETCO2)、minimum carbon dioxide inhalation (Inspired Minimum CO2：InsCO2) and airway respiration rate (Air Way Respiration Rate：AWRR) and shows CO2 pressure waveforms, as shown in Figure 12-1. The parameter labels displayed on the screen are as follows:

■CO2： end-tidal carbon dioxide (ETCO2)

■INS： suction Minimum CO2

■AWRR： airway breathing rate (number of breaths per minute)

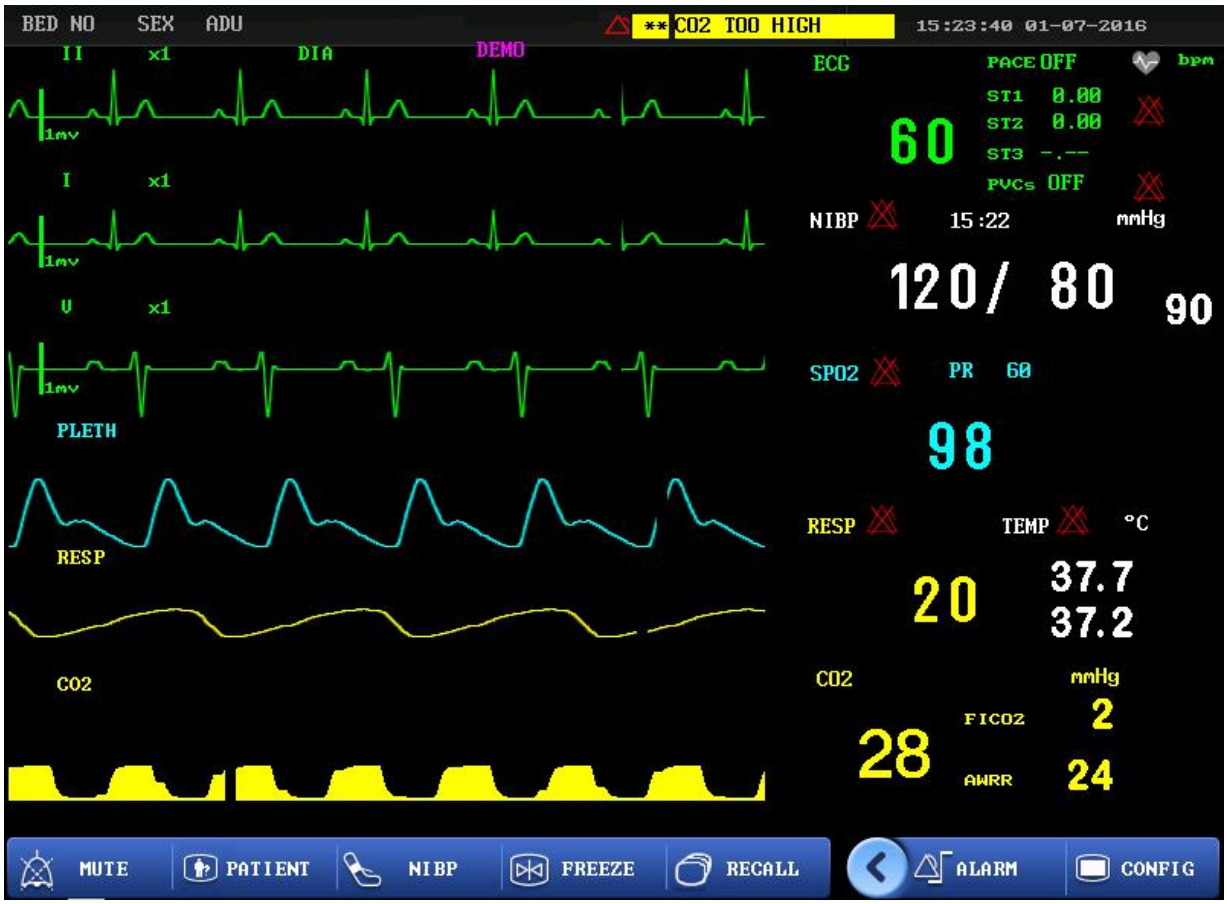


Figure 12-1 Interface Display

The following factors may affect the accuracy of measurements:

■ Leaks or internal leaks of sampled gases

■ Mechanical impact

■ Higher than 10 kPa (100 cmH_2O) cyclic pressure;

■ Other sources of interference (if any).

⚠Warning⚠

Try to avoid collision and vibration of CO2 modules.

⚠Attention⚠

Do not use instruments in environments with flammable anesthetic gases.
The instrument is limited to professional personnel trained and familiar with this manual.

12.2 Measurement principles

CO2 measurement principle is mainly based on the characteristics of CO2 absorption wavelength of 4.3 u m infrared. The measurement method is to send the CO2 gas to the measuring room, one side is illuminated by infrared ray, the other side is measured by sensor,

and the attenuation degree is proportional to the CO2 concentration.

The conversion formula of CO2 partial pressure and CO2 concentration is as follows:

CO2 partial pressure (mmHg)=CO2 concentration (%)* Pamp (ambient pressure mmHg)/100

CO2 partial pressure (kPa)=CO2 partial pressure (mmHg)/7.5

Automatic command measurement mode is used whether the user chooses the CO2 mainstream module or the bypass module. The waveform sampling speed is every 31 milliseconds. The working sequence is as follows:

Mainstream working sequence: after the system is powered on, the CO2 module automatically starts preheating the sensor. After 45s to 90s, the sensor motor is started. After 5s to 10s, the infrared light source is turned on for 10s. Enter normal measurement state.

Side flow working sequence: except the system does not need preheating stage and start pumping pump after power on, other similar to mainstream type.

12.3 Methods of operation of CO2

CO2 measurement settings

1. Connection CO2 module cable
2. Insert the mainstream module into the CO2 socket on the side panel of the monitor, and connect the other end of the module to the anesthetic machine.
3. Enter the CO2 settings menu and set "operation mode" to "measurement ". This step needs to be set for the first time.
4. After thesetting is complete, wait about three minutes, the module is preheated;
5. After preheating, the module enters the state of full precision measurement;

⚠**Warning**⚠

- **If the package is disassembled or the internal parts are damaged, please do not use this accessory and return it to the supplier.**
- **When the information "CO2 module is starting" and "CO2 module is preheating" is displayed on the screen, the sensor is starting and preheating. During preheating, the module can be CO2 measured, but not standard. When this information disappears from the screen, standard measurements can be made.**
- **Side flow sampling tube is a disposable item, can not be re-sterilized use, do not allow animals to cross-use.**

12.4 Carbon dioxide menu

12.4.1 Parameter Setting and Adjustment

From the System Menu, go to the Parameters Menu, select CO2 Hotkeys, and go to CO2 Settings, as shown in Figure 12-3:

Figure 12-3 CO2 Settings

Below is the role of each menu item in the CO2 Settings menu.

- Alarm switch: on: when the CO2 alarm occurs, alarm warning and storage;
  Close: when appear CO2 alarm, do not carry on alarm prompt and store;
- Alarm level: three options "high "," middle "," low ". The change of alarm level only affects CO2 parameters (including EtCO2 upper limit, EtCO2 lower limit, InsCO2 upper limit, AwRR upper limit and lower limit).
- Alarm record: used to adjust the amplitude of the waveform. Optional are "high" or "low ".
- CO2 alarm high limit: used to adjust the upper limit of EtCO2 alarm.
- CO2 alarm low limit: used to adjust the EtCO2 alarm lower limit.
- INS alarm high limit: used to adjust the upper limit of InsCO2 alarm.
- AWRR alarm high limit: used to adjust the upper limit of AWRR alarm.
- AWRR alarm low limit: used to adjust the AWRR alarm lower limit.
- Waveform speed: used to adjust the display speed of CO2 waveforms, with options such as "6.25 mm/s" and "12.5 mm/s".
- Pressure unit: display unit used to change CO2 and InsCO2 parameters. can choose "mmHg"、"kPa" or "%".

12.4.2 CO2 Other settings

Figure 12-4 CO2 Other settings menu

Here's an introduction to the role of the menu items on the CO2 Other Settings menu:

- Waveform gain: used to adjust the amplitude of a waveform. Optional are "high" or "low ".
- Working mode: used to change the working mode of CO2, you can choose "measure" mode or "standby" mode.
- O2 compensation: the presence of oxygen will cause the measured CO2 value to be lower than the actual value. Using this option, the existence of oxygen can be compensated, and the optional range is "0~100".
- Balance gas: Optional are "indoor air "," nitrous oxide "," oxygen ".
- Anesthetic gas: the strength of an anesthetic. Alternative range "0.0~20.0"
- Gas temperature: current gas temperature. Alternative range "0.0~50.0"
- Atmospheric pressure: the current measured atmospheric pressure. Alternative range "400~850"
- Computational cycle: optional "one cycle ","10 s"、"20s".
- Calibration: select Calibration to confirm the calibration of CO2 modules.

12.5 CO2 Alarm and alert information

12.5.1 Alarm setting range:

Parameters	Maximum alarm limit	Minimum Alarm Low Limit	Step length
CO2	100	0	1
INS	100	/	1
AwRR	150	0	1

Default alarm limit:

Parameters	Animal type	High alarm limit	Alarm Low Limit
CO2	Dog	50	20
	Cat	45	30
INS	Dog	4	/
	Cat	4	/
AwRR	Dog	30	8
	Cat	100	30

12.5.2 Alarm and alert information

CO2 physiological alarm, technical alarm and prompt information that may occur in the measurement of the module are listed in the following table:

Physiological alarm:

Prompt information	Causes	Alarm level
CO2 too high	EtCO2 measured value is higher than set alarm high limit	User optional
CO2 low	EtCO2 the measured value is below the set alarm high limit	User optional
INS too high	InsCO2 measured value is higher than the set alarm limit	User optional
AWRR too high	AwRR measured value is higher than set alarm high limit	User optional
AWRR low	AwRR measured values below set alarm low limits	User optional

Technical alarm:

Prompt information	Reasons	Alarm level	Countermeasures
CO2 sensor shedding	Mainstream sensors not plugged in or off	Low	Ensure mainstream sensors are installed
CO2 sampling tube shedding	Side flow sampling tube not inserted or shed	Low	Make sure the bypass tube is firmly secured
CO2 sampling tube blocked	Obstruction of exhaust from side flow sampling tube	Low	Make sure the exhaust of the bypass sampling tube is smooth

CO2 signal weak	Measurement Module Technical Fault	Low	If necessary, restart the oximeter, if the failure persists, stop using the CO2 measurement function, notify the biomedical engineer or our customer service department
CO2 signal is too weak		Low	
High CO2 pressure		Middle East	
CO2 pump leakage		Middle East	
CO2 signal noise		Low	
CO2 signal saturation		Low	
CO2 calculation error		High	
CO2 sensor fault		High	
CO2 sensor temperature is too high		High	
CO2 sensor temperature is too low		High	
CO2 supervision overtime		High	
CO2 Internal communications		High	
CO2 system errors		High	
CO2 pump malfunction		High	
CO2 Abnormal Reverse Flow		High	
CO2 Abnormal Forward Flow		High	
CO2 dysfunction		High	
High CO2 pressure		High	
CO2 pressure		High	
CO2 communication error	CO2 Module Communication Fault	High	Discontinue use of the CO2 measurement function, notify the biomedical engineer or our customer service department
CO2 initialization error	CO2 module installed or malfunctioned	High	
CO2 communication stopped	Measurement module failure or communication failure	High	
CO2 alarm limit	Functional security	High	

	failures		
INS alarm limit	Functional security failures	High	
AWRR alarm limit	Functional security failures	High	
CO2 module standby	Switching from measurement mode to standby mode makes the module energy-efficient	No alarm	
CO2 module is preheated	indicates that the sensor is in the start heating stage	No alarm	
CO2 sensor preheating	It indicates that the sensor has just started	No alarm	

12.6 Maintenance, calibration and cleaning

1. Side flow module is a one-time sampling tube, can not be re-sterilized use.
2. Please pay attention to keep the sampling tube clean and prevent dust from entering the pipe. It is recommended that the sampling tube be replaced every 12 hours (up to 120 hours if the filter nozzle is used) or if air leakage, damage or contamination is found in the sampling tube.
3. Mainstream module is a one-time air-circuit binder, can not be re-sterilized use.
4. When the sampling system of the bypass module is blocked, first check whether the sampling tube is wound together. If not, unplug the sampling tube and check. If the blocking prompt on the screen disappears, the sampling tube must be replaced. If there is still a blocking prompt on the screen, the module must be replaced.
5. The bypass CO2 module and the microflow CO2 module do not need to be calibrated daily, but every other year or when the deviation of the measured value is large, it needs to be calibrated. mainstream CO2 modules do not require calibration. For details, see the maintenance section below.

Chapter XIII Invasive Blood Pressure (IBP)(optional)

13.1 Overview

This chapter mainly introduces the monitoring of invasive blood pressure and the maintenance and cleaning of accessories.

The portable monitor can provide two channels to hand test the pressure (diastolic pressure, systolic pressure, average pressure) of the selected blood vessel and display two pressure waveforms on the screen, as shown in figure 13-1:

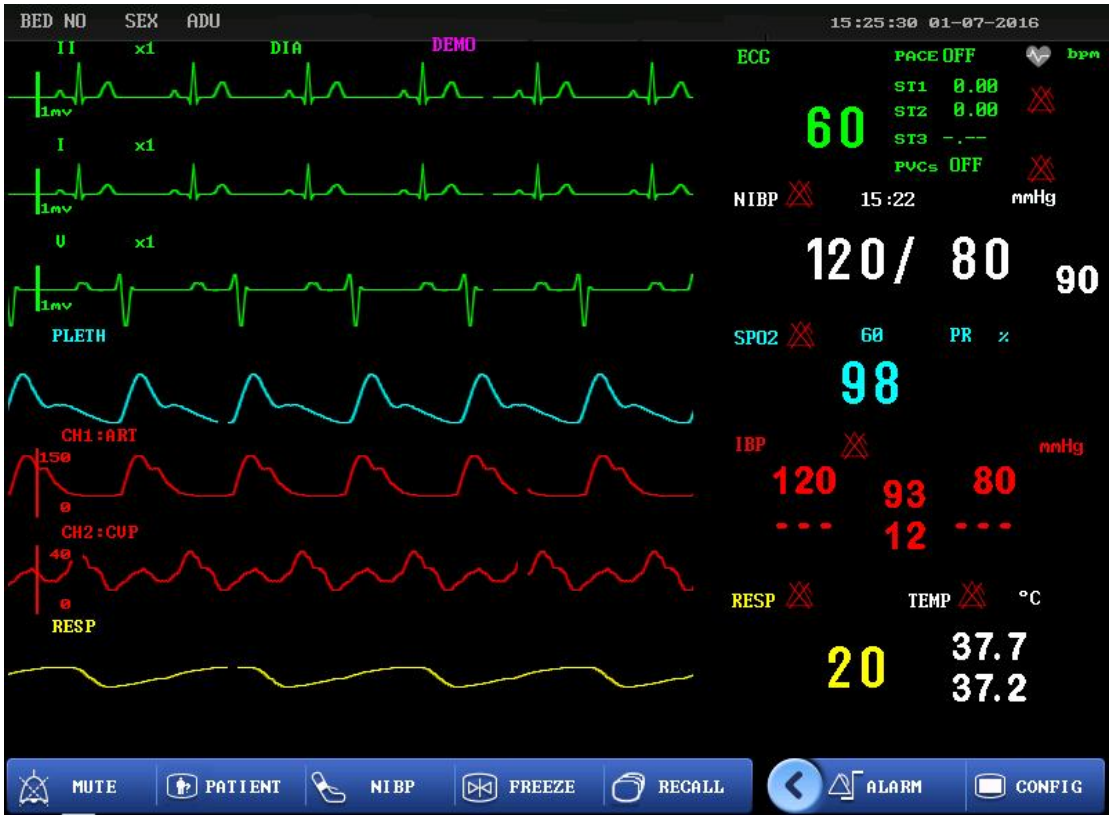


Figure 13-1 IBP interface

The displayed waveforms are:

Waveform name	Definition
ART	Arterial pressure
PA	Pulmonary artery pressure
CVP	Central venous pressure
RAP	Right room pressure
LAP	Left room pressure
ICP	Intracranial pressure
P1-P2	Expansion pressure

13.2 Precautions in IBP custody

⚠Warning⚠

- **Avoid touching metal parts connected to electrical when accessories are connected and used.**
- **When the monitor is connected with the high frequency surgical equipment, the sensor and cable of the monitor should be avoided contact with the high frequency surgical equipment in the future to prevent leakage and burn animals.**
- **Disposable pressure sensors can not be reused.**
- **Before starting monitoring, the sensor cable should be checked for normal or not. Pull the sensor of channel 1 from the Jack, the screen will display the error message "IBP the sensor falls off" and make an alarm sound. the same for other channels.**
- **If a liquid (not a solution used for pouring pressure tubes with sensors) splashes on the equipment or accessories, especially when the liquid is likely to enter the sensor or monitor, please contact the maintenance department of the hospital.**

⚠Attention⚠

- **Use only the pressure sensors specified in this manual.**
- **Both new and used sensors should be calibrated regularly in accordance with hospital procedures.**

Designated sensors (excluding ICT/B sensors) have anti-shock functions (especially to prevent leakage current) and to prevent the effects of cardiac defibrillators. It can be used in surgery. When the animal is in defibrillation, the pressure wave may be temporarily disturbed. After defibrillation, the monitor will work properly. Monitor operation mode and user configuration will not be affected.

13.3 Guardianship procedure

Preparation of measurements:

1) Plug the cable into the corresponding socket and check that the monitor power is on.
2) Prepare pressure tubes and sensors by filling the program with saline solution to ensure no bubbles in the catheter system.
3) Ensure no air in ducts and pressure tubes and sensors.
4) Placed the sensor at the same level as the heart, approximately in the midaxillary line.
5) Confirm that the correct name has been selected, see the following section for details.
6) Zero the sensor, see the next section for details.

⚠Warning⚠

If bubbles appear in a pressure tube or sensor, then pour the system with a liquid.

13.4 IBP menu

Turn the knob, move the cursor to the hot key IBP the parameter area on the screen, and press the knob to pop up the IBP Settings menu, as shown in figure13-2.

Figure 13-2 IBP Settings menu

The following can be set up:

- Alarm switch: select "on ", then in the IBP(of invasive blood pressure) alarm alarm alarm warning and storage, select" off "do not report physiological alarm, and in the screen parameter area IBP next to the prompt .
- Alarm level: for setting alarm level, there are three optional items, which are "high "," middle "," low ".
- Alarm record: select "on" to output the recorder when the IBP alarm occurs.
- Amplitude regulation mode: used to adjust the amplitude of a waveform. There are two options, respectively "manual" and "automatic ". When set to automatic, The IBP stress name is: P1 and P2(or P3, P4), IBP measurement range is automatically adjusted by the system. When set to manual IBP ART, pressure name PA, CVP, RAP, LAP, ICP, P Ⅰ, P2 eight options, IBP measurement range is adjusted by the user through the pressure gauge adjustment item.
- Waveform speed: two options for setting the scan speed of IBP waveforms ,12 mm/s and 25 mm/s respectively
- Pressure units: there are two options, mmHg and kPa., respectively
- Filter mode: used to set the filtering mode of the system. there are three options, namely "normal filtering "(with 16 Hz of frequency filtering)," smooth filtering "(with 8 Hz of frequency filtering) and" non-filtering "(showing the original waveform). the system default is "no filtering ".
- Alarm limit setting: select this item and the user can enter the "IBP alarm limit setting" submenu, as shown in figure 13-3. In this submenu, the alarm high and low limits of systolic, diastolic and mean pressure of channels 1 and 2 can be set respectively.
- Pressure gauge adjustment: select this item and enter the IBP pressure gauge

adjustment submenu. In this submenu, the position of the upper ruler, the lower ruler and the winning ruler of the waveform on the screen can be adjusted separately.

- Expansion pressure settings: select this item and enter the IBP expansion pressure Settings submenu. user can set P 1、P2 pressure type here.
- Additional settings: sets other items IBP.
- Default configuration: select this to enter the IBP default configuration dialog box, and the user can select the manufacturer default configuration or user default configuration item. After the selection exits, the system pops up a dialog box that requires the user to confirm the selection.
- Exit: select this item and return to the next menu.

⚠Warning⚠

In setting the alarm time limit, confirm the item to be set.

Figure 13-3 IBP Alarm limits

When the measured value exceeds the alarm limit, the alarm is triggered.

IBP Alarm Limit:

Pressure Name	Maximum ceiling (mmHg)	Minimum floor (mmHg)	Single step adjustable step (mmHg)
ART	300	0	1
PA	120	-6	1
CVP	40	-10	1
RAP	40	-10	1
LAP	40	-10	1
ICP	40	-10	1

IBP pressure zero

On the IBP(1,,2) Settings menu, press IBP pressure zero to pop up the menu as shown in figure 13-4.

Sensor zero

Select "channel 1 zero ", the system to channel 1 zero: select" channel 2 zero ", the system to channel 2 zero.

Points to zero:

- Close the three links on the animal side before starting to zero.
- Before starting to zero, the sensor must first communicate with the atmosphere.
- The sensor must be placed at the same level as the heart, about in the axillary midline.
- Zero should be carried out before starting monitoring and at least once a day (zero must be carried out after each cable is pulled).

Figure 13-4 IBP Pressure Calibration

⚠**Attention**⚠

The user should ensure that the sensor has been calibrated to zero before measurement, otherwise the instrument will not have a zero value, which will lead to inaccurate measurement data.

Zero related tips :(take channel 1 as an example)

- "Channel 1 Zero Success"

The zero correction process is over and the sensor connection to the atmospheric end can be closed and the animal connection can be opened.

- "Channel 1 sensor off, can not zero !"

Make sure channel 1 has no sensor shedding prompt and zero again. If the problem is still there, please contact the maintenance staff.

- "Demo state, can not zero !"

Make sure the instrument does not work in the "demo waveform" state. Check again, if the problem is still there, please contact the maintenance staff.

- "The pressure exceeds the range, can not zero !"

Make sure the three-way switch leads to the atmosphere and zero again. If the problem is still there, please replace the sensor and contact the manufacturer's maintenance staff.

- "Pulsating pressure, not zero"

Make sure the sensor is not connected to the animal and the three-way switch leads to the atmosphere. Check again, if the error still exists, please contact the manufacturer maintenance staff.

IBP pressure calibration

On the IBP(1,2) selection menu, press the IBP pressure Calibration item and pop up the menu as shown in figure 13-5.

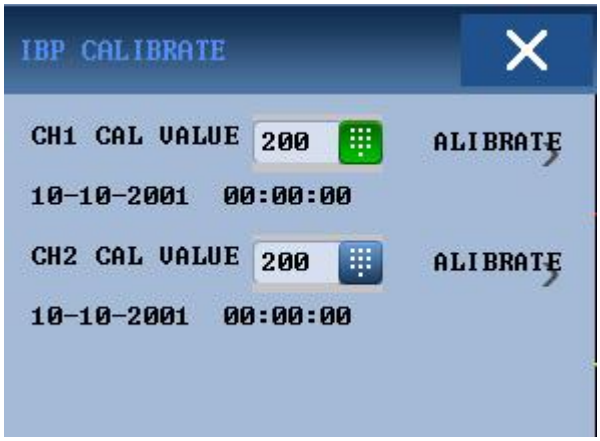


Figure 13-5 IBP Pressure Calibration Menu

Calibration sensors:

Turn the knob, move the cursor to the "Channel 1 pressure Calibration value" item, press and rotate the knob, select the calibration value, then move the cursor to the "Calibration" item to start calibration.

Turn the knob, move the cursor to the "Channel 2 pressure Calibration value" item, press and rotate the knob, select the calibration value, then move the cursor to the "Calibration" item to start calibration.

◆ Pressure calibration connection diagram:

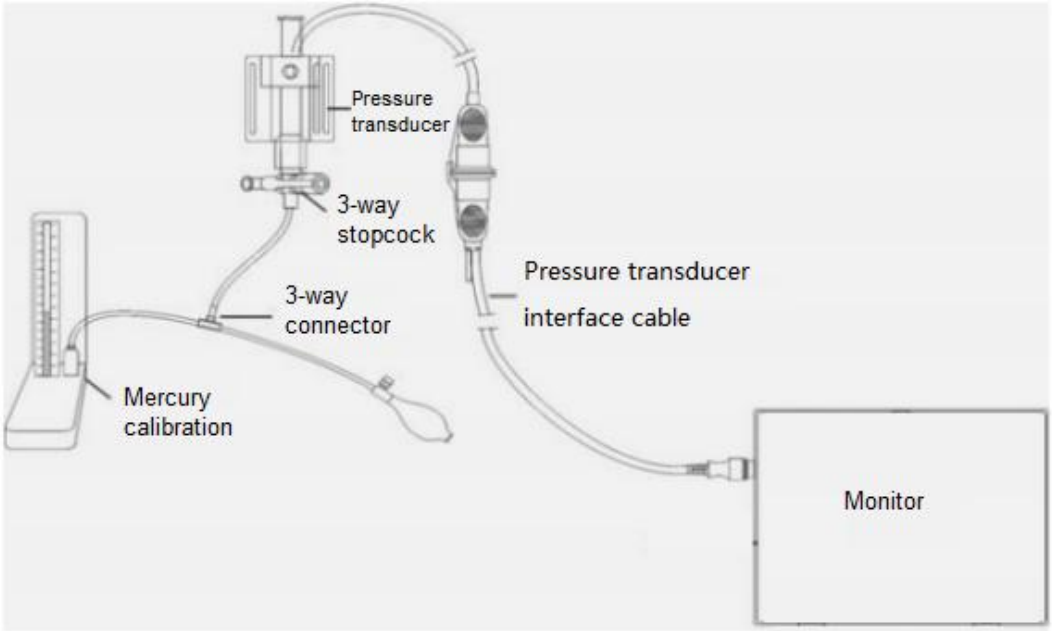


Figure 13-6 IBP Pressure Calibration Connections

Key points for calibration of mercury manometers:

■ Mercury pressure gauge calibration should be carried out when new sensors are enabled, or should be carried out according to the cycle specified in hospital procedures.

- The purpose of calibration is to ensure that the system can provide accurate measurement results.
- The zero correction process must be advanced before starting mercury pressure calibration.
- If the user needs to do this, the following devices should be available:
  - Standard sphygmomanometer
  - Three-way piston
  - About 25 cm long

Mercury Calibration Steps :(Refer to Figure 13-6 Connections)

⚠Warning⚠

When monitoring animals, pressure sensor calibration must not be carried out.

1) Closing the piston is to open the zero point to calibrate the atmospheric pressure.
2) Attach catheter to sphygmomanometer.
3) Please make sure the connection, otherwise the animal and sphygmomanometer catheter connection failed.
4) A section of the three-way piston is connected through the pipe and the three-way of the pressure sensor, the inflatable balloon is connected through the pipe to the other end of the three-way piston, and the sphygmomanometer is connected through the pipe to the third end of the three-way piston.

5) The sensor's three-way switch to the atmosphere, zero correction, zero correction success, open the three-way switch to the sphygmomanometer end.

6) Select the channel to be calibrated in the IBP pressure calibration menu and set the pressure value for the channel calibration

7) Inflation makes the sphygmomanometer pressure close to the pressure values set in the menu.

8) Adjust the calibration pressure values in the menu repeatedly until both are equal.

9) Press the Calibration button, the instrument starts calibration.

10) Waiting for calibration results. According to the prompt information, decide to take the corresponding countermeasures.

11) After calibration, remove the sphygmomanometer line and the additional three-way piston, and the sensor is connected to the animal for monitoring according to the operating specifications.

Calibration related tips :(take channel 1 as an example)

- "Channel 1 calibrated successfully !"
  Channel 1 works normally and users can use channel 1 to monitor animals IBP.

■ "Channel 1 sensor shedding, not calibrated !"

Check the connection of channel 1 sensor to ensure calibration without lead shedding prompt. If there are still errors, please contact the manufacturer's maintenance staff.

■ "Can not be calibrated in demo state"

Make sure the instrument does not work in the "demo waveform" state before calibration. If there are still errors, please contact the manufacturer's maintenance staff.

■ "Pressure beyond range, not calibrated"

Ensure that the selected calibration values are reasonable and then calibrated. If there are still errors, please contact the manufacturer's maintenance staff.

● "Pulse pressure, not calibrated"

Make sure the current pressure value of the sphygmomanometer is constant and calibrated. If there are still errors, please contact the manufacturer's maintenance staff.

Pressure Scale Regulator Menu

IBP pressure gauge adjustment menu:

Figure 13-7 IBP Pressure gauge regulation

The scale of the waveform is given in the invasive blood pressure waveform region. the three dashed lines from top to bottom of each invasive blood pressure waveform represent the upper scale, the reference scale and the lower scale of the waveform, respectively. the values of these three scales can be set. the specific method is introduced in this menu.

■ IBP1、IBP2 pressure marker name: ART, can be selected from the home screen IBP waveform hotkey area PA, CVP, RAP, LAP, ICP, P Ⅰ, P2;

■ Upper scale: the pressure value represented by the upper limit of the scale. The selection range is the measurement range of the current pressure.

⚠Attention⚠

■ **The upper limit of the scale is higher than the lower limit**

Lower ruler: the pressure value represented by the lower limit of the ruler. The selection range is the measurement range of the current pressure.

■ **The lower limit of the scale is below the upper limit**

Middle scale: the pressure value represented by a reference scale (between HI,LO). The pressure value of the reference scale.
The lower pressure limit, the upper pressure limit, the reference ruler and the waveform are displayed on the screen at the same time, so that the user can observe the waveform change after adjusting the ruler.

13.5 Alarm and alert information

Alarm information

When the alarm record switch in the relevant menu is turned on, the physiological alarm caused by the parameter exceeding the alarm limit will trigger the recorder to automatically output the alarm parameter value and the related measurement waveform.
IBP physiological alarm, technical alarm and prompt information that may occur in the measurement of the module are listed in the following table:

Physiological alarm:

Prompt information	Causes	Alarm level
IS1 TOO HIGH	SYS measuring value of channel 1 is above upper alarm limit.	User-selectable
IS1 TOO LOW	SYS measuring value of channel 1 is below lower alarm limit.	User-selectable
ID1 TOO HIGH	DIA measuring value of channel 1 is above upper alarm limit.	User-selectable
ID1 TOO LOW	DIA measuring value of channel 1 is below lower alarm limit.	User-selectable
IM1 TOO HIGH	MAP measuring value of channel 1 is above upper alarm limit.	User-selectable
IM1 TOO LOW	MAP measuring value of channel 1 is below lower alarm limit.	User-selectable
IS2 TOO HIGH	SYS measuring value of channel 2 is above upper alarm limit.	User-selectable

IS2 TOO LOW	SYS measuring value of channel 2 is below lower alarm limit.	User-selectable
ID2 TOO HIGH	DIA measuring value of channel 2 is above upper alarm limit.	User-selectable
ID2 TOO LOW	DIA measuring value of channel 2 is below lower alarm limit.	User-selectable
IM2 TOO HIGH	MAP measuring value of channel 2 is above upper alarm limit.	User-selectable
IM2 TOO LOW	MAP measuring value of channel 2 is below lower alarm limit.	User-selectable

Technical alarm:

Message	Reasons	Alarm level	Remedy
IBP1 SENSOR OFF	IBP cable of channel 1 falls off from monitor.	Low	Make sure that cable is properly connected.
IBP2 SENSOR OFF	IBP cable of channel 2 falls off from monitor.	Low	Make sure that cable is properly connected.
IBP(1,2) INIT ERR	IBP module failure	High	Stop using measuring function of IBP module, notify biomedical engineer or Our service staff.
IBP(1,2) INIT ERR1			
IBP(1,2) INIT ERR2			
IBP(1,2) INIT ERR3			
IBP(1,2) INIT ERR4			
IBP(1,2) INIT ERR5			
IBP(1,2) INIT ERR6			
IBP(1,2) INIT ERR7			
IBP(1,2) INIT ERR8			
IBP(1,2) COMM STOP	IBP measurement module failure or communication failure	High	Stop using measuremen t function and notify
IBP(1,2) COMM ERR	IBP measurement module failure or communication failure	High	

IBP1 ALM LMT ERR	Functional security failures	High	biomedical engineer or maintenance staff of our company.
IBP2 ALM LMT ERR	Functional security failures	High	

Prompt information

Prompt information	Causes	Alarm level
IBP1 SYS measurement of super-boundary	Channel 1 IBP Shrinkage measurement beyond measurement	High
IBP1 DIA measurement of super-boundary	Channel 1 IBP Shrinkage measurement beyond measurement	High
IBP1 MEAN measurement of super-boundary	Channel 1 IBP Shrinkage measurement beyond measurement	High
IBP2 SYS measurement of super-boundary	Channel 2 IBP Shrinkage measurement beyond measurement	High
IBP2 DIA measurement of super-boundary	Channel 2 IBP Shrinkage measurement beyond measurement	High
IBP2 MEAN measurement of super-boundary	Channel 2 IBP Shrinkage measurement beyond measurement	High
IBP1 need to be zeroed	Channel 1 IBP No calibration	Low
IBP2 need to be zeroed	Channel 2 IBP No calibration	Low

13.6 Maintenance and cleaning

⚠Warning⚠

Turn off the monitor and disconnect the AC power supply before cleaning the monitor or sensor.

Cleaning of pressure sensors (reusable)

After the pressure monitoring operation, remove the pipe and cap on the sensor and wipe the film of the sensor with water. Sensors and cables can be scrubbed and soaked with soap solution and the cleaning agent listed below for cleaning purposes.

Cetylcide cleaning agent

Wavicide-01 cleaning agent

Wescodyne cleaning agent

glutaraldehyde

Vesphene cleaning agent

Do not put connectors into any liquid. After cleaning, let the sensor dry thoroughly before collecting. It is not necessary to regard the slight fading of the cable or the temporary increase of viscosity on the surface as abnormal. If the residue must be removed from the sensor cable, the use of double-sided adhesive scavenger is effective: careful use can minimize damage to the cable. do not advocate the use of acetone, alcohol, ammonia and chloroform or other strong solvents because of the long time, they will damage the vinyl cable.

⚠Attention⚠

- **If a disposable sensor or cap is used, it can not be disinfected or reused.**
- **In order to protect the environment, disposable sensors or caps must be recycled or properly treated.**

Disinfection

Chemical liquid disinfection

Follow the steps described above to remove obvious dirt. Select a disinfectant that your unit thinks is effective for chemical disinfection of operating room equipment. Buffer glutaraldehyde (glutaraldehyde or preservative) has been found to be very effective. Do not use tetravalent cationic detergents such as benzoylamine chloride. If you want to sterilize the whole equipment, immerse the sensor (except the electrical understanding) in disinfectant at the recommended time. Make sure the cap is removed and all components of the sensor (except electrical connectors) are bleached with sterile water or saline. Before collecting, the sensor must be dry.

Gas disinfection

To be completely sterile, gas disinfection is required.

Remove obvious dirt with the cleaning steps described earlier. In order to inhibit the formation

of ethylene glycol, the sensor should be completely dry when using ethylene oxide gas disinfectant.
Be sure to follow the operating methods provided by the gas disinfectant manufacturer.

⚠**Warning**⚠

The disinfectant temperature shall not exceed 70℃(150 F), and the plastic in the pressure sensor may deform or melt above this temperature

CHAPTER XIV PROTECTION

⚠**Warning** ⚠

- **Hospitals or medical institutions that use this equipment should establish a sound maintenance plan, otherwise it may cause equipment failure and unintended consequences and may endanger physical safety.**
- **All safety inspections or maintenance work requiring the removal of equipment should be performed by professional maintenance personnel whose operations may cause equipment failure and may endanger physical safety.**
- **If equipment problems are found, please contact the maintenance personnel or our company.**

14.1 Inspection

Before the monitor is used, continuously for 6~12 months, after maintenance or upgrade, a comprehensive inspection should be carried out by qualified maintenance personnel to ensure the normal operation and work of the monitor.

Items inspected shall include:

- The environment and power supply meet the requirements.
- No mechanical damage to equipment and accessories.
- Power cord without wear, good insulation performance.
- Use the specified attachment.
- The function of alarm system is normal.
- The recorder works normally and the recording paper meets the specified requirements.
- performance of the battery.

- All kinds of monitoring functions are in good working condition.

If any damage or abnormal phenomenon is found, please do not use the monitor and contact the medical engineer of the hospital or the maintenance personnel of our company immediately.

14.2 Maintenance plan

The following tasks, except visual inspection, boot detection, touch screen calibration, battery inspection and recorder inspection, can only be completed by the company's approved professional maintenance personnel. When the following maintenance is required, please contact the maintenance staff in time. The equipment must be cleaned and disinfected before testing or maintenance.

<table>
<tr><th colspan="2">Inspection/maintenance projects</th><th>Recommended frequency</th></tr>
<tr><td colspan="3">Preventive maintenance</td></tr>
<tr><td colspan="2">Visual visual</td><td>first installation, or after each reinstallation.</td></tr>
<tr><td rowspan="2">NIBP testing</td><td>Pressure tests</td><td rowspan="5">1. when the user suspects that the measurement value is inaccurate.
2. the relevant modules were repaired or replaced.
3. at least once a year.</td></tr>
<tr><td>Air leakage</td></tr>
<tr><td rowspan="3">Side flow and microflow</td><td>Air leakage</td></tr>
<tr><td>Performance testing</td></tr>
<tr><td>Module calibration</td></tr>
<tr><td colspan="3">Performance testing</td></tr>
<tr><td rowspan="2">ECG testing</td><td>Performance testing</td><td rowspan="14">1. when the user suspects that the measurement value is inaccurate.
2. the relevant modules were repaired or replaced.
3. at least every two years.

Note: NIBP and CO2 modules should be at least once a year.</td></tr>
<tr><td>Module calibration</td></tr>
<tr><td colspan="2">Resp performance testing</td></tr>
<tr><td colspan="2">SpO2 testing</td></tr>
<tr><td rowspan="2">NIBP testing</td><td>Pressure tests</td></tr>
<tr><td>Air leakage</td></tr>
<tr><td colspan="2">Temp testing</td></tr>
<tr><td rowspan="2">IBP testing</td><td>Performance testing</td></tr>
<tr><td>Pressure calibration</td></tr>
<tr><td colspan="2">mainstream CO2 testing</td></tr>
<tr><td rowspan="4">Side flow and microflow CO2 testing</td><td>Air leakage</td></tr>
<tr><td>Performance testing</td></tr>
<tr><td>Module calibration</td></tr>
<tr><td>Output Calibration</td></tr>
<tr><td colspan="3">Electrical Safety Testing</td></tr>
<tr><td rowspan="4">Electrical Safety Testing</td><td>Shell leakage current test</td><td rowspan="4">1.After maintenance or replacement of the power module.
2.After the monitor falls.
3.at least biennially or on dmand.</td></tr>
<tr><td>Floor drain current</td></tr>
<tr><td>Animal Leakage Current</td></tr>
<tr><td>Animal Assisted Current</td></tr>
<tr><td colspan="3">Other tests</td></tr>
</table>

Boot test		1. the first installation, or after each reinstallation. 2. after each repair or replacement of the mainframe parts.
Touch screen calibration		1. when the touch screen function is not normal. 2. After changing the touch screen.
Recorder inspection		After repairing or replacing the recorder.
Battery testing	Functional check	1. first installation 2. replace battery
	Performance check	every two months or when the battery runs significantly

14.3 Viewing information

Select [main menu]→[maintenance >>]→[software version >>]. In the pop-up menu, you can view the monitor configuration and version information of the system software

14.4 ECG Calibration

During the use of the monitor, the ECG signal may be inaccurate due to hardware or software problems. The main performance is that the waveform amplitude becomes larger or smaller. At this point, you need to calibrate the ECG.

1. Select ECG parameter region or waveform region, select [filter] as [diagnosis].
2. Select [main menu]→[maintenance >>][ECG module calibration]. At this time the screen will appear square wave signal, technical alarm area display [ECG is calibrating].
3. Comparing the amplitude of square wave with the scale, the error range should be within 5%.
4. Complete calibration, select [stop ECG module calibration].

When needed, you can also output square waves and rulers through the recorder, and then measure more accurate errors. If the error exceeds 5, please contact the maintenance staff.

14.5 NIBP Air leakage detection

The purpose of gas leakage detection is to detect whether the airtight condition of gas path is good. If the leak test passes, the system will not give any hints. If not, there is a corresponding prompt in the NIBP information area. NIBP leak detection should be performed at least once a year or when you think the reading is inaccurate.

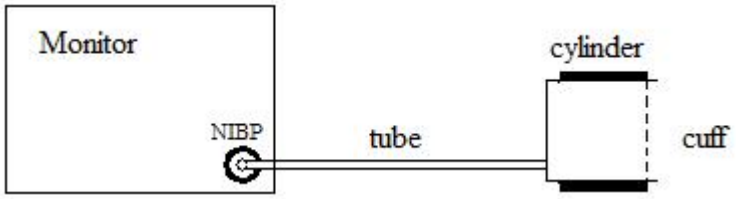
The following materials need to be prepared before testing:

- Sleeve: One
- Inflatable tubes: Article 1
- Cylinders: One

The steps are as follows:

1. set [animal type] to [dog].
2. connect the sleeve with the NIBP sleeve interface of the monitor.

3. wrap the sleeve around a cylinder of the appropriate size; as shown in the figure.



4.select [main menu]→[maintenance >>][NIBP leak detection], the NIBP parameter area will display [leak detection...].

5.After about 20 seconds of 5., the system automatically deflates and marks the completion of leak detection.

6.If there is no prompt information in the NIBP parameter area, it indicates that there is no leakage in the system. If [NIBP pump leakage] is displayed, it indicates that there may be air leakage failure in the gas path. At this point, the operator should check whether the whole connection is loose, and when the connection is correct, carry out a leak detection again.

If there is still a fault prompt, please contact the manufacturer for maintenance.

⚠Attention⚠

The above gas leakage detection method is only convenient for users to detect NIBP air leakage when inflated, different from the EN 1060-3 standard.

14.6 NIBP Pressure calibration

NIBP pressure checks should be performed at least once every year or when you think the readings are inaccurate.

The following materials need to be prepared before verification:

T connector

trachea

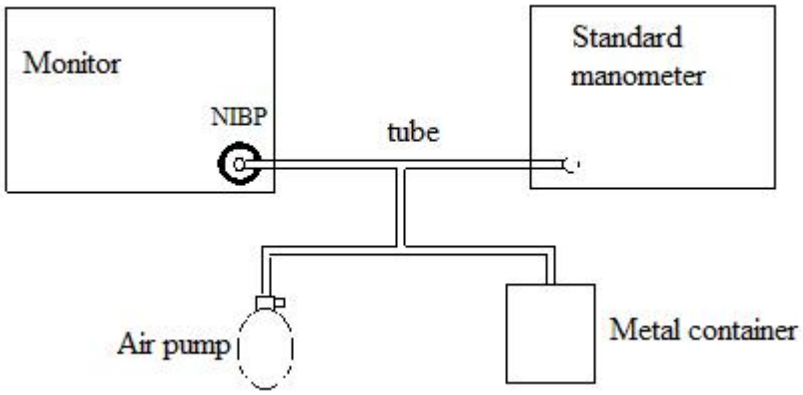
Ballistic air pump

Metal packagings :500±25 ml

• Standard manometer: has been calibrated, accuracy higher than 0.75mmHg

Check the steps as follows:

1.Connect the monitor, pressure gauge, spherical air pump and metal vessel as shown below.



2.Before inflating, the pressure gauge reading should be zero. If not zero, open the spherical pump valve so that the entire air path leads to the atmosphere and close the valve after the standard gauge reading is zero.

3.Select [main menu]→[maintenance >>][NIBP pressure test].

4.Check the readings of standard pressure gauges and monitors, both of which should show a pressure value of 0 mmHg.

5.The metal vessel is inflated by a spherical air pump with an internal pressure of up to 50 mmHg.; and stop inflating and wait 10 s to stabilize the measured value.

6.check the reading of standard pressure gauge and monitor, the difference between them should be within of ±3 mmHg .

7.The metal vessel is 7. inflated by a spherical air pump with an internal pressure of up to 200 mmHg.; and stop inflating and wait 10 s to stabilize the measured value. Repeat step 6.

If the reading difference between the pressure gauge and the monitor exceeds 3 mmHg, please contact the maintenance staff.

14.7 CO2 Calibration

Mainstream CO2 modules do not require calibration. The bypass CO2 module and the microflow CO2 module do not need to be calibrated daily, but at least once a year or when the deviation of the measured value is large. After the bypass CO2 module enters the full precision mode, it can be calibrated.

The following materials need to be prepared before calibration:

- Cylinders containing 6±0.05% concentration CO2 gas and N2 equilibrium gas
- T connector
- airway

The calibration steps are as follows:

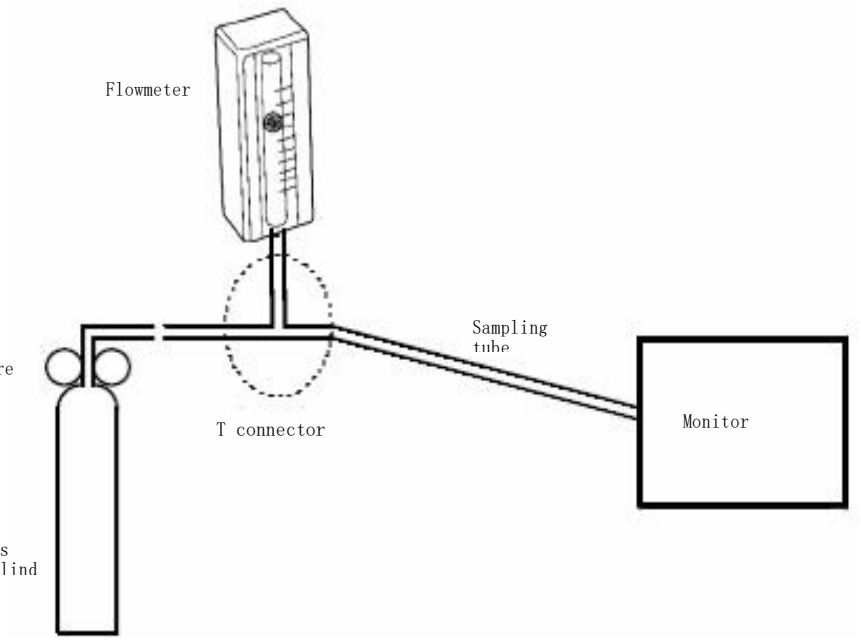
1. determine that the bypass CO2 module or the microfluidic CO2 module has been preheated or started.

2. check the gas path and check the air leakage to ensure that there is no leakage.

3. open [CO2 calibration] menu: select [main menu]→[maintenance >>]→ enter user maintenance password [CO2 module maintenance >>][CO2 calibration].

4. select [calibration] in the [CO2 calibration] menu]. Zero must be calibrated before calibration.

5. After zero success, press the following figure to connect.



6. open and adjust the pressure reducing valve switch so that the flow rate indicated by the Flowmeter is 10~50 mL/min, and remains stable.

7. in the box in the upper right corner of the [CO2 calibration] menu, select the concentration as the same value as the input gas concentration.

8. current measured CO2 concentrations will be displayed in the [CO2 calibration] menu. When the measured CO2 concentration is stable, the CO2 module is calibrated.

After the calibration is successful, the calibration success will be prompted on the CO2 Calibration menu! If calibration fails, prompt [calibration fails!] The calibration needs to be recalibrated.

Use an exhaust pipe to connect to the exhaust hole on the module to drain the calibrated gas into the exhaust gas treatment system.

14.8 Touch screen calibration (optional)

1. select [main menu]→[maintenance >>][touch screen calibration].
2. different positions on the screen will appear in turn.
3. click here the marked center point.
4. After calibration, the screen calibration is successful! Select [confirm] to complete the calibration.

Appendix I Product Specifications

I.1 monitor type

Standard Electrical Protection	I class with internal power
Standard electrical resistance	CF Application Section
Anti-liquid level	General sealing instrument, no function to prevent liquid from entering
Disinfection/sterilization methods	For more information, see chapter V.
Working methods	Continuous work

I.2 Monitor Specification

1.2.1 monitor size and weight

Weight (multiple models) 3.5~4.5(kg)

1.2.2 working environment

Temperature range

Work 5℃~40℃

Transport and storage temperature -20~50 C°

Humidity range

Work 15%~80%, no condensation;

Transport and storage of humidity ≤90%

Elevation

Work -500-4,600 m (-1,600-15,000 ft)

Transport and storage altitude -500-13,100 m (-1,600-43,000 ft)

Electrical specifications 220V AC 50/60 Hz, maximum input power 70 VA

F2AL 250V is the fuse

1.2.3 Display Information

Up to 6 waveforms

One alarm indicator (yellow/red)

One work indicator (green)

One battery charging status indicator (green)

Three sound alarm modes corresponding to the alarm state

1.2.4 batteries

rechargeable battery

Normal full power working time is more than 30 minutes.

1.2.5 recorder

Record width	48 mm
Paper speed	25 mm/S
Mapping Waveforms	2
Record type	8s real time record

1.2.6 review

Trends review

Short trends	1 hour, resolution 1 second or 5 seconds
Long-term trends	72 hours, resolution 1 minute ,5 minutes or 10 minutes
NIBP Measurement Review	400 NIBP survey data reviews

I .3 ECG specifications

1.3.1 Lead Configuration

Standard 3 or 5 cable

Three leads RA 、LA 、LL, lead mode: I ,I ,I I

Five leads RA 、LA 、LL 、RL 、V, lead mode: I ,I ,I I ,aVR ,aVL ,aVF ,V

1.3.2 gain ×0.25,×0.5,1,2, automatic

gain change less than 0.66% min per minute

Total gain change within 1 h is less than ±10 per cent

1.3.3 heart rate

3.3.1 heart rate range

Dogs/cats 15~350 bpm(beats/min)

3.3.2 accuracy ±1% or ±bpm Take the Great

3.3.3 resolution 1 bpm(beats/min)

3.3.4 Average heart rate

3.3.4.1 Mindray algorithm

Meet the requirements of YY1079 d 4.1.2.1. The average heart rate is calculated by the following methods:

When the last three consecutive RR intervals are greater than 1200 ms, the heart rate is calculated by averaging the four nearest RR intervals. Otherwise ,12 nearest RR intervals are taken, minus the maximum and minimum values, and then the average is taken to calculate the heart rate.

The heart rate displayed on the screen is refreshed once a second

I.3.4 I time baseline selection and accuracy

25mm/s (optional: 6.25mm/s 、12.5mm/s 、50mm/s)

Duration error: less than ±10 per cent

I.3.5 HR change response time

The heart rate increased from 80 to 120 bpm less than 12s

The heart rate was reduced from 80 to 40 bpm less than 12s

I.3.6 I heart alarm start-up time

Activation time of cardiac arrest alarm is less than 12s

Heart rate low alarm startup time less than 12s

High heart rate alarm startup time less than 12s

I.3.7 I Heart Rate Alarm Range

Upper limit (dogs and cats):17~350 bpm

Lower limit (dogs and cats):15~348 bpm

Resolution :1 bpm

Alarm limit error :±1% or ±1 bpm, larger

I.3.8 I electrical interference suppression

Heart rate changes less than ±10% compared to before interference

I.3.9 I overload protection

reater than 1V

I .3.10 QRS wave detection

Range of amplitude and width of QRS wave

Range (P-V RTI): 0.5~5 mV

Width (dogs and cats): 40~120 ms

No response to the following signals

Range (except dogs / cats working mode)(p-v RTI) less than 0.15 mV

Width of 1 mV (except dogs / cats working mode) less than 10 ms

I.3.11 power frequency voltage tolerance

greater than 100uV

I.3.12 Input Dynamic Range

The amplitude of input signal is less than ±5 mV

Rate (RTI) less than mV/s 320

DC bias voltage -300~300 mV

Change of output signal less than ±10% change

Failure to display (attenuation before display) less than ±50%

I.3.13 system noise

Less than 30μV

I.3.14 multichannel crosstalk

Less than 5 per cent

I.3.15 output display

Channel width greater than 30 mm

aspect ratio 0.4 s/mV

I.3.16 Reconstruction accuracy of I input signal

The total error of the system is less than ±20% or 100% μV larger

I.3.17 Frequency Response

Sinusoidal input frequency 0.67 Hz ~40 Hz, corresponding output response :0.67~40 Hz (attenuation-3dB)

Response to the input 20 ms width triangular wave: the peak amplitude attenuates from 0 to 25%.

Response to 0.3 mV ·s shocks outside impact range:

Offset (RTI): less than 0.1 mV

Slope (RTI): less than 0.3 mV/s

Electrode Weight Factor: Less than ±5%

Lag effect of offset 15 mm: less than 0.5 mm.

I.3.18 I sensitivity

>200μV (peak)

I.3.19 I input impedance signal attenuation (0.67 Hz to 40 Hz)

Less than 20 per cent

I.3.20 I bandwidth

Diagnostic mode 0.05~130 Hz

Monitoring Mode 0.5~40 Hz

Operation pattern 1~20 Hz

I.3.21 common-mode rejection ratio

Diagnostic mode dB >90

Monitoring Mode dB >100

Operation pattern dB >100

1.3.22 electrode polarization voltage range

±300 mV

1.3.23 suppression of fast ECG signals by pacemaker pulse detector

1V/s RTI, accuracy 5%, measured in accordance with clause 1.4.3 of YY1 079

1.3.24 baseline control and stability

Recovery time less than 3s after reset

Drift rate within 10s less than 10 uV/s

Baseline drift less than 500 uV within 1 h

Baseline drift less than 50 uV/C at operating temperature°

1.3.25 drift tolerance

Triangle amplitude (p-v RTI)4mV

QRS amplitude (p-v RTI)0.5mV

QRS wave width 100 ms

QRS wave repetition rate bpm 80

1.3.26 signal range

±8 mV (Peak)

1.3.27 calibration signal

1 mV(Peak), accuracy ±5%

1.3.28 ST segment measurement

Measuring range :-2.0 mV ~+2.0 mV

Measurement accuracy :-0.8 mV ~+0.8 mV the measurement error is ±0.02 or ±10% larger.Other ranges are not defined.

1.3.29 tall T wave suppression ability

Maximum T wave amplitude 1.2mV

I.4 breathing specifications

1.4.1 I measurement methods

RA-LL impedance method

1.4.2 I Respiratory Impedance Detection Range

0.3~3Ω

1.4.3 I base impedance range

200~4000Ω

1.4.4 I bandwidth

0.1~2.5 Hz

1.4.5 I respiratory rate

Scope

Dogs/cats	0~150 BrPM
Resolution	1BrPM
Precision	±2BrPM

1.4.6 I asphyxiation alarm

10~40 seconds

1.4.7 respiration, lead shedding detection and active noise suppression

DC current of active lead less than 0.1 uA

I.5 SpO2 specifications

For this product, blood oxygen probe and probe extension line are used to test the compliance of YY0784 standard with monitor.

measuring range: 0%~100%

Resolution： 1%

Precision Dogs: 70~100,±2

0%~69%, undefine

Cats: 70~100,±3

0%~69%, undefined

Pulse rate

Measuring range： 20 bpm ~300 bpm

Resolution： 1 bpm

Precision： ±3 bpm

Data update： 1s

The emission wavelength of blood oxygen probe is: red light 660±3 nm, infrared light 905±3 nm, emission light energy less than 15Information on wavelength ranges and emitting light energy is particularly useful for clinicians, such as photomechanical therapy.

I .6 TEMP specifications

1.6.1 applicable temperature sensor

YSI series, CYF series

1.6.2 number of channels

2 channels

1.6.3 measurement

Scope	0~50 C°
Resolution	0.1 C°
Precision	±°0.1 C (No sensor error included)

I .7 NIBP specifications

1.7.1 measurement methods

Pulse wave oscillation

1.7.2 work model

Manual/automatic

1.7.3 measurement interval in automatic measurement mode

1,2,3,4,5,10,15,30,60,90,120,180,240,480 minutes

1.7.4 Measuring time I continuous measurement mode

5 minutes

1.7.5 pulse rate range

40-240 bpm

1.7.6 measuring range and accuracy

Scope

Shrink pressure	40~270 mmHg
diastolic blood pressure	10~215 mmHg
Average pressure	20~235 mmHg

Static pressure range	0~300 mmHg
Static Pressure Accuracy	±3 mmHg
Blood pressure accuracy:	Maximum average error ±5 mmHg;
	Maximum standard deviation 8 mmHg

I .8 CO2 specifications

1.8.1 Side Flow

Preheating time: waveform display 2s; 25℃, full specification 10 min

Range: 0-114mmHg; 0-15.0%; 0-15kPa

Resolution :0.1 mmHg： 0-69mmHg; 0.25mmHg：70-150mmHg

Accuracy: 0-40 mmHg： ±2 mmHg

41-70 mmHg： ±5% reading

71-100 mmHg： ±8% reading

101-150 mmHg：±10% reading

Breathing frequency range :3-160/ min (BPM)

Breathing frequency accuracy :±1 breath

I .8.2 mainstream

Preheating time: waveform display 2 s;25℃, full specification 10 min

Range: 0-114mmHg; 0-15.0%;0-15kPa

Resolution :0.1 mmHg： 0-69mmHg;0.25mmHg：70-150mmHg

Accuracy: 0-40 mmHg： ±2 mmHg

41-70 mmHg： ±5% reading

71-100 mmHg： ±8% reading

101-150 mmHg：±10% reading

Breathing frequency range :3-160/ min (BPM)

Breathing frequency accuracy :±1 breath

I .9 IBP specifications

I .9.1 number of channels

Double channel

I .9.2 Pressure Name

APT,PA,CVP,RAP,LAP,ICP,P1,P2

I .9.3 measurement and alarm range

mmHg ART	0~300
PA	-6~120 mmHg
CVP/RAP/LAP/ICP	-10~40 mmHg

P1/P2 -10~300mmHg

I .9.4 Pressure Sensor

Sensitivity 5 uV/V/mmHg

impedance range 300~3000Ω

Resolution 1 mmHg

The accuracy ±2% or ±1 mmHg, Take the Great

Update about 1 minute

Statement:

Maintenance materials such as circuit diagram, component list, drawing notes, correction rules, etc., are only provided to qualified repair personnel and units trained by the factory.

The company can provide users with random documents and maintenance training materials by mail or other electronic documents.

Appendix II Quick Action Guide

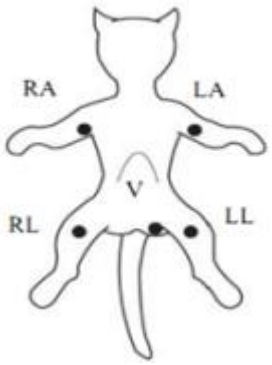
1. Preparation before use：

Connect the power cord, plug in the relevant accessories to the host, press the boot button to boot (hold down the lower left corner power switch for 2 seconds), check the state of the instrument after boot, the instrument enters the program for 40 seconds without abnormal alarm.

2. Accessories

Standard configuration of monitor accessories: ecg cable, blood pressure cuff, blood oxygen probe, temperature sensor;CO2 module (optional)

2.1 Schematic diagram of ECG wire connection



Lead Name	Color
RA	white
LA	black
LL	red
RL	green
V	brown

Figure 1.1 Five-lead connection method

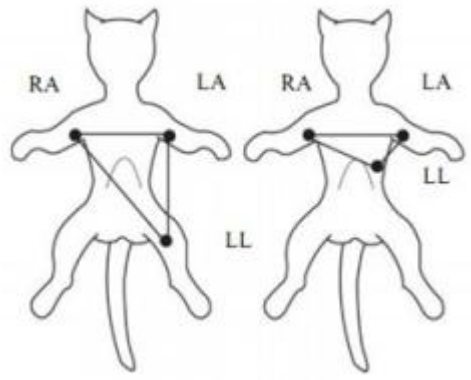


Figure 1.2 Three-lead connection method

When using the connection method shown in figure 1.2, go to the ECG setting (in the upper right corner of the LCD screen) and change < lead type > to < three-lead >.

The appearance of the ecg wire is divided into 5 threads (or 3 threads) from a main line, depending on the configuration.

2.2 Blood oxygen probe connection method

The blood oxygen probe shall be plugged into the blue socket corresponding to the machine.

The blood oxygen probe is clamped on the tongue of the animal, and one to two layers of sterile gauze can be added between the probe and the tongue. When pinching your tongue, try to pinch the base of your tongue. The ears do not need gauze.

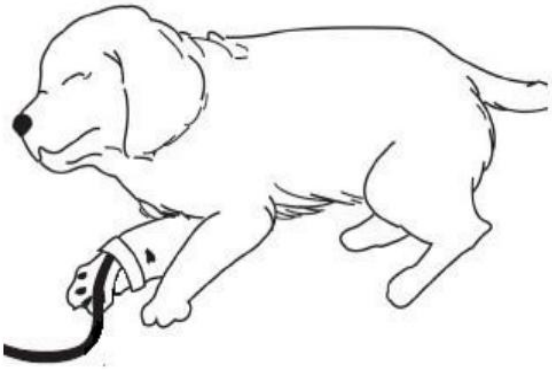
The blood oxygen probe can also be clipped to the animal's ear. There is no need to add gauze when pinching the ears. The clip is as close as possible to the base of the ear.

The blood oxygen probe will emit a red light, and the part irradiated by the red light must have arteries before the value can be measured. If no signal is detected, move the position of the blood oxygen probe in a small range. Only when the blood oxygen waveform is at equal intervals and the waveform is relatively regular can the value be stable.

2.3 Non-invasive Blood Pressure Connection method

It is recommended to measure the forelimbs of animals。

The cuff should be loosely tied rather than too tight. After the cuff is bound, a cylinder with a diameter of 0.2-0.5cm should be inserted between the cuff and the calf.



2.4 Temperature Connection Method

The routine measurement site for animal temperature is the rectum. Please insert the probe from the anus. Please disinfect in time after use. There are temperature jacks on the side or front of the machine, and some models are equipped with two jacks, which can be used at will.

2.5 Use of partial keys

How to use the knob: The monitor is equipped with a knob at the lower right corner. Rotate the knob to move the cursor. Press the knob to confirm and enter the function button.

Example: If you want to modify the blood pressure measurement to be automatic every 5 minutes.

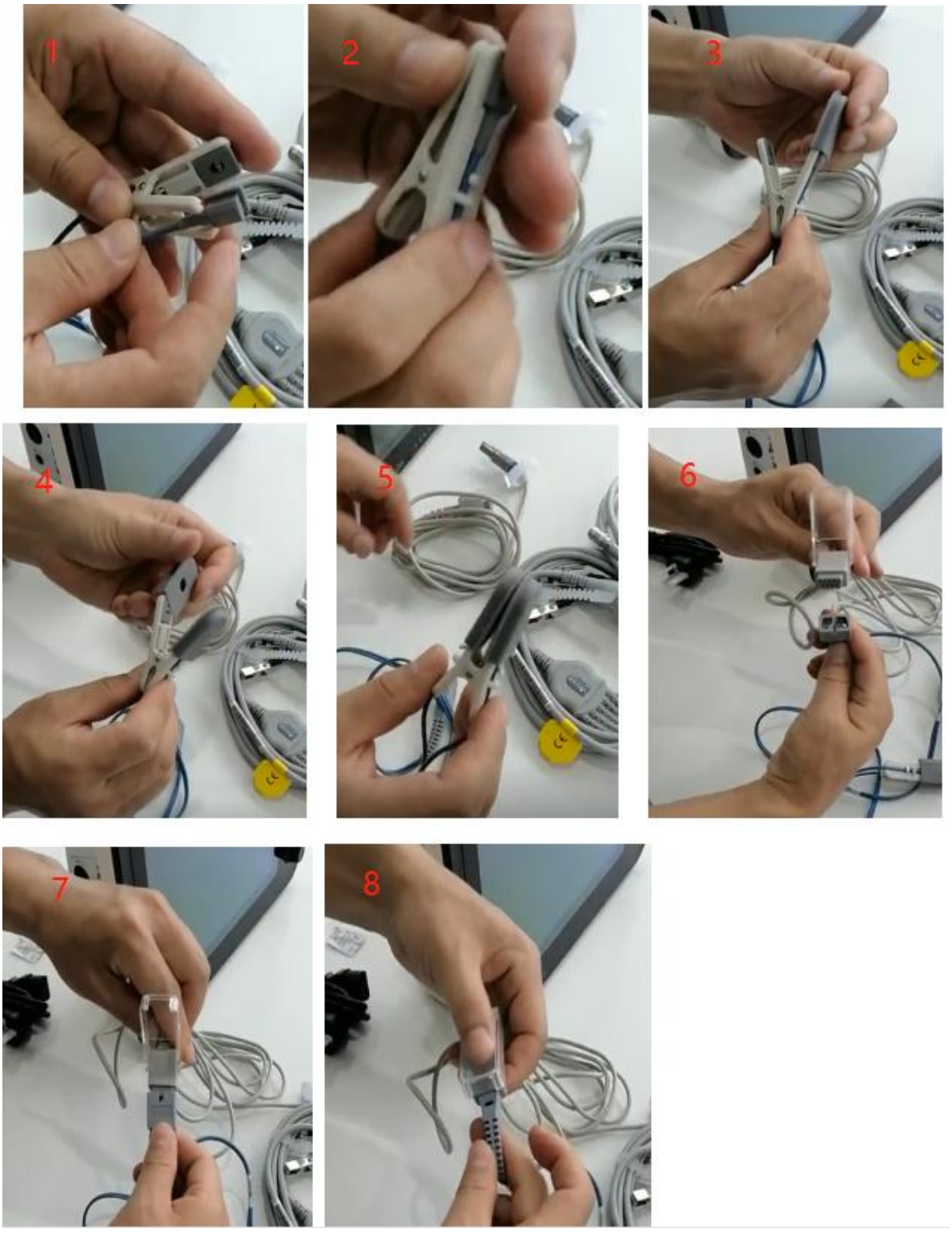
First, turn the knob to move the cursor to the <NIBP> position, press the knob to enter the <NIBP setting>, turn the knob to move the cursor to <interval time>, press the knob to enter

the setting, select <5 minutes>, press the knob To confirm, turn the knob to the <X> in the upper right corner of the pop-up window, and press to exit. The setup is complete.

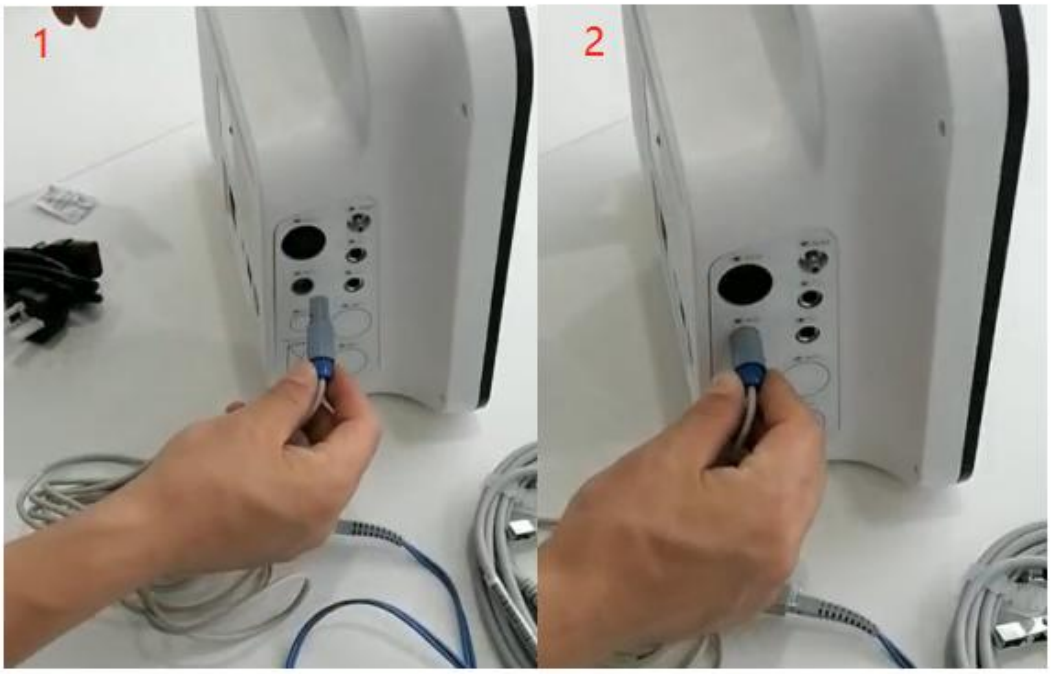
After connecting the cuff, press the <NIBP> button (there is this button on the right or below the instrument) to start the automatic pressure measurement function.

3、Installation diagram

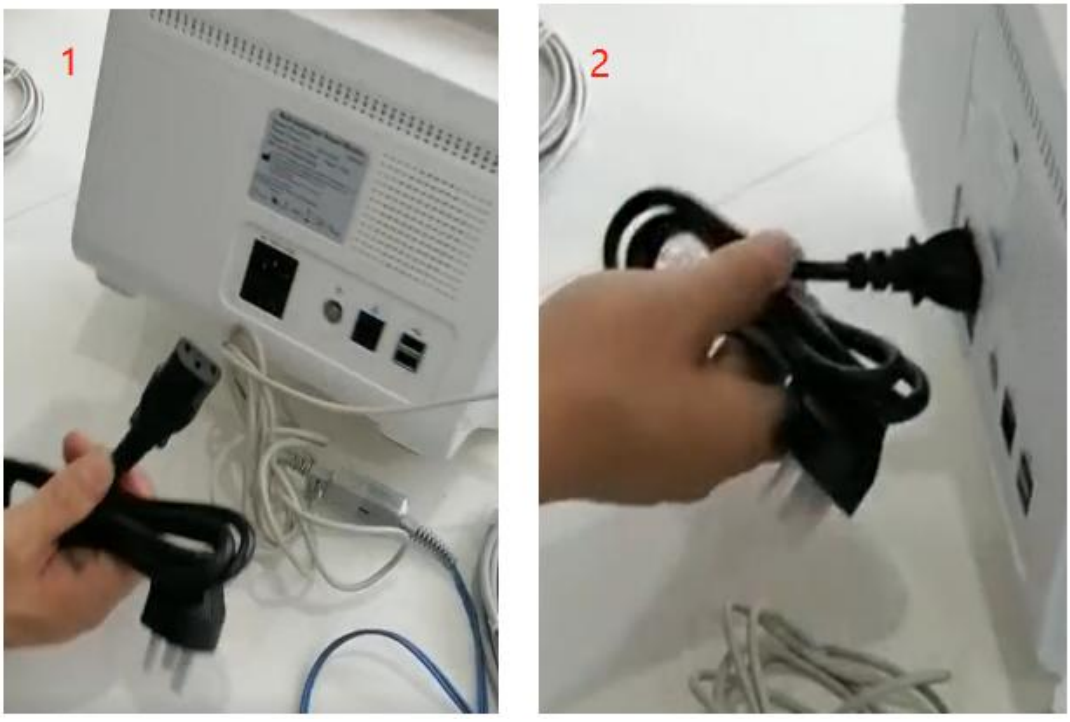
3.1 Oxygen probe assembly step：



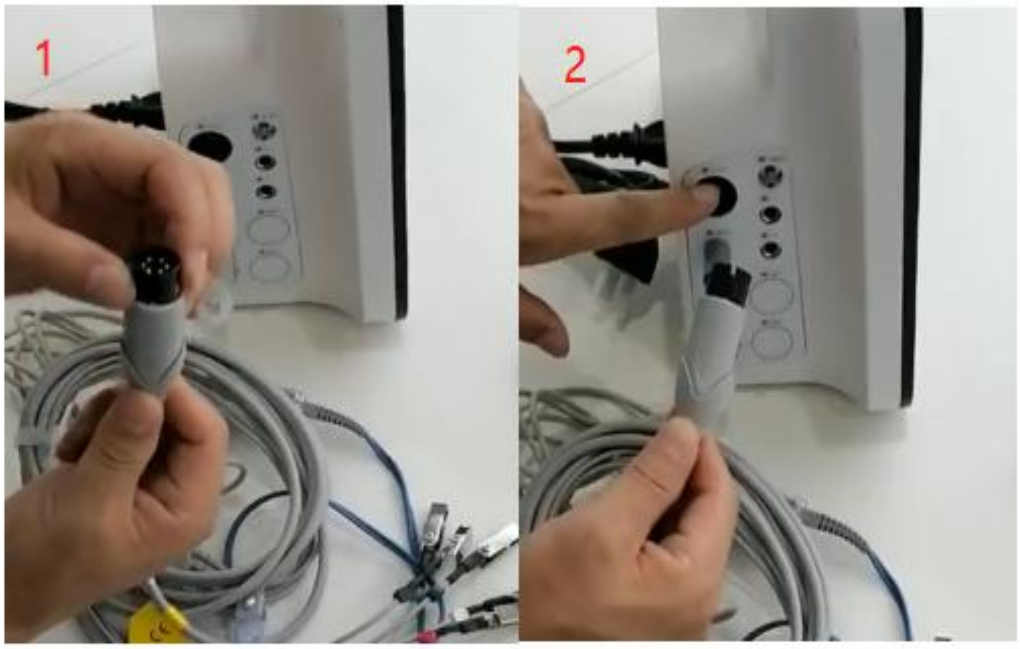
3.2 Blood oxygen interface：



3.3 Power interface：



3.4 ECG interface



3.5 Temperature interface：

3.6 Blood pressure interface：